Telecommunications Carriers' Forum

Report on Local Loop Unbundling and NDSL

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FOREWORD

Recent amendments to telecommunications legislation fundamentally change the shape and direction of New Zealand's telecommunications industry.

Under the new regime, Telecom is required to split into three business units – fixed network access, wholesale, and retail – each operating at arms length, with separate financial reporting. Telecom's separation plan must also ensure transparency and equivalence[1].

In addition, access to Telecom's local loop network is to be 'unbundled'. In practice, this means that non-Telecom service providers will be able to:

- Install and operate their own broadband equipment inside Telecom's exchanges and roadside cabinet, connecting directly to customers' lines;
- Sell to their customers Telecom's broadband services without requiring their customer to also buy Telecom calling or local access services;
- Install and operate their own transmission lines from Telecom roadside cabinets to Telecom exchanges, and from Telecom exchanges to their own network; and
- Use Telecom's transmission lines from Telecom roadside cabinets to Telecom exchanges, and from Telecom exchanges to their own network.

Significant technical and operational issues need to be addressed in implementing these changes, which impact on Telecom, other service providers, and the industry as a whole.

In consultation with the Government, members of the Telecommunications Carriers' Forum (TCF) and other industry participants agreed to establish two working parties to develop, in a two-phase process, codes of practice to address these technical and operational issues.

This approach of using well structured industry groups, working within clear parameters, is a common in other countries that have unbundled.

The TCF working parties on local loop unbundling and 'naked DSL' convened in early September 2006, and formed workshop groups that met weekly.

This report sets out the TCF's analysis and recommendations from phase one. It is a genuinely joint effort, synthesising inputs for every workshop group participant.

[1] Equivalence means that third party access seekers are treated in the same or an equivalent way to Telecom's own business operations, including in relation to pricing, procedures, operational support, supply of information, and other relevant services.

All the parties have participated extremely positively, working in a climate of intellectual openness and relative rigour, with a shared commitment to implementing unbundling in a timely and efficient manner.

The result is a high level of agreement on all but a few issues.

Interested parties are invited to make submissions on this report by 19 January 2007. The relatively short period for submissions reflects the fact that most of the interested parties are members or observers of the relevant TCF working parties, and have had the opportunity to be closely involved. The working parties' processes have also been transparent, with copies of minutes provided to all parties, and input papers posted on the TCF web site.

The timing also reflects the participants' shared sense of urgency and commitment to implement unbundling as soon as possible.

Phase one has created a strong platform for the phase two, in which the high level analysis and agreements from phase one are to be set out in more detailed technical and operational rules.

Phase two is due to start in early February 2007.

In late January, the TCF Board will meet to review submissions and, in discussions with stakeholders, set a timeline for completion of phase two.

As independent chair, it is my view that phase one has achieved its terms of reference, and the process is well placed to progress all of the technical and operational issues in phase two.

Tony Baldwin
Independent Chair
TCF Working Parties on Local Loop Unbundling and 'Naked DSL'

TELECOMMUNICATIONS CARRIERS' FORUM

The TCF was established as an incorporated society in August 2002. Its establishment was a response to the enactment of the Telecommunications Act 2001 which contemplates that an industry forum will form part of the wider framework for telecommunications regulation in New Zealand, with particular emphasis on the development of telecommunication access codes under Schedule 2 of the Act.

The purpose of the TCF is to facilitate co-operation amongst telecommunications carriers to encourage the efficient provision of both regulated and non-regulated telecommunications services, in order to promote competition in telecommunications markets for the long-term benefit of end-users in New Zealand.

The TCF welcomes the opportunity to co-ordinate the industries input into developing this report and the delivery of the codes in phase 2.

The TCF is experienced in code development and in recent times has developed codes relating to:

- The transfer of customers between service providers.
- Business rules, processes and network requirements required to enable local and mobile number portability.
- Radiocommunication co-location.

All of these codes have been reviewed and approved by the Commerce Commission or incorporated into Commerce Commission Determinations.

The consultation process is an important step in the TCF's code development process. The LLU/NDSL report is essentially a scoping document for the codes to be developed, and as such the TCF welcomes and encourages your feedback to assist in the preparation of robust and practical codes.

The following information can be found on the TCF's website at www.tcf.org.nz:

- Copies of the codes referred to in this report http://tcf.org.nz/outputs/?doc=f
- This report http://tcf.org.nz/outputs/?doc=n
- Links to additional information on LLU (found under the "Forum Outputs").

INTERPRETATION

List of Abbreviations

- ACCC - Australian Competition and Consumer Commission
- ADSL - Asymmetric Digital Subscriber Line
- ATM - Asynchronous Transfer Mode
- BT - British Telecommunications plc
- CBD - Central Business District
- CIR - Committed Information Rate
- DSL - Digital Subscriber Line
- DSLAM - Digital Subscriber Line Access Multiplexer
- GSP Gaining Service Provider
- EU - European Union
- FCC - Federal Communications Commission
- IP - Internet Protocol
- ISDN - Integrated Services Digital Network
- ISP - Internet or Independent Service Provider
- ISPANZ - Internet Service Providers Association of New Zealand
- ITU - International Telecommunications Union
- Kbit - Kilobit
- Kbit/s - Kilobit per second
- LSP Losing Service Provider
- LLU - Local Loop Unbundling
- LX - Local Exchange
- Mbit - Megabit
- Mbit/s - Megabit per second
- MDF - Main Distribution Frame
- MPF Metallic Path Facility
- NDSL Naked DSL

- NGN - Next Generation Network
- NNI - Network Node Interface
- NT - Network Terminator
- OECD - Organisation for Economic Co-operation and Development
- Oftel - Office of Telecommunications (UK)
- OSS - Operational Support System
- PDN - Public Data Network
- POTS Plain Old Telephone Service
- POI - Point of Interconnection
- POP - Point Of Presence
- PSTN - Public Switched Telephony Network
- QoS - Quality of Service
- RFS Ready for Service
- SDSL - Symmetric Digital Subscriber Line
- SL - Service Levels
- SLAs - Serve Level Agreements
- TCF Telecommunications Carriers' Forum
- TCL - TelstraClear Limited
- TCNZ - Telecom Corporation of New Zealand Limited
- TEBA - Telstra Equipment and Buildings Access
- UBS Unbundled Bitstream Service
- USAP - Unbundled Service Aggregation Point
- VoIP - Voice over Internet Protocol
- xDSL - Digital Subscriber Line. The 'x' refers to the DSL services in generic terms, e.g. encompassing ADSL (Asymmetric Digital Subscriber Line), HDSL - (High speed Digital Subscriber Line), SHDSL - (Symmetric HDSL), and VDSL (Very high speed Digital Subscriber Line)

Definition of Certain Terms

Act	means the Telecommunications Act 2001
Access provider	(a) means, in relation to a designated service or specified service, the person named or described in Part 2, or Part 3, of Schedule 1 of the Act as the access provider for the designated service or specified service; and (b) means, in relation to a service that is supplied under a registered undertaking, the person that provided the undertaking under Schedule 3A of the Act.
Access seeker	(a) means, in relation to a designated service or specified service, the person named or described in Part 2, or Part 3, of Schedule 1 of the Act as the access seeker for the designated service or specified service; and (b) means, in relation to a service that is supplied under a registered undertaking, a service provider who seeks access to the service and who complies with any conditions set out in the registered undertaking for eligibility for as an access seeker.
Bill	means the Telecommunications Amendment Bill as reported back to Parliament by the Finance and Expenditure Select Committee on 28 November 2006.
Bow Wave	means the expected initial bulk migration of customers as access seeker establish services in the LLU environment
Line	(a) means a wire or a conductor of any other kind (including a fibre optic cable) used or intended to be used for the transmission or reception of signs, signals, impulses, writing, images, sounds, instruction, information, or intelligence of any nature by means of any electromagnetic system; and (b) includes- (i) any pole, insulator, casing, fixture, tunnel, or other equipment or material used or intended to be used for supporting, enclosing, surrounding, or protecting any of those wires or conductors; and

(ii) any part of a line.

Local loop network	The Bill deletes the definition of 'local loop network'. Its boundaries are described under each 'designated access service' in Part 3 of Schedule 1 of the Bill.
Naked DSL	In practice, this means Telecom's UBS service without the end customer purchasing a local access or calling service
Network	means a system comprising telecommunications links to permit telecommunication
Telecommunication	(a) means the conveyance by electromagnetic means from one device to another of any encrypted or non-encrypted sign, signal, impulse, writing, image, sound, instruction, information, or intelligence of any nature, whether for the information of any person using the device or not; but (b) does not include any conveyance that constitutes broadcasting
Telecommunication link	means any line, radio frequency, or other medium used for telecommunication
Telecommunications service	means any goods, services, equipment, and facilities that enable or facilitate telecommunication
Unbundle	Neither the Act nor the Bill defines 'unbundled'. In its December 2003 report[2], the Commerce Commission referred to the Shorter Oxford Dictionary for a definition of 'unbundled elements' and concluded that the term did not require technology-specific definition.

[2] *Telecommunications Act 2001: Section 64 Reviews Into Unbundling The Local Loop Network And The Fixed Public Data Network: Issues Paper*, Commerce Commission, December 2003, at para 94

SUMMARY OF RECOMMENDATIONS

The summary of recommendations is as follows:

PART B – Technical Standards

Co-location Space Design

1. The TCF recommends:

   (a) The code should specify a particular co-location type as a default option for all exchanges, with criteria and a process to depart from the default for a particular exchange;

   (b) The default should be co-mingling, with the type of co-mingling to depend on the degree of any medium-term space restrictions. For any severe restrictions, the default could be co-mingled racks. For moderate restrictions, the default could be co-mingled rows. For low restrictions, the default could be co-mingled groups of rows;

   (c) The code would also set-out high level guidelines to which the access provider would prepare the site audit and design for the access seeker; and

   (d) An independent party should be appointed to:

      (i) arbitrate any disputes arising in relation to a space design proposal;

      (ii) approve a departure from the co-mingling default referred to above if it would have a material impact on other access seekers (including future access seekers).

Co-location Space Allocation

2. The TCF recommends:

   (a) Depending on forecasts, the initial 'bow-wave' of space requirements may need to be dealt with differently to ongoing requirements. For example, in the event of over-subscription for available physical co-location space, a scaling down of forecasts or an allocation of space based on relative priorities (via an independent third party) may be required, as referred to in Option 5 section 8.20.

   (b) For ongoing requirements, a first-come, first-served allocation approach with no maximum allocation specified, but a "use it or lose it" provision seems preferable. This should apply equally to

Telecom's LLU related equipment, with a consistent space reservation approach.

(c) Remote co-location options should be available where an access seeker is not able to obtain physical co-location space in the exchange or cabinet. The question of which party should meet the costs of transmission (tie cables or leased capacity) for remote co-location has yet to be considered.

3. Stage 2 of this project will address the detailed rules of the process recommended above and also whether there should be pro-rata rights to cabinet space to access seekers (including Telecom) with equipment in an exchange when the exchange is replaced. This approach would imply a minimum period for renting the copper.

Co-location Setup costs

4. The TCF recommends that the preferred model is determined in phase 2.

Co-location rights of Tenure

5. The TCF recommends:

(a) Option 1 in relation to tenure rights, with a 'use it or lose it' requirement is preferred. The desirability of this option will need to be confirmed in phase 2 following discussions around set-up cost allocation. If a monthly rental is preferred as the cost recovery method, then a minimum term may be needed to provide some certainty around cost recovery by Telecom;

(b) Except in emergency situations, Telecom should be required to give reasonable notice of any changes to its network that would affect an access seeker's co-location access tenure at an exchange or cabinet; and

(c) Reasonable notice should also be given of cabinetisation and cross-connect that may affect an access seeker's addressable market. The required notice period needs to strike a balance between ensuring certainty for access seekers and allowing improvements to the network to occur. The length of notice required before changes can occur will be discussed further in phase 2. As long as an exchange or cabinet is still operating, an access seeker should continue to have access to it.

Cable Management

6. The TCF recommends:

(a) ITO certification of people allowed to complete cabling, jumpers and MDF block installation;

(b) Telecom install, own and thus rent overhead iron work and cable trays;

(c) Telecom will pay for jumpering and cover cost through installation charge to access seeker;

(d) Access seekers to be responsible for their own installation of both cabling and equipment. They have control over quality and costs subject to minimum standards; and

(e) Standards will need to be set for cables and rack equipment used. This maybe integrated into the overall co-location design process.

Power Supply Management

Exchanges

7. The TCF recommends option 2 – that is, DC power supply is provided, and any requirement for AC power is arranged on commercial terms outside the regulated service.

Cabinets

8. The TCF recommends option 3: Both AC and DC power can be readily made available at the cabinet without incurring additional set up cost due to the confined space. However if an access seeker wants back-up power supply they must use Telecom's DC power supply.

Heat Management

Exchange Buildings

9. The TCF recommends option 3 if the billing costs can be minimised by using an agreed methodology. A key issue for phase 2 will be to agree on a method for billing heat management.

Roadside Cabinets

10. The TCF recommends that:

(a) Heat management (and power supply) will have to be considered as part of the whole cabinet regime, recognising that it is closely tied to issues of space availability; and

(b) The ongoing cooling charge be incorporated into the footprint charge, recognising that it will be very minor.

Premises and Cabinet Maintenance

11. The TCF recommends option 1, including a set of general obligations on the access provider along the lines in the BT LLU Reference Offer.

Equipment and Cable Maintenance

12. The TCF recommends:

    (a) Independent Training Organisation (ITO) for certification of people allowed to work on cabling, jumpers and MDF block installation;

    (b) Telecom to maintain all overhead iron work and cable, power systems and air conditioning;

    (c) Access seekers to be responsible for their own maintenance, quality and costs, subject to minimum standards;

    (d) Service Levels for notifications of planned work; and

    (e) Communication methodology using inter-NOC agreements for notifications of major works, as well as direct communications during any major outage affecting access seeker.

Access Rights to Telecom Facilities

13. The TCF recommends:

    (a) Use of an appropriate Independent Training Organisation (ITO) for certification of people able to access specific areas within an exchange;

    (b) PTW required to access the building, which is potentially linked to a live security controller in the future;

    (c) SL's for notifications of planned or unplanned access; and

    (d) Consultation with relevant government agencies on security issues relating to access.

Handover and Demarcation Points

Exchanges

14. The TCF recommends that the handover point for exchanges with co-location is option 2 – namely, an HDP on the MDF, for the reason that minimises installation costs and maximises space efficiency in the access seeker footprint.

Cabinets

15. The TCF recommends that the handover point in a cabinet with co-location is option 2 – namely on the cabinet distribution frame.

Exchanges with Remote Equipment

16. The TCF recommends that the handover point for exchanges with remote equipment is left for negotiation, recognising the right of the access seeker to access the MDF with the appropriate copper tie cable. The final solution will be driven by cost and accessibility. In any event, it is agreed that there must be a mechanism to ensure that access is available.

Cabinets with Remote Equipment

17. The TCF recommends that the handover point for cabinets with remote equipment is left for negotiation, recognising the right of the access seeker to access the distribution frame for the appropriate copper tie cable.

Backhaul Policy

Cabinet Backhaul

18. The TCF recommends that:

    (a) End-to-end Ethernet is provided where available. The service attributes such as CIR will need to be agreed as part of phase 2.

    (b) Details for agreeing alternatives for cabinet backhaul, when end-to-end Ethernet is not available, will be considered as part of phase 2.

    (c) The process for Telecom and the access seeker agreeing on an equivalent facility to handover cabinet backhaul will be considered as part of phase 2.

Exchange Backhaul

19. The TCF recommends:

    (a) End-to-end Ethernet interface is provided where available. The service attributes such as CIR will need to be agreed as part of phase 2. Where end-to-end Ethernet it is not available the TCF recommends that a menu of options be available;

        (i) Access provider to provide and deploy end-to end Ethernet (quote to be provided to access seeker prior to deployment)

        (ii) Access provider to provide an Ethernet interface; or

        (iii) Access seeker to provide its own interface.

(b) This process would also apply where there was insufficient existing backhaul capacity.

(c) The process for the access provider and an access seeker agreeing on the most suitable point of interconnection will be considered as part of phase 2.

Backhaul Interconnection

20. The TCF recommends that:

(a) The access provider provides co-location facilities for access seekers or their 3rd party suppliers on similar terms to co-location space for access seekers cabinet co-location.

(b) Exchange and cabinet cable entry arrangements be formalised in the code to provide:

(i) Neutrality and equivalence between the access provider and access seeker including their 3rd party backhaul suppliers in relation to LLU; and

(ii) Reasonableness in competitive opportunities for cabling remote co-location and co-location 'on' or 'around' Telecom premises.

Resource Management Act issues

21. At this stage, the TCF simply notes the menu of potential issues.

Liabilities

22. Many of these questions will be addressed in a commercial context. However, the issues also need to be considered in the context of an overall framework for LLU, and any other mechanisms parties may use to manage risk.

23. The TCF recommends that the options will be considered in further detail, where relevant, in phase 2 of this project.

PART C – Interference Management

24. The TCF recommends the following key next steps in relation to developing an industry agreed interference management plan:

(a) Further comprehensive impact measurement and data analysis in relation to crosstalk, which will include using a model being developed for Telecom by the University of Canterbury. The ACIF modelling tool is also available. Agreement will need to be reached

around the testing of cable crosstalk characteristics and the brief for any statistical modelling, to ensure the parties had confidence in and bought into the results;

(b) Completing Telecom's current process of categorising lines by attenuation ranges, to develop a better understanding of the characteristics of the New Zealand network;

(c) Obtaining industry feed-back on the policy trade-offs outlined above, and the preferred mix of interference management mechanisms; and

(d) Evaluating the relevant factors outlined above for each broad option, and reach agreement on the preferred option.

PART D - Operational Standards and Support Systems

Overview of Operation and Support Systems

25. The TCF recommends:

(a) The objective and framework set in the introduction to Part D;

(b) That as the NZ industry is already using electronic interfaces:

(i) A minimum standard of a web portal interface is required;

(ii) An electronic business-to-business interface is preferable, but it is for each access seeker to choose whether to interface in this manner; and

(iii) Business continuity plans are required in the event the system becomes unavailable for a defined period of time.

26. Ordering mechanisms for co-location products and backhaul be covered in phase 2.

Pre-ordering

27. The TCF recommends;

(a) A pre-order process is included in the code based on the high level design outlined above and that further work is undertaken in phase 2 to develop a process to apply where site investigation is required.

(b) A process needs to be developed in phase 2 for the provision of pre-launch information.

Ordering

28. The TCF recommends the principles set out in section 31.3 and recommends that:

    (a) The OSS is developed in accordance with the high level design specifications set out in Figures 12 to 20;

    (b) Where there are duplicate orders the access provider will process the first order received and reject successive orders unless that first order is withdrawn in time;

    (c) In phase 2 the code will need to further develop these design specifications and set out the actual service levels for provisioning timeframes. The indicative timeframes in section 31.13 reflect the TCF's understanding of current practice and broad expectations; and

    (d) Further consideration needs to be given to the possibility of creating a centralised system for the communication of authorisations between losing and gaining access seekers.

Customer Authorisations

29. The TCF recommends the customer authorisation process in the TCF Customer Transfer Code and the Local and Mobile Terms for Number Portability is used.

Batch Processing

30. The TCF recommends the objectives set in section 1.033.2 and recommends that a batch process be developed: Using the same electronic interface as the single line transfer;

    (a) Which enable orders to be grouped into batches depending on whether they relate to bulk migration or special projects; and

    (b) In accordance with the key design principles outlined in the report.

Faults Management

31. The TCF recommends:

    (a) The objectives and principles set out above;

    (b) The development of protocols for proactive diagnosis and management of faults in an LLU environment be explored in phase 2;

    (c) The fault process illustrated in the fault reporting section to apply for LLU;

(d) The current process for fault resolution of UBS services will form the basis of procedures for NDSL services;

(e) Further discussion is required on the definition of "no fault found" and the arrangements for the access provider to co-operate with the access seeker to remedy such faults and on the preferred approach for classification and monitoring the prioritisation of faults;

(f) As noted in section 34, faults resulting from interference have not been addressed in this report, however the procedures for dealing with such faults will need to be addressed in any codes developed in phase 2; and

(g) The current process for fault resolution of UBS services will form the basis of procedures for NDSL services.

Planned Maintenance and Permit to Work

32. The TCF recommends modifying Telecom's existing permit to work process to extend to cover access seekers in an LLU environment.

Billing

33. The TCF recommends:

(a) The billing data provided in an LLU/NDSL environment is delivered in a manner consistent with the key design principles outlined above; and

(b) Further work will be required in phase 2 to more clearly define the nature and format of the information to be provided.

PART E – Information Reporting

Overview of Information Requirements

34. The TCF recommends the high level objectives set out in Part E.

Pre-Launch Information

35. The TCF recommends option 3 (auditing some exchanges up front with the remainder on request). Further work is being undertaken to identify the first 20 exchanges which should be audited with the intention of commencing the audits early in the New Year.

Pre-Ordering Information

36. The TCF recommends:

(a) Until a customer authorisation has been provided, the access seeker will only be provided with the total number of available MPFs that could be readily delivered to the premises. This number will include both in-use and spare MPFs but they will not be separately identified.

(b) Further work is undertaken in phase 2 to consider options which allow the MPF identifiers for in-use MPFs to be obtained without the need to request this manually from the losing service provider. Consideration will need to be given to the level of customer authorisation required, and how to protect against competitor abuse of this information.

(c) Data calculated based on network records will be provided as the minimum requirement, with the ability for access seekers to have MPFs measured as an option, to be provided based on commercial terms.

(d) Only key information will be provided about the MPF, as the attenuation of the MPF (at one or more frequencies) was the only relevant and useful parameter, and providing full physical characteristics would drive cost through additional data management and/or testing requirements for little perceived incremental benefit.

37. The requirement for an access seeker to provide information on the characteristics of a MPF be further considered in phase 2. It is agreed, however, that if access seekers are required to provide measured MPF data, a key objective should be to minimise the industry cost to manage this data.

Forecasting

38. The TCF recommends:

(a) The proposal set out in sections 40.21 to 40.39 which includes:

(i) Access seeker providing forecasts for initial bulk migration within an agreed timeframe;

(ii) A set of forecast requirements in relation to business as usual scenarios; and

(iii) Distinction between space requirements and expected MPF and NDSL provisioning requirements.

(b) The details of this proposal will be further developed in phase 2.

Service Level Setting, Monitoring and Reporting

39. The TCF recommends:

(a) LLU/NDSL process performance reporting is expected to be predominantly reporting around the agreed service levels relating to the key technical and operational processes and interactions required between access seekers and the access provider, and any additional requirements of the regulator.

(b) In phase 2 service levels and associated monitoring and reporting requirements are established, including what the consequences may be of not meeting those service levels.

SUBMISSION PROCESS

Submissions on the report are invited from all interested parties.

If you wish to make a submission, it must be submitted by the **close of business on 19 January 2007**.

Please provide an electronic copy and 10 hard copies of the submission.

Submissions should be sent to:

Telecommunications Carriers' Forum
Box 302 469
North Harbour
Auckland

Tel: (09) 414 5552
Email: susan.wells@organisers.co.nz

All submissions will be treated as public information and placed on the TCF's website, unless clearly identified as containing confidential information.

PART A – INTRODUCTION

1 Legislative context[3]

Government's Policy Objectives

1.1 On 26 June 2006, the Government introduced into Parliament the Telecommunications Amendment Bill, which is intended to implement the Cabinet Policy Committee decisions of 3 May 2006[4]. These policy decisions are based the Minister of Communication's papers to Cabinet entitled "Telecommunications Stocktake"[5], and a "Telecommunications Implementation Review"[6].

1.2 The Government's goals are to:

(a) Increase broadband service uptake, and the timely availability of cost-effective broadband services, including advanced broadband services;

(b) Encourage investment in alternative infrastructure (such as fibre, wireless and satellite networks); and

(c) Future proof the regulatory environment to technology change and market dynamics.

1.3 A regulatory regime that pro-actively encourages vigorous competition for the long term benefit of end-users is the means by which these goals are to be achieved.

Bill's Key Features

1.4 Key features of the Bill as reported back to Parliament by the Finance and Expenditure Select Committee on 28 November 2006 ('the Bill') include:

(a) Designated access services – The Bill expands the range of regulated services to include (in summary):

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3 This section draws on various sources, including the Commerce Commission's submission of August 06 on the Bill, a public note of October 06 on the Bill by Simpson Grierson, various Cabinet papers, the Explanatory Note to the Bill, and the Bill itself

4 CAB Min (06) 15/3

5 Released with the above Cabinet Minute

6 The Implementation Review of November 2004, identified a range of potential amendments to the Act, including:

- Improvements to the process for resolving the key terms and conditions for regulated services;
- Increased flexibility in processes for, and duration of, regulated services; and
- Increased flexibility in the Minister's powers to avoid unnecessary delays in implementing Commerce Commission recommendations.

(i) 'Naked DSL' or NDSL – access to Telecom's fixed PDN that connects the end-user's distribution frame to Telecom's first data switch (other than a DSLAM), without having to buy any local access or calling services;

(ii) UBS backhaul – transmission capacity in Telecom's network between the trunk side of Telecom's first data switch (other than a DSLAM) connected to the end user's distribution frame and the access seeker's nearest point of interconnection;

(iii) Unbundled access to copper wires – access to Telecom's local loop network, including any relevant line in the exchange or cabinet;

(iv) LLU co-location – co-location facilities for an access seeker's equipment, and access to the handover point, at a Telecom exchange or cabinet, for the purpose of providing access to Telecom's unbundled local loop network;

(v) LLU backhaul (cabinets) – transmission capacity in Telecom's network between the handover point in Telecom's cabinet and the line side of the distribution frame in Telecom's exchange, for the purpose of providing access to Telecom's unbundled local loop network;

(vi) LLU backhaul (exchanges) – transmission capacity in Telecom's network between the handover point in Telecom's exchange and the access seeker's nearest point of interconnection, for the purpose of providing access to Telecom's unbundled local loop network.

1.5 Applications for determinations – The Bill allows access seekers to apply for determinations in relation to a regulated service, even if they already have a commercial arrangement for the supply of that service.

1.6 Standard terms determinations – The Bill introduces a standard terms determination process allowing the Commission to set access terms and conditions for regulated services for multiple access seekers. The Act currently only allows determinations to be made on a bilateral basis.

1.7 Undertakings – The Bill enables the Commission to accept binding commitments from access providers as an alternative to regulation. However, the Act does not specifically provide for such undertakings

1.8 Monitoring – The Bill empowers the Commission to continuously monitor the performance and development of the telecommunications sector and/or specific telecommunications markets.

1.9 Information disclosure regime – The Bill establishes an information disclosure regime that will require access providers to periodically

disclose certain information prescribed by the Commission, with a view to enabling access seekers to monitor compliance.

1.10 Operational separation of Telecom – The Bill requires Telecom to establish and maintain three operationally separate business units:

(a) A fixed network access services business unit (which may provide a wholesale function for those services), with an independent oversight group;

(b) One or more business units which must provide a wholesale function for all relevant services (except for those that were allowed to be provided by the fixed network access services business unit);

(c) One or more other business units (for example, retail)

1.11 Accounting separation of Telecom - Telecom is also to prepare and disclose information about its network, wholesale and retail business units as if they were separate entities. The primary objective is to improve the financial and economic transparency of regulated activities.

1.12 Enforcement – The Bill enables the Commission to take direct enforcement action, and provides the Commission with a wider range of enforcement tools. New penalty provisions allow for a maximum fine of $10,000,000 for breach of the operational separation requirements, $1,000,000 for breach of accounting separation requirements, and $300,000 for any other case. Further penalties may also be imposed for continuing breach.

1.13 Codes – The Bill enables the Commission to prepare access codes, in addition or as an alternative to the Telecommunications Industry Forum.

Approach to Broadband

1.14 The Government's broadband package is based on the 'ladder of investment' concept[7]. With the addition of access products along the broadband value chain, access regulation is intended to support market entry at progressively deeper levels of the access provider's fixed network.

1.15 Under the Bill, the pricing principles are:

[7] In Appendix 1 at paras 15 and 23 of its Aug 06 submission on the Bill, the Commerce Commission describes 'a ladder of investment' strategy "as a regulatory approach to access regulation consistent with the investment incentives of both the incumbent and its competitors. It is essentially a mechanism designed to encourage 'facility-based competition' at the deepest level for assets which are replicable"…."Flexibility and adaptability of regulatory intervention are paramount for promoting infrastructure-based competition via the ladder of investment. They are required to ensure that the economic space between different rungs is such that competitors can replicate the equivalent service of the incumbent and hence have an incentive to undertake investments. As entrants move up, their reliance on the incumbent network and bitstream products decrease. The corollary of increased facility-based competition is that some access regulation can be withdrawn".

(a) ‘Retail minus avoidable retail costs’ for UBS (plus a cost increment for unrecovered local loop costs for NDSL); and

(b) Forward-looking ‘cost-based’ for local loop unbundling.

1.16 The Bill also includes a specific provision directing the Commission to consider the relative price of the local loop unbundling compared to UBS when setting the UBS price and vice versa.

1.17 For the avoidance of doubt, pricing issues are beyond the scope of the TCFs’ terms of reference.

2 Telecommunications Carriers' Forum Working Parties

Formation

2.1 In consultation with the Government, Telecommunications Carriers' Forum (TCF) members and other industry participants agreed to establish, under the TCF's rules[8], two working parties to develop, in a two-stage process, codes of practice covering technical and operational standards for the implementation of local loop unbundling and NDSL in New Zealand.

Purpose

2.2 It is intended that industry agreement on these non-price terms will be turned into codes that would:

(a) Form the basis of any commercial offers presented by the access provider to access seekers in the case of bilateral issues (such as forecasting and provisioning rules); or

(b) Become an enforceable multilateral code in the case of multilateral issues (such as interference management rules).

2.3 It is possible that the outputs of the TCF could be developed into a code under the Act; however this has not been included in the TCF's scope of work at this stage.

Phase 1 objectives

2.4 In phase one, the TCF is to prepare a report that:

(a) Identifies the scope and depth of work required;

(b) Specifies the technical, operational and business requirements in each area;

(c) Provides a high-level draft design brief covering each area, in accordance with the Standard Access Principles in the Act;

(d) Sets out the most likely alternative approaches, and the rationale behind them, where the members of the Working Party have been unable to reach full agreement on a particular issue;

(e) Draws on overseas experience, utilising members' internal expertise, and adapting that experience to the New Zealand environment;

[8] See out at http://www.tcf.org.nz/about/governance.php

(f) Identifies any 'quick win' opportunities;

(g) Identifies a list of issues, risk and unknown items that will need to be addressed during the second phase; and

(h) Provides a framework for phase two, including a timetable and budget to deliver voluntary codes, if there is industry support for continuing with this multilateral process.

TCF Working Party Membership

2.5 The members of the Working Parties are:

Technical Standards Working Party	
Organisation	**Name**
CallPlus Services Limited	John Butt
Commerce Commission	Adam Hibbs
Convergex Limited	John Humphrey
Econet Wireless	Andrew Davis
Econet Wireless	David Rauscher
Ihug	David Diprose
InternetNZ	Jordan Carter
MED	Nancy So/Sean Mosby
Orcon Internet NZ	Thomas Salmen
Siemens (NZ) Limited (Orcon Internet NZ Representative)	Charlie Boyd
Telecom New Zealand Limited	Chris Dhyrberg
Telecom New Zealand Limited	Mike Moran
Telecom New Zealand Limited	Kevin Mason
Telecom New Zealand Limited	Lawrence Watson
TelstraClear Limited	John Davenport
TelstraClear Limited	Wendy Dodd
TelstraClear Limited	Dr Phil Potter
Kordia Limited	Susie Stone
TUANZ	Ernie Newman
Vector Communications Limited	David Robinson
Vodafone New Zealand Limited	Sathyendran Arasaratnam
Vodafone New Zealand Limited	Nik Kitson
Woosh Wireless	Nick Clarke

Operational Standards Working Party	
Organisation	**Name**
CallPlus Services Limited	John Butt
Commerce Commission	Adam Hibbs
Convergex Limited	John Humphrey
Econet Wireless	Andrew Davis
Econet Wireless	David Rauscher
Ihug	Catherine Dent
Ihug	David Diprose
InternetNZ	Jordan Carter
MED	Nancy So/Sean Mosby
Orcon Internet NZ	Mark Mackay
Orcon Internet NZ	Desman Chan
Siemens (NZ) Limited (Orcon Internet NZ Representative)	Matt Clark
Telecom New Zealand Limited	Chris Dhyrberg
Telecom New Zealand Limited	Mike Moran
Telecom New Zealand Limited	Rex Haslip
TelstraClear Limited	Craig Young
Kordia Limited	Susie Stone
TUANZ	Ernie Newman
Vector Communications Limited	Kevin Oswin
Vodafone New Zealand Limited	Sathyendran Arasaratnam
Vodafone New Zealand Limited	Nik Kitson
Woosh Wireless	Nick Clarke

2.6 The TCF Working Parties' terms of reference and membership criteria are set out in Appendix 1. Pricing, detailed design, and implementation are excluded from the scope of work.

2.7 The TCF Working Parties had their first meeting on 5 September 2006 and this phase-one report was submitted to the TCF Board on 15 December 2006 in accordance with the project time-line.

Workshop groups

2.8 The original project proposal contemplated two TCF Working Parties each with relatively large numbers meeting for half a day every two weeks. After two meetings on 5 and 19 September, the Working Parties divided into four Workshop Groups[9]:

[9] Some issues, like legal policy issues – including dispute resolution, enforcement, and any liability for non-performance – have yet to be addressed in any detail. These are matters for phase two of the project

(a) 'Physical Interface' – including co-location, cable management, backhaul and faults;

(b) OSS – including Service Levels and performance monitoring;

(c) Spectrum Management; and

(d) Information disclosure[10].

2.9 The aim of this approach was to:

(a) Progress key work-streams in parallel;

(b) Deploy joint resources and expertise as efficiently as possible, matching issues and expertise more closely;

(c) Create smaller, tighter groups to facilitate more active discussion;

(d) Follow a consistent and robust analytical methodology across the full suite of issues to be addressed; and

(e) Promote a climate of intellectual openness and rigour.

2.10 The strategy has been to proxy project team approach, such as an individual company may follow deploying an optimal mix of in-house and external expertise.

2.11 The meeting frequency was increased from three hours every fortnight to around five hours a week for each group. This up-scaling was strong demonstration of commitment from participants and their supporting organisations.

Opportunity to participate

2.12 Some parties attended the initial TCF Working Party meetings, but then elected to not attend the Workshop Groups. However, non-participation in a Workshop Group did not exclude or limit the flow of information, or the ability to input. All parties were sent copies of minutes and papers. Key inputs from participants were posted on the TCF's web site. And participants were invited to participate in the penultimate Workshop Group meetings which considered this report as a draft.

Approach

2.13 Each Workshop Group followed a common set of steps in considering the issues – namely:

(a) Define the meaning of key terms (to ensure a common understanding of scope);

[10] After a few meetings, this group was folded into the OSS Workshop Group

(b) Agree objectives relevant to the particular issue;

(c) Define each issue (including a range of specific scenarios), seeking clarity on the particular problem to be addressed;

(d) Specify possible options to address each issue;

(e) Evaluate each option against a common set of criteria (outlined in the analytical framework section of this report); and

(f) Set out the menu of options in a ranked order based on results of evaluation against criteria, considering alternative combinations of options.

Overseas experience

2.14 Lessons from overseas experience are set out in a report by Gilbert + Tobin and Political Intelligence for the European Commission[11]. These include:

(a) Under estimation of the complexity of the technical and operational difficulties of LLU;

(b) Under estimation of the competitive implications of the technical and operational issues of LLU;

(c) Not providing appropriate boundaries and balances around industry self-regulatory processes to address technical and operational issues;

(d) Over-expecting 'quick wins'[12];

(e) Unrealistic time-lines: Overseas, expectations of the time required to implement LLU varied between incumbents and new entrants. The incumbents thought that implementation would take up to 18 months. The new entrants thought it could be completed within 6-9 months. An expert is quoted as saying the implementation from commencement of the design of the business rules through to commissioning of the electronic interfaces for inter-operator systems would take 14-18 months[13].

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[11] "Operational Implications of Local Loop Unbundling and the Need For Technical Co-Ordination", Gilbert & Tobin and Political Intelligence, September 2001, pages 4-8.

[12] The Director General of Telecommunications in the United Kingdom, with the benefit of hindsight given the difficulties encountered in that country, is reported as saying that "LLU is one of the most complex pieces of regulation that OFTEL has undertaken in recent years, as it has proved to be in all countries where unbundling has taken place." Similarly, the Authorité de Régulation de Télécommunications in France acknowledged that there was no real alternative to the process of negotiation undertaken with France Telecom

[13] The same report notes that the required implementation period depends on the sophistication of the required solution, particularly in relation to interfaces for operational support systems (OSS). LLU could be implemented in 6 months or less if inter-operator processes mainly relied on manual systems. However, manual inter-operator systems may prove "too crude" to make LLU effective, both for the incumbents

(f) 'Blame game': The report notes a pattern of disputes overseas between incumbent and new entrants in establishing LLU, each blaming the other for delays or difficulties.

(g) Balance of roles: The report concludes that, while implementation of LLU has not been easy in any country, it certainly has been less contested between incumbents and new entrants in some countries than others. LLU implementation will proceed more effectively if the regulator takes an active role, but there are clear limits to how much a coercive regulatory system can achieve, especially at the level of detail required for LLU. LLU and other wholesale services seem more likely to be successful if the regulatory system, rather than "flogging the incumbent forward", can develop a better mix of "carrots and sticks". The experience in countries which already have implemented LLU suggests that many of the technical and operational issues are likely to be resolved more quickly and more beneficially for the new entrants if the incumbent can be encouraged and has the opportunity to develop a stronger wholesale mentality.

(h) Technical and operational issues: The report recommends these issues should be principally addressed by a several industry-based working groups, chaired by a neutral party, working within clear regulatory criteria.

Outcomes to date

2.15 The TCF has been mindful of these overseas lessons, and adopted an approach that seeks to avoid the pitfalls.

2.16 A key factor in the current NZ environment is that the incentives of the Working Party members' seem to be relatively well aligned, particularly in relation to making timely progress on developing efficient industry solutions to technical and operational LLU issues.

2.17 The result is that the TCF has achieved the goals outlined above, and reached unanimous agreement on the main LLU elements relating to 'physical interface' and operational service standards to the level that these issues have been addressed in this scoping stage. Resolution of a limited number of issues and the detail around all agreed issues has been referred to phase 2 for further work.

2.18 The Interference Management Workshop Group met less frequently than the other groups. In addition, much of the available time was taken up building a common understanding of the complex technical detail, then trying to distil it into a clear public policy framework. Progress has been made in this regard, which is set out in a later section of this report. Further progress is achievable. Submissions around the policy

because of the inefficiencies of the processes and for the new entrants because they would not be in a position to effectively compete in downstream markets against the incumbent.

trade-offs are being sought to provide direction around the broad approach that the Workshop Group should take to an interference management plan.

3 Analytical Framework

Relevant criteria

3.1 Schedule 2 of the Act sets out the criteria and process to be followed for a code to be approved under the Act. While it has yet to be decided whether a voluntary code developed by the TCF for LLU technical and operational standards will become a 'telecommunications access code' under the Act, the TCF has based its analytical framework on the requirements for code approval under the Act.

3.2 Among other things, Schedule 2 of the Act requires a draft code to[14]:

(a) Be consistent with applicable access principles and any regulations made in respect of the applicable access principles;

(b) Be consistent with the purpose set out in section 18 of the Act;

(c) Comply with the Commerce Act 1986; and

(d) Not directly provide for the implementation and final pricing principles and any regulations relating to those principles.

3.3 The TCF's intention is to satisfy these requirements.

Standard access principles

3.4 Standard access principles for designated access services and specified services, which are set in out in Schedule 1 of the Act (with the Bill's proposed amendments), are as follows:

(a) principle 1: the access provider must provide the service to the access seeker in a timely manner:

(b) principle 2: the service must be supplied to a standard that is consistent with international best practice:

(c) principle 3: the access provider must provide the service on terms and conditions (excluding price) that are consistent with those terms and conditions on which the access provider provides the service to itself:

(d) principle 4: the access provider must, if requested, provide an access seeker with information about a designated access service or specified service at the same level of detail, and in the same time frame, that the access provider would provide that information had it been requested by one of its own business units.

[14] Paragraph 2(2), Schedule 2 of the Act

3.5 These principles are limited by the following factors:

(a) reasonable technical and operational practicability having regard to the access provider's network:

(b) network security and safety:

(c) existing legal duties on the access provider to provide a defined level of service to users of the service:

(d) the inability, or likely inability, of the access seeker to comply with any reasonable conditions on which the service is supplied:

(e) any request for a lesser standard of service from an access seeker.

3.6 In addition, principle 4 does not extend to information about any identifiable individual customers of the access provider, and is subject to the requirement that any confidential information provided to the access seeker, in accordance with that principle, must be kept confidential to that access seeker.

3.7 In relation to the designated access service relating to co-location, limits on the standard access principles apply "with the additional limit of the interests of other service providers who are co-located in the relevant facility"[15].

Section 18 purpose

3.8 The purpose statement in section 18 of the Act provides:

(a) The purpose of this Part and Schedules 1 to 3 is to promote competition in telecommunications markets for the long-term benefit of end-users of telecommunications services within New Zealand by regulating, and providing for the regulation of, the supply of certain telecommunications services between service providers.

(b) In determining whether or not, or the extent to which, any act or omission will result, or will be likely to result, in competition in telecommunications markets for the long-term benefit of end users of telecommunications services within New Zealand, the efficiencies that will result, or will be likely to result, from that act or omission must be considered.

3.9 The Commerce Commission's "Guide to the Role of the Commerce Commission in Making Access Determinations under the Telecommunications Act" ('the Guide')[16] indicates how the Commission

[15] Amendment in the Bill to Part 2 of Schedule 1

[16] Guide to the role of the Commerce Commission in making Access Determinations under the Telecommunications Act., Commerce Commission, [28 May 2002]

expects to interpret the section 18 purpose statement, which includes interpretation of a number of the economic terms as well as certain legal terms. To summarise[17]:

(a) Promotion of competition: New entry is a key factor in the promotion of competition. Competition will be promoted where efficient access prices provide the potential entrant with incentives for entry which neither encourage inefficient entry nor deter efficient entry[18].

(b) Long-term benefit of end users: This will generally be promoted by sustainable lower prices, higher quality of service and greater choice. There may be trade-offs between these.

(c) Efficiency: In determining whether or not, or the extent to which, any act or omission will result in competition for the long-term benefit of end-users of telecommunications services, the Commission must consider the efficiencies that may result from that act or omission. There are three forms of efficiency: allocative efficiency, productive efficiency and dynamic efficiency. These are considered in more detail below.

(d) Trade-offs: The Commission may face trade-offs in attempting to achieve the Act's purpose, including trade-offs between the three different forms of efficiency. The Commission takes the view that dynamic efficiency will generally better promote competition for the long-term benefit of end users.

(e) Regulatory risk and its management: The Commission will need to manage risks associated with regulatory intervention.

3.10 In Part IV of the Guide, the Commission states that, in considering whether to recommend an amendment to the list of designated or specified services, it may have reference to:

(a) The extent and speed of deployment of telecommunications services in overseas jurisdictions.

(b) The extent to which technology has an impact on the dynamics of competition.

3.11 When assessing the extent to which acts or omissions will result in competition and the efficiencies which will result from them, the Commission will consider the costs and benefits associated with them, compared to the counterfactual.

[17] Telecommunications Act 2001: Section 64 Reviews Into Unbundling The Local Loop Network And The Fixed Public Data Network: Issues Paper, Commerce Commission, April 2003, paras 42-49

[18] Noting that pricing is not within the Working Parties' terms of reference

Other relevant terms

3.12 The section 18 purpose statement refers to promoting competition in telecommunications markets for the "long-term benefit of end-users". The Commission has considered these terms as follows:

(a) End users: Section 5 of the Act provides that an end-user, in relation to a telecommunications service, means a person who is the ultimate recipient of that service or of another service whose provision is dependent on that service. In its determination on interconnection services (Decision 477)[19], the Commission expanded on this:

The end-user is therefore the ultimate user or consumer of telecommunications services. The end user includes not simply subscribers but telephone *users more generally. Therefore the Commission must have regard to the long-term benefit of the ultimate consumers of telecommunications services when making an access determination.*

The ultimate consumers will include both residential and business users.

(b) Long term: In the Guide, the Commission notes that the long-term benefit of end-users will generally be promoted where prices are lower on a sustainable basis, there is a higher quality of service and greater choice[20].

Types of efficiency

3.13 The purpose statement in section 18 of the Act requires the Commission to consider efficiency effects. In Part III of the Guide, the Commission notes that there are three forms of efficiency: allocative efficiency, productive efficiency and dynamic efficiency. For completeness, the Commission's interpretation[21] of each efficiency in relation to telecommunications markets is set out below.

3.14 The TCF has considered these efficiencies on a broad qualitative level in relation to the technical and operational options for LLU, within the constraint of not directly addressing pricing elements.

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[19] Determination on the TelstraClear Application for Determination for Designated Access Services, Decision 477, Commerce Commission, 5 November 2002

[20] In its April 2003 Issues Paper (at para 47), the Commission points out, by way of comparison, that the ACCC uses the following approach, "the long term is not a set period, but rather the time taken for the substantive consequences of a declaration decision to unfold." Telecommunications Services – Declaration Provisions: A guide to the declaration provisions of Part XIC of the trade Practices Act, ACCC, July 1999

[21] From Telecommunications Act 2001: Section 64 Reviews Into Unbundling The Local Loop Network And The Fixed Public Data Network: Issues Paper, Commerce Commission, April 2003, paras 179-188

Allocative efficiency

3.15 This occurs where service providers use their resources to produce the telecommunications services most valued by end-users.

3.16 Where natural monopolies exist, market demand can be met at lowest costs by one firm because of the large fixed costs involved in production. In the absence of any regulation, a monopolist will generally set prices above economic cost. Depending on the ability of the monopolist to price discriminate, this is likely to lead to some loss of allocative efficiency as some consumers do not receive the quality of service they desire, even though they would be willing to pay the additional cost of providing the service.

3.17 As noted in the Guide, the features of the telecommunications industry make it hard to apply simple concepts of allocative efficiency where efficient prices would be expected to be close to marginal costs. In industries which involve a high proportion of fixed costs, average costs tend to decline across the relevant range of output. If average costs are declining, marginal cost will be below average costs. Setting prices at marginal cost would therefore generally result in the business failing to recoup costs.

3.18 A qualitative assessment of the impact of regulation on allocative efficiency may need to be made. For example, where there is spare capacity in the network with no assigned or planned use and if an access provider is obliged to release it, it may lead to an improvement in allocative efficiency.

Productive efficiency

3.19 This occurs where service providers produce telecommunications goods and services at lowest cost. An improvement in productive efficiency increases welfare by freeing up resources for other purposes. There may be factors that work both to reduce and to increase costs as a result of unbundling regulation, e.g. opening up access markets may put downward pressure on costs, but this could be offset by an increase in transactions costs.

Dynamic efficiency

3.20 The Commission will need to consider whether benefits to end-users through increased competition are likely to be short lived or whether, for example, they may be outweighed by losses to reduced innovation and investment by operators over time. Dynamic efficiency occurs where service providers invest, innovate and improve telecommunications services, increase productivity and lower costs through time.

3.21 As noted above, the Guide also clarified the Commission's interpretation of long-term benefits of end-users:

> The long-term benefit of end-users will generally be promoted by lower prices on a sustainable basis, higher quality of service, and greater choice.

3.22 Benefits to end-users are therefore interpreted in economic terms. Lower prices, on a sustainable basis, higher quality and greater choice are the end results of the promotion of competition.

3.23 Underlying this, the Commission will need to consider the factors likely to promote dynamic efficiency, including:

(a) Investment: Efficient infrastructure investment makes an important contribution to the promotion of the long-term interests of end-users. It can lead to more efficient methods of production and enhance the level and diversity of services to end-users. The impacts may vary depending on the type of investment in question.

(b) Innovation: Innovation can increase the quality and choice of telecommunications services. Innovation takes a number of forms, e.g. process innovation, service innovation, technological innovation, and marketing innovation. The Commission will consider the extent to which technology has an impact on the dynamics of competition.

(c) Productivity through time: The Commission will consider the impact on productivity in the two states of the world, e.g. whether the act or omission will increase productivity and lower costs through time or whether regulation would reduce productivity through time, for example through reduced economies of scale or scope

TCF's Evaluation Criteria

3.24 Any designated LLU and NDSL services will be made up of many elements, including those considered later in this report. Within each element, various options are available. These can be assembled in a variety ways that will meet the standard access principles ('SAPs').

3.25 At least two levels of evaluation are therefore relevant to the Working Parties' analysis:

(a) Is an option (in combination with other elements to form a package) consistent with the SAPs; and

(b) How do potentially SAP-consistent options compare with each other?

3.26 During phase one of this project; the TCF has focused on comparing the various options for the key technical and operations elements. This is the second level of evaluation mentioned above. The criteria at this level of evaluation need to be more granular than the SAPs.

3.27 The TCF therefore applied the following criteria in evaluating options for the elements that make up the technical and operational elements of an LLU service:

(a) Equivalence – between the access provider and access seekers, and among access seekers;

(b) Timeliness - time to implement;

(c) Implementation costs – for the access provider relative to access seekers;

(d) On-going costs – for Telecom (as access provider) relative to access seekers;

(e) Technical and operational practicability;

(f) Network security and safety;

(g) Consistency with Telecom's existing legal duties;

(h) Telecom unable to comply with reasonable conditions;

(i) Consistency with international best practice;

(j) Overseas precedent for option (where);

(k) Overseas outcomes from option (relative success);

(l) Expected impact on competition/choice for access seekers;

(m) Expected impact on LLU uptake by end-customers;

(n) Likely durability of option (how 'future-proof'?);

(o) Degree of interdependency with other issues.

4 Relevant Technologies

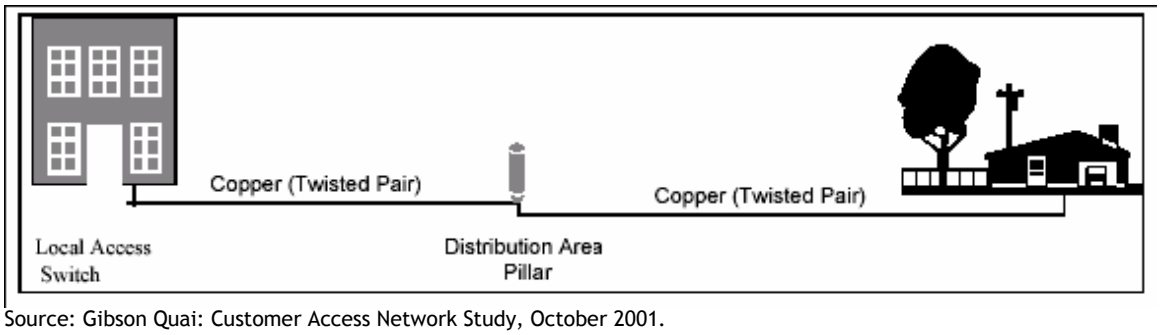
Introduction

4.1 The technical and strategic issues involved in the unbundling of the local loop network are complex. It is therefore essential to have a common view of the physical elements of the local network to be unbundled, and the emerging technologies likely to be used on the network.

Local loop network[22]

4.2 Historically, copper cable has been used to deliver standard telephone services. Cables with multiple twisted pairs of metallic copper conductors are typically installed in ducts laid under footpaths and along streets and highways. In some areas, the cable may be ploughed directly into the ground to reduce costs (i.e. no ducts are provided) or carried on aerial cables. The cables connect to the wider network via a Main Distribution Frame (MDF) at the local switch or telephone exchange (LX). In New Zealand, the existing copper cable network is predominantly provided by Telecom. A simplified residential copper cable configuration is shown in Figure 1 below.

Figure 1: Simplified Residential copper cable configuration



Source: Gibson Quai: Customer Access Network Study, October 2001.
http://www.iie.qld.gov.au/publications/infrastructure/CAN_Study_Report.pdf

4.3 Cables are broken down into smaller feeder and distribution cables (often via pillars, cabinets or cable terminals) often located on footpaths in suburban areas. Each customer typically has an exclusive pair (or circuit) for each service installed at their premises. Telecom generally provisions a standard two-pair cable 'lead in' to each residence to allow for growth margins for second lines, spares for fault rectification and so on. Telecom's general standard is to provision two pairs of copper cables from the cable terminal to the end-customer, though only one pair will be terminated at the customer end and at the cable terminal (giving roughly a 50% 'fill factor').

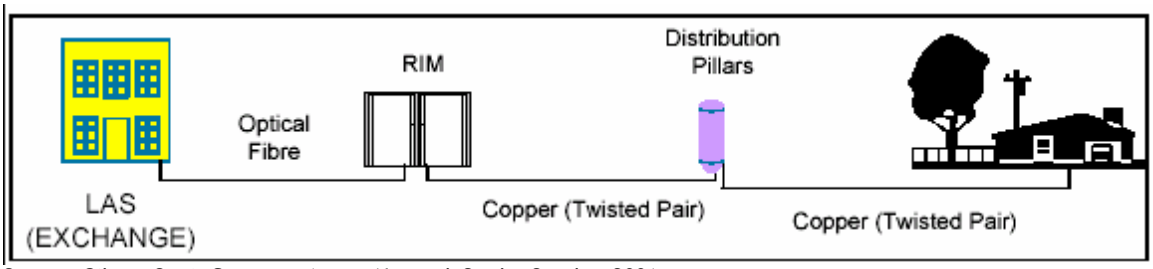
[22] This section is extracted from paras 103 to 116 of the final report of the Commerce Commission dated December 2003 on its investigation into unbundling the local loop network and fixed public data network [ISBN: 1-86945-222-4]

4.4 The copper network was designed to provide access for standard analogue voice communications. Digital services such as ISDN and digital data via ADSL can be provided over copper cable networks but are subject to distance limitations and require detailed design and provisioning arrangements to meet performance specifications.

4.5 Telecom is likely to extend the reach of optical fibre cable into the customer access network over time. Telecom is not currently actively replacing copper in the feeder network on any scale, but that some replacement does form part of its Next Generation Network plans.

4.6 Where copper is being replaced by fibre in the feeder network, the optical fibre may extend up to a cabinet. The use of optical fibre allows the aggregation of multiple lower speed services (voice, internet data etc) into a single high speed transmission link to the local exchange or point of interconnect to other carriers' networks. It reduces the investment in, or the need to extend, copper cable infrastructure. This is likely to be the preferred infrastructure strategy for new housing or business parks and residential areas where the distance from the local exchange and/or existing copper infrastructure is increasing or costly to maintain.

Figure 2: Copper and Fibre Feeder Network

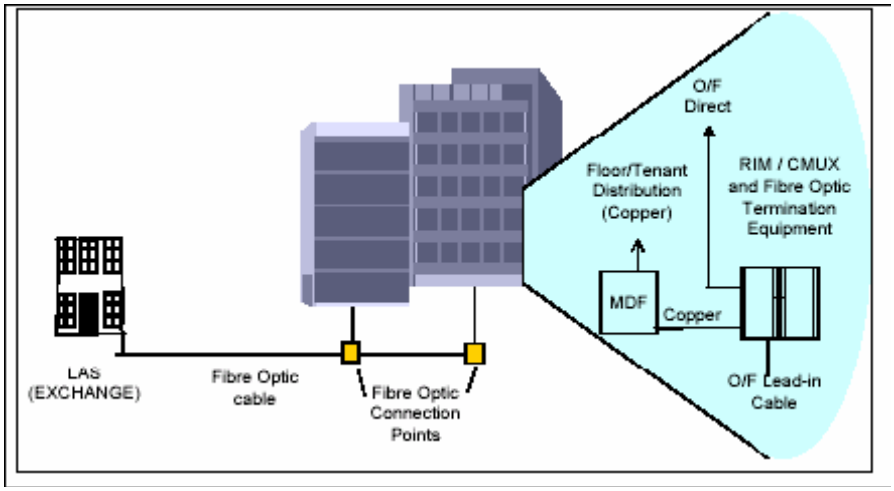


Source: Gibson Quai: Customer Access Network Study, October 2001

4.7 Commercial premises are often supplied with sufficient capacity (often up to several hundred pairs) to meet known demand and enabling them to be readily upgraded as necessary to meet changing service requirements. Alternatively, many larger businesses and organisations in CBD areas are directly connected using fibre optic cable. Depending on the location, optical fibre can be installed in ducts at relatively low cost. Unlike copper cable, it is not subject to electrical or magnetic interference.

4.8 Figure 3 below provides an example of a direct optical fibre connection. The fibre is terminated on customer multiplexers (CMUXs) to aggregate all lower speed services at the site (such as voice and data) and provide quality, cost-effective delivery.

Figure 3: Direct Optical Fibre connection



Source: Gibson Quai: Customer Access Network Study, October 2001

Evolution of broadband systems and services[23]

4.9 As noted above, the traditional PSTN is ideally matched to voice traffic. It is based on circuit switching and time division multiplexing to prevent latency of traffic. In contrast, data traffic is based on packet switching and statistical multiplexing, which involve the sharing of transmission capacity.

4.10 New technologies, and more demand for network reliability, are driving changes in PSTN architecture:

(a) In contrast to the PSTN, the internet uses routers with dumb functions. The intelligence is on the edges and in the terminals.

(b) In contrast to the traditional (ISDN-type) data networks, the internet is not responsible for correcting errors. Rather, error correction is done by hosts.

(c) Voice over the internet Protocol (VoIP) potentially has large capacity requirements. Again, the intelligence in the terminals.

(d) The trends in the traditional PSTN are also shaped by advances in cable TV and wireless. New cable TV networks (triple play) look more like the new PSTN.

(e) Similarly, cellular networks are evolving alternative structures.

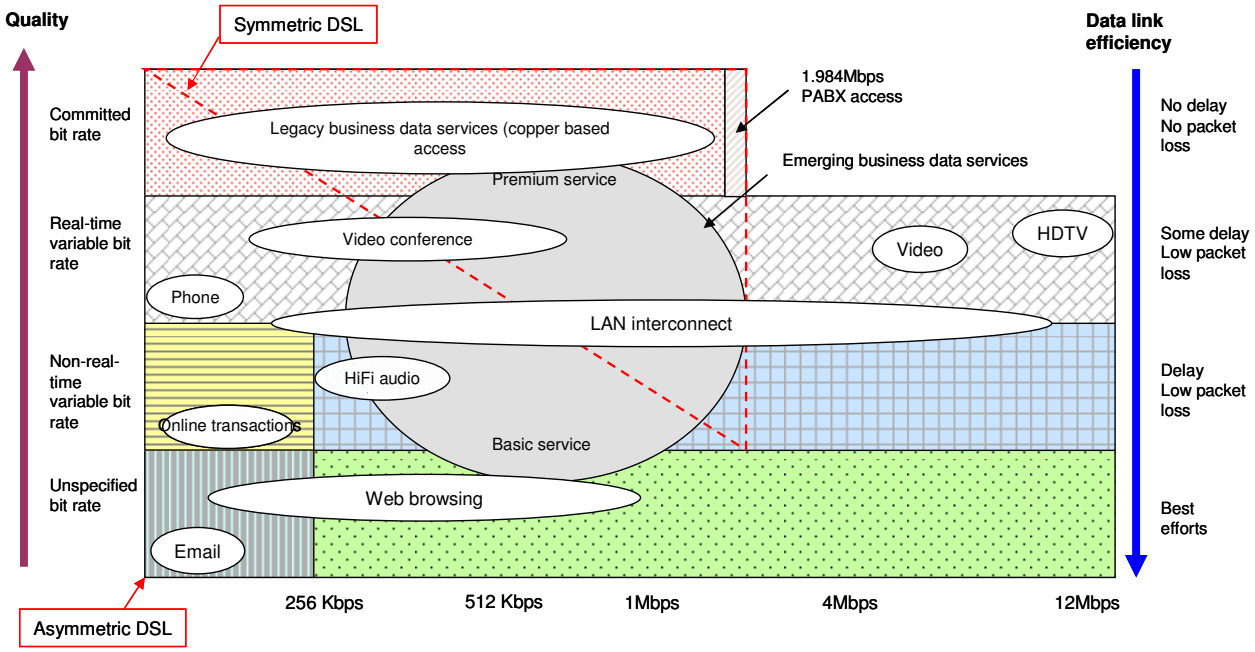
4.11 Broadband systems and services are constantly evolving. The current range of transmission systems available in countries with LLU include

[23] The section is drawn, in part, from "Handbook of Telecommunications Economics", chapter 1, section 2.1, vol 2, edited by S Majurndar et al, 2005 Elsevier BV,

HDB3, BR-ISDN, HDSL, SDSL, ADSL1, ADSL2 and 2+ and VDSL, VDSL2, SHDSL, and eSHDSL. These are described in more detail in Appendix 5 to Part C.

4.12 Current and emerging broadband services are shown in the figure below. Given the rate of change in technology, this 'map' is likely to become even more multi-layered over coming years.

Figure 4: Range of services and related transmission characteristics



Source – MED, Report to the Minister of Communications, 5 May 2004

5 TCF Approach

5.1 The transition to LLU creates significant challenges and opportunities for access seekers and the access provider. Technical and operational complexities have arisen, which have been addressed in different ways, in every other LLU country.

5.2 Drawing on this overseas experience, the TCF has scoped the key technical and operational support issues.

5.3 In the following sections of this report, high level options are examined, and broad recommendations are outlined. Together, these are intended to provide a platform for undertaking the task of preparing detailed industry rules covering technical and operational support requirements for LLU in New Zealand.

5.4 In addition to the detailed specifications around the recommendations contained within this report, issues relating to dispute resolution and enforcement of LLU rules will also be addressed in phase 2.

5.5 This report is structured as follows:

Part		Description
	Preliminary	Sets out background information on the TCF, the foreword, and a list of key abbreviations.
A	Introduction	Describes the legislative context, the TCF working parties (including terms of reference, membership and approach), the analytical framework, an overview of relevant technology trends, and broad conclusions from phase one.
B	Technical Standards	Examines the high level issues and options relating to co-location, ancillary services (heat and power management), access, maintenance, RMA and liability issues.
C	Interference Management	Describes the problem of crosstalk, issues relating to managing crosstalk, public policy objectives and key choices, overseas practice, broad management options, and next steps.
D	Operational Support Services	Outlines proposals for OSS interface mode, pre-ordering, ordering, customer authorisation, batch processing, faults management, planned outages, permit to work, and billing.
E	Information Reporting	Examines information issues relating to pre-launch, pre-ordering, forecasting, and service level setting, monitoring and reporting.

PART B – TECHNICAL STANDARDS

6 Overview of Technical Issues

Background

6.1 Unbundling requires the access provider to offer access seekers an equivalent opportunity to locate, in the access provider's exchange and cabinet facilities, equipment that the access seeker requires to provide broadband services to its customers over the copper local network. The heart of this is 'co-location', by which an access seeker puts their equipment in facilities owned or operated by Telecom[24].

6.2 Co-location involves a range of components, including space allocation, equipment configuration, the 'hand-over' or demarcation point[25], access arrangements, installation and maintenance (including DSLAMs and backhaul equipment).

6.3 Regulated backhaul means the transmission capacity in Telecom's network that carries the aggregated data from a point in Telecom's network to the point of interconnection with the entrant's network[26]. Backhaul can also be provided by the access seeker or by a 3rd party on behalf of the access seeker.

6.4 Unbundling also requires Telecom to provide access to the copper loop network, including any relevant line in the local exchange or distribution cabinet.

6.5 In essence, these are the 'hardware' or 'physical' elements of local loop unbundling. The 'software' elements come under the umbrella of operational and support systems and information exchange, which is discussed in Part D and E respectively of this report.

6.6 This section scopes the 'hardware' or 'physical' issues, and sets out the TCF's recommendations.

Requirements of Act and Bill

6.7 When the Bill is passed, the Commerce Commission will be able to prescribe the terms and conditions on which Telecom is to provide certain co-location, backhaul services and LLU line rental.

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[24] Refer footnote 5 in the Commentary section of the Bill as reported from the Finance and Expenditure Select Committee, which notes that the statutory definition of 'co-location' is contained in Part 3 of Schedule 1 of the Bill.

[25] This is the physical junction of access seeker and access provider equipment.

[26] Refer footnote 6 in the Commentary section of the Bill as reported from the Finance and Expenditure Select Committee, which notes that the statutory definition of 'backhaul' is contained in Part 3 of Schedule 1 of the Bill.

6.8 The legislation also allows the Telecommunications Industry Forum or the Commission to prepare access codes covering non-pricing elements of these services.

6.9 The relevant services, as set out in the Bill[27], are as follows:

(a) Access to copper local loop:

A service (and its associated functions, including the associated functions of Telecom's operational and support systems) that enables access to, and interconnection with, Telecom's copper local loop network (including any relevant line in the exchange or distribution cabinet)[28].

(b) Co-location facilities, including 3rd party backhaul:

A service (and its associated functions, including the associated functions of Telecom's operational and support systems) that provides co-location facilities for an access seeker's equipment, and access to the handover point, at Telecom's local telephone exchange or distribution cabinet (or equivalent facility) for the purpose of providing access to, and interconnection with, Telecom's copper local loop network (including any necessary supporting equipment).

(c) Telecom backhaul to co-located equipment:

A service (and its associated functions, including the associated functions of Telecom's operational and support systems) that provides transmission capacity in Telecom's network (whether the transmission capacity is copper, fibre, or anything else) between the handover point in Telecom's distribution cabinet (or equivalent facility) and the handover point in Telecom's local telephone exchange (or equivalent facility), for the purpose of providing access to, and interconnection with, Telecom's copper local loop network (including any necessary supporting equipment).

(d) Telecom backhaul to access seeker's POI:

A service (and its associated functions, including the associated functions of Telecom's operational and support systems) that provides transmission capacity in Telecom's network (whether the transmission capacity is copper, fibre, or anything else) between the handover point in Telecom's local telephone

[27] Amendments to Schedule 1 of the Act set out in the Bill as reported from the Finance and Expenditure Select Committee.

[28] In relation to this service, the Commerce Commission is required to consider, as an additional matter, relativity between this service and Telecom's unbundled bitstream service (to the extent that terms and conditions have been determined for that service)

exchange (or equivalent facility) and the access seeker's nearest available point of interconnection, for the purpose of providing access to, and interconnection with, Telecom's copper local loop network (including any necessary supporting equipment).

(e) Telecom backhaul for wholesale bitstream (including 'naked DSL')[29]:

A service (and its associated functions, including the associated functions of Telecom's operational and support systems) that provides transmission capacity in Telecom's network (whether the transmission capacity is copper, fibre, or anything else) between the trunk side of Telecom's first data switch (or equivalent facility), other than a digital subscriber line access multiplexer (DSLAM), that is connected to the end-user's building (or, where relevant, the building distribution frames) and the access seeker's nearest available point of interconnection.

6.10 Other relevant features of the Bill include:

(a) Meaning of "local loop network"[30]: For 'designated access services', 'local loop network' is defined as that part of the Telecom's copper local network that connects the end user's building (or, where relevant, the building distribution frames) to the handover point in Telecom's local telephone exchange or distribution cabinet (or equivalent facility).

(b) 'Hand-over point': As introduced to Parliament, the Bill specified the line side of the distribution frame as one boundary point for access to the local loop network by access seekers. As reported back to Parliament, this has been changed to 'the handover point', which does not appear to be defined in the Bill or the Act. It therefore needs to be defined in any determination or access code.

(c) Access to co-location facilities, (including 3rd party backhaul): Under the Bill:

(i) The service for co-location includes access to, and use of, space in, on, or around Telecom's local exchange or distribution cabinet (or equivalent facility) for the purpose of installing and maintaining the access seeker's equipment.

(ii) 'Access seeker's equipment' is defined to include the equipment of any person other than the access seeker (including any line) if that equipment is being used to

[29] Refer to ISPANZ work on this service
[30] Amendments in Bill to Part 1 of Schedule 1

support the provision of backhaul for the access seeker. This means that co-location of 3rd party backhaul from an exchange or cabinet can be regulated, when used by an access seeker.

(iii) Limits on the standard access principles[31] apply with the additional limit of the interests of other service providers who are co-located in the relevant facilities.

Relationship of Unbundling 'Hardware' and Regulation

6.11 The diagram below is a simplified illustration of the key technical or 'hardware' elements involved in local loop unbundling, mapped with the main points of possible regulation under the Bill. In the diagram:

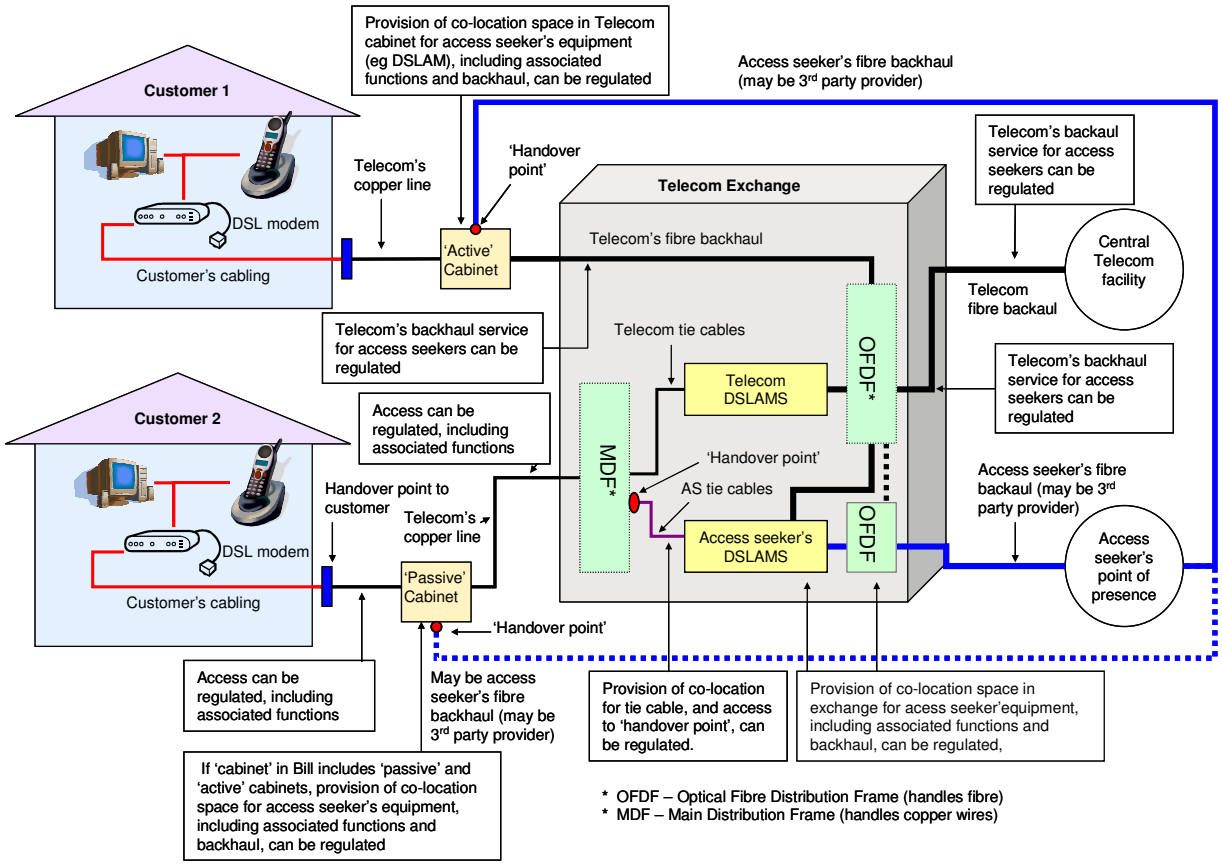
(a) Customer 1 is serviced by copper line from a road-side cabinet, which is connected to the exchange by a fibre backhaul cable.

(b) Customer 2 is serviced only by copper lines, which connect to the exchange.

(c) In addition (but not shown on the diagram), the Bill will make it possible to regulate for 'naked DSL', which is, in essence, access seekers using a Telecom UBS service without the end customer also purchasing a local access and calling service[32].

[31] Clause 6 of Part 1 of Schedule 1
[32] Schedule 1, Part 2 as amended by the Bill

Schematic Illustration of Physical Components of Local Loop Unbundling



6.12 The key sets of hardware installed and maintained by or for an access seeker in Telecom facilities for unbundling include:

(a) Access seeker DSLAMs in exchanges;

(b) Access seeker DSLAMs in cabinets;

(c) Access seeker (or 3rd party) backhaul transmission from cabinets to exchanges;

(d) Access seeker (or 3rd party) backhaul transmission from exchanges to the access seeker's nearest point of presence; and

(e) Access seeker cabling related to DSLAMs and backhaul.

6.13 A variety of technical options are available in relation to the 'handover point'. These are discussed in section 17 (demarcation) below.

6.14 An access seeker may choose to use Telecom's backhaul facilities, which can be determined by the Commission.

6.15 As noted above, a range of 'software' functions are required to enable an access seeker's deployment of equipment and use Telecom's local loop network. These operational and support systems are discussed in Part C of this report.

Range of Technical Issues

6.16 The technical issues to be addressed in relation to local loop unbundling and 'naked DSL' include:

(a) Forecasting co-location needs and availability, including an ordering system. (refer section 7);

(b) Co-location site and space design (refer section 7);

(c) Co-location space allocation (refer section 8);

(d) Co-location set up costs (refer section 9)

(e) Co-location rights of tenure (refer section 10)

(f) Cabling[33] (refer section 11);

(g) Power supply (refer section 12);

(h) Heat management (cooling) (refer section 13);

(i) Premise and cabinet maintenance (refer section 14);

(j) Equipment and cable maintenance (refer section 15);

(k) Access rights (refer section 16);

(l) Approval of contractors (refer section 16);

(m) Hand-over or demarcation point (refer section 17);

(n) Rights to work-on other parties' equipment (refer section 18);

(o) Obligations to report (refer section 19); and

(p) Liabilities for interference or damage (refer section 20).

Objectives and Framework

[33] Which includes DSLAM to MDF, jumpering between lines and equipment sides of MDF, and DSLAM to backhaul

6.17 The objective is to address these technical issues relating to local loop unbundling and 'naked DSL' in a manner that is consistent with the purpose set out in section 18 of the Act and applicable access principles.

6.18 However, there are no 'naked DSL' specific technical issues since this is in technical respects the same service as unbundled wholesale bitstream. ISPANZ is addressing backhaul issues in relation to enhanced wholesale bitstream (which will also cover NDSL).

6.19 Particular aims in relation to co-location include achieving outcomes where:

(a) Space in Telecom exchanges and cabinets is optimised over time to foster competition, and made available to all parties on an equivalent, non-discriminatory basis;

(b) All parties' equipment and related services are able to be installed, operated and maintained in a manner that is technically efficient, timely (in particular, responsive to customer demand), and minimises disruption to all parties' customers;

(c) Network security and safety is preserved; and

(d) Prices reflect costs, and costs are subject to downward pressure.[34]

6.20 Conceptually, areas in exchanges and cabinets required for local loop unbundling, particularly equipment co-location, are 'neutral' spaces, with Telecom and access seekers having equivalent rights and obligations in relation to use, access and standards of care, recognising the needs of Telecom in relation to other equipment unrelated to LLU.

Process Requirements

6.21 Processes in relation to these technical issues need to ensure that:

(a) Relevant information is exchanged between all parties in a timely and efficient manner;

(b) All relevant arrangements and systems are auditable; and

(c) Performance standards are established, measured and reported.

(d) Overseas Experience

6.22 The Commerce Commission observed in its October 2003 issues paper[35] on local loop unbundling that:

[34] Discussion on pricing is outside the scope of the TCF's brief. Pricing issues will be addressed by the access provider and access seekers on a commercial basis, or by the Commerce Commission.

"In other jurisdictions, long and complex proceedings have followed the imposition of LLU as a result of technical considerations. For example, US regulators, including the FCC and many state commissions, engaged in extensive proceedings to resolve matters relating to spectrum compatibility and spectrum management (the ability of various loop technologies to reside and operate in close proximity) and co-location of equipment by competitors seeking access to unbundled loops."

6.23 However, Nortel Networks has noted that[36]:

"While the technical issues in deploying DSL technologies, particularly on an unbundled local loop, may appear complex to the non expert, this is now common practice in countries with an unbundled local loop as identified in the Issues Paper. New Zealand is now in the position of being able to draw on the work done by other countries in implementing an unbundled local loop for DSL. This should greatly simplify the task of developing technical requirements for an unbundled local loop in New Zealand because the issues, process etc are now well understood and documented."

6.24 The TCF has drawn on a wide range of overseas experience in seeking to address the technical (and operational) issues, including (where relevant documentation can be obtained) policies and practices from the UK, France, Australia, Germany, USA, and Ireland.

6.25 As reflected in the high level of agreement around most options, positive progress has been made by the TCF participants in laying out the framework for an LLU and NDSL in relation to operational issues code for the New Zealand context.

[35] Commerce Commission: "Telecommunications Act 2001: Section 64 Review and Schedule 3 Investigation Into Unbundling The Local Loop Network And The Fixed Public Data Network, Issues Paper", April 2003, at para 197

[36] 'Response to the Unbundling Issues Paper', 27 May 2003

7 Co-location Space Design

Background

7.1 This section provides a high level overview of the issues and options relating to how space in Telecom's exchanges and cabinets can be designed for co-location of access seeker equipment for LLU.

7.2 Several physical constraints need to be taken into account in relation to using co-location space:

(a) Space available - the amount of space that is physically available (or can be feasibly made available) for co-location of access seeker equipment;

(b) Power - supply of power to equipment and UPS and generator capacity/availability; and

(c) HVAC - heating, ventilation, and air conditioning.

7.3 Power and HVAC are discussed in sections 12 and 13 respectively.

7.4 Feedback from Telecom as the access provider suggests than in most exchanges physical space is not a significant limiting factor. However, actual space availability in exchanges has yet to be systematically assessed by an external audit. In addition, availability of space will changes over time, as access seekers' business plans develop, and NGN roll out starts to occur.

7.5 The bill refers to co-location as the use of space 'in' or 'on' or 'around' Telecom exchanges buildings or cabinets. This section deals largely with co-location 'in' Telecom exchange buildings or cabinets; further work will be required to consider the 'on' or 'around' which may include equipment such as digital microwave radio.

Issues

7.6 There are various issues worthy of discussion with regard to co-location site design. Key issues include:

(a) Defining the different requirements that access seekers and 3rd party backhaul providers have, (in relation to a specific access seeker). It is important that the definitions are not too strict, to prevent artificial restrictions on services that can be deployed from exchanges.

(b) The design decision – who makes the decision as to what solution is deployed at a given exchange? It is important that the access seekers and access provider all have a degree of input.

(c) How extensively are the access seekers involved?

Objectives

7.7 The key objective in relation to co-location space design is to enable efficient and fair use of available space in exchanges and cabinets, in particular to:

(a) Promote maximum competitive LLU opportunities over time;

(b) Respond to access seekers' needs for space in a timely manner;

(c) Seek to minimise costs;

(d) Ensure equivalence;

(e) Safeguard network integrity and safety; and

(f) Industry confidence in design and optimisation process will be critical to the successful implementation of LLU.

Options

7.8 Seven co-location options have been considered:

(a) Virtual;

(b) Co-mingled racks;

(c) Co-mingled groups of racks;

(d) Co-mingled rows;

(e) Hostelling;

(f) Caging; and

(g) Remote.

These are described further below.

Criteria

7.9 The options outlined above have been evaluated against several criteria, including:

(a) Implementation cost - the cost of initial implementation (at a given exchange).

(b) Ongoing cost - the ongoing cost for the solution.

(c) Space utilisation - how efficiently space is utilised.

(d) Time to deploy - the time required to implement the solution (at a given exchange).

(e) Physical access - how easy it is to grant access seekers physical access to their equipment (in the event of equipment faults, MACs, etc). This impacts network security and safety, for both access provider and access seekers. Note that physical access has strong dependencies on the access arrangements agreed between access seekers and the access provider.

(f) Other issues - any other issues that may arise under the relevant option.

Virtual Co-location

7.10 Virtual co-location is where the access provider manages all aspects of co-location for an access seeker. In summary, the access provider:

(a) Provides rack space for an access seeker's equipment;

(b) Decides where to locate the access seeker's equipment. It may or may not be located in the same racks as equipment belonging to other access seekers. Indeed, it could be configured in any of the options outlined below. The key is that the access provider decides;

(c) Arranges and charges for utilities (power, additional exchange or cabinet cooling, and so on) required for the access seeker's equipment; and

(d) Manages and charges for maintenance of the access seeker's equipment.

7.11 Evaluating this option against the criteria above:

(a) Precedent: Several other countries have virtual co-location as an option under LLU. It is often offered as an option where exchange space is at a premium (often as a cheaper alternative to remote co-location), and in cabinets. Germany and France both require virtual co-location to be made available where physical co-location is not;

(b) Implementation cost: Initial implementation costs are relatively low. The access provider can use space wherever it is available, including in its own racks, and refitting exchanges is less likely to be required. Access seekers do not have to provide racks of their own, worry about cabling, utilities, or facilities management, and have less of an operational support burden;

(c) Ongoing cost: Ongoing wholesale costs for access seekers are likely to be relatively high. The access provider will recover the cost of equipment management through monthly fees, which are likely to be higher than those for simply providing space. However, the total cost of ownership may be relatively cost effective for an access seeker;

(d) Space utilisation: Space is likely to optimally utilised, as the access provider retains direct control over the equipment and is therefore likely to be less inclined to want a physical separation from its own equipment;

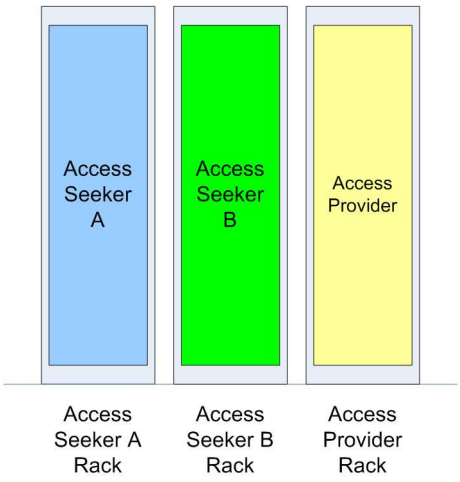
(e) Time to deploy: Exchanges are less likely to require refitting to provide additional space, access-ways and the like, so time to deployment should be less than for other options;

(f) Physical access: Because the access provider is managing the equipment, the access seeker does not require physical access to sites;

(g) Other issues: The exact definition (and cost) of the access seeker's management services will be key in development of a viable virtual co-location option.

Co-mingled Racks

7.12 Co-mingled racks are access seekers racks that are inter-mixed directly with each other (access seeker racks may also be inter-mixed with access provider racks). There is no segregation of space within the exchange, and no attempt to group racks belonging to each access seeker together. Racks are installed in the available space in a manner that optimises available space.



7.13 Evaluating this option against the criteria above:

(a) Precedent: Security concerns have kept some countries from deployment of co-mingled racks. Security policies implemented by the access provider in some jurisdictions have precluded co-mingled racks as an option. Many countries categorise co-mingling as any sharing of a common area, regardless of how space is allocated within the area (be it intermixed racks, groups, or rows);

(b) Implementation cost: Because construction requirements are low (no cages, walls, etc are required), implementation costs are likely to be low. There could be some cost complexity with this option for power supply and metering;

(c) Ongoing cost: Space is sold on a per-unit basis (one square meter per rack, for example), and is likely to be comparatively cheap. This is dependent on how space is allocated and associated issues (such as cabling). There is potential for co-mingled racks to be more expensive than co-mingled groups or rows;

(d) Space utilisation: Utilisation of space is fairly efficient, as space does not need to be pre-allocated to access seekers or reserved for future growth. Racks are installed in any space that is available at the time;

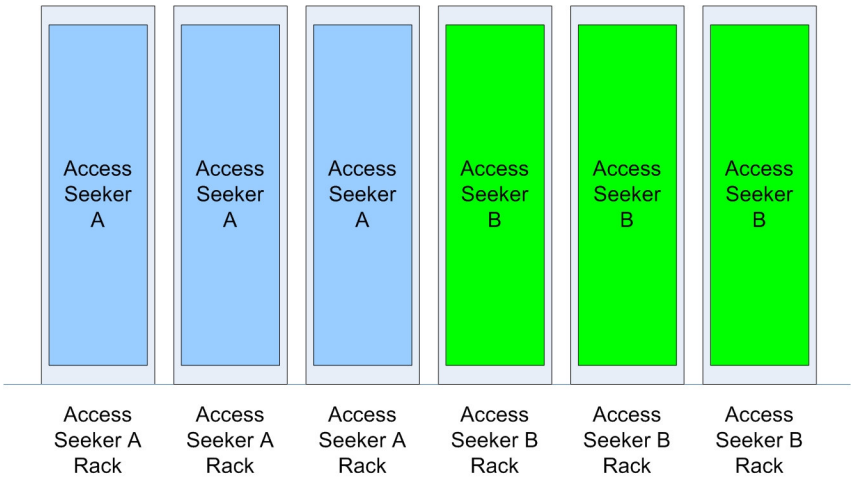
(e) Time to deploy: As racks can simply be deployed in any available space (cages, walls, etc are not required), initial deployment should be fairly quick;

(f) Physical access: Physical access may be problematic. Because access seeker (and access provider) racks are intermingled, the risk of damage to other tenants' equipment is higher. Once a tenant has access to the site, they have physical access to any rack within that site. Some countries have found that physical security is a significant issue in exchanges where access seekers have ready access to each others racks; and

(g) Other issues: Because racks for a given access seeker may not be located next to each other, cable runs could become expensive. A single access seeker may need cabling run to or between several different locations within an exchange. Managing space, record-keeping, and managing utility supply (power) can become more problematic with cabinet scatter within an exchange.

Co-mingled Groups of Racks

7.14 Co-mingling groups of racks is a similar concept to straight co-mingled racks, with the difference that access seeker racks are grouped together within a row as much as possible. This facilitates cabling, in that cabling from the MDF/HDF only needs to be run to one area of the exchange, and cable runs between cabinets is much simpler.



7.15 Evaluating this option against the criteria above:

(a) Precedent: More often used overseas when co-mingling is specified as an option, (which is increasingly the case). For example, in the UK OfCom required co-mingling to reduce costs and open up space in exchanges previously classed as full;

(b) Implementation costs: Cost to implement would be similar to those of standard co-mingled racks;

(c) Ongoing cost: On-going costs would be similar to those of standard co-mingled racks. There could be some cost complexity with this option for power supply and metering;

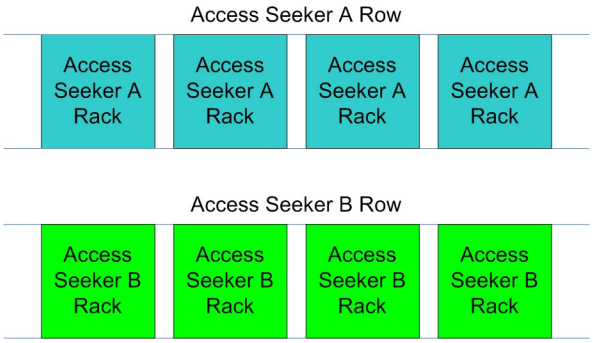
(d) Space utilisation: Utilisation of space may be slightly less efficient than the scenario where racks are not grouped, primarily because space will need to be pre-allocated to allow for growth. For example, if an access seeker only installs one rack on day 0, but forecasts requirement for an additional two racks on day X, space for those two racks must be allocated next to the first rack and left aside;

(e) Time to deploy: Time to deployment will be similar to that of standard co-mingled racks; and

(f) Physical access: Physical access issues are similar to those in the scenario of co-mingled racks. There may be opportunities to provide access only to areas of exchange buildings where access seekers equipment is located. Security concerns can also be managed via conditions around access rights and the approval of contractors.

Co-mingled Rows

7.16 Co-mingling groups of racks is a similar concept to straight co-mingled racks, but instead of a unit of space for racks, access seekers are allocated an entire row for their equipment.



7.17 Evaluating this option against the criteria above:

(a) Precedent: More often used overseas when co-mingling is specified as an option, (which is increasingly the case). For example, in the UK OfCom required co-mingling to reduce costs and open up space in exchanges previously classed as full;

(b) Implementation cost: Cost to implement would be similar to those of co-mingled groups of racks;

(c) Ongoing cost: On-going costs would be similar to those of co-mingled groups of racks;

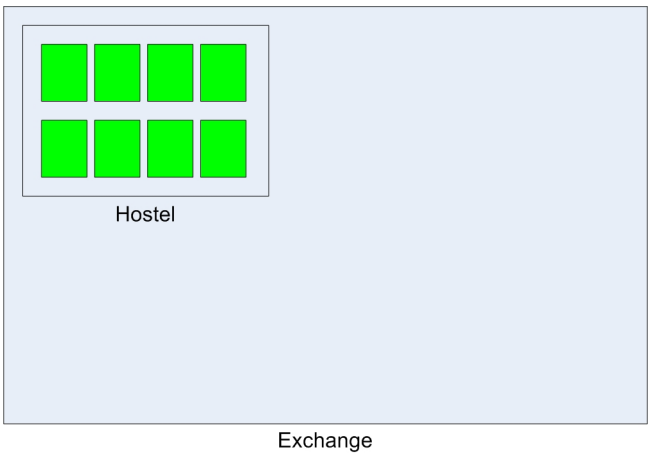
(d) Space utilisation: Utilisation of space would be less efficient again than that of co-mingled groups of racks. If an access seeker requests an entire row and only uses half of it, the other half effectively goes to waste;

(e) Time to deployment: Time to deployment would be similar to that of standard co-mingled racks. Obviously as use of space becomes less efficient, the likelihood that space will be exhausted increases, meaning that major refitting or the adoption of remote or virtual co-location may be required; and

(f) Physical access: Physical access issues are similar to those in the scenario of co-mingled racks. There may be opportunities provide access only to areas of exchange buildings where access seekers equipment is located. Security concerns can also be managed via conditions around access rights and the approval of contractors.

Hostelling

7.18 A hostel is a separate room that is built within an exchange for the exclusive purpose of housing access seeker equipment. A hostel may be built for a single access seeker, or access seekers may share a hostel area.



7.19 Evaluating this option against the criteria above:

(a) Precedent: Common practice in some countries. Often a combination of hostel, caged, and remote co-location is offered where access seekers want additional control and security over their environment, (Germany, UK);

(b) Implementation cost: Implementation costs are high, because construction may be required to build a suitable room. The room will also require fitting out with its own HVAC (heating, ventilation, and air conditioning) and power systems;

(c) Ongoing cost: Ongoing cost would be higher on a per-rack basis than in the co-mingled scenarios;

(d) Space utilisation: Space is not utilised as efficiently in the case of hostelling as it is where racks are co-mingled. The hostel itself requires physical space, and sizing the room becomes problematic – it needs to be big enough to cater for access seeker growth, but

not so big that it takes up more room than is ever going to be required;

(e) Time to deploy: Physical construction is required for this option, which will increase deployment time in a given exchange. Build time will also be required for HVAC and power systems; and

(f) Physical access: Physical access is easier to manage when access seekers only require access to a specific area. Note that there may still be the problem of people needing to pass through other areas of the exchange to reach the cage, or between access seekers in shared areas.

Caging

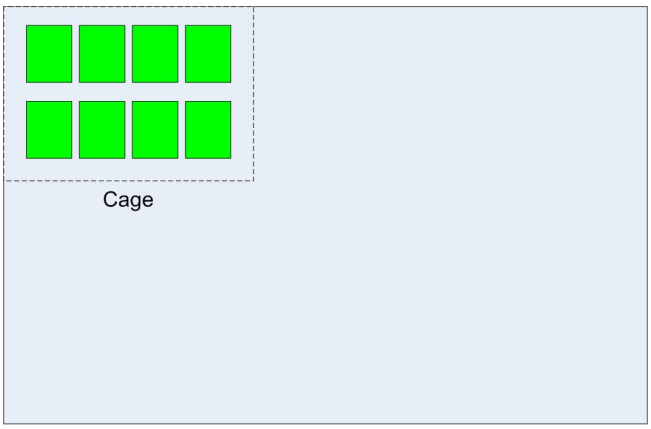
7.20 Caging within an exchange is a similar concept to hostelling, with the primary difference that instead of solid walls separating the access seekers equipment off, wire cages are used. There are several reasons why this might be done instead of hostelling:

(a) Cost, which would generally be slightly lower;

(b) Sharing the environment – because the walls separating off the equipment are wire mesh rather than solid, the environment in the total area is effectively shared. HVAC conditions are the same in and out of the caged areas. Access seekers have no control over the environment within their area, which they do in a hostel installation;

(c) Use of space – a cage will generally take up slightly less room than a separate room; and

(d) As with hostelling, there are two scenarios – first, where a cage is built for each access seeker and second, where a caged section is shared by all access seekers.



7.21 Evaluating this option against the criteria above:

(a) Precedent: Common practice in some countries. Often a combination of hostel, caged, and remote co-location options are offered where access seekers want additional control and security over their environment (Germany, UK);

(b) Implementation cost: Implementation requires some construction (a caged section needs to be built within the exchange). This increases implementation cost, although not as much as a hostel installation;

(c) Ongoing cost: Cost could be for rack space within the cage (if all access seekers are sharing one caged area), or for the space taken up by the entire cage (if a dedicated cage is built per access seeker). Depending on how the build cost is recovered, the ongoing rental for the space could be the same as in the simple co-mingled scenarios, or slightly higher;

(d) Space utilisation: Space is not utilised as efficiently in the caging scenarios as it is where racks are co-mingled. The cage itself requires physical space, and sizing the cage becomes problematic. Obviously space can be more efficiently utilised if all access seekers are sharing the same cage;

(e) Time to deploy: Physical construction is required for this option, which will increase deployment time in a given exchange; and

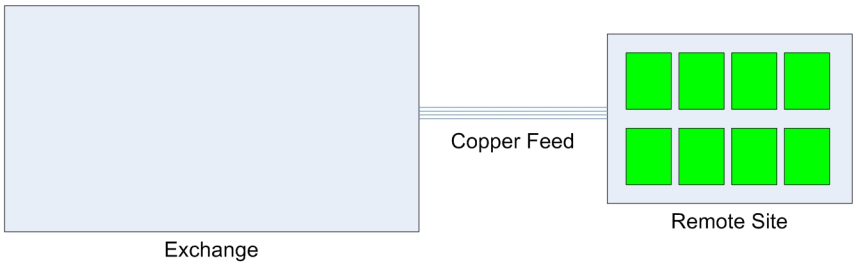
(f) Physical access: Physical access is easier to manage when access seekers only require access to a specific area (be it a cage or a hostel area). Note that there may still be the problem of people needing to pass through other areas of the exchange to reach the cage, or between access seekers in shared areas.

Remote Co-location

7.22 Remote co-location is the only option where access seeker equipment is not located within the physical exchange. Instead, a secondary site is established in close proximity to the exchange, and a feeder cable is run between the two. This option could be considered where:

(a) Space is totally exhausted within the exchange itself; or

(b) The access seeker wants total control over how their equipment is installed.



7.23 Evaluating this option against the criteria above:

(a) Precedent: Common practice in some countries. Often a combination of hostel, caged, and remote co-location options are offered where access seekers want additional control and security over their environment (Germany, UK);

(b) Implementation cost: Implementation costs are higher in most cases than any other option;

(c) Ongoing cost: Ongoing costs will likely be considerably varied – the access provider may not end up charging anything for the co-location. All costs for running the remote site may end up being borne by the access seeker;

(d) Space utilisation: Utilisation of space is something of a non-issue in this scenario;

(e) Time to deploy: This option is likely to be the most time-consuming to build and deploy; and

(f) Physical access: Physical access can be designed to suit the requirements of the access seekers.

7.24 There are also RMA requirements which need to be considered under this option.

Initial Ranking of Options against Criteria Relative to Each Other

	Remote	Hostelled	Caged	Co-mingled Rows	Co-mingled Groups	Co-mingled Racks	Virtual
Time to Implement	Slow.	Slow.	Slow.	Relatively quick, site dependent.	Relatively quick, site dependent.	Relatively quick, site dependent.	Quick, depends on management component.
Implementation costs	Very high.	High.	Medium/High	Medium.	Low.	Low.	Low. Depends on management.
Ongoing costs	Depends on facility.	Potentially high.	Medium/High	Medium. Opportunity cost in inefficient use of space.	Relatively low. Opportunity cost in inefficient use of space.	Relatively low.	Potentially high. Depends on management.
Utilisation of space	Not applicable.	Inefficient.	Inefficient.	Moderately inefficient.	Moderately inefficient.	Fairly efficient.	Very efficient.
Dynamic efficiency (impact on competition, innovation)	Very high deployment cost and timing could represent a potential barrier to entry.	High deployment cost and timing could represent a potential barrier to entry.	High deployment cost and timing could represent a potential barrier to entry.	Lower deployment cost and faster timing reduces potential barriers to entry.	Lower deployment cost and faster timing reduces potential barriers to entry.	Lower deployment cost and faster timing reduces potential barriers to entry.	Innovation totally dependent on access provider management service.
Network security	Very secure.	Very secure.	Very secure.	Moderately secure. Potential for interference but can be managed.	Moderately secure. Potential for interference but can be managed.	Moderately secure. Potential for interference but can be managed.	Very secure.

	Remote	Hostelled	Caged	Co-mingled Rows	Co-mingled Groups	Co-mingled Racks	Virtual
Equivalence between access seekers	Very high deployment cost will have varying impact on access seeker.	High deployment cost will have varying impact on access seeker. Dependent on allocation rules.	High deployment cost will have varying impact on access seeker. Dependent on allocation rules.	Dependent on allocation rules.	Dependent on allocation rules.	Dependent on allocation rules.	Dependent on allocation rules. Fairly equivalent between access seekers.
Equivalence between access seeker and access provider	Very high deployment cost serves to discourage access seeker – whereas access provider is entrenched.	High deployment cost serves to discourage access seeker – whereas access provider is entrenched.	High deployment cost serves to discourage access seeker – whereas access provider is entrenched.	Dependent on allocation rules.	Dependent on allocation rules.	Dependent on allocation rules.	Favours access provider – very little opportunity for access seeker to differentiate.
Overseas experience	Common overseas.	Common overseas.	Common overseas.	Increasingly used overseas.	Increasingly used overseas.	Not as common overseas – grouping/rows preferred option.	Often used overseas (Germany, France) where space is a premium.
Durability	Long term provides best environment for access seeker equipment.	Long term provides very good environment for access seeker equipment. Management of growth key.	Long term provides very good environment for access seeker equipment. Management of growth key.	Management of growth within exchange key. Should provide good long term option.	Management of growth within exchange key. Should provide good long term option.	Long term difficulties with managing equipment spread across exchange.	Probably least preferred by access seeker long term.
Interdependencies	Backhaul and spectrum management (similar issues to sub-loop insertion?)	HVAC and power issues (note that access seeker potentially has control over these issues).	HVAC and power issues. Allocation of space. Cabling.	HVAC and power issues. Allocation of space. Cabling.	HVAC and power issues. Allocation of space. Cabling.	HVAC and power issues. Allocation of space. Cabling key dependency.	N/A

	Remote	Hostelled	Caged	Co-mingled Rows	Co-mingled Groups	Co-mingled Racks	Virtual
	potential dependencies.	Allocation of space. Cabling.					
Overall	Used where no space is available - may in some cases be cheaper for the access seeker or access provider. Attractive where the access seeker wants complete control over their environment. Probably seen as last resort option by most access seekers.	Good technical justifications (assuming space is available and is not an issue), costs likely to mean less preferred by access seeker. Attractive where access seeker wants to control their environment.	Good technical justifications (assuming space is available), costs likely to mean less preferred by access seeker. Attractive where access seeker is particularly concerned about security.	Combination of co-mingling options likely to be preferred in most scenarios by larger access seekers, where space is available. Good balance of cost and operational/technical outcomes (particularly for larger installations).	Combination of co-mingling options likely to be preferred in most scenarios by smaller access seekers, where space is available. Good balance of cost and operational/technical outcomes (particularly for larger installations).	Combination of co-mingling options likely to be preferred in most scenarios by access seeker, where space is limited. Best utilisation of space outside virtual co-location. Some technical issues (cabling, for example) start to creep in where racks are directly co-mingled.	Probably least preferred by access seekers (has potential to limit service deployment, etc). Best use of limited space. Questions around its suitability for inclusion as a co-location option (falls more into managed, value-added category).

7.25 Conclusion:

(a) The high level evaluation outlined above tends to indicate that co-mingling is preferable. Co-mingling as an option is increasingly mandated overseas to reduce cost and optimise space;

(b) The degree of co-mingling will depend on the degree of any space limitations, taking a medium view. Closer co-mingling is likely to be most appropriate where space constraints are severe. Cabinets are an example of highly constrained space. However, limited space over the medium term could also arise in some exchanges;

(c) Site surveys or audits are likely to be needed to manage the initial bow-wave of LLU; and

(d) Network security issues will need to be taken into account in optimising co-location design for each site, access rights to manage security concerns are mentioned in section 16.

7.26 Choice of co-location types: A key issue is what process to use to decide on the type of co-location for a particular exchange. The choice of possible processes includes:

(a) The code specifying a standard 'menu of options' for all exchanges, but allows access seekers to select an option based on their preference;

(b) The code specifying a 'hierarchy of options', where the first ranking option would be used unless it is clearly not optimal, in which case the second ranking option would be used, unless it was clearly not optimal – and so on, working down the hierarchy until reaching an option that is clearly optimal for a particular exchange;

(c) The code specifies categories of exchanges (where exchanges are grouped into types) and a particular co-location type for each exchange category;

(d) The code specifies a particular co-location type as a default option for all exchanges, with criteria and a process to depart from the default for a particular exchange; or

(e) The code does not specify a requirement to use any particular type of co-location, but rather sets out criteria and a process for deciding which type of co-location to use in the context of a particular exchange.

Recommendations

7.27 The TCF recommends:

(a) The code should specify a particular co-location type as a default option for all exchanges, with criteria and a process to depart from the default for a particular exchange;

(b) The default should be co-mingling, with the type of co-mingling to depend on the degree of any medium-term space restrictions. For any severe restrictions, the default could be co-mingled racks. For moderate restrictions, the default could be co-mingled rows. For low restrictions, the default could be co-mingled groups of rows;

(c) The code would also set-out high level guidelines to which the access provider would prepare the site audit and design for the access seeker; and

(d) An independent party should be appointed to:

(i) arbitrate any disputes arising in relation to a space design proposal;

(ii) approve a departure from the co-mingling default referred to above if it would have a material impact on other access seekers (including future access seekers).

8 Co-location Space Allocation

Background

8.1 This section provides a high level overview of the options for allocating space in an exchange or cabinet as between access seekers (including Telecom, as regards future requirements) where a constraint exists. Co-location space allocation sits between forecasting and provisioning.

8.2 The impact of any space allocation rules will depend on the extent to which space is constrained. The extent of space constraints will depend on forecasting, design specifications for co-location (such as whether co-mingling (or cageless co-location) is allowed and options for remote or virtual co-location), and the sequencing and pace of the co-location conditioning rollout process.

8.3 For example, to address potential space constraints the UK defined an initial bow-wave process that specified an independently administered voting process to determine the initial sequencing of BT exchanges for co-location conditioning (this "bow wave" did not eventuate to the extent predicted). In contrast, in France a structured rollout process was agreed which set milestones for the conditioning of exchanges in stages – commencing with major urban areas. In Australia, space constraints were reportedly not a major problem. Co-location conditioning work was undertaken by an access seeker using contractors approved by Telstra.

8.4 Constrained space appears to have turned out to be less of a problem than first anticipated internationally. For example, in Australia there have not been any significant problems in terms of competing requirements for space by access seekers. Overseas experience suggests that space constraints are likely only to be an issue in some CBD exchanges, and in cabinets.

8.5 Telecom's current preliminary assessment is space limitations should not be a major issue in any exchanges but will be in cabinets. If there is a space issue, it is likely to relate to optimising space over time to provide similar co-location costs for access seekers.

8.6 The alternative types of co-location are outlined in section 7.

Issues

8.7 Understanding where space is constrained: In order to understand where space allocation rules may be required, information will be required about space availability from Telecom both initially and on an ongoing basis. For example, in Australia Telstra undertook desk studies to identify space available for LLU. The information could be obtained via a regular survey of exchanges and cabinets for space availability for LLU and posted on a website. Such surveys could be timed to fit in with regular building surveys to avoid additional cost.

8.8 How should space be allocated when it is at a premium?

(a) Various methods generally seek to ensure equivalence, while not constraining competition (for example, by preventing scale). Under all options, rules would need to be established to govern what is defined as a co-location request, when a request can be submitted, whether requests can be waitlisted and whether space reservation is permitted (including by Telecom) and, if so, for how long. For example, in the US service providers can only reserve space for one year. In France the permitted reservation period is 6 months. A "use it or lose it" policy could be adopted and/or provisioned space could be tradable;

(b) Other rules, for example around co-location design, should seek to optimise space over time (for the medium term benefit of all access seekers) and reduce timeframes to provide co-location. For example, in the UK, Ofcom required co-mingling to reduce costs and open up space in exchanges previously classified as full; and

(c) Space allocation rules will also need to take account of Telecom's regulatory obligations (e.g. to provide voice services under its Telecommunications Services Obligations, and to provide wholesale bitstream), and Telecom's requirement for space for its core network equipment.

8.9 What happens if there is no space or a particular access seeker's requirements cannot be met?

(a) Other options (such as remote or virtual co-location) may need to be offered by Telecom. This is required in a number of overseas countries, such as the UK, US, France, Germany and Denmark;

(b) Remote co-location means that the access seeker's equipment would be housed in an adjacent building or cabinet and is connected via a tie cable. In France, France Telecom must provide a shelter within the grounds of the exchange, or within 500 metres of the exchange, or virtual collocation. In the UK, BT must provide remote accommodation located on BT's premises. In some countries, such as Germany and Denmark, incumbents are required to pay for transmission (tie cables or leased capacity) from the Point of Interconnect to the access seeker's premises where there is insufficient space;

(c) Virtual co-location means that the access seeker's DSLAM is located at Telecom's exchange or cabinet, but is managed by Telecom. Virtual co-location is different to wholesale bitstream in that the access seeker's DSLAM does not form part of Telecom's DSL network. Rather, Telecom would be providing facilities management plus IP backhaul; and

(d) Some means of independently assessing any rejection for lack of space is likely to be required. For example, in the US incumbents who allege there are space constraints are required to provide detailed floor plans or diagrams to the relevant state commission and provide further information. Access seekers are able to inspect floor plans and tour the premises. In France, access seekers can inspect a site where France Telecom claims there is a lack of space. In the UK, access seekers were reportedly unhappy with the accuracy of information provided by BT about space in exchanges.

8.10 How is cabinet space allocated when replacing exchange co-location? Should access seekers with equipment in an exchange that is being replaced by a cabinet have preferential rights to space in the cabinet? Should it be provided on a pro-rata basis?

Objectives

8.11 The overriding objective is to promote competition by ensuring the equitable and efficient allocation of available space in exchanges and cabinets between all service providers (including Telecom) over time.

8.12 Key elements that any co-location process is likely to need to achieve and balance are:

(a) Timeliness;

(b) Low cost;

(c) Equivalence;

(d) Avoiding anti-competitive gaming;

(e) Technical efficiency;

(f) Dynamic efficiency to enable innovation over time;

(g) Durability; and

(h) Consistency with international best practice.

Options

Option 1: "First-come, first-served"

8.13 Option 1 would require the access provider to provision collocation space strictly in accordance with the sequence in which requests are received. This approach could either operate on a waitlist basis or from notice of availability.

8.14 For example, this approach is used in the UK for Business As Usual requests after the initial 'bow wave', in Hong Kong in conjunction with maximum space allocation, in the US where the incumbent is also required to take co-locator demand into account when renovating existing facilities or constructing or leasing new facilities, and in Germany where co-location is rented by the square metre without a max or min allocation.

Option 2: Rotating Queue

8.15 Option 2 would require the access provider to provision space on a rotating queue basis. Under this option access seekers (incl. Telecom) would take turns in using new space.

Option 3: Pro-rata allocation of space

8.16 Under option 3, all access seekers would receive a minimum equivalent amount of space or a scaled down proportion of their original forecast requirement.

8.17 For example, this approach is used in Hong Kong where there is a maximum floor space allocation per access seeker. Where there is insufficient space to allow for minimum allocations, access seekers are encouraged to negotiate amongst themselves. In France, where there is a lack of space new entrants are limited to one rack each (although space constraints have not been a major problem).

Option 4: Auction or tender basis

8.18 Option 4 would require the access provider to provision limited collocation space to the highest bidder(s) or tender(s).

Option 5: Specific individual order basis

8.19 Option 5 would require the access provider to provision limited collocation space based on specific individual contracts with access seekers.

8.20 A version of this approach was adopted in the UK for the initial 'bow wave', which allowed for the allocation of space based on new entrants' priorities if space was limited in a particular exchange. If there was insufficient space, space was allocated on the basis of priorities expressed by new entrants for that exchange by an independent third party. Initial space is allocated in units of three racks. Additional space if available is also allocated in units of three racks.

8.21 Under all options, the extent to which the access provider should have priority over other access seekers for space due to its regulatory obligations and core network requirements will need to be addressed.

Evaluation

8.22 Options 1, 2 and 3 are all likely to be equitable, timely and low cost. Option 1 seems to be the most common approach adopted internationally. However, options 2 and 3 may constrain a service provider's ability to build scale, which would not be efficient or promote competition.

8.23 Option 3 (pro-rata allocation of space) may also lead to an inefficient use of space, as there is potential for unused space in the event that a minimum allocation is defined. This approach may facilitate entry by a large number of players but constrain the larger access seekers, which could have more of an impact on the market. "Use it or lose it" provisions or tradability may help improve the efficiency of this approach.

8.24 Option 4 (allocating space based on a pure market model) – e.g., a highest bidder auction – is unlikely to be consistent with the proposed regulated LLU collocation service. The LLU network collocation service in the Bill has a cost-based (initially benchmarked against forward-looking cost-based prices for comparable countries overseas and then based on TSLRIC) pricing principle. There may also be costs involved in administering this approach.

8.25 Option 5 may prefer larger access seekers, which would facilitate scale but could disadvantage smaller entrants.

8.26 Different options may be preferable for the initial 'bow-wave' of space allocation versus ongoing requirements.

Recommendations

8.27 The TCF recommends:

(a) Depending on forecasts, the initial 'bow-wave' of space requirements may need to be dealt with differently to ongoing requirements. For example, in the event of over-subscription for available physical co-location space, a scaling down of forecasts or an allocation of space based on relative priorities (via an independent third party) may be required, as referred to in Option 5 Section 8.20.

(b) For ongoing requirements, a first-come, first-served allocation approach with no maximum allocation specified, but a "use it or lose it" provision seems preferable. This should apply equally to Telecom's LLU related equipment, with a consistent space reservation approach.

(c) Remote co-location options should be available where an access seeker is not able to obtain physical co-location space in the exchange or cabinet. The question of which party should meet the

costs of transmission (tie cables or leased capacity) for remote co-location has yet to be considered.

8.28 Stage 2 of this project will address the detailed rules of the process recommended above and also whether there should be pro-rata rights to cabinet space to access seekers (including Telecom) with equipment in an exchange when the exchange is replaced. This approach would imply a minimum period for renting the copper.

9 Co-location Set-up Costs

Background

9.1 This section provides a high level overview of the options for allocating set-up costs for making co-location available at exchanges or cabinets. This could be addressed in bilateral commercial discussions, but principles relating to the broad options could be set out in an LLU code.

9.2 Design and construction set-up work may be required to make the relevant facility (exchange or cabinet) suitable for co-location. The extent of work required will depend on the design specification for co-location (e.g., whether co-mingling is required). The costs involved for this set-up work will be common costs if more than one access seeker intends to co-locate in the facility (or the set-up work benefits Telecom).

9.3 Work that is access seeker specific, e.g., to install equipment within racks or any cabling or jumpering within the racks, should be undertaken and paid for by the relevant access seeker and will not form part of the common set-up costs.

9.4 A related question is whether an access seeker is entitled to undertake the design and construction work needed for co-location. This is permitted in Australia on a commercial basis, as long as Telstra approved contractors are used.

9.5 The question of allocation of set-up costs is separate from co-location design and tenure (i.e., bearing the costs of set-up does not give an access seeker rights to determine high-level co-location design, in terms of co-mingling versus caged etc, or guarantee tenure).

Issues

9.6 The key issue is which party should bear the costs of the initial set-up and how this cost should be apportioned, especially as between current and future users. Related to this is who should bear the risk of under recovery of set-up costs.

9.7 In all options, independent verification or auditing before commitment of initial set-up costs may be required (at least in the event of a dispute) to ensure only efficient costs are recovered. This role will need to be undertaken by an independent adjudicator.

9.8 Common infrastructure/facilities that form part of initial design and construction set-up work include power systems, cable trays, overhead superstructure, air conditioning plant and ducts, fire detection systems, electronic swipe card (EACS) readers, floor re-instatement, MDF

extensions and building renovations[37]. Access seeker racks and cabinets are excluded.

Objectives

9.9 The key objective is to ensure common set-up costs are apportioned equitably and efficiently and do not represent an inefficient barrier to entry.

9.10 Key elements that any cost allocation methodology needs to achieve include:

(a) Timeliness – ensuring space is available as soon as possible when required by an access seeker (including Telecom);

(b) Low cost – minimising the cost of obtaining collocation space and of administering any space allocation regime;

(c) Equivalence – ensuring equivalence in rights to space as between access seekers and Telecom and among access seekers;

(d) Efficiency – enabling dynamic efficiency or innovation in providing new services;

(e) Durability – ensuring space tenure rules are sustainable going forward; and

(f) Consistency with international best practice.

Options

9.11 There are two broad options for apportioning set-up costs - monthly rentals, or upfront charges (or a combination of the two). Where charges are upfront, either Telecom or an access seeker could be responsible for bearing the total costs prior to cost recovery.

Option 1: Set-up costs are recovered through rental charges

9.12 Under option 1, Telecom would undertake the necessary work based on forecasts and recover the common set-up costs through monthly co-location rental charges.

9.13 The UK appears to have moved to this model at least in some respects, where reportedly Ofcom ruled that BT was not allowed to charge for the clearance of a site as well as a monthly rental. If this option is preferred further details on the UK approach will be required.

[37] This list of common infrastructure/facilities comes from the relevant TEBA product.

Option 2: Set-up costs are recovered through one-off set-up charges

9.14 Under option 2, Telecom would undertake the necessary work based on forecasts and divide the set-up costs amongst access seekers (the entire cost would be borne by one access seeker in the event that only one access seeker sought to co-locate in a particular exchange or cabinet).

9.15 This option appears to have been adopted in the UK (initially), France, Germany, Denmark, and Hong Kong. Usually the access provider provides a quote and, if accepted, the quoted set-up cost is apportioned among initial access seekers.

9.16 In Germany and France the initial access seekers can recoup their costs proportionately from subsequent access seekers. In Germany, this is only permitted for a five-year period after the building work has taken place. Deutsche Telecom acts as an administrator, organising collection and redistribution of payments. After five years no contribution to set-up costs is required from access seekers (except in relation to their own installation).

9.17 In the UK, costs were apportioned between operators on the basis of an allocation formula (independently audited). Often the separate room was only built to meet the needs of operators interested in space at a particular time. This resulted in high incremental cost for further entrants.

Option 3: One or more access seekers bears the costs and is reimbursed for the costs that do not relate to its own requirements

9.18 Under this option, the lead access seeker(s) would bear the initial set-up costs and be subsequently reimbursed for the common costs over and above those related to the access seeker's own requirements.

9.19 This is the approach taken in Australia for the TEBA product. In the Australian model, an access seeker is entitled to undertake the necessary design and construction work and receives a credit for the cost of supporting infrastructure and facilities that are installed as part of their TEBA order which are likely to be used to support the operation of third party customer equipment in TEBA areas. The TEBA credit is based on the proportion of infrastructure that is not utilised by the access seeker (this is generally calculated based on the number of new TEBA rack positions created by the access seeker in comparison to the number of new rack positions utilised by the access seeker). Telstra then gives the access seeker a 15% add-on credit additional to this figure.

Evaluation

9.20 The trade-off to be balanced in deciding whether set-up costs should be recovered upfront or through ongoing rental charges is certainty of cost recovery/payment (achieved via upfront charges) versus a lower upfront cost, which may be preferred by smaller access seekers even if the overall cost incurred is greater over time.

9.21 Option 1 has the lowest upfront cost barrier, however it may be difficult to estimate the number of operators the cost should be recovered over. Therefore, rental charges may end up being overstated if Telecom errs on the side of over-recovery rather than under-recovery. Due to the uncertainty and risk in estimating future requirements this option may create significant capital burden on Telecom.

9.22 Option 2 has higher upfront costs for initial access seekers than option 1.

9.23 Option 3 has the highest upfront capital costs for access seekers. This approach could be a barrier to entry, especially for smaller access seekers. In Australia, this approach is used where the access seeker who meets the costs also undertakes the initial design and construction work (related to the elements described in the 'problems and issues' paragraphs above). This means the access seeker gains some compensating benefit in the form of greater control over the cost and timing of the set-up work. The co-location set-up work can also often be undertaken more quickly, as the set-up work can be shared across different parties.

9.24 Overall, it is possible that different access seekers may have different preferences between a certain upfront charge or ongoing monthly rentals. Cost recovery from subsequent access seekers will ensure some subsequent compensation for any costs that are of benefit to third parties.

Recommendation

9.25 The TCF recommends that the preferred model is determined in phase 2.

10 Co-location Rights of Tenure

Background

10.1 This section provides a high level overview of the options for co-location rights of tenure.

10.2 Co-location tenure rules will determine an access seeker's rights (including Telecom's) once an access seeker has been provided with co-location space and facilities. Tenure rules will also impact on the degree of certainty Telecom has around co-location set-up cost recovery if these are not recovered up front from access seekers.

10.3 The relevance of any rights of tenure are related to the extent of any likely changes to Telecom's network and the amount of notice an access seeker received of such changes prior to co-locating. The other co-location options available will also be relevant.

Issues

10.4 The key issues related to rights of tenure in an exchange or cabinet are duration, transferability and obligations to use (i.e., a "use it or lose it" type provision or a right to trade rights to space).

10.5 The trend towards cabinetisation creates related issues around the potential for stranded assets at the exchange if it is closed down or there is a reduction in the number of addressable lines from an exchange even if it is not closed. Further, as space is at more of a premium in cabinets there may be more call for "use it or lose it" type provisions or tradability.

10.6 It is important to guard against risks of gaming or anti-competitive behaviour in relation to occupation of premium space in exchanges.

Objectives

10.7 The objective is to provide sufficient certainty to encourage efficient investment, balanced against the need to promote dynamic pressures (innovation) in the competitive process.

10.8 Key elements that any tenure rules will need to achieve and balance are (as for set-up cost allocation):

(a) Timeliness;

(b) Low cost;

(c) Equivalence;

(d) Efficiency;

(e) Durability; and

(f) Consistency with international best practice.

Tenure Options

10.9 There are four broad options around tenure rights, which could all be combined with notice requirements discussed below in relation to changes to Telecom's network.

Option 1: No duration period specified (with or without a "use it or lose it" provision)

10.10 Under option 1, an access seeker would be entitled to continue to rent building and equipment access for as long as the co-location service is regulated. There would be no minimum term required. The only limits on this would be: (a) a "use it or lose it" period, if agreed; and/or (b) notice provided by the access provider of closure of the relevant facility.

Option 2: Minimum term specified

10.11 Under this approach, an access seeker would be required/entitled to rent building and equipment access for a minimum term. Subsequent to that term, ongoing access would be provided for as long as the co-location service is regulated, subject to: (a) a "use it or lose it" period, if agreed; and/or (b) notice provided by the access provider of closure of the relevant facility.

Option 3: Maximum term specified

10.12 Under option 3, an access seeker would only be entitled to rent building and equipment access for a maximum term.

Tradability

10.13 A related issue is whether access seekers may trade (sell or sub-let) their co-location tenure rights. This could be an add-on feature, or an alternative to the "use it or lose it" provision.

Notice of Changes to Telecom's Network – Exchange or Cabinet Closures or Changes that Affect Co-location Space

10.14 Under any of the above options, Telecom should be required to provide reasonable notice of any changes to its network (e.g., closure of an exchange) that could affect an access seeker's tenure at a particular facility.

10.15 For example, BT was initially required to give a notice period of three years before closure of an exchange. This has subsequently been reduced to 12 months. If 12 months notice is not given, BT is required

to indemnify access seekers for the cost of disruption arising from the moves. If an access seeker is not made aware of the closure before collocation, compensation could include meeting the access seeker's costs of relocating, including additional recurrent costs for a period of three years.

10.16 Access providers are also generally required to make access seekers aware of alternatives available to the access seeker to continue to offer services in the exchange area using LLU in a comprehensive closure plan provided at least 12 months in advance. In the US, incumbents are required to enable access seekers to continue to use the copper to the exchange or allow access seekers to purchase a line card in the incumbent's cabinet.

Notice of changes to Telecom's network – Cabinetisation or Changes that Affect Addressable Lines from an Exchange

10.17 As well as the above issue around tenure rights to co-location space, cabinetisation by Telecom is likely to change the addressable lines from an exchange and will also require rules around notification.

10.18 As and when Telecom installs new cabinets, some end customers previously serviceable from exchanges will move to be fed from cabinets. This will alter the potential serviceable market for access seekers and could therefore have an impact on an access seeker's investment in DSLAMs at the exchange.

Evaluation

10.19 Option 2 in terms of space tenure would provide the most certainty for both access seekers and Telecom – the minimum term could be set to ensure recovery of Telecom's costs (if recovered on an ongoing basis) and an access seeker's sunk costs in DSLAM investment and related equipment. However, this approach may restrict Telecom's ability to modify the network.

10.20 Under all options, adequate notice should be provided of changes to Telecom's network that would affect an access seeker's 'space' tenure at an exchange.

10.21 Adequate notice should also be provided of changes to Telecom's network that would affect the number of lines that are addressable from an exchange (or cabinet). This notice period needs to strike a balance between ensuring sufficient certainty for investment, allowing innovation in access seeker services (the benefits of competition), and allowing service improvements by Telecom or any other party (in relation to the access network, particularly cabinetisation).

10.22 Tradability may help ensure the efficient reallocation of unused space. However, as access seekers are entitled to obtain cost-based co-location from Telecom under the Bill there may be limits on the

development of a secondary market for co-location space depending on how the regulated price for collocation is set.

10.23 Tradability without a 'use it or lose it' provision could also lead to inefficient or anti-competitive use of space.

Recommendations

10.24 The TCF recommends:

(a) Option 1 in relation to tenure rights, with a 'use it or lose it' requirement is preferred. The desirability of this option will need to be confirmed in phase 2 following discussions around set-up cost allocation. If a monthly rental is preferred as the cost recovery method, then a minimum term may be needed to provide some certainty around cost recovery by Telecom;

(b) Except in emergency situations, Telecom should be required to give reasonable notice of any changes to its network that would affect an access seeker's co-location access tenure at an exchange or cabinet; and

(c) Reasonable notice should also be given of cabinetisation and cross-connect that may affect an access seeker's addressable market. The required notice period needs to strike a balance between ensuring certainty for access seekers and allowing improvements to the network to occur. The length of notice required before changes can occur will be discussed further in phase 2. As long as an exchange or cabinet is still operating, an access seeker should continue to have access to it.

11 Cable Management

Background

11.1 This section outlines the high level issues and options relating to cable management in co-location spaces.

Cabling elements

11.2 Cabling between racks in an exchange is typically done with cables specifically designed for the purpose, whether copper or fibre. This cabling is usually installed in cable trays located above (or below) the racks and installed with permanent fittings, often becoming part of the infrastructure of the exchange.

11.3 Jumpers are usually red and white twisted pair wires, loosely laid on a rack as a temporary connection between a fixed cable on the exchange side and one on the distribution side (usually between a service and the local loop). These pairs are designed to slip out from under many others so that when a connection is no longer required the jumper can be removed and replaced for the next connection to either the service or the local loop. Fire resistance is a major consideration, because these connections traverse the entire exchange and could help spread a fire quickly.

11.4 MDF connectors are part of the cabling infrastructure and need to be considered within this category

Trends

11.5 Neither exchange cables nor jumpers have changed significantly for generations. New plastics for insulations have altered the cost and performance, but their function and appearance is the same as in 1950.

11.6 A potential, but unlikely, change in the future is the introduction of "jumperless MDF's", these are effectively switches for pairs, and have yet to be widely used due to cost and effectiveness.

11.7 Fibre MDF's are now growing in size and already require similar practices to copper, although more stringent to avoid short bends.

11.8 Copper connectors are reducing in size and simplicity of connection to minimise space and labour respectively. Telecom can only update these economically when the associated cables are disconnected and replaced, leading to slow changes to the MDF.

11.9 However against this trend the activation of fibre in cabinets leads to increasing space from cables being removed (typically activation of a cabinet, removes 400 pairs from the MDF, which become direct

connections to the NEAX through PRA connections over E1's, the copper jumper having effectively moved to the cabinet.

Constraints

11.10 Practices that enable good management and quality of the cables and jumpers are required to be maintained on this equipment. There is a strong requirement to constrain access to work build or maintain internal cables and jumpers to those who are well trained. Equipment standards are required that ensure long term reliability for these assets which have very long lives, many past errors were avoided in New Zealand by prudent management of these facilities.

Empirical information

11.11 The resource required for jumpering can be significant, especially in relation to the space available. Running jumpers requires a lot of movement around and about an MDF, restricting the numbers of people who can comfortably work on any MDF at the same time.

11.12 Jumpers are required to connect the equipment of either an access provider or an access seeker to the individual cable pairs leading to customers.

11.13 There are in the order of approximately 4,000,000 pairs terminated on MDF's nationwide in about 500 exchanges and over 4,000,000 in about 10,000 cabinets, of which 3,000 are derived or fibre fed, thus very difficult to unbundle.

Objectives

11.14 Key objectives in relation to cable management in co-location facilities include:

(a) Keeping the cost low;

(b) Preserving network integrity and safety;

(c) Meeting agreed standards to ensure technical efficiency; and

(d) Equivalence between access seekers and the access provider.

Issues and Options

11.15 Trained installers and maintenance workers. Both the access provider and access seekers seek to ensure that only appropriately trained people have access to build, move or change equipment or cables in an exchange or cabinet. The Independent Training Organisation (ITO) has excellent processes for training, certificating and maintaining the quality of training materials to be entrusted with this function.

Minimum standard qualifications should be set for workers on internal cabling.

11.16 Who does it? Telecom or access seeker?

(a) Telecom currently employs contractors for all this work. They have maintained their standards by having the ITO identify who can do this work. Thus the person most likely to do this work is neither Telecom nor the access seeker, but an independent contractor.

(b) A competitive market already exists for the provision of cabling, it would be smart to maintain that market by allowing access seekers to contract directly for the provision of services, avoiding the pitfalls of keeping Telecom to a SLA regime that is artificial and unproductive.

(c) Jumper running can be "lumpy" in activity, leading to a requirement to spread the workload to avoid having too many people working on an MDF at once. This can best be achieved, whilst maintaining high standards by having a single "owner" of the pool of jumpers. Jumpers are a consumable, so they have no value once installed, however the pool needs to be maintained well to minimise the cost of running future jumpers, this can best be done by a single contractor with clear incentives to achieve. The access provider should be responsible for this activity.

11.17 Who pays for cabling?

(a) Telecom could pay, but this will add complexity, cost and risk on timing to the access seeker, while increasing financial risk to Telecom.

(b) Overhead iron work and cable is a common facility that is likely best rented by Telecom to the access seeker.

(c) MDF blocks are a fundamental part of the MDF, but within minimum standards, could be bought and installed by contractors employed by the access seeker, allowing innovation to provide better solutions on the service side, using Telecom blocks on the local loop side.

(d) The cabling should be paid for by the access seeker to enable innovation.

11.18 Who pays for jumpering?

(a) Access seeker; or

(b) Access provider.

11.19 Who owns? Ownership needs to be held by the company who pays for the asset in all cases, to ensure liability for performance and management.

11.20 Materials standards - Racks, cables, fibres. The use of any equipment can compromise the functionality of the exchange, potentially making it unsafe or electrically interfering with other equipment, (for example the use of cabinet blocks on an exchange MDF may make it difficult to avoid damage with normal practices). Further work on standards will need to be completed to enable the setting and management of equipment standards that ensures the quality required to avoid interference with other carriers' assets and work practices.

Recommendations

11.21 The TCF recommends:

(a) ITO certification of people allowed to complete cabling, jumpers and MDF block installation;

(b) Telecom install, own and thus rent overhead iron work and cable trays;

(c) Telecom will pay for jumpering and cover cost through installation charge to access seeker;

(d) Access seekers to be responsible for their own installation of both cabling and equipment. They have control over quality and costs subject to minimum standards; and

(e) Standards will need to be set for cables and rack equipment used. This maybe integrated into the overall co-location design process.

12 Power Supply Management

Background

12.1 This section provides an overview of the issues and options relating to power supply management in an LLU/NDSL exchange or cabinet.

12.2 Equipment characteristics. While telecommunication equipment can run on both AC and DC power supplies, the majority run on DC power. DSLAMs, used to deliver broadband connections, are almost exclusively powered by DC power.

12.3 Continuity of supply. An important requirement of most service providers is continuity of service during a failure of the main power supply to the site. Continuity is achieved by various means:

(a) A UPS (uninterruptible power supply) can be used to avoid any short breaks in an AC power supply. UPS is used to cover short breaks, or to allow equipment to be shut down correctly;

(b) DC battery supply can be used to supply both DC and AC powered equipment. Converters are used to produce AC power. The size of the battery and actual load determine the length of time a battery will maintain the equipment before this voltage level drops to an unacceptable level. This length of time can vary from one hour for a big site that has engine alternators, to 12 hours for a remote site that has battery back up only; and

(c) An engine alternator (EA) is often provided at larger sites, which reduces the DC battery size and also provides AC power for other uses. The only limitation is the amount of fuel that is held on site, which is usually in the order of weeks.

12.4 Exchanges. For a site that has either an EA and/or DC battery, there is an ongoing process of checking that the equipment loading does not exceed the capacity installed. For DC power, the feeder cable sizing is also critical as an increase in load can cause a significant voltage drop affecting the equipment. This is more critical for DC fed equipment than AC equipment.

12.5 Cabinets. Power supply to cabinets is generally always by battery to provide DC power. There are certain limitations in providing power to cabinets due to their remote nature and the physical space available to house the batteries.

Objectives

12.6 The objective is to ensure that power services in an LLU environment are provided in a manner that meets the power needs of access seekers and the access provider in an efficient manner, in particular, it should:

(a) Leverage off existing power management processes and arrangements;

(b) Avoid over or under provision of power services;

(c) Optimise space for co-location (particularly in cabinets);

(d) Enable flexibility of arrangements between the access provider and access seeker where necessary;

(e) Be compatible with current technologies;

(f) Be reliable and uninterruptible;

(g) Be cost effective for both the access provider and access seekers; and

(h) Meet the requirements of the RMA process.

Constraints

12.7 Four key constraints need to be considered:

(a) The main trade-offs are between providing flexibility (AC and DC power), back-up facilities, space conservation, and cost;

(b) AC power supply must be isolated from telecommunications services to avoid interference and ensure electrical safety;

(c) If DC power only is supplied, there will be no differentiation in services offered by access seekers and access providers in relation to reliability as all back-up services will be provided by the access providers' EA and DC batteries; and

(d) Power supply competes with LLU equipment for space in cabinets. Power issues (along with heat management) can create critical and binding limitations for co-location in cabinets.

Issue

12.8 The key issue is whether the access provider should provide AC power only (and let the access seeker convert to DC), DC power only, or both AC and DC.

Options for Exchanges

Option 1: AC power only

12.9 Relevant accountabilities include:

(a) The access provider provides one or more 16 Amp circuit breakers on a distribution board located in the co- location area;

(b) Where available, the supply will be connected to that 'back up' by an engine alternator;

(c) The access seeker runs a feed from the distribution board to their equipment rack(s); and

(d) Any UPS or battery requirement must be supplied by the access seeker in their footprint.

12.10 Other relevant features of this option include:

(a) It is used by BT, which also offers, as part of their infrastructure rack, the option of a UPS and/or DC rectifiers;

(b) It can be an inefficient use of floor space if the access seeker also wants to install their own battery back up;

(c) Generally AC power feeds are cheaper to install into co-location areas; and

(d) If the access seeker installs UPS and DC batteries, then the combined access provider and access seeker costs are likely to be higher than just a DC power supply.

(e) Allows differentiation for back-up times.

Option 2: DC power as the main supply

12.11 Relevant accountabilities include:

(a) The access provider provides fused DC power supply;

(b) The access seeker runs DC power cables from the provided DC sub board in the co-location area.

12.12 Other relevant features of this option include:

(a) It is used by Telstra. There is no AC available and if required it must be inverted by the access seeker;

(b) Eircom also use this approach. However a three-pin outlet is supplied for test equipment;

(c) Establishing a DC power feed into the co-location area tends to be more expensive than just an AC option. The overall cost will be higher than the AC option as the components are the same with the additional cost of the battery;

(d) This option is usually more space efficient than providing a number of individual batteries;

(e) More care is required in cable design than for AC supply due to the lower tolerance of voltage drops;

(f) As this option uses low voltage it avoids issues that occur when extending AC power along rack rows; and

(g) It is expected that a three-pin AC outlet would be located in the area for use by test instruments.

Option 3: Both AC and DC power

12.13 Relevant accountabilities include:

(a) The access provider provides both AC power and DC power;

(b) Other accountabilities are as above.

12.14 Other relevant features of this option include:

(a) It is not known to be used by any other LLU country; and

(b) It has higher set up cost than the other options, offering only one choice, which must then be recovered. This is because both AC and DC would need to be installed for a co-location area and the set-up costs recovered from all access seekers regardless of whether they use both supplies.

Evaluation

Options	OPTION 1: AC Power Only	OPTION 2: DC Power Only	OPTION 3: AC and DC Power
Set up costs	Cheapest for the access provider. Access seeker incurs costs if they want a no break supply and/or battery back up	More expensive for the access provider. Cheapest for the access seeker	Most expensive option for the access provider as the infrastructure for both supplies is required.
Back up systems	AC power is connected to an Engine Alternator (EA) supply if available. Access seeker must supply UPS and/or batteries and rectifiers if they want a	The access provider provides the back up battery power supply. These are installed to support the load for a set number of hours.	Dependant on which system the individual access seeker uses.

Options	OPTION 1: AC Power Only	OPTION 2: DC Power Only	OPTION 3: AC and DC Power
	more reliable supply		
Space efficiency	Poor due to access seeker having to install any back up systems within their footprint	Good due to the use of a common centralised supply	Poor if access seeker installs a UPS and/or batteries
Forecast accuracy	Forecast of AC power requirements usually has sufficient capacity to allow for forecast inaccuracies	DC power design requires a more accurate forecast as the DC power design is less tolerant of forecast variation	As per AC and DC option
Technical issues	AC power supply must be isolated from telecommunications services to avoid interference.	Has the best mean time between failures rating.	As per AC option
Back up flexibility	Allows the access seeker to determine the level of back up in terms of duration	Is set by the access provider's requirements. Would require a separate commercial arrangement to extend it.	As per AC and DC option
Operational cost	Access seeker has running costs of UPS and/or battery. Access provider has running cost of AC supply - passed on as a rental Combined operational costs expected to be similar to the DC option	Access provider has all the running costs - passed on as a rental. Access provider charge is higher than the AC option but overall costs expected to be similar	As the access provider has both the running costs of the AC and DC power the combined power charge is likely to be higher
Other Telcos.	BT	eircom, Telstra, current Telecom NZ Ltd practice	None known
Summary	As most DSLAMs are DC powered all access seekers will install rectifiers and at least small batteries. Consequently this option is space inefficient and will drive up costs in terms of footprint usage.	Optimises space usage but does lock the access seeker into the reserve timing set by the access provider	As a co-location area would have to be set up for both AC and DC power this first-up cost would be shared by all access seekers regardless of their requirements.

12.15 In essence, it is a trade-off between flexibility, space conservation and cost:

(a) Option 1 can lead to poor space efficiency;

(b) Option 2 minimises space usage but requires more accurate load forecasting; and

(c) Option 3 gives the most flexibility but at the highest cost.

Recommendation for Exchanges

12.16 The TCF recommends option 2 – that is, DC power supply is provided, and any requirement for AC power is arranged on commercial terms outside the regulated service.

Options for Cabinets

12.17 Cabinet space is at a premium and limits the available options for power supply. Within the cabinet, the access seeker's equipment is connected to the same distribution panel as the access provider's equipment, which means that rather than having a separation of services, power supply and heat management will have to be considered as part of the whole cabinet regime.

Option 1: Only AC power is provided

12.18 Relevant accountabilities include:

(a) The access provider provides a 16 Amp circuit breaker; and

(b) Space, or high cost of creating additional space, is likely to preclude the access seeker installing a UPS or a separate battery. Consequently the AC supply should be treated as having no backup.

Option 2: DC power as the main supply

12.19 Relevant accountabilities include:

(a) The access provider provides fused DC power supply;

(b) The cabinet will have limited capacity for batteries, which will set the maximum available back up time/load relationship (as shown in picture below); and

(c) Note that cabinet has a 3 pin outlet for test instrument use.

Option 3: Both AC and DC power

12.20 Relevant accountabilities include:

(a) The access provider provides both AC power and DC power; and

(b) As the access seeker equipment is fed directly from the cabinet's distribution boards, this option does not incur the level of additional cost that the equivalent option for an exchange does.

Evaluation

Options	OPTION 1: AC Power Only	OPTION 2: DC Power Only	OPTION 3: AC and DC Power
Set up costs	Due to the confined space both AC and DC options are available as an integral part of the cabinet	Due to the confined space both AC and DC options are available as an integral part of the cabinet. If the required battery capacity is greater than what can be housed in the cabinet there may be a set up cost to house a larger battery remotely.	See AC and DC options
Back up systems	No AC supply back up. Unlikely to be any room for access seeker to install UPS and/or batteries	DC battery available. Capacity limited to that which can fit into the cabinet.	Dependant on which system the individual access seeker uses.
Space efficiency	Poor due to access seeker having to install any back up systems within their footprint	Good due to the use of a common centralised supply	Poor if access seeker installs a UPS and/or batteries
Forecast accuracy	Forecast of AC power requirements usually has sufficient capacity to allow for forecast inaccuracies	DC power design requires a more accurate forecast as the DC power design is less tolerant of forecast variation	As per AC and DC option
Technical issues	AC power supply must be isolated from telecommunications services to avoid interference.	Has the best mean time between failures rating.	As per AC option
Back up flexibility	Not applicable due to confined space	Is set by the access provider's requirements. Would require a separate commercial arrangement to extend it.	As per AC and DC option

Options	OPTION 1: AC Power Only	OPTION 2: DC Power Only	OPTION 3: AC and DC Power
Operational cost	Access seeker has running costs of UPS and /or battery. access provider has running cost of AC supply - passed on as a rental Combined operational costs expected to be similar to the DC option	Access provider has all the running costs - passed on as a rental. access provider charge is higher then the AC option but overall costs expected to be similar	As the access provider has both the running costs of the AC and DC power the combined power charge is likely to be higher
Other Telcos.		Current Telecom NZ Ltd practice	Current Telecom NZ practise which is available but not currently used.
Summary	Due to the restricted space in a cabinet an access seeker is extremely unlikely to have the option to install their own UPS and/or battery.	Optimises space usage but does lock the access seeker into the reserve timing set by the access provider	As per AC and DC option

Recommendation for Cabinets

12.21 The TCF recommends option 3: Both AC and DC power can be readily made available at the cabinet without incurring additional set up cost due to the confined space. However if an access seeker wants back-up power supply they must use Telecom's DC power supply.

13 Heat Management

Background

13.1 This section provides an overview of the issues and options in relation to heat management in an exchange or cabinet in the context of an LLU environment.

Equipment Trends

13.2 Cooling requirements of electronic equipment are driven by the:

(a) total heat generated;

(b) concentration of the heat; and

(c) surrounding environmental conditions.

13.3 The equipment trend is towards a high density packing of components and functionally, which means that the heat per space unit is increasing even though improvements in electronics are reducing power consumption. For example DSLAMs in the last 12 to 15 months have doubled the line capacity for the same space unit, with heat dissipation for the space unit increasing by about 75%.

Cooling technologies

13.4 Cooling methods available for telecommunication equipment are[38]:

(a) Air-to-air heat exchanger – moderate price and small in size;

(b) Air Conditioner – expensive, moderate in size;

(c) Passive through wall cooling – low cost, low power; and

(d) Forced Air Cooling – low cost, low protection.

13.5 Consideration is also given to the cooling of the site or location of the equipment and this is often multi-layered:

(a) The "box of electronics" has its own set of fans cooling using forced air, ensuring no heat spots occur.

(b) If the "box of electronics" is located in a cabinet then the cabinet may have a set of fans, again ensuring adequate air flow to avoid hot spots.

[38] Eaton Industries presentation 'The challenges involved in fitting broadband equipment into roadside cabinets'. 31 October 2006.

(c) The equipment room is then cooled on a room basis to remove the excess heat from the site. Careful design of this system is required to ensure that there are no hot spots within the room.

Site characteristics

13.6 In general, telecommunication sites within New Zealand can be divided into three groups:

(a) Large sites that use full air conditioning systems which are often part of the building infrastructure but can also utilize stand alone systems. This is the most expensive option so requires the scale of larger sites to ensure reasonable economics.

(b) Filtered fresh air cooling at smaller exchange sites which require regular filter changing, driving operating costs and hence the practice is not widely used. This is a low cost option to install though running costs are higher then a passive heat exchanger.

(c) Passive heat exchangers, which are generally only used in roadside cabinets and consists of the internal hot air being circulated over a ribbed metal surface which is cooled with forced external air. Low cost both to install and maintain, can only handle small sites such as roadside cabinets.

13.7 As telecommunications equipment is expected to continue to work during a power supply outage to the site the cooling system must also be able to function during this period or the equipment will overheat and fail.

13.8 There are two key issues in relation to heat management in an LLU exchange:

(a) To measure the generation of heat as a separate item, a bespoke measuring system will need to be developed and installed; and

(b) There may be some conflict between heat dissipation and co-location depending on the type of cooling facilities an exchange has. The costs to upgrade the cooling facilities to accommodate LLU will need to be considered as part of the initial set-up cost. Auditing the exchange buildings will identify areas of concern.

Cabinets

13.9 The cooling options for a roadside cabinet are limited because the main constraint is the need to minimise external cooling noise to comply with RMA requirements (i.e. keeping noise levels low enough that neighbouring residents are not affected). Consequently, the choice of air conditioning systems is not generally available due to the noise levels generated by these units. In addition, most cooling systems use heat exchangers to transfer the heat from inside to outside for

dissipation, which also avoids the possibility of dust entering the cabinet.

13.10 Constraints on managing heat in cabinets can therefore create critical and binding limitations on co-location in cabinets.

13.11 The key technical challenge in relation to heat management in an LLU cabinet is to minimise the space required for cooling, and maximise the space available for co-location of DSLAMs. At present, cabinet design is dictated by the limitations of heat dissipation, noise of cooling equipment and cooling methods, which uses valuable space within a cabinet and therefore seriously impacts on co-location options in a cabinet.

Objective

13.12 The objectives in relation to heat management at an exchange or cabinet in an LLU environment are to provide cooling services in a manner that:

(a) Meets the needs of access seekers and the access provider, avoiding over or under provision of cooling services;

(b) Optimises space for co-location over time;

(c) Is reliable;

(d) Is cost effective for both the access provider and access seekers; and

(e) Meets the requirements of the RMA process.

Framework

13.13 The TCF's framework assumptions are that:

(a) The service levels to which an area is cooled will be set out in the code;

(b) The access provider will provide the required level of cooling at the most economic rate taking into account future requirements; and

(c) The access seeker needs to manage the heat dissipation from its racks or cabinets. Telecom will ensure management of heat being dissipated from the room or roadside cabinet.

Key Issue

13.14 A key issue to be considered at this stage is the basis on which the cost of cooling should be recovered, as this will have a material impact on the degree to which the objectives outlined above are achieved.

Options for Exchange Buildings

Option 1: Standard footprint rental

13.15 Under this option, the cooling costs are included in the foot print rental – in other words, a fixed heat dissipation per footprint, set at current average levels. Under this option:

(a) The access provider provides cooling on the basis that there is a maximum allowable heat load per foot print that the access seeker is allowed;

(b) If the access seeker's heat load per footprint is higher than this allowance then the access seeker must purchase additional foot prints to compensate.

13.16 Some other relevant features:

(a) This approach is used by both BT and Eircom;

(b) It allows appropriate sizing of the air conditioning unit, set by the number of foot prints in an area; and

(c) It will drive some inefficiencies of space utilisation as equipment becomes higher density and hence a higher heat load per foot print.

Option 2: Future-based footprint rental

13.17 This is the same as option 1 except that heat load per footprint is set at a high enough level that it will meet most footprint loadings. - in other words, a fixed heat dissipation per footprint set at expected future levels.

13.18 This will avoid the need to purchase extra footprints to meet heat loadings. In some instances this may mean that the access seeker pays for cooling it does not use.

Option 3: Separate cooling charge

13.19 Under this option, each access seeker would have a separate cooling charge based on power load, and therefore effectively no restriction on footprint heat dissipation.

13.20 Relevant accountabilities include:

(a) The access provider provides cooling on the forecasted loading provided by access seekers; and

(b) The access provider has to manage the increasing heat load to know when an expansion is required.

13.21 Relevant impacts include:

(a) An access seeker will have to nominate for charging purposes a number of units of cooling capacity when they rent a foot print. If they wish to exceed this cooling capacity they will have to order more, if there is no spare available then despite having the space for equipment they will have to wait until the upgrade is complete;

(b) This option requires a higher level of management from both the access provider and access seeker. Hence will have a higher ongoing cost;

(c) It would require an access seeker that already had a footprint to forecast an increase in heat load;

(d) It would allow floor space to be used more efficiently; and

(e) Billing costs could potentially increase significantly. This may be minimised if the cooling charge is based on power consumption (the Telstra approach). Alternatively an agreed estimate could be based on equipment types with the ability to audit as required.

Option 4: Combination of options 1 and 3

13.22 This is a combination of options 1 and 3 – that is, a base level allowed in the footprint charge with any overage charged on usage. Put another way, a fixed dissipation per footprint with ability to exceed this rate.

13.23 This would require the billing system to track usage and deduct the base level. The billing system would therefore be more complex.

Evaluation

Options	OPTION 1: A fixed heat dissipation per footprint. Set at current average levels	OPTION 2: A fixed heat dissipation per footprint. Set at expected future levels	OPTION 3: Separate charge	OPTION 4: A fixed dissipation per foot print with ability to exceed this rate.
Charge mechanism	Recovered as part of the footprint rental	Recovered as part of the footprint rental	Charged based on usage	Fixed part is recovered as part of the footprint. An overage is recovered based on usage
Billing overhead	No additional overhead to footprint billing	No additional overhead to footprint billing	Additional billing overhead. See text re significance	Additional billing overhead. See text re significance
Access seeker forecasting	No additional forecasting requirement, access provider bases requirement on footprint forecast	No additional forecasting requirement, access provider bases requirement on footprint forecast	Access seeker must forecast separately to footprint forecast. 12 month forecast gains importance because of build lead time	Access seeker must forecast separately to footprint forecast. 12 month forecast gains importance because of build lead time
Space efficiency	Drives poor efficiency	Improves efficiency depending on level set	Most efficient	Most efficient
Cooling capacity efficiency	High as the allowed heat dissipation rate will be used. Minimum margin for error.	Low efficiency as the level provisioned based on footprints may be higher then that used. Consequently will contain some headroom for error.	Will be high as capacity is built to meet forecasted demand. Minimum margin for error.	Will be high as capacity is built to meet forecasted demand. Minimum margin for error.
Operational cost	Additional footprints may have to be purchased to meet cooling requirements driving costs up	Higher footprint charge to cater for higher cooling allowance. Expensive if cooling allowance not used	Minimises footprint area and only purchase cooling required.	Minimises footprint area and only purchase cooling required.
Overseas practice	BT, eircom Telstra but on a sub footprint		Current Telecom practice	

Options	OPTION 1: A fixed heat dissipation per footprint. Set at current average levels	OPTION 2: A fixed heat dissipation per footprint. Set at expected future levels	OPTION 3: Separate charge	OPTION 4: A fixed dissipation per foot print with ability to exceed this rate.
	level.			
Summary	Easy to manage and provide. Very inefficient use of space	Easy to manage and provide. Depending on level set can give efficient usage of space. But will drive up costs as not all capacity may be required.	Has a high management overhead but allows efficient usage of space.	Has a higher management overhead but allows efficient usage of space. Higher management overhead than the "no restriction" option as the "fixed" allowance must be tracked.

13.24 The key trade-off is between additional operational cost and more efficient use of the floor space.

Recommendation for Exchange Buildings

13.25 The TCF recommends option 3 if the billing costs can be minimised by using an agreed methodology. A key issue for phase 2 will be to agree on a method for billing heat management.

Options for Roadside Cabinets

Assumptions

13.26 In relation to cabinets, the TCF considers it is reasonable to assume that:

(a) As outlined above, cabinets will continue to be cooled using air based heat exchangers;

(b) Without an active cooling system, on-going operational costs relating to cooling are minimal; and

(c) The cost of setting up the cabinet infrastructure will be recovered either through the initial set up charge or the footprint rental.

Alternative cooling options.

13.27 The only other cooling options in relation to cabinets are to go to active cooling or underground chambers. Neither option is covered here, but cost recovery mechanisms would have to be considered if this development took place.

13.28 Relevant accountabilities would include;

(a) The access provider must ensure that requests from the access seekers do not exceed the cooling capacity of the cabinet.

(b) An additional factor the access provider must consider is the external noise levels to ensure compliance with RMA requirements.

(c) The access seeker must have their equipment tested/integrated into the cabinet to ensure that the equipment does not interfere with the cabinet cooling mechanism.

(d) The testing/integration process is also required to establish the incremental noise load that the equipment represents.

Recommendations for Roadside Cabinets

13.29 The TCF recommends:

(a) Heat management (and power supply) will have to be considered as part of the whole cabinet regime, recognising that it is closely tied to issues of space availability; and

(b) The ongoing cooling charge be incorporated into the footprint charge, recognising that it will be very minor.

(c) Set up cost recovery is considered in section 9.

14 Premise and Cabinet Maintenance

Background

14.1 The section outlines the high level issues and options relating to the maintenance of exchanges and cabinets for LLU purposes.

Scope of maintenance

14.2 While premises and cabinet maintenance could include a wide range of requirements, including those relating to the more aesthetic qualities of premises, the issue considered here is limited to factors that could impact on the reliable operation and protection of access provider and access seeker equipment, which essentially amounts to protection from weather and other external elements.

14.3 Maintenance requirements will, however, also extend to factors impacting the minimum reasonable and safe working conditions for personnel working in premises.

14.4 Most premises maintenance requirements will relate to access provider obligations. Some requirements relating to general upkeep will be equally applicable to both the access provider and access seeker, for example requirements to keep premises in a clean and tidy state.

14.5 There are several other issues covered in this report that will also have an impact on the reliable operation of access provider and access seeker equipment, for example heat management and power supply. Issues considered here specifically exclude factors covered elsewhere in this report.

14.6 The issues are also related to liability provisions for damage to either the access provider's or access seeker's equipment caused by a failure of the premises to adequately protect that equipment. This is discussed further in section 20.

Incentives

14.7 In assessing the options for addressing this issue, alignment of access provider and access seeker incentives in relation to maintenance need to be taken into account. It is useful to consider the relative consequences for the access provider compared to an access seeker if the access provider fails to adequately maintain the premises or cabinet.

14.8 There are no obvious reasons why an access provider would have weaker incentives than an access seeker to ensure that exchanges and cabinets are maintained to a level that ensures equipment within the facility is reasonably safe and protected. While in relative terms damage to access seeker equipment could have a significant impact, there are a

number of factors that tend to support the proposition that there is no less incentive on an access provider, in particular:

(a) an access provider will generally have a significantly greater amount of equipment situated in any premises or cabinet than an access seeker;

(b) that equipment will usually be used for a range of purposes other than (or in addition to) LLU-type services; and

(c) any damage to that equipment may adversely affect a significant number of access provider customers.

Overseas experience

14.9 Little is to be found internationally in relation to these requirements. As an example, the only reference in the BT LLU Reference Offer requires that property services are to be provided to the higher of:

(a) A reasonable level;

(b) The level agreed between the Parties or determined by Ofcom; or

(c) the level BT provides those services to itself.

Issue

14.10 The issue that needs to be resolved is what obligations should be placed on the access provider and access seekers in relation to the general upkeep and maintenance levels of:

(a) premises provided by the access provider for LLU co-location purposes; and

(b) cabinets where access seeker equipment is co-located.

Objectives

14.11 The objective is to ensure that co-location exchange premises and cabinets are maintained in a manner, and to level, that is cost-effective (for access seekers and the access provider) and ensures that the facilities are fit for purpose during the tenure of the access seekers.

Options

Option 1: No explicit maintenance standards defined

14.12 Under this option, it is assumed that because the access provider will already have a significant amount of equipment in any exchange or cabinet that is provided for LLU co-location, the access provider will

have the same incentives as the access seeker to ensure that exchanges and cabinets are adequately maintained.

14.13 It may be that some general upkeep requirements on both access provider and access seeker are still required to ensure minimum standards are maintained relating to Health and Safety Act obligations.

14.14 A variation to this option is to have a set of obligations on the access provider along the lines of those referred to above in the BT LLU Reference Offer. The added advantage with this option is that it places an added obligation on the access provider to maintain the entire premise to the same standard and avoids the risk that the access provider could neglect the area where access seeker equipment is located.

Option 2: Industry agreed SL's for maintenance

14.15 Under this option, a set of minimum standards would be defined relating to the level of maintenance that must be carried out on premise and cabinets. These would probably relate to things like the minimum frequency of building inspections and the NZ Standards that the premises should be maintained to.

14.16 A variation of this option would be to include a requirement to provide proactive reporting to access seekers on the inspection and maintenance programme in relation to any premises or cabinets that they had equipment in.

Option 3: Individual site maintenance plans agreed by the access provider and access seeker

14.17 Under this option, a forum representing the access provider and all access seekers with equipment in an individual premises or cabinet would agree specific maintenance plans for each relevant premises and cabinet. This would need to involve agreed periodic inspections and reports on the condition and any issues with the premises or cabinet and then agreeing what remedial or preventative maintenance is needed and then re-inspection and reporting to confirm it has been done. Maintenance standards would need to be agreed to provide some objective guidance to the process.

14.18 To ensure the smooth operation of these forums, an agreed format and procedure for agreeing maintenance plans would be required, including an escalation and dispute resolution process where agreement is not able to be reached.

Evaluation

14.19 The main evaluation criteria that seem to be most relevant in assessing the options are:

(a) Cost to administer;

(b) Operational efficiency;

(c) Equivalence;

(d) Consistency with international best practice;

(e) Ease and reliability of compliance; and

(f) Overall effectiveness in addressing the objectives.

14.20 An assessment on a scale of 1 to 10 (10 being best) of each option above against these criteria is set out below. The assessment assumes that any variation noted above under an option is included.

	Options		
	Option 1: No specific standards but general BT-style obligations	**Option 2: Industry agreed standards with proactive reporting**	**Option 3: Individual plans for each site agreed by forum**
Criteria			
Cost to administer	No administration.	Reporting would incur some cost.	Complex will add cost.
Operational efficiency	Should be efficient unless an access seeker wants to disputes.	Agreeing standards and reporting add complexity.	Most complex system.
Equivalence	Equivalent by nature.	Standards may not be consistent.	May create very inconsistent results.
Consistency with international best practice	Fits with other practice identified.	No equivalent practice found.	No equivalent practice found.
Ease and reliability of compliance	May be an issues to prove reasonable standards met.	Reporting should demonstrate compliance.	Agreement on a plan will be compliant by only if agreed.
Overall effectiveness in addressing the objectives	May be difficult to provide comfort to stakeholders.	Reporting will facilitate ongoing comfort but add cost.	Complexity and time consuming.

Recommendation

14.21 The TCF recommends option 1, including a set of general obligations on the access provider along the lines in the BT LLU Reference Offer.

15 Equipment and Cable Maintenance

Background

15.1 Maintenance of both equipment and cables can be done by trained and approved people along the lines that Telecom currently use, in fact in many instances access seeker's will use the same people. This work will in all instances be managed by a Network Operations Centre (NOC), this unit may require an agreed standard to issue notifications to other Network Operations Centres.

15.2 Permits to work (PTW) and change notifications (NCN) are common practices. Standards need to be agreed that are reported as SLA's to ensure they are met and followed.

Objectives

15.3 Key objectives in relation to equipment and cabling maintenance in an LLU context include:

(a) Keeping the cost low;

(b) Achieving economic, yet timely completion of fault repair;

(c) Meeting agreed standards to ensure technical efficiency;

(d) Preserving network integrity and safety; and

(e) Equivalence.

Issues and Proposals

15.4 Trained installers and maintenance workers

(a) Fault repair should be performed by people with equivalent training to that required in relation to those who do the construction.

(b) As noted elsewhere, the ITO has excellent processes for training, certificating and maintaining the quality of training materials to be entrusted with this function. Any oversight group formed for the management of the LLU, should set minimum standard qualifications for workers on internal cabling. To achieve this, consideration could be given to appointing a representative to the ITO.

15.5 Who does it? Telecom or access seeker? The owner of the faulty equipment or cabling must take responsibility to arrange to have it repaired.

15.6 Who pays? Owner pays.

15.7 Appropriate timing of work. This is up to the owner, but the timing must be communicated within agreed SL's. This issue is being worked on now in the industry.

15.8 Communications. During a major outage or fault that affects more than one party, not only must SL's be maintained, but open communications between affected NOC's is essential.

15.9 In an LLU environment which an access seeker has control of the line current cable testing arrangements may not be useable and this issue will be considered further in phase 2.

Summary of Proposals

Issues	MDF jumpers	Cabling to MDF	Cable to Backhaul	MDF Blocks
Trained installers and maintenance workers	Nat Cert Level 2	Nat Cert Level 4	Nat Cert Level 4	Nat Cert Level 2
Who does it - access provider or access seeker?	access provider	access seeker	access seeker	access seeker
Who pays?	access provider	access seeker	access seeker	access seeker
Who owns?	access provider	access seeker	access seeker	access seeker
Communications	access provider + access seeker	access provider + access seeker	access provider + access seeker	access provider + access seeker
Appropriate timing of work	access provider manages	access provider manages timing, but meets SL's	access provider manages timing, but meets SL's	access provider manages timing, but meets SL's

Recommendations

15.10 The TCF recommends:

(a) Independent Training Organisation (ITO) for certification of people allowed to work on cabling, jumpers and MDF block installation;

(b) Telecom to maintain all overhead iron work and cable, power systems and air conditioning;

(c) Access seekers to be responsible for their own maintenance, quality and costs, subject to minimum standards;

(d) Service Levels for notifications of planned work; and

(e) Communication methodology using inter-NOC agreements for notifications of major works, as well as direct communications during any major outage affecting access seeker.

16 Access Rights to Telecom Facilities

Background

16.1 Access to exchanges is required by a wide range of people and Telecom has long maintained a system of control with the use of swipe cards. This system is in some cases supported by video, but not often. Access seekers' requirements for security are almost identical to those of Telecom, and the access seeker community is unlikely to require much change from current practices.

16.2 Maintenance of both equipment and cables can be done by trained and approved people along the lines that Telecom currently use, in fact in many instances access seekers will use the same people. This work will in all instances be managed by a network operation centre (NOC), which may require an agreed standard to issue notifications to other NOC's.

16.3 Maintenance in this context only applies to equipment and cables within an exchange or cabinet.

Trends

16.4 Telecom has maintained their access with the swipe cards and has used a process of access if you have the rights. Overseas it is more common for access to be pre-arranged with a security manager.

16.5 Maintenance practices are currently going through major changes in the whole industry. The development of network operation centres (NOC) by access seekers is only just beginning and Telecom's processes that require interaction with them are relatively embryonic, as are the interactions in the opposite direction. Evolution will come naturally due to pressures from each side.

16.6 Video surveillance is a very likely trend in the future as security issues become more prevalent, given that these buildings hold the communications facilities of New Zealand, so are a strategic asset for New Zealand companies and people.

Contextual information

16.7 There are in the order of 500 exchanges and over 10,000 cabinets in New Zealand. These all require security monitoring at a cost that needs to be shared and managed if access is allowed.

Objectives

16.8 Key objectives in relation to developing a regime for access seekers (or their contractors) to access Telecom's facilities for the purpose of servicing their LLU equipment include:

(a) Keeping the cost low;

(b) Providing timely access;

(c) Preserving network integrity and safety;

(d) Maintaining relevant equipment and systems;

(e) Meeting agreed standards; and

(f) Equivalence between access seekers and the access provider.

Issues and Proposals

16.9 Trained installers and maintenance workers. Access to specific spaces within a building needs to be limited to people with acceptable skills or those under the supervision of such a person.

16.10 Who does it? Telecom or access seeker? Telecom is currently operating a suitable system, with card access to the MDF separate from card access to the switch room. Criteria can be set based on card holder's training level and function which will provide good control of access.

16.11 Who pays for the access management system? By contract between access seekers and access provider

16.12 Appropriate timing of access. Timing of access should be completely up to the access provider or access seekers who wishes to do the work, however work done may be restricted due to other reasons, e.g. PTW

Summary of Proposals

Issues	MDF jumpers	Cabling to MDF	Cable to Backhaul	MDF Blocks
Trained installers and maintenance workers	Nat Cert Level 2	Nat Cert Level 4	Nat Cert Level 4	Nat Cert Level 2
Who does it - access provider or access seekers?	access provider	access provider	access provider	access provider
Who pays?	access provider	access seekers	access seekers	access seekers
Who owns?	access provider	access provider	access provider	access provider
Appropriate timing of work	access provider manages	access provider manages timing, but meets SL's	access provider manages timing, but meets SL's	access provider manages timing, but meets SL's

Recommendations

16.13 The TCF recommends:

(a) Use of an appropriate Independent Training Organisation (ITO) for certification of people able to access specific areas within an exchange;

(b) PTW required to access the building, which is potentially linked to a live security controller in the future;

(c) SL's for notifications of planned or unplanned access; and

(d) Consultation with relevant government agencies on security issues relating to access.

17 Handover and Demarcation Points

Background

17.1 The access seeker's equipment must be connected from their footprint via a tie cable to the distribution frame, from where it is cross jumpered to the required copper circuit. Within an exchange building this distribution frame is referred to as the MDF (Main Distribution Frame), in a cabinet it is referred to as just a distribution frame.

17.2 Some practices see the use of an intermediate jumper field located in the equipment area. This is known as an Intermediate Distribution Frame (IDF). This allows rearrangements to be made in the equipment area rather than having to go to the MDF which is usually located in another area.

17.3 Under the Bill, in relation to 'designated access services', 'local loop network'[39] is defined as that part of the Telecom's copper local network that connects the end user's building (or, where relevant, the building distribution frames) to the handover point in Telecom's local telephone exchange or distribution cabinet (or equivalent facility).

17.4 'Handover point' does not appear to be defined in the Bill or the Act. It therefore needs to be defined in any determination or access code. The issue is where to set the handover point.

Objectives

17.5 The objective is to define the handover point for LLU in the proposed code in a manner that provides an efficient allocation of responsibility, in particular:

(a) Clear lines of accountability and responsibility;

(b) Technical efficiency in relation to installing, operating, and maintaining access seekers and access provider equipment and related services;

(c) Network integrity and safety;

(d) Low costs; and

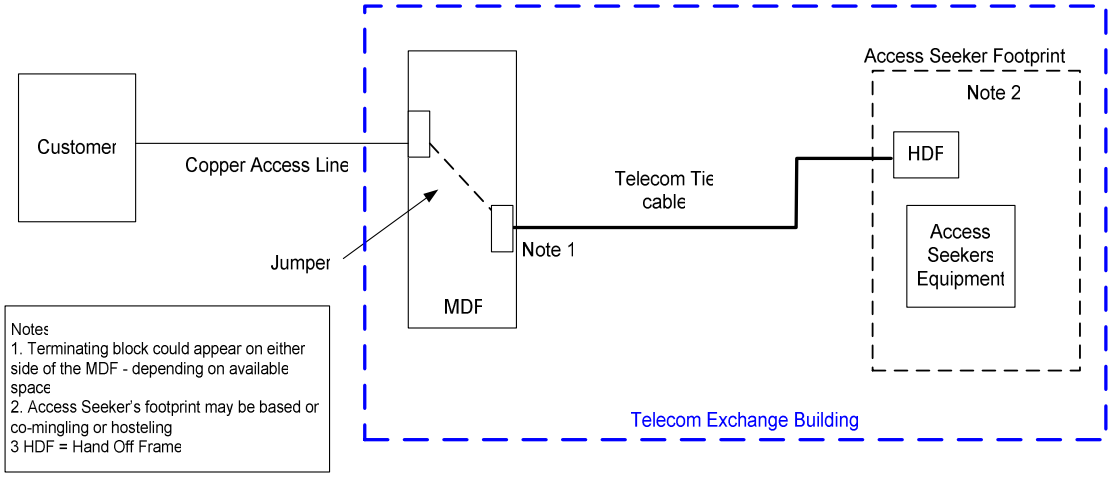
(e) Handover point in exchanges with co-location.

[39] Amendments in Bill to Part 1 of Schedule 1

Options

Option 1- Handover at HDF

17.6 Under this option, the hand over point is located on the Hand Over Frame (HDF) in the access seeker's footprint as indicated in Figure 5 below.



Sketch 1

17.7 Key accountabilities under this option include:

(a) The access seeker's responsibilities do not extend outside their footprint;

(b) The access seeker would isolate a port at the HDF, which is located in their footprint;

(c) Telecom is responsible for the tie cable and termination on the MDF and the blocks on the HDF;

(d) The access provider would install the tie cable and blocks at either end of it; and

(e) It is assumed that the access provider would recover the cost in an installation charge.

17.8 Other key features of this option include:

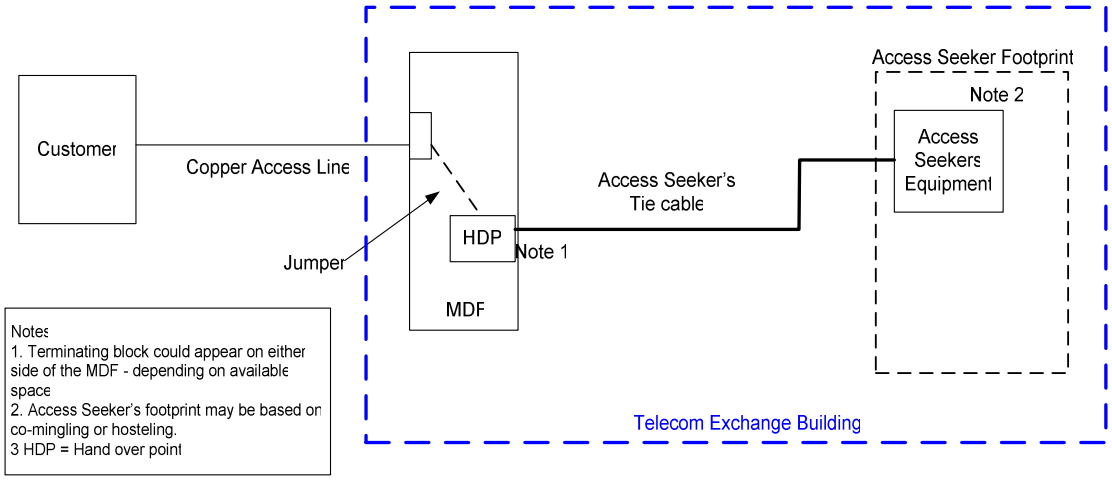
(a) This approach is currently used by BT who supply an infrastructure rack as part of the installation on which is mounted the hand over frame;

(b) The access seeker can carry out port isolation or rearrangements of port to copper circuit within their footprint; and

(c) Requires a block mounted on the MDF which is an area of potential congestion.

Option 2 - MDF handover

17.9 Under this option, the handover is located on the MDF as indicated in Figure 6 below.



Sketch 2

17.10 Key accountabilities under this option include:

(a) The access seeker's responsibilities include the tie cable to the hand over point (HDP) on the MDF;

(b) This approach has the access seeker isolating a port at the HDP, which is located at the MDF; and

(c) The access seeker is responsible for the tie cable.

17.11 Other features of this option include:

(a) It is used by Eircom. It also reflects the current practice of Telecom NZ;

(b) Unless the access seeker installs an intermediate terminating block in their footprint it means any rearrangement of the access seeker's ports requires re-running jumpers on the MDF;

(c) Isolation of ports requires a visit to the MDF area. This has both efficiency and security access issues;

(d) Requires a block mounted on the MDF which is an area of potential congestion; and

(e) The tie cable would be installed by the access seeker under access provider supervision or by the access provider under contract.

Evaluation

17.12 Both options are very similar in cost and time taken to install. If intermediate blocks are used by the access seeker in option 2, then the effective cost is the same. Neither option avoids adding to the potential congestion on the MDF. A comparative evaluation is set out in the table below.

Option	Option 1: Handover point at an HDF in the access seeker footprint	Option 2: Handover point on the MDF
Tie cable and MDF block costs	Access seeker pays for HDF, tie cable and MDF blocks, ownership is access provider	Access seeker pays for HDF, tie cable and MDF blocks, ownership is access seeker
Access seeker Operational costs - new connection	Requires jumper both on the HDF and MDF	Only requires one jumper on the MDF. Assumes DSLAM is hardwired to the tie cable. If an intermediate block is used then two jumpers required.
Access seeker Operational costs - rearrangement	Only requires the jumper on the HDF to be changed	Jumper on the MDF is changed. Exception is if intermediate blocks installed.
Operational efficiency	Ports/customers can be isolated in the access seeker footprint	Ports/customers have to be isolated at the MDF unless intermediate blocks are installed
Space efficiency	Poor space efficiency due to part of the access seeker footprint including the HDF	Allows efficient use of access seeker footprint, can be negated if access seeker uses intermediate blocks.
MDF operational Issues	Minimises MDF congestion for rearrangements to DSLAM ports - expected to be minimal changes.	No change
Other Telcos.	BT	eircom, current Telecom NZ Ltd practice
Summary	BT offered this as part of an infrastructure rack that was sold as part of the LLU product. Restricts the access seeker to their footprint and avoids access issues etc to the MDF area	Gives the choice to the access seeker whether they require the use of intermediate blocks. Is the cheaper of the two options as one less block is required.

Recommendations for Exchanges

17.13 The TCF recommends that the handover point for exchanges with co-location is option 2 – namely, an HDP on the MDF, for the reason that

minimises installation costs and maximises space efficiency in the access seeker footprint.

Handover Point in Cabinets with Co-location

17.14 Options for cabinets when the access seeker equipment is located within the cabinet space is essentially the same as for co-located equipment in an exchange area. The main point of difference with exchange sites is that the equipment is effectively mounted on one equipment rack.

17.15 Within a cabinet, space is at a premium. Consequently any additional termination blocks need to be minimised. Mounting of the handover point on the cabinet distribution frame best achieves this. Having to use space to mount blocks in the area occupied by the access seeker's equipment would be wasteful. Because of the nature of the cabinet, no significant increase in security would be achieved by having the HDP in the access seeker area.

17.16 A comparison of the options for handover points in a cabinet with co-location is set out in the table below.

Options	**Option 1: Handover point at an HDF in the** access seeker **'s space**	**Option 2: Handover point on the cabinet distribution frame**
Tie cable and MDF block costs	Access seeker pays for HDF, tie cable and MDF blocks, ownership is access provider	Access seeker pays for HDF, tie cable and MDF blocks, ownership is access seeker
Access seeker operational costs - new connection	Requires jumper both on the HDF and MDF	Only requires one jumper on the MDF. Assumes DSLAM is hardwired to the tie cable. If an intermediate block is used then two jumpers required.
Access seeker operational costs - rearrangement	Only requires the jumper on the HDF to be changed	Jumper on the MDF is changed. Exception is if intermediate blocks installed.
Operational efficiency	Due to restricted space no difference between options	Due to restricted space no difference between options
Space efficiency	Poor space efficiency due to part of the access seeker footprint including the HDF	Allows efficient use of access seeker footprint.
Summary	Space is at a premium in a cabinet so this option makes inefficient use of it by requiring an additional block.	Minimises space usage.

Recommendations for Cabinets

17.17 The TCF recommends that the handover point in a cabinet with co-location is option 2 – namely on the cabinet distribution frame.

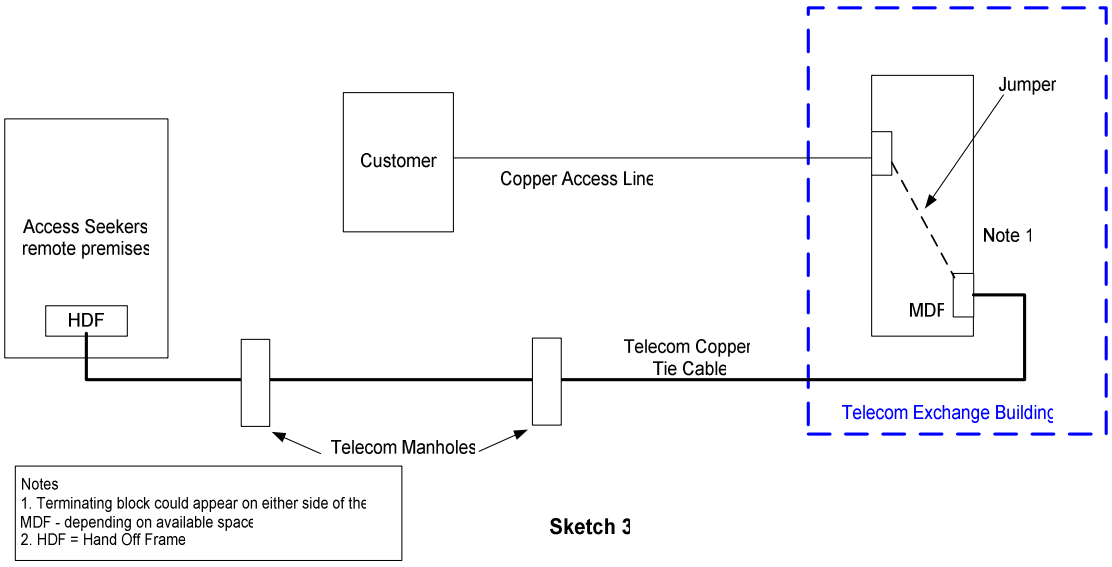
Handover Point in Exchanges with Remote Equipment

17.18 This is where the access seeker's equipment is located on a site other than the exchange site.

Options

Option 1- HDF handover

17.19 Under this option, the HDF is located in the access seeker's remote premises. Telecom installs a tie cable in Telecom's ducts to link the HDF to the MDF outlined in the Figure 7 below.



Sketch 3

17.20 Key accountabilities under this option include:

(a) The access seeker's responsibility ends at the HDF in their remote premises;

(b) The access seeker would isolate a port at the HDF, which is located in their premises; and

(c) The access provider is responsible for the tie cable, which connects to the exchange MDF via the access provider's ducts and manholes and the blocks on the HDF.

17.21 Other features of this option include:

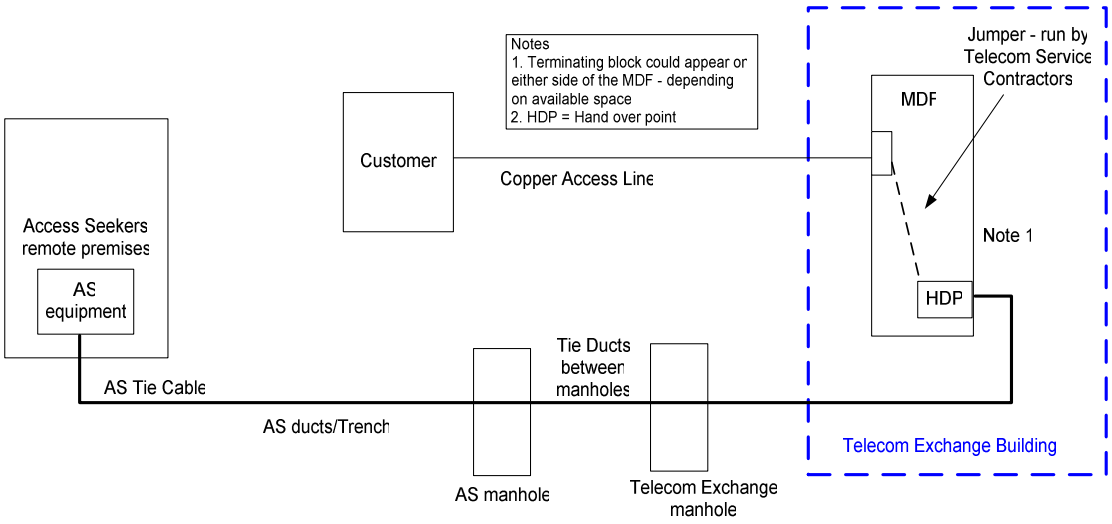
(a) It is currently used by BT;

(b) The access seeker can carry out port isolation or rearrangements of port to copper circuit within their premises; and

(c) It requires a block mounted on the MDF, which is an area of potential congestion.

Option 2 – Handover at MDF

17.22 Under this option, the handover block is located on the MDF as indicated in sketch 4. The access seeker installs a tie cable to connect to the HDP on the exchange site MDF outlined in Figure 8 below.



Sketch 4

17.23 Key accountabilities under this option include:

(a) The access seeker's responsibilities include the tie cable to the hand over point (HDP) on the MDF;

(b) This approach has the access seeker isolating a port at the HDP, which is located at the MDF;

(c) The access seeker is responsible for the tie cable and delivery of it to the designated exchange manhole via the access seeker's ducts and manholes; and

(d) Access provider gives access to the exchange MDF via a designated exchange manhole to which the access seeker duct line is connected.

17.24 Other features of this option include:

(a) Good practice would dictate that the access seeker will have intermediate blocks on their premise to allow for isolation or rearrangement of circuits; and

(b) It requires a block mounted on the MDF which is an area of potential congestion.

Evaluation

17.25 Both options for exchanges with remote equipment location essentially use the same components; hence costs and efficiencies are essentially the same. The main differentiating factor would be based around where the costs associated with connecting the two sites lie and how they are recovered.

17.26 If the access seeker has available a duct line system to the designated exchange manhole then they have minimal cost to install a tie cable.

17.27 If the access seeker does not have a duct line to the designated manhole then it may be more cost effective for the access provider to provide the tie cable using the access provider's duct line system and recover the investment by rental and installation charge.

17.28 A comparison of the handover options for exchanges with remote equipment is set out in the table below.

Option	Option 1: Handover point at HDF in the access seeker footprint	Option 2: Handover point on the MDF
Tie cable and MDF block costs	Access seeker pays for HDF, tie cable and MDF blocks, ownership is access provider.	Access seeker pays for HDF, tie cable and MDF blocks, ownership is access seeker.
Operational issues	Isolation or rearrangements by the access seeker will be completed at the HDF in the remote premises	It is assumed that the access seeker will install intermediate blocks at the remote location for isolation and rearrangements.
Tie cable access to the MDF	Will be installed in access provider ducts	Will be installed in access seeker ducts to the designated exchange manhole
Operational efficiency	Ports/customers can be isolated in the access seeker footprint	Ports/customers have to be isolated at the MDF unless intermediate blocks are installed
Space efficiency	Poor space efficiency due to part of the access seeker footprint including the HDF	Allows efficient use of access seeker footprint, can be negated if access seeker uses intermediate blocks.
MDF operational Issues	Minimises MDF congestion for rearrangements to DSLAm ports - expected to be minimal changes.	No change
Other Telcos.	BT	BT also offers the option of delivering the tie cable to an access seeker manhole near the remote site.
Summary	A remote site will always have blocks available for isolation and rearrangements. This option allows the use of the access provider's ducts	A remote site will always have blocks available for isolation and rearrangements. This option allows the access seeker to minimise

Option	Option 1: Handover point at HDF in the access seeker footprint	Option 2: Handover point on the MDF
		payment to the access provider by using their own duct line.

Recommendations for Exchanges with Remote Equipment

17.29 The TCF recommends that the handover point for exchanges with remote equipment is left for negotiation, recognising the right of the access seeker to access the MDF with the appropriate copper tie cable. The final solution will be driven by cost and accessibility. In any event, it is agreed that there must be a mechanism to ensure that access is available.

Handover Point in Cabinets with Remote Equipment

17.30 This is where the access seeker installs their equipment in housing separate to the access provider's cabinet. The other housing may be another cabinet or a hardened enclosure.

17.31 The options are the same as for the exchange with remote equipment. Access to the cabinet distribution frame would be through the designated cabinet manhole. The same operational and cost efficiency rankings apply.

Recommendations for Cabinets with Remote Equipment

17.32 The TCF recommends that the handover point for cabinets with remote equipment is left for negotiation, recognising the right of the access seeker to access the distribution frame for the appropriate copper tie cable.

18 Backhaul Policy

Background

18.1 This section discusses the high level issues and options relating to certain backhaul services in an LLU environment.

18.2 Backhaul is a critical component of the service because the dimensioning and quality of the backhaul service can have a great impact on the experience of the customer using the derived service. Constraints on backhaul services could make it difficult for an access seeker to achieve the customer experience they wish to deliver.

18.3 The Bill has the effect of enabling access seekers to make use of competitive Backhaul options where available. Regulate backhaul services should be provided in a way that allows LLU service providers to develop products to their own specification, recognising that competitive backhaul options may not be economical for all exchanges.

Act and Bill

Legal definition of backhaul

18.4 As noted earlier, the Bill refers to 'backhaul' as the transmission capacity in Telecom's network that carries the aggregated data from a point in Telecom's network to the point of interconnection with the entrant's network[40]. The Bill provides that the transmission capacity may be copper, fibre, or anything else.

Regulated backhaul services

18.5 When the Bill is passed, the Commerce Commission will be able to prescribe the terms and conditions on which Telecom is to provide a co-location service in relation to access seekers using 3rd party backhaul, and access to Telecom backhaul services.

18.6 The legislation also allows the Telecommunications Industry Forum or the Commission to prepare access codes covering non-pricing elements of these services.

18.7 As noted earlier, the four services the Commerce Commission will be able to regulate in relation to backhaul[41] are:

(a) Telecom backhaul from cabinet to co-located equipment:

[40] Footnote 6 in the Commentary section of the Bill as reported from the Finance and Expenditure Select Committee, which also notes that the statutory definition of 'backhaul' is contained in Part 3 of Schedule 1 of the Bill.

[41] Refer to Bill's amendment to Part 2 of Schedule 1 of the Act

"A service (and its associated functions, including the associated functions of Telecom's operational and support systems) that provides transmission capacity in Telecom's network (whether the transmission capacity is copper, fibre, or anything else) between the handover point in Telecom's distribution cabinet (or equivalent facility) and the handover point in Telecom's local telephone exchange (or equivalent facility), for the purpose of providing access to, and interconnection with, Telecom's copper local loop network (including any necessary supporting equipment)".

(b) Telecom backhaul from exchange to access seeker's POI:

"A service (and its associated functions, including the associated functions of Telecom's operational and support systems) that provides transmission capacity in Telecom's network (whether the transmission capacity is copper, fibre, or anything else) between the handover point in Telecom's local telephone exchange (or equivalent facility) and the access seeker's nearest available point of interconnection, for the purpose of providing access to, and interconnection with, Telecom's copper local loop network (including any necessary supporting equipment)."

(c) Telecom backhaul for 'naked DSL':

"A service (and its associated functions, including the associated functions of Telecom's operational and support systems) that provides transmission capacity in Telecom's network (whether the transmission capacity is copper, fibre, or anything else) between the trunk side of Telecom's first data switch (or equivalent facility), other than a digital subscriber line access multiplexer (DSLAM), that is connected to the end-user's building (or, where relevant, the building distribution frames) and the access seeker's nearest available point of interconnection."

(d) Co-location facilities for 3rd party backhaul used by an access seeker: The potential to regulate the provision of co-location for 3rd party backhaul in exchanges or cabinets arises from an amendment in the Bill which clarifies that, in the context of Telecom providing co-location services to access seekers, 'access seeker's equipment' includes[42]:

"the equipment of any person other than the access seeker (including any line) if that equipment is being used to support the provision of backhaul for the access seeker."

[42] Refer to relevant provision in Bill's amendment to Part 2 of Schedule 1 of the Act

Outline

18.8 Issues and options relating to these scenarios are discussed and evaluated below.

18.9 This section also discusses the need for physical access to the access provider's facilities (exchanges and cabinets) for access seekers' and third parties' (who are providing services to access seekers) communications cables to enable competitive backhaul options.

18.10 A list of abbreviations used in the diagrams below is set out at in the Foreword.

Objectives

18.11 The objective is to provide the backhaul services referred to above in a manner that is consistent with the purpose in section 18 of the Act and applicable access principles. Particular factors relevant to backhaul include:

(a) Equivalence;

(b) Low cost;

(c) Network integrity and safety;

(d) Technical efficiency;

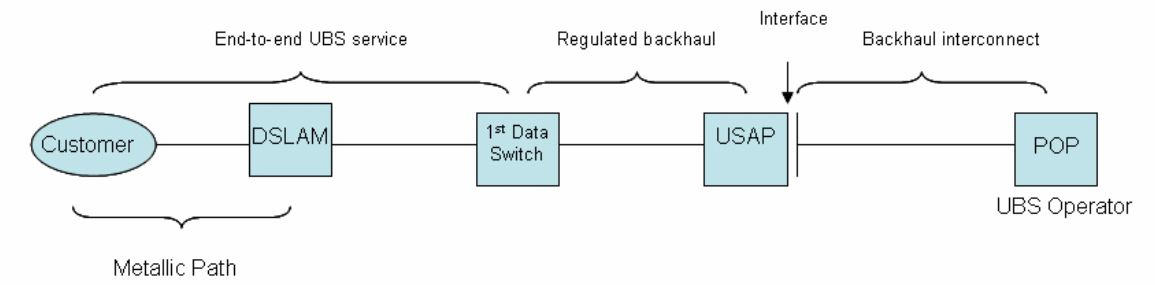
(e) Dynamic efficiency to enable innovation over time;

(f) Timeliness of access;

(g) Durability; and

(h) Consistency with international best practice

Figure 9: Telecom backhaul for NDSL

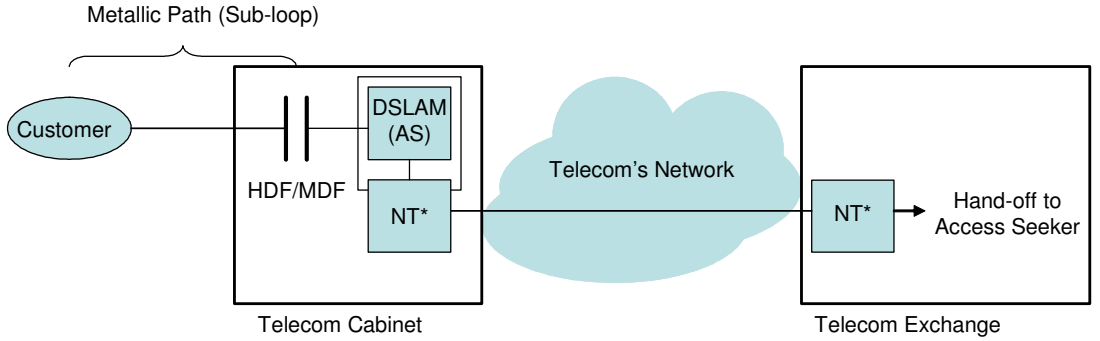


18.12 Backhaul arrangements for NDSL could be very similar to existing UBS arrangements as they are in technical respects the same services. The

TCF acknowledges that this issue is being addressed by the ISPANZ process that is developing an enhanced UBS.

18.13 Where additional service attributes (e.g. CIR or QoS options) come at extra cost, these should be optional for access seekers.

Figure 10: Telecom Backhaul from Cabinet to Co-located Equipment



*NT: Network Terminal which may be fibre, copper or radio.

18.14 The Bill specifies this service as between the handover point in Telecom's distribution cabinet and the handover point in Telecom's local exchange, or equivalent facility, as agreed between access provider and the access seeker.

Options

18.15 Options considered are:

(a) Option 1: Access provider to provide n x E1;

(b) Option 2: Access provider to provide Ethernet interface over legacy network; and

(c) Option 3: Access provider to provide end-to-end Ethernet.

18.16 Access seeker will also have the option of providing independent backhaul (supplied by the access seeker or a 3rd party network provider to the access seeker)

18.17 The problems with option 1 are that few of the DSLAMs considered by access seekers entering the market would support E1 interfaces. The prevailing international trend is toward Ethernet interfaces. Also as demand for higher bandwidths grows the limited bandwidth provided by the multiplexer will be problematic.

18.18 Under option 1, access seekers would need to either use a DSLAM with E1 interfaces or provide a suitable E1 to Ethernet device. Such devices are available at a cost, but there are practical challenges with ensuring that such a device could fit and operate satisfactorily in a cabinet.

18.19 Under option 2, access provider to provide the device and recover the cost through its backhaul charge. The same challenges exist, however the access provider may be better positioned to meet the challenges and provide an industry standard solution. This option constrains the bandwidth available but may be the only cost effective solution particularly where the backhaul medium is not fibre.

18.20 To provide end-to-end Ethernet under option 3, a suitable device would need to be identified, tested and qualified for operation inside a cabinet. This would incur some cost but is recommended as trends in technology and bandwidth consumption will make it an inevitable requirement in the near future.

18.21 Significant issues will be raised by the inherent restrictions on space within a typical cabinet and also by the reluctance of local authorities to allow a proliferation of closely spaced cabinets.

18.22 Access to cabinet for independent backhaul should also be allowed for. This means that an access seeker or 3rd party network provider could arrange entry into the cabinet for their own backhaul cable and associated equipment. This would help create a market for backhaul services to cabinets.

18.23 Where additional service attributes (e.g. CIR or QoS options) come at extra cost, these should be optional for access seekers.

Recommendation for Cabinet Backhaul

18.24 The TCF recommends that end-to-end Ethernet is provided where available. The service attributes such as CIR will need to be agreed as part of phase 2.

18.25 Details for agreeing alternatives for cabinet backhaul, when end-to-end Ethernet is not available, will be considered as part of phase 2.

18.26 The process for Telecom and the access seeker agreeing on an equivalent facility to handover cabinet backhaul will be considered as part of phase 2.

Telecom Backhaul from Exchange to Access Seeker's POI

18.27 The Bill specifies this service is to be provided between the handover point in Telecom's local exchange (or equivalent facility), and the access seekers nearest available point of interconnection.

18.28 The point of interconnect could be a Telecom USAP (as for UBS) if the access seeker has a presence there, but more likely some other point of interconnection to be agreed between access seeker and access provider.

18.29 This backhaul service is not separated into the "regulated backhaul" and "backhaul interconnect" components of UBS backhaul.

Options

18.30 Options considered are:

(a) Option 1: Access provider to provide ATM Extension;

(b) Option 2: Access provider to provide Ethernet interface; and

(c) Option 3: Access provider to provide end-to-end Ethernet.

18.31 Access seeker will also have the option of providing independent backhaul (supplied by the access seeker or a 3rd party network provider to the access seeker)

18.32 As noted above, access seekers are most likely going to want Ethernet interfaces to their DSLAMs in Telecom exchanges. An ATM service would burden access seekers with extra costs in purchasing ATM interface equipment which may have a limited useful life.

18.33 Under option 1, access seekers would need to either use a DSLAM with ATM interfaces or provide a suitable ATM to Ethernet device at their own cost.

18.34 Under option 2, the access provider presents an Ethernet interface albeit that it is transported over the ATM or other network and recover any additional cost through its backhaul charge.

18.35 An end-to-end Ethernet, option 3 service could be provided based on an existing service such as Metro-IP with cost-based pricing as set out in the Bill. This option is most similar in nature to the Openreach Backhaul Extension Service, but it may not be practical to provide this in some of Telecom's exchanges.

Recommendations for Exchange Backhaul

18.36 The TCF recommends:

(a) End-to-end Ethernet interface is provided where available. The service attributes such as CIR will need to be agreed as part of phase 2. Where end-to-end Ethernet it is not available the TCF recommends that a menu of options be available;

(i) Access provider to provide and deploy end-to end Ethernet (quote to be provided to access seeker prior to deployment)

(ii) Access provider to provide an Ethernet interface; or

(iii) Access seeker to provide its own interface.

(b) This process would also apply where there was insufficient existing backhaul capacity.

(c) The process for the access provider and an access seeker agreeing on the most suitable point of interconnection will be considered as part of phase 2.

Co-location Facilities for 3rd Party Backhaul used by an Access Seeker

18.37 As noted above, the Bill has been amended to include Telecom co-location facilities for 3rd party backhaul used by access seekers from exchanges and cabinets.

18.38 Access seeker or 3rd party backhaul is the provision of network capacity between the Telecom exchange or cabinet and the access seeker's facilities. In most cases, the access seeker should have a number of options to provide this, especially in the larger metropolitan centres.

18.39 An independent backhaul provider may be:

(a) The access seeker, or

(b) An alternative network operator that is not itself taking LLU services but is supplying to an access seeker.

18.40 Access seeker or 3rd party backhaul should not be bundled with regulated elements, or for example the UBS UNI/NNI interface, and thereby effectively subsidised.

18.41 Non-discriminatory arrangements should be made for the entry of backhaul cables and co-location of associated equipment in Telecom facilities. These arrangements should consider the following elements:

(a) Access to spare Telecom duct;

(b) Access to exchange cable vault;

(c) Alternate building entry arrangement; and

(d) Access to cable trays and the like.

18.42 Equivalent access to building entry ducts will be critical, but it must be recognised that a site by site consideration will be required due to differences in duct availability and congestion.

18.43 These exchange access requirements will also be necessary to support remote co-location where one or more operators establish a near-by facility in which to house their DSLAM and other network equipment. In this case, the operators will seek access to run a multi-pair copper tie cable into the exchange and terminate it on a distribution frame where pairs can be jumpered to the access network cables.

Recommendations for Backhaul Interconnect

18.44 The TCF recommends that:

(a) The access provider provides co-location facilities for access seekers or their 3rd party suppliers on similar terms to co-location space for access seekers cabinet co-location.

(b) Exchange and cabinet cable entry arrangements be formalised in the code to provide:

(i) Neutrality and equivalence between the access provider and access seeker including their 3rd party backhaul suppliers in relation to LLU; and

(ii) Reasonableness in competitive opportunities for cabling remote co-location and co-location 'on' or 'around' Telecom premises.

19 Resource Management Act Issues

Background

19.1 This is a brief overview of RMA and resource consent issues that could arise in relation to LLU. However, these vary from council to council. A case-by-case approach is therefore required. However, issues can be grouped into two broad categories.

19.2 At this stage, the TCF simply notes this menu of potential issues.

Modifications to Size/Shape of Existing Cabinets or Installation of New Cabinets

Issue	Consent/RMA	Examples
Change in size of the existing cabinet	Resource consent may be required	North Shore City has rules on size, shape, number and location of cabinets
Change in location	Resource consent may be required	May come within drip line of tree etc as ruled by Auck City Council, Line of Sight etc
Change in noise levels at property boundary at dwelling	Resource consent may be required	Manukau City – Res Zone – 35dB
Additional cabinet required	Resource consent may be required	North Shore City has rules on max size, shape, number and location of cabinets

Installing New Access to the Cabinets

Issue	Consent/RMA	Examples
Cable is run underground	No resource consent will be required. Will trigger a 'road opening consent' requirement from Council.	All major Councils enforce this with varying degrees of notice period required
Single overhead cable run	May or may not be a permitted activity depending on a particular Council. Need to consider on whose infrastructure the cable is to be carried.	Auckland City – Vector owns most of the overhead infrastructure
Bundled overhead cable run	Notified RMA consent will be likely to be required	Auckland City Council blocked TCL in this endeavour

20 Liabilities

Background

20.1 The general issue in relation to liabilities is to define the obligations of the access provider and access seekers to each other in the event that there is any damage or loss to one party as a result of actions or inactions by others.

20.2 A large part of this issue is for commercial discussions, which is beyond the LLU Working Parties' scope. However, co-location issues give rise to a range of generic and inter-related liability issues. Some general discussion is therefore considered useful at this point.

20.3 This section focuses on three liability-related topics:

(a) Liabilities for interference or damage;

(b) Rights to work-on ('touch') other parties' equipment; and

(c) Obligations to report.

20.4 There are a large number of other related topics that will have a bearing on what liability provisions should apply. For instance, the type of co-location options that are allowed will have an impact on the risk that inadvertent or deliberate damage can be caused to either the access provider or access seeker equipment. For example, caged co-location will have a lower risk profile to the access provider than co-mingled options. Also, strict limitation on who can have access to a facility or what training they will require can also lower the risk of inadvertent or deliberate damage. This in turn will impact the extent to which there should be limits to the liability of an access seeker. Therefore, how the overall package of rules and conditions relating to the provision of LLU services is defined will impact what the appropriate liability provisions should be.

20.5 There are also a number of other related commercial issues that will need to be considered when considering what are appropriate arrangements for liabilities. These issues include warranties, covenants, indemnities and force majeure. All these mechanisms aim to deal with the issues of risk management and, therefore, liability provisions need to be considered as part of a package of options to manage risk and shouldn't be considered in isolation.

Objectives

20.6 As an operational level, the key objective is to set out clearly the respective obligations of all parties, including any express obligations to take reasonable steps to mitigate any financial loss or damage to property.

20.7 At a policy level, the objective is to allocate liability in an economically efficient manner. There are some general policy principles that can help guide how liabilities should be defined and allocated, in particular:

(a) risks should be allocated to the party that is best placed to manage or eliminate them;

(b) liabilities must be clearly defined so that all parties understand the extent of their liability in all situations and, therefore, adequately assess the level of risk that they face and make commercial decisions as to the management of those risks; and

(c) an allocation arrangement needs to recognise that different parties may have different assessments of the risks, and place different values on the costs of mitigation relative to the risk.

Liabilities for Interference or Damage

20.8 As set out above, to a large extent the question of who should bear the risk if one party's equipment is damaged by a third party or other external force, and any limits to liability, is a commercial question. However, some general principles can be considered by asking the following questions.

Who should be held responsible?

20.9 In relation to any damage that can be directly attributed to the action or omission of an identifiable party to the LLU service, that party should clearly be held responsible. However, there is a distinction between responsibility and liability, and the more important question is the case of damage caused by one of the parties is the question of actual liability.

20.10 Options to cover cases of damage caused by an unrelated third party or an uncontrollable external force include:

(a) Force majeure provisions;

(b) Pursuing the third party, if identified;

(c) Make the access provider responsible as the facility owner, particularly if there is damage caused by (for example) a failure of the building; or

(d) Holding the owner of the equipment responsible, as a condition of locating their equipment in the facility.

Who should bear the risk (be held liable)?

20.11 This is the key question and there are a number of approaches that can be found in commercial situations for similar services both in New

Zealand and in overseas jurisdictions. The common law would also dictate a particular approach in the event that liability is not defined by agreement. In essence, there are almost as many approaches or variations on approaches as there are arrangements.

20.12 The high level options here are:

(a) the party that caused the damage, where identifiable, can be held liable and be required to compensate the damaged party;

(b) all parties can be required to bear their own risk and be responsible for covering their own loss, including insuring against their risk if they see fit;

(c) there can also be a non-reciprocal arrangement where the access seeker bears their own risk as a condition of occupation but is required to indemnify the access provider; and

(d) Force Majeure provisions could cover situations where damage is caused by a defined Force Majeure event.

20.13 These choices can be further refined to differentiate between deliberate or negligent acts or omissions and accidental damage. For instance, all parties may be required to bear their own risk for accidental damage while liability for deliberate or negligent acts or omissions could be held by the party responsible.

20.14 A related question that may need to be addressed in the standard terms for supply is whether the parties have obligations to insure. This is to provide parties with confidence that where they suffer damage and another party is liable, that liable party is able to pay the required compensation.

Options in relation to meeting liability obligations include:

20.15 Holding insurance:

(a) Only require parties that are not able to meet a certain level of financial security (e.g. credit rating etc) to hold insurance. This option allows companies, where appropriate, to self insure; or

(b) Require all parties to hold insurance reflecting their maximum level of liability; or

(c) Require the access provider to hold insurance that covers all parties in their premises.

20.16 In some situations it may also be appropriate for parties to post a bond to cover their liability up to an agreed level. This is often the case with property leases. It is also often required prior to undertaking any infrastructure build work.

20.17 Another common practice is to require a party to have a guarantor to cover their liability in the event they are unable to. This option may be limited by a requirement that it is only needed where a party is not able to meet certain credit worthiness threshold.

What extent of any liability?

20.18 In most commercial arrangements, limits are placed on the extent each party's liability to others. This includes limits on the amount of any liability and the types of loss that will be covered. Options here include:

(a) All liabilities can be unlimited;

(b) Some limits can be set.

(c) Options include:

(i) fixed amounts per incident/event;

(ii) in addition to the above, there can be fixed limits in a year or other fixed period;

(iii) rather than fixed amounts, limits can be set relative to a party's annual revenue; and

(iv) limits can be set based on the potential damage that one party could incur. This would indicate that the limits would not necessarily be reciprocal.

(v) liability can be limited to direct losses and not extend to consequential losses;

(vi) a variation to the above to make direct losses unlimited but consequential losses limited to a fixed amount.

20.19 What obligations should there be to mitigate damage or loss?

(a) As a general principle, all parties should have an obligation to take reasonable steps to minimise any loss or damage they suffer. In common law, for instance, a party is not liable to the extent that the damaged party failed to take reasonable steps to minimise loss from reasonable foreseeable events. In addition, a party has to take steps to minimise any further loss or damage occurring once that party becomes aware that it is happening.

(b) Some specific options that can be considered here include:

(i) requirements to have equipment enclosed in some level of protective cover;

(ii) requirements to vet and approve any persons allowed access to a facility;

(iii) clarification on the extent to which the access provider is required to supervise any access seeker access to facilities;

(iv) requirements on parties to limit any liability to another party in their contracts with their end users; and/or

(v) requirements to monitor alarms and address the issue of damage in a timely manner. While parties will generally have incentives to do this anyway, a clear obligation should help to minimise the extent of any loss or ongoing damage.

Rights to Work-on ('touch') Other Parties' Equipment

20.20 This issue is likely to arise only in a limited number of scenarios, in particular:

(a) the only reason for a party to touch another's equipment without explicit permission would be to eliminate an immediate and unavoidable risk or mitigate some ongoing damage;

(b) an example of where a party may touch another's equipment without requiring permission is where a party notices a significant problem with the other party's equipment. This is likely to be limited to events such as fire or some other external factor causing significant damage, or where a party has done something, probably inadvertently, that has caused some damage to another party's equipment that may continue or worsen if not resolved immediately;

(c) where two parties have reached agreement that one of them will touch the other's equipment, the arrangements for this will be entirely up to those parties to determine;

(d) an example of where a party may agree to another touching their equipment is where the installation of new equipment requires cable to be run in another party's cable tray.

20.21 Where a party has a right to touch another party's equipment without permission, that right should be clearly defined in the standard terms for the provision and receiving of services. Options to consider here include:

(a) where someone notices something in another party's equipment that may cause damage to their equipment (e.g. a fire that may spread), that person has the right to take any action to protect their equipment (e.g. spray the fire with an approved fire extinguisher).

(b) where someone notices something causing ongoing damage to a third parties equipment, they could be given the:

(i) right to take steps to mitigate the damage, and be liable for any damage they cause if something else goes wrong;

(ii) right to take steps to mitigate the damage, but have no liability if something goes wrong as long as the situation is legitimate and they are not grossly negligent;

(iii) obligation to take steps to mitigate the damage, and be held liable for any damage they cause if something else goes wrong; or

(iv) obligation to take steps to mitigate the damage, but have no liability if something goes wrong as long as the situation is legitimate and they are not grossly negligent.

(c) where a party has done something, probably inadvertently, that has caused some damage to another party's equipment that may continue or worsen if not resolved immediately. The possible liability options are the same as for the situation above.

Obligations to Report

20.22 This issue is linked to the discussion above in relation to rights to touch other parties' equipment. The question relate to what obligations should be imposed on a party to notify another party of any damage or risk of damage to its property. Possible options include:

(a) all parties have an obligation to report an immediate risk that they become aware of to another party's equipment where that risk:

(i) exists in the other parties equipment and poses no risk to any other party's equipment; and/or

(ii) exists in the party's equipment that notices the problem, and the risk may affect the other party's equipment.

(b) all parties have an obligation to report potential risks to equipment that they become aware of;

(c) all parties have an obligation to report damage that they notice in another party's equipment;

(d) all parties have an obligation to report damage to another party's equipment that they cause;

(e) all parties have an obligation to report any incident where they touched another party's equipment without permission even when no damage was caused;

(f) all parties have an obligation to report a risk to equipment or personal safety caused by an issue with a premise. This would include Health & Safety Act obligations; and/or

(g) all parties have an obligation to report security risks, including insecure premises and cabinets or unauthorised persons in premises.

Recommendations

20.23 As noted above, many of these questions will be addressed in a commercial context. However, the issues also need to be considered in the context of an overall framework for LLU, and any other mechanisms parties may use to manage risk.

20.24 The TCF recommends that these options will be considered in further detail, where relevant, in phase 2 of this project.

21 References for Part B

Co-location Space Design

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PART C – INTERFERENCE MANAGEMENT

22 Cross Talk Problem

Outline

22.1 This section sets out a clear description of the technical issues relating to crosstalk, places these issues within a wider policy framework, and distils the key trade-offs to be made in order to develop an industry plan for managing harmful crosstalk in an LLU environment.

Local loop network[43]

22.2 Telecom has used random jointing of cables pairs within a binder or layer for many years. In addition, distribution cables currently being deployed have pairs laid within a binder in a random manner during manufacture.

22.3 Signals transmitted on a cable pair create an electromagnetic field that surrounds nearby pairs and induces energy into those pairs. The twisting of the insulated conductors into pairs minimizes this coupling, as does the twisting of the binder groups (bundles of pairs) in the cable. Despite these measures however, capacitive and inductive coupling still exist between pairs of a multi-pair loop cable.

Nature of crosstalk

22.4 Transmission of the human voice in analogue form (POTS)[44] uses a limited frequency range45. The local copper loop network, with its many unshielded twisted copper pairs, was designed for this purpose46.

22.5 However, several other types of non-voice services now use technologies over these copper loop cables including, but not limited to, digital data services, E1-carrier systems, and digital subscriber line (xDSL47) transmission systems. In contrast to analogue voice service, data transmission often uses a much wider range of frequencies.

22.6 These wideband signals on one copper pair cause interference to other signals on other copper pairs in the same cable. Crosstalk is electromagnetic energy that couples into a metallic cable pair from transmission system technologies on other pairs in the same cable.

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43 The three paragraphs under this heading are drawn from "Copper Loop Frequency Management Plan", Telecom, 1 September 2006, section 6.1

44 'Plain Old Telephone Service'

45 DC-4kHz

46 The traditional PSTN is based on circuit switching and time division multiplexing to minimise latency of traffic

47 xDSL is a generic abbreviation for the many varieties of Digital Subscriber Line (DSL) technology

22.7 Whether crosstalk is disturbing to other systems depends on a range of factors, including the crosstalk tolerance of the relevant transmission technologies. Crosstalk effects can be viewed like water or air pollution:

"There is no finite limit to the number of people or processes that can coexist within a given volume of air or water, however the more participants or users there are, the dirtier the resource becomes. Whether this is actually a problem or not for any class of users depends largely on the degree of tolerance they have for a degree of pollution…"[48]

22.8 By analogy, different technologies have different degrees of tolerance to crosstalk.

Types of crosstalk

22.9 Some degree of interference is unavoidable for any technology used in multi pair metallic cables[49]. In adverse circumstances, interference from crosstalk can potentially degrade the performance of services deployed over that cable (referred to as victim services) and compromise network integrity[50].

22.10 Crosstalk can result in interference at:

(a) The near end, when one or more transmitters are co-located with a receiver (NEXT)[51]; and

(b) The far end, when a receiver's wanted signal is interfered with by signals from other transmitters at the distant end of the cable (FEXT)[52].

22.11 NEXT is typically more severe than FEXT, particularly when transmission takes place in both directions in a binder and there is an overlap in the frequency bands between the upstream and downstream signals.

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48 Layer 10 Pty Ltd: "Local Loop Spectrum Management", Report for the Commerce Commission, 26 July 2006, at section 1.1

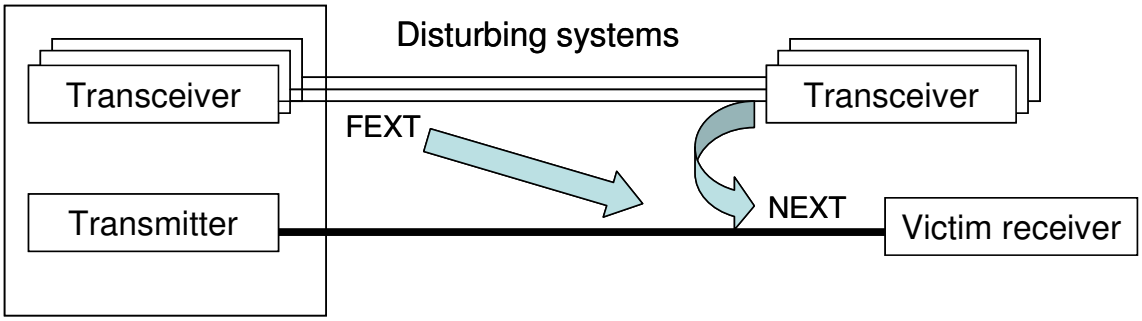
49 But note that interference generated at one frequency cannot affect a transmission channel of a different frequency if good filters are used in the equipment.

50 ACIF C559: 2006, Part 2, section 1.2. Also Gilbert and Tobin, and Political Intelligence prepared for European Commission, 'Operational implications of local loop unbundling and the need for technical co-ordination', 19 September 2001, page 131

51 NEXT occurs when a receiver on a disturbed pair is located at the same end of the cable as the transmitter of a disturbing pair

52 FEXT occurs when a receiver on a disturbed pair is located at the other end of the cable as the transmitter of the disturbing pair

Figure 11 : Crosstalk model for downstream systems



Source: Telecom Copper Loop Frequency Management Plan, 1 September 2006

Classes of transmission technology

22.12 Two broad spectral classes of transmission technologies are in common use today – symmetric and asymmetric. Each has different crosstalk features, which are outlined below. More detail is set out in Appendix 2.

Spectrally symmetric

22.13 Spectrally symmetric technologies (like SHDSL) cannot avoid near end cross talk from like systems because they use the same frequencies on the go and return channels. They must therefore be deployed to tolerate the impact of interference from crosstalk. Because of the NEXT impact, the working reach of symmetric technologies, in the presence of like systems, is less than the achievable reach of homogenous spectrally asymmetric deployments.

22.14 There is insufficient bandwidth at the long range lower frequencies for symmetric technologies to practically split the usable spectrum to reduce self-NEXT, so some allowance for NEXT interference must be made and achievable reach traded off.

22.15 NEXT is the dominant form of interference that determines the design limit for a symmetric system when surrounded by other like symmetric systems[53]. For an SHDSL system, other SHDSL systems are generally its worst disturbers. Replacing SHDSL disturbers with ADSL generally results in an improvement in performance[54].

22.16 Performance of spectrally symmetric technologies is very dependent on the NEXT coupling statistics of cables used.

[53] In ACIF C559, the benchmark for 2320kbit/s SHDSL when surrounded by 8 identical interferers in a 10 pair cable unit is about 1.7km with 6 dB margin (this is for 1% worst case crosstalk). This is a reasonably conservative rule and providers including Telstra and Telecom would choose to design at slightly longer ranges and take greater risk of failure.

[54] Dr Phil Potter, Telstra

22.17 Symmetric technologies are typically used where the consumer is a material source of data. Upstream rate is valued for "source locations" (for example, fixed and mobile voice networking sites, and "peer to peer" or "host" data sites).

Spectrally asymmetric

22.18 Spectrally asymmetric systems like ADSL have been specifically designed to avoid NEXT from other like systems by using different frequency ranges for the go and return paths55. The result of this is generally longer range for the same downstream rate, but the cost of reduced upstream rate. The range advantage of asymmetric over symmetric technologies is achieved at the cost of increased susceptibility to NEXT.[56]

22.19 After interference from symmetric systems in the vicinity of the customer's end, the dominant interference to ADSL systems on long lines is external interference, followed by internal modem noise, and then FEXT from other ADSL in the cable which can generally be ignored. However FEXT cannot be ignored for short to medium range systems at higher rates, including VDSL2.

22.20 Asymmetric technologies are now widely deployed to sites where the consumer is predominantly a recipient of data. Downstream rate is more valued for "sinks of data" (for example, web browsing and video streaming).

22.21 Asymmetric technologies allocate a large portion of the usable spectrum to the downstream path, and are therefore able to achieve greater reach by minimising upstream bandwidth and splitting the spectrum for go and return directions to reduce NEXT interference from like systems.

22.22 As loop lengths are reduced, "spectrally asymmetric" technologies can provide more symmetric capacity. This is because the original split of up and downstream bandwidth for ADSL was very asymmetric. As usable spectrum increases, that additional spectrum can be more equally allocated between go and return bands (e.g. VDSL2) without increasing NEXT interference to lower frequency asymmetric systems providing a basic level of downstream reach on longer loops.

Fixed rate vs variable rate systems

22.23 There is only a gradual increase in the probability of failure when you exceed a design limit. There is a more catastrophic effect on fixed rate systems than on variable rate systems. Variable rate systems are rate-

55 That is, by using separate frequency bands for each direction of transmission

56 With a view to allowing ADSL systems to reach their full potential (which is almost full coverage of customers who are within standard voice design limits), the Australian code limits the interference from other symmetric systems on longer lines. Hence for example the 2320 kbit/s SHDSL system is limited to 1.9km equivalent by ACIF. That decision is purely subjective based on accepting a reasonable degradation of ADSL in order for SHDSL to be permitted to a reasonable design range.

adaptive so they are able to adjust their line rate if interference increases.

Crosstalk characteristics

22.24 The fundamental nature of pair to pair crosstalk is that it is effectively an "error" signal after the cable designer has attempted to cancel the pair-to-pair coupling by using different non-integrally related twist lengths for the pairs in a binder group.

22.25 Crosstalk is highly variable from one pair to the next, and therefore requires statistical determination of design limits, which are subject to engineering and business judgements on the costs (including non-performance) against the benefits (including revenue opportunity of greater coverage). Crosstalk characteristic are described in more detail in Appendix 3.

22.26 Crosstalk depends on pair-to-pair exposure, signal frequency and signal strength (power)[57], in particular crosstalk:

22.27 Increases with closer pair proximity. Exposure or coupling is a measure of the proximity of metallic pairs at various points along a cable and the length over which pairs are in close proximity. The greater the exposure, the greater the total crosstalk[58];

22.28 Increases with more pairs in a binder used (however, marginal increase in crosstalk decreases as more systems are added – e.g. a doubling of the number of disturbers results typically results in only 1.8 dB worse crosstalk at the 99th percentile);

22.29 Increases with higher frequencies – high frequency energy has higher coupling than lower frequency energy. This is because as the signal frequency increases, the crosstalk coupling loss between the pairs of a cable decreases. Hence, for two signals of equal strength, the higher the frequency, the greater the crosstalk. Thus the higher the speed/capacity of the xDSL system, the greater the potential for inter-system interference.59 This is true for the fundamental crosstalk coupling through a small segment of the cable, and is also true for NEXT. However in the case of FEXT, which also includes the attenuation of the cable in the FEXT path, the FEXT ratio between the received signal and the received crosstalk at lower frequencies does increase with frequency, but at higher frequencies the path attenuation becomes more dominant and FEXT coupling decreases with frequency at higher frequencies.

[57] ACIF C559:2006, section 1.2

[58] "Copper Loop Frequency Management Plan", Telecom, 1 September 2006, section 6.2

[59] ACIF C559:2006, section 1.2, and "Copper Loop Frequency Management Plan", Telecom, 1 September 2006, section 6.2

22.30 Increases with power – crosstalk is directly proportional to transmit (or disturbing) signal strength, so limiting transmit power lessens inter-service interference. Thus an effective means of controlling crosstalk interference is to limit the signal energy that is applied to cable pairs [60], but only if you reduce the power of some systems and not others. If you reduce all, the net signal to noise ratio from crosstalk remains the same.

22.31 Variance is inherent in the design of the twisted pair cable as described in Appendix 3. Additional variance results from variability in cable manufacture and jointing practices.

22.32 Other factors limiting line rate performance include[61]:

(a) Copper loop performance and characteristics – this may require strategies to deal with loop length, mixed gauge loops, insulation failure, loading coils, faults, pair-gain impact (analogue and digital), and crosstalk-control[62];

(b) Customer premises wiring – this is often not well suited for DSL and can therefore have significant impact on DSL performance. Centralised splitters isolate the building wiring and therefore can overcome most of the problems arising from home wiring;

(c) Modem behaviour – it is important to ensure that modems behave predictably, which is affected by modem power back-off, modem behaviour under noise disturbance, modem margin estimation, and modem output power control;

(d) External noise sources – performance issues often arise, for example, when aerial plant is located in close vicinity to broadcast stations, microwaves or power line interference sources. New technologies are being deployed on copper twisted pairs that are more susceptible to external sources of interference than has previously been the case [63]; and

(e) Concentration of xDSL services on each cable – the risk of crosstalk tends to increase as the concentration of DSL services on the same cable increases. However, Telecom considers that further work is required to understand the dynamic cross-interactions with ADSL and services delivered using other technologies (e.g. E1-HDB3, SDSL, HDSL) that share the same cable. Much work on static

60 ACIF C559:2006, section 1.2 and "Copper Loop Frequency Management Plan", Telecom, 1 September 2006, section 6.2

61 From Telecom/Alcatel (July 2006) supra

62 Telecom notes that minimising crosstalk interference requires the careful manufacturing, installation, maintenance, and administration of loop cables: "Copper Loop Frequency Management Plan", Telecom, 1 September 2006, section 6.1

63 A recent example of this internationally is interference measured between broadband power line systems operating over aerial mains power drops, and VDSL2 operating over twisted pair aerial drops in the same neighbourhood (AT&T submission dsl2006.630.00 to DSL forum WT-114) - "Approach to New Systems: Issues and Options" – A paper from Telecom for the LLU Working Parties, 3 October 2006, at p3

interactions has been done with extensive measurements to model crosstalk.

22.33 Telecom considers that the theoretical maximum speeds of ADSL1 (approx 8Mbps) and ADSL2+ (approx 29Mbps) can only be obtained under the most favourable conditions, including:

(a) Very short lines (<1km);

(b) Cables in excellent state of repair;

(c) Cables using heavier gauge copper;

(d) No interference from other DSL services in the same cables;

(e) No other interference sources, and

(f) Excellent modems.

22.34 There is some difference of opinion in relation to the occurrence and materiality of crosstalk effects[64]. Relatively limited measured information on crosstalk effects is available for different technologies under different line conditions in New Zealand. For example, the impact of ADSL on HDB3 in Telecom network is unknown[65]. Unavoidable variability and uncertainty therefore leads to statistical techniques for performance measurement[66]. The statistical techniques are required because of the fundamental statistical nature of pair to pair crosstalk, which can be tested at the fundamental level, and then applied to different cases through computer simulation.

22.35 However, Dr Phil Potter of Telstra notes that once the cable crosstalk has been characterised as NEXT at a given frequency and FEXT at a given frequency (e.g. 1 MHz), then static crosstalk behaviour is relatively well understood and its effects can be calculated as in the ACIF or other tools. Crosstalk appears to be similar on most unit cables from around the world, although there is some variance in quad designs. To achieve meaningful statistical results, certain sampling requirements need to be satisfied which are described in Appendix 3.

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64 As shown in the conflicting reports prepared by TCNZ/Alcatel, and Layer 10 Pty Ltd

65 Alcatel/Telecom: "Increasing ADSL Line Rate Speeds in the New Zealand Network – Copper Network Impairments", 24 July 2006, at p6. This report states that: "Further investigation is required to understand the nature of these cross-impacts within Telecom's copper loop network and the affects on business services".

66 ACIF C559:2006 – Part 2. See also "Copper Spectrum Management - Cross Technology Impacts", Telecom, 1 September 2006, at p4: "All predictions of interaction between technologies in the same cable are based on theoretical mathematical models. There is no known empirical field data to verify these models for ongoing cross technology impacts relevant to the specific mix of technologies and cable types operated in the NZ network today".

23 Interference Management

Spectral compatibility[67]

23.1 In general, spectral compatibility is the capability of a transmission system technology on any cable pair to coexist in the same cable as other systems of the same or different type without one causing undue harm to any other system operating in the same cable binder.

23.2 A loop transmission system technology is considered to be spectrally compatible with other loop transmission systems when it meets the signal power limits, the deployment guidelines and other criteria for the type of loop defined in an interference management plan.

Interference management techniques

23.3 There are six main techniques for managing crosstalk:

(a) Altering standard transmit signal spectral masks (PSDs), which is a form of static spectrum management. PSD masks are generally specified in international standards (e.g. ITU, ETSI, ANSI). PSD masks effectively give permission to transmit a certain signal spectrum in each direction on a line. Deployment rules are restrictions on where technologies that meet PSD masks can be deployed. PSD masks can also be altered with different deployment rules applying[68];

(b) Physical separation of different technologies (for example, put full power ADSL in different binders);

(c) Deployment limits, which includes line length limits (max and/or min) and 'lower' feed point). This is a form of static spectrum management, which discussed in more detail below;

(d) Dynamic frequency and transmission power management (for adjustable technologies like ADSL2+)[69], which is a form of dynamic spectrum management (DSM), which is described further below;

(e) Replace systems currently deployed that would not comply with the proposed rules with systems that would comply; or

(f) Noise cancelling, which is not currently feasible because no equipment currently supports it.

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[67] These two paragraphs are from "Copper Loop Frequency Management Plan", Telecom, 1 September 2006, section 6.3

[68] For example, power reduction as an alternative to pair separation requirements, or PSD shaping to allow cabinet feeds where systems are also deployed from the exchange.

[69] ADSL2+ systems provide significantly better management information to allow some of the dynamic system management techniques to be implemented: Layer 10 Pty Limited (July 2006) supra at p27

23.4 DSM refers to the ability for technologies such as ADSL2, ADSL2+ and VDSL2 to modify the size and shape of their spectral transmission profile while still maintaining connectivity with the corresponding receiver at the other end of the line. This modification may occur autonomously, with the two devices agreeing between them on their spectral profile and transmission levels, or directed under external management control70.

23.5 Conventional dynamic spectrum management approaches requires a single autonomous spectrum coordinator (cable manager) to manage spectrum resources within a cable in near real time. Semi-autonomous approaches are the subject of research efforts internationally but the practical implementation and operational performance benefits of such techniques are still largely unknown71.

23.6 The New Zealand industry will need to come to a view on the role DSM should play in any interference management plan for New Zealand.

Types of deployment rules

23.7 There are four potential types of deployment rule parameters.

(a) Maximum range from exchange for customer end;

(b) Lowest feed point for technology;

(c) Minimum range from exchange for customer end; and

(d) Pair separation.

Maximum Range

23.8 This defines the lowest point (which is the point more distant from the wire centre) at which a specified upstream signal can be launched. If the customer end is beyond that range (called a deployment limit), the service would fail service qualification. For example, in Australia SHDSL at up to 2056 kbit/s cannot be deployed beyond 2km. This is in line with reasonable design rules for the SHDSL itself and avoids serious interference to ADSL and ADSL2+ that results when deployed beyond that limit.

Lowest Feed Point

23.9 This defines the lowest point at which standard PSD masks apply. For example, in Australia (in Deployment State A), the standard ADSL and ADSL2+ masks cannot be fed from anywhere but the exchange. Reduced power (or reduced PSD) transmission is required from remote nodes to

[70] Layer 10 Pty Limited (July 2006) supra, at p43

[71] "Copper Loop Frequency Management Plan", Telecom, 1 September 2006, section 6.3

protect exchange-fed DSL. Full power transmission at remote nodes is addressed in Deployment State B, however this is not the default.

23.10 The UK also mandates PSD modification (reduced power) for downstream DSL from remote cabinets to ensure DSL from the exchange is protected.

23.11 It is important to note that New Zealand practice is not to have dual feed from cabinets (i.e. services launched from the exchange and a cabinet in the same distribution cable). But New Zealand must decide whether to leave exchange copper in place and hence have dual feed, or remove exchange copper and hence have single feed, when a remote fibre-fed node is established. This links to the discussion in Part B Section 16 on rights of tenure and notification periods for network changes.

Minimum Range

23.12 For example, in Australia reach extended ADSL cannot be deployed on a line shorter than a specified range.

Pair Separation

23.13 This involves limits on the separation of deployable systems from legacy systems that might be affected by crosstalk from newly deployed systems. The basis of separation is generally the cable unit or binder group, so that particular deployable systems cannot be deployed in the same binder as specific legacy systems.

23.14 Pair separation is difficult to manage and prevents 100% fill, so should only be considered for the protection of existing legacy systems deployed by the incumbent, which would suffer unduly from interference from systems such as ADSL that cannot be limited in range.

23.15 There is no pair separation in the UK or Ireland, effectively allowing for 100% fill. In the UK, this is since HDB3 is in separate cables already. In Australia, the Industry ACIF Code (C559) protects the return channel of the HDB3 from crosstalk from ADSL and ADSL2+. In practice, Telstra has found that level of protection excessive, and only uses a pair separation of at least 4 pairs so that pairs within the same or an adjacent quad in quad cable are prohibited. If the only available pairs are within 4 pairs of an HDB3 return, then they may still be used with modified PSDs (or reduced power).

23.16 Telstra and Telecom agree that it is not possible pre-predict the performance of one pair relative to another so that the performance can be predictably improved by selecting a better performing pair. However systemic separation of binders or quads can be effective in reducing crosstalk.

Need for a management plan

23.17 In traditional radio, each transmission service occupies a single very narrow portion of the frequency range. The aim of spectrum management in relation to conventional radio is therefore to keep each transmission frequency separate[72].

23.18 As outlined above, the challenge with broadband transmission is that it covers a very wide range of overlapping frequencies. To deliver the required rates, an access transmission spectrum must use a large portion of the available bandwidth (as set out in Appendix 4). In an LLU environment, with the prospect of large scale mass market deployment of multiple technologies in the cable network, many service providers could operate transmission equipment simultaneously at similar frequencies within the same cable binder.

23.19 The current range of main transmission systems is outlined in Appendix 5. Current systems deployed in New Zealand include HDB3, BR-ISDN, HDSL, SHDSL, ADSL1. New technologies include ADSL2 and 2+, VDSL2, and eSHDSL. Standards are set by international agencies.

23.20 Without rules, there is a material risk of interference (crosstalk noise) that could seriously degrade the quality of service for some customers, and adversely affect network integrity.

23.21 Managing spectrum in an LLU context therefore focuses on techniques and rules that minimise interference to allow multiple transmission services to operate with overlapping frequencies. The aim is to optimise the choice and use of different transmission technologies by competing service providers on the (common) local copper loop network.

23.22 Without rules, the local network's full potential for carrying alternative transmission technologies, with acceptable levels of crosstalk, is unlikely to be realised. The transmission technology with "the biggest bull-bars" would prevail, reducing opportunities for a wider range of alternatives on the same network at the same time.

23.23 It is therefore proposed to develop an interference management code, agreed by the industry, which will set out spectral rules relating to the deployment and use of transmission technologies. The rules will need to balance a range of factors, including service coverage, service performance, and service sustainability of current and reasonably foreseen technologies using the copper cable network.

Key technical trade-offs

23.24 The technical issues in interference management are complex and detailed. In addition, there is on-going disagreement among leading experts in relation to some elements of spectral cause and effect analysis, and the effectiveness of some technical options.

[72] Layer 10 (26 July 06) supra, at section 1.1

23.25 However, at a general level, the key technical trade-off in designing rules to manage harmful crosstalk in the New Zealand context is whether priority (and if so, to what degree) should be given to:

(a) Asymmetric systems over symmetric systems, or visa-versa; and

(b) Legacy symmetric systems over new symmetric systems, or visa-versa.

(c) There is a time dimension to the trade-offs outline above.

23.26 Telecom's assessment of the impacts of symmetric systems on asymmetric systems in the same binder is set out in Appendix 6. In summary:

(a) An increasing number of ADSL disturbers in a binder has a higher relative impact on SHDSL reach than the impact that a rising number of SHDSL systems has on ADSL reach;

(b) The ADSL upstream performance is impacted more by rising numbers of SHDSL interferers because the upstream link is impacted by the NEXT effect of the SHDSL transmitters operating at the wire centre in the same frequency range as the ADSL upstream wire centre receiver(s);

(c) The impact of SHDSL on ADSL upstream is still less in relative reach than the reach impact that ADSL has on SHDSL performance.

23.27 Based on current information, Telecom expects that, going forward, symmetric services will be provided by high performance asymmetric technologies run with symmetric upstream and downstream rates. There is limited on-going development of symmetric transmission systems.

23.28 Telstra's assessment of the trade-off between spectrally asymmetric ADSL systems and spectrally symmetric SHDSL systems is provided in detail in Appendix 2. The main conclusions of that assessment are:

(a) ADSL can tolerate 100% cable fill of other ADSL systems and achieve long ranges at moderate downstream rates and low upstream rate to enable coverage of a very high percentage of customers from the exchange. With unconstrained deployment of SHDSL, ADSL suffers considerable reduction of rate and range. An ADSL worst case range in excess of 4 km at 2 Mbit/s downstream rate is reduced to less than 3 km if unconstrained deployment of SHDSL at 2312 kbit/s is permitted.

(b) SHDSL at 2312 kbit/s has a design range of roughly 2 km when the crosstalk interference from other similar SHDSL systems or ADSL in the same binder is taken into account. That range represents a much lower coverage than ADSL at a comparable downstream

rate. Because the crosstalk interference from other SHDSL and from ADSL systems in the binder have similar impact on the SHDSL disturbed system, there should be little concern with allowing ADSL in the same binder as SHDSL, provided the SHDSL has been designed to accommodate other SHDSL disturbers in the cable.

24 Public Policy issues

Wider framework

24.1 A range of broader policy issues and trade-offs overarch the design of rules to optimise spectral efficiency. How these wider policy issues are resolved will provide the framework in which the detailed technical rules are to be developed.

24.2 In a normal competitive market, providers compete to win and retain customers by offering competing ranges of products and services. The mix of products and services delivered over time is determined by customer choice.

24.3 As outlined in the diagram above, services offered to customers in a more diverse broadband market are likely to include traditional voice services, internet browsing, VoIP, HDTV including video on demand, high resolution video conferencing[73], and range of new data services for business.

24.4 The crux of the difference between an LLU broadband market and other markets is that, in the broadband market, competing providers offer alternative services on a common transport system (the local loop network) using different transmission systems that can conflict with each other in a manner that may adversely affect the quality of services to some customers.

24.5 In an LLU broadband market, customers' choice of product or service will therefore be strongly influenced not only by the inherent features of one product relative to another, but also the relative degree to which the transmission technology used to deliver the product is adversely affected by crosstalk. As outlined above, this is a function of physics, and the nature and extent of any deployment rules or other requirements designed to limit cross-talk effects for particular technologies.

24.6 The range of mechanisms available for managing harmful crosstalk is outlined above. In general terms, these have the potential to limit a provider's options in relation to transmission technologies, and therefore (indirectly) the type and quality of services offered to customers.

24.7 In summary, an industry interference management plan impacts on:

[73] Which may be used for remote learning, remote surgery, and variety of other customer services

(a) 'Innovation' interests – which include customer choice over time, in particular any barriers to introducing new higher performance systems;

(b) 'Legacy' interests – which include investors' returns on 'legacy' transmission systems, and meeting customer contracts for services using 'legacy' systems;

(c) Costs – which includes the changes in costs for investors, customers and the industry as a whole, and how any increased costs are allocated; and

(d) Different customer categories – the management plan may have the effect of limiting or enhancing services to different customer groups, including business, urban, rural, or the mass market in general. On another level, the plan may favour customers who value sending information ('sources' needing better upstream capability) over those who put more value on receiving information (needing better downstream capability), or visa versa.

24.8 It is hard, if not impossible, to develop an interference management plan where the impacts are neutral across these competing interests. The fundamental question is therefore how to balance the impacts or, put another way, to decide which outcomes should be prioritised over others.

Policy objectives

24.9 As outlined in Part A of this report, the Government's broadband policy goals are to:

(a) Increase broadband service uptake, and the timely availability of cost-effective broadband services, including advanced broadband services;

(b) Encourage investment in alternative infrastructure (such as fibre, wireless and satellite networks); and

(c) Future proof the regulatory environment to technology change and market dynamics.

24.10 Pro-actively encouraging vigorous competition for the long term benefit of end-users is the means by which these goals are to be achieved.

24.11 Any interference management plan developed by the industry must[74]:

(a) Be consistent with applicable access principles and any regulations made in respect of the applicable access principles; and

[74] Paragraph 2(2), Schedule 2 of the Act

(b) Be consistent with the purpose set out in section 18 of the Act.

24.12 The Commerce Commission's approach to section 18 focuses on[75]:

(a) Promotion of competition: New entry is a key factor in the promotion of competition. Competition will be promoted where efficient access prices provide the potential entrant with incentives for entry which neither encourage inefficient entry nor deter efficient entry[76];

(b) Long-term benefit of end users: This will generally be promoted by sustainable lower prices, higher quality of service and greater choice. There may be trade-offs between these;

(c) Efficiency: In determining whether or not, or the extent to which, any act or omission will result in competition for the long-term benefit of end-users of telecommunications services, the Commission must consider the efficiencies that may result from that act or omission. There are three forms of efficiency: allocative efficiency, productive efficiency and dynamic efficiency;

(d) Trade-offs: The Commission may face trade-offs in attempting to achieve the Act's purpose, including trade-offs between the three different forms of efficiency. The Commission takes the view that dynamic efficiency will generally better promote competition for the long-term benefit of end users; and

(e) Regulatory risk and its management: The Commission will manage risks associated with regulatory intervention.

24.13 As noted above, the Commission has made it clear that, in relation to trade-offs, dynamic efficiency tends to be given weight.

24.14 In relation to interference management, the Commission has noted (in public documents) that:

(a) Any interference management regime to Telecom connections would be applied the same to the access seeker [equivalency];

(b) The long-term benefits to end-users of bitstream access with a full-speed ADSL system would likely exceed the incremental risk a full-speed ADSL system may have on other ADSL systems [relative trade-off];

(c) An interference management plan would balance competing objectives of the availability of higher speed service against

[75] Telecommunications Act 2001: Section 64 Reviews Into Unbundling The Local Loop Network And The Fixed Public Data Network: Issues Paper, Commerce Commission, April 2003, paras 42-49

[76] Noting that pricing is not within the Working Parties' terms of reference

degradation of service to marginal customers [benefit v detriment];

(d) In considering loss of service to some customers, thought must be given to the possibility of those customers losing service to obtain service from an alternative broadband platform [efficiency of technology];

(e) A common feature of overseas spectrum management regimes is managing interactions (both ways) between different technologies, rather than the same technology on two copper pairs [general approach]; and

(f) It is not necessary to differentiate between the *types* of retail services being delivered over each technology when formulating an interference management plan [general approach].

Key policy choices

24.15 The menu of high level policy choices to be made in relation to an interference management plan includes:

(a) 'Minimum for most' – maximum opportunity of access to minimum level of broadband service for as many people as possible;

(b) 'Maximum for some' – maximise availability of the maximum performance broadband services;

(c) Priority of some technology configurations over others (e.g. committed bit rate v rate adaptive – or symmetric v asymmetric) [77];

(d) Decoupling services from technology[78] to enable providers freedom to innovate by tailoring service mix provided over any technology;

(e) Maximising the ability to innovate by minimising barriers to new technology introduction (effective consumer choice);

(f) Seeking to give freedom for service providers to offer different service mixes over time to meet changing customer demand and competition;

(g) Ensuring an adequate return on investment (for existing systems and future systems); and

(h) Minimising costs of implementation for the industry as a whole.

[77] Symmetric technologies typically used for fixed line rate services with contracted performance guarantees (typically used for business grade services). Variable line rate asymmetric technologies typically used to provide services without contracted fixed line rate performance guarantees.

[78] For example, it is not necessary to have voice services over only symmetric technology

24.16 How these competing objectives should be optimised in relation to interference management is a function of economic and social policy preference. In any event, these high level policy decisions need to be made before the process of technical design on an interference management plan begins.

25 Current Arrangement

Interim plan

25.1 Since the introduction of "above voice band" pair gain and E1 PCM digital transmission line systems in the 1970's, Telecom has maintained proprietary spectrum management techniques to avoid the detrimental affects of crosstalk. The percentage of pairs in any cable used by these transmission systems was typically small and so simple deployment tactical rules were operationally and commercially manageable.[79]

25.2 In short, NZ does not currently have an industry-agreed interference management plan. Telecom's current rules, which are internal and not published, only accommodate vendor-specific technologies used by Telecom for its own services.

25.3 In New Zealand, mass market internet services are mainly ADSL. Business services use a mix of ADSL, HDB3, HDSL and SHDSL.

25.4 Telecom is concerned that ADSL variable rate services degrade fixed rate services (for example, services based on SHDSL and HDB3). Pending the formulation of an industry agreed interference management rules, Telecom proposed an interim plan[80] on 6 September 2006 for approval by the Commerce Commission.

25.5 The aim of Telecom's proposed interim plan was to improve bit rate performance for all users by:

(a) Reducing the maximum ADSL power on a mixed length binders for lines with attenuation of less than 25dB @ 160 KHz by 10dB (and a maximum spectral density of less than 46.5 dBm/Hz), when those lines are in a binder of lines:

(i) of mixed length (i.e. the binder also contains lines with attenuation of more than 21db), which are capable of achieving a minimum nominated bit rate; and

(ii) where legacy symmetric technologies are used[81].

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79 "Copper Loop Frequency Management Plan", Telecom, 1 September 2006, section 6.4

80 "Copper Loop Frequency Management Plan", Telecom, 1 September 2006. This was supported by a report prepared by Alcatel - "Increasing ADSL Line Rate Speeds in NZ Network – Copper Network Impairments", 24 July 2006

81 "Copper Spectrum Management - Cross Technology Impacts", Telecom, 1 September 2006, at p3

(b) Allowing all lines to operate at the maximum achievable line rate for the power setting applied.

25.6 Layer 10 Pty Limited advised the Commerce Commission that the main effect of this power reduction was expected to be an increase in performance for 'mid-range' services on lines between 2 and 3km long[82]. Telecom considers that the interim plan would roughly provide at least 4 Mbps for all lines that would otherwise support at least this line rate if no power reduction was applied.

25.7 Other options considered but not proposed by Telecom included[83]:

(a) Bit rate limiting – Telecom acknowledged that long term, as broadband penetration increases, bit rate limiting is not as effective as explicit power controls;

(b) Tone control – there are limitations in ADSL1 and it is difficult to identify a band that is effective for all symmetric technologies; or

(c) Coupling length limitations –this would require Telecom to withdraw some symmetric services which is not acceptable to Telecom or its customers.

25.8 A range of submissions and reports were received by the Commission in relation to Telecom's proposed interim plan, which are posted on the Commission's website[84].

Commerce Commission view

25.9 On 27 October 2006, the Commerce Commission wrote to Telecom advising that it would not approve the interim plan, recommending that Telecom submit an alternative plan that would allow ADSL systems to be deployed without restrictions. In particular:

"Telecom's interim plan would have a substantial impact on broadband customers while providing a modest increase in the typical reach of SHDSL systems and unnecessarily protecting all HDB3 systems when only a relatively small number are at risk. Other solutions are available and in use overseas which achieve the same purpose".

25.10 The Commission suggested that "*in submitting an alternative plan that would allow ADSL systems to be deployed without restrictions, Telecom would have to consider making other arrangements for the SHDSL and HDB3 systems that are deemed to be at risk*", which could include:

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82 Layer 10 (July 2006) supra, at p26, which also comments that full-powered ADSL interference is not viewed by Telecom as a problem for services on extremely long lines.

83 "Copper Spectrum Management - Cross Technology Impacts", Telecom, 1 September 2006, at p4

84 Regarding the proposed interim plan, TelstraClear agrees with limited pair separation from HDB3 and power reduction if that cannot be achieved (which is the approach taken under the ACIF code). However, based on experience in Australia we do not consider that pair separation from SHDSL or power reduction within the same cable unit is necessary

"SHDSL
For the existing 254 at risk systems and longer systems that are required for services for which a 4-wire option is not available, consider the conversion of 2-wire systems to 4-wire, the migration of Private Office customers to One Office for the development of a 4-wire Private Office option.

HDB3
For the approximately 1500 at risk systems, consider better pair selection, pair separation, insertion of a regenerator or replacement with SHDSL."

25.11 The Commission agreed with Telecom's proposal to take restrict downstream speed to 3.5bps for the 24,134 working lines provided by Conklin DSLAMs because of their limited bearer capacity.

26 Broad options and overseas practice

Background

26.1 In many international jurisdictions, formal public cable spectrum management plans have now been established as a result of moving to LLU. These are summarised in Appendix 7.

26.2 Three broad options can be considered:

(a) Spectral compatibility benchmarks for defined technologies – For example, in Australia the Industry ACIF code (C559) sets out spectral compatibility benchmarks for defined technologies (basis systems). These benchmarks are only used as measures of interference from other systems when deployed according to their deployment rules and do not constitute a restriction per se on the performance or deployment of a similar system.

(b) Overall PSD masks and coarse range groupings – For example, overall masks and coarse range groupings are used in Ireland or the UK. In Ireland, specific PSD masks are set for each spectral class (asymmetric and symmetric). In the UK, one generic PSD mask is set for each range grouping. The latter approach admits all standard systems and applies coarse deployment limits (inferred as short, medium and long class PSD masks) to many systems in order to control interference. This increases the risk of harm to asymmetric systems, particularly in the upstream due to NEXT, because it theoretically permits a system that uses the entire spectrum under the overall mask. If customer-end systems are in the near vicinity of each other, a system that utilised the full upstream band would cause more severe degradation of asymmetric systems than would be caused by any single standard system.

(c) Standard PSD masks only – For example, in France operators can deploy broadband technologies over every copper pair regardless of (a) location of the pair in the cable, and (b) regardless of length. Having only standard defined PSD masks will mean some systems or technologies (e.g., SHDSL) may interfere with ADSL when deployed in certain ways. This interference will be difficult to predict. Deployment rules ensure a more predictable noise environment.

26.3 On a continuum, Australia and the USA are more prescriptive (protecting ADSL and certain legacy systems[85]). France is more permissive (at the other end of the continuum). The UK is somewhere between the two.

Relevant factors

26.4 Overseas experience needs to be taken into account in developing an interference management plan for New Zealand. However, the plan will need to be specific to New Zealand network conditions and policy objectives, and reflect technology and market changes since overseas plans were developed.

26.5 In considering the options, a range of factors need to be taken into account, including the:

(a) Number of services affected (current and forecast);

(b) Relative impact on different customer groups and service providers;

(c) Relative value of each service (to customers and providers);

(d) Whether alternative technologies are available;

(e) Relative cost and quality impacts of constraining one technology on others; and

(f) Ease, timing and cost of implementation.

Australian approach to legacy systems

26.6 The Australian approach does not seek to enforce replacement of at risk legacy systems. (As far as the TCF is aware, nor does any other jurisdiction).

26.7 Applied to the New Zealand context, if agreed rules allow interference to those systems, then the responsibility would fall to Telecom to assess the risk and only replace where necessary.

[85] The legacy prescriptive component in ACIF applies only to HDB3 and its application by Telstra has minimal impact, as it is almost always possible to allocate a LLU with more that 3 pairs separation from any HDB3.

26.8 Under the Australian approach, the main reason to force replacement of legacy systems would be if they cause excessive interference to ADSL or ADSL2+. For example, to replace SHDSL systems beyond 1.9km and HDB3 systems beyond 0.7km because they degrade ADSL below a required benchmark expectation. In the Australian code (C559), interference from longer legacy systems is not included in the calculations of benchmark performance. Clearly, ADSL can suffer much lower performance when sharing a cable unit with such long legacy systems. All Telstra SHDSL systems are within ACIF deployment limits. Telstra has not agreed to replace potentially interfering legacy HDB3 up front, but has taken the approach that it only replaces such systems when they cause interference that prevents ADSL from working at the standard 1.5Mbit/s profile rate.

26.9 Appendix 7 high level information about other countries' approach to legacy systems.

27 TCF Position

27.1 This Part C has been agreed by the TCF. Establishing a clear description of the technical issues, placing them within a wider policy framework, and distilling the key trade-offs, is positive progress on the path to developing an industry agreed plan for managing harmful crosstalk in an LLU environment.

Next steps

27.2 Key next steps in relation to developing an industry agreed interference management plan include:

(a) Further comprehensive impact measurement and data analysis in relation to crosstalk, which will include using a model being developed for Telecom by the University of Canterbury. The ACIF modelling tool is also available. Agreement will need to be reached around the testing of cable crosstalk characteristics and the brief for any statistical modelling, to ensure the parties had confidence in and bought into the results;

(b) Completing Telecom's current process of categorising lines by attenuation ranges, to develop a better understanding of the characteristics of the New Zealand network;

(c) Obtaining industry feed-back on the policy trade-offs outlined above, and the preferred mix of interference management mechanisms; and

(d) Evaluating the relevant factors outlined above for each broad option, and reach agreement on the preferred option.

Request for submissions

27.3 The TCF invites submissions from interested parties on the issues and policy options set out above. Of particular interest is how you would rank the competing policy choices set out in section 24.15.

27.4 Ranking the choices on the policy menu in section 24.15 will determine how the technical trade-off in section 23.24 is to be made.

27.5 For clarity, the key technical issue involves trading-off:

(a) the relative reach of higher upstream speeds (which currently use symmetric systems) against -

(b) the relative reach of higher downstream speeds (which use asymmetric systems).

27.6 Symmetric systems are generally used to deliver business-grade services. Asymmetric systems are more commonly used to deliver mass-market internet-grade services.

27.7 In developing an interference management plan, one system will be preferred over the other. The extent of the trade-off required is a function of the relative technical impacts, which are explained in more detail in the appendices to this section. As noted above, how the trade-off is made will flow from the higher level policy choices to be made under section 24.15.

28 References for Part C

UK: NICC ND 1602:2005/08 Issue 3; August 2005, "Specification of the Access Network Frequency Plan applicable to transmission systems connected to the BT Access Network". Available at http://www.nicc.org.uk

Australia: ACIF C559:2005, Issue 4; April 2005, "Unconditioned Local Loop Service (ULLS) Network Deployment Rules". Available at: http://www.acif.org.au

Ireland: CLFMP, Issue 3; January 2005, "Copper Loop Frequency Management Plan: Local Loop Unbundling". Available at http://www.eircomwholesale.ie/dynamic/pdf/clfmp_iss3.pdf

France, Germany: European Commission, "Operational Implications of Local Loop Unbundling and the Need for Technical Co-ordination", European Commission Study, 19 September 2001. Available at: http://europa.eu.int/information_society/topics/telecoms/regulatory/studies/documents/2001_ull_study_final.pdf

US: ATIS NIPP NAI, "Spectrum Management for Loop Transmission Systems", T1.417-2003. May be downloaded from: http://www.atis.org/doccenter.shtml

Other: http://irgis.anacom.pt/admin/attachs/176.pdf

PART D – OPERATIONAL STANDARDS & SUPPORT SYSTEMS

29 Overview of Operation and Support Systems' (OSS)

Background

29.1 OSS refers to the operations support systems used by an operator to support its services, including to process orders for new connections and record or track trouble or fault reports. While OSS may be partly or fully automated, it involves processes used by the access provider and the access seeker, including manual systems[86]. Such systems allow for the administration, maintenance and update of network services, providing access seekers with an equal opportunity to compete with the access provider[87].

29.2 Overseas LLU jurisdictions view non-discriminatory OSS and local loop information as essential for competitors to effectively access the local loop network and serve their customers[88].

29.3 For the purposes of this report, it is assumed the access seeker is always the service provider – the party who provides telecommunication services to end use customers. Furthermore, in Part D it is assumed that references to access seekers also include Telecom in situations where it is a service provider.

29.4 The TCF recognises that an access seeker may be wholesaling services to a reseller using its LLU capability. In these situations the access seeker will not be the service provider to the end use customer. The report does not cover the OSS requirements in relation to this situation. This will need to be considered in phase 2.

Range of Processes

29.5 OSS covers all interactions between the parties in relation to LLU and NDSL, from pre-ordering to ordering to provisioning, including information exchange and fault management. Key OSS elements therefore include:

(a) Interface mode (refer section 29.13);

(b) Pre-ordering (refer section 30);

(c) Ordering (refer section 31);

(d) Customer authorisation (refer section 32);

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[86] "Operational Implications of Local Loop Unbundling and the Need For Technical Co-Ordination", Gilbert & Tobin and Political Intelligence, September 2001, section 9.1

[87] Commerce Commission report dated December 2003 on its investigation into unbundling the local loop network and fixed public data network, at para 277 [ISBN: 1-86945-222-4]

[88] Commerce Commission report of December 2003 (referred to above) at para 282-288

(e) Batch processing (refer section 33);

(f) Fault management (refer section 34);

(g) Planned outages and permit to work (refer section 35); and

(h) Billing (refer section 36).

29.6 In a number of sections in the report, reference is made to events or transactions being performed within certain timeframes. The actual timeframes for these events/transactions will be further considered in phase 2.

29.7 Ordering mechanisms for co-location products and backhaul will also be covered in phase 2.

Objectives

29.8 The objective is to establish in a timely manner an OSS between access seekers and access providers for LLU and NDSL that is consistent with the purpose set out in section 18 of the Act and applicable access principles.

Framework

29.9 To meet this objective, the OSS will need to be:

(a) Cost effective;

(b) Accurate (low error rate);

(c) Supportive of business operations (timeliness);

(d) Available when required (responsive to demand);

(e) Interactive;

(f) Auditable;

(g) Able to support visibility of the order status; and

(h) Provide for minimum service disruption.

29.10 The OSS system will also need to be carefully integrated with relevant technical processes, other LLU requirements, and existing approved codes.

29.11 OSS efficiency will depend on the quality and consistency of procedures within access seekers and the access provider, including (for example):

(a) Meeting agreed lead times;

(b) Providing the necessary level of order management activity to co-ordinate related LLU orders submitted for each customer transaction; and

(c) Only submit valid and authorised orders.

29.12 Finally a business continuity plan is required to allow for situations where there is a planned or unplanned outage of the OSS systems.

Interface mode - Issue and options

29.13 A key aspect considered for the overall OSS solution is nature of the interface between the access seeker's and the access provider. The following interface options have been considered:

(a) Fax;

(b) Email;

(c) Web Portal; and

(d) Electronic business-to-business interface to the access providers order and tracking system.

Overseas experience

29.14 With a view to rigorously applying the non-discrimination standard, the federal regulator in the US has imposed explicit OSS electronic interfacing requirements. While all countries have the basic requirement of non-discriminatory treatment, few have followed the US electronic bonding requirement[89]. The Australian approach has been to:

> *"treat OSS issues as a matter more appropriately addressed through the terms and conditions of supply. These arrangements can be developed bilaterally or as part of an industry-wide approach rather than through inclusion within the description of the service to be declared"*[90]

29.15 Overseas industry practice has been to progressively move towards an electronic interface due to the ability to track orders and readily date

[89] "Operational Implications of Local Loop Unbundling and the Need For Technical Co-Ordination", Gilbert & Tobin and Political Intelligence, September 2001, page 125

[90] Australian Competition and Consumer Commission "Declaration of local telecommunications services" A report on the declaration of an unconditioned local loop service, local PSTN originating and terminating services, and a local carriage service under Part XIC of the Trade Practices 1974. July 1999, para 3.8.2

stamp activities. They also deliver on-going efficiencies, and are readily scalable, to accommodate the increased volumes expected with LLU.

29.16 Business continuity plans (in the event of the system becoming unavailable for a defined period of time) will be required. These should be defined as part of the electronic interface working procedures.

Recommendations

29.17 The TCF recommends:

(a) The objective and framework set out above;

(b) That as the NZ industry is already using electronic interfaces:

(i) A minimum standard of a web portal interface is required;

(ii) An electronic business-to-business interface is preferable, but it is for each access seeker to choose whether to interface in this manner; and

(iii) Business continuity plans are required in the event the system becomes unavailable for a defined period of time.

(c) Ordering mechanisms for co-location products and backhaul will also be covered in phase 2.

30 Pre-Ordering

Background

30.1 Internationally, pre-ordering is treated as covering:

(a) Forecasting;

(b) Pre-ordering access to information held by access provider – e.g.

(i) Network information;

(ii) MPF qualification information;

(iii) Individual customer information;

(c) MPF qualification testing.

30.2 The TCF has taken a slightly different approach and separated pre-provisioning into two categories – provision of pre-launch information and provision of pre-ordering information.

30.3 Part E of the report sets out the key issues and options the TCF considered in relation to the information requirements related to pre-launch and pre-provisioning and this section of the report sets out the process for requesting pre-ordering information. A further process needs to be developed for the provision of pre-launch information. This will be considered further in phase 2.

30.4 Pre-ordering relates to the information access seekers need to be able to determine what services they can deliver to the customer.

30.5 They may also have multiple networks capable of servicing the customer, for example wireless, fibre, NDSL or LLU. Some service offerings are dependent on the capabilities of MPF/NDSL service. For example one MPF may only be capable of supporting POTS whereas another may be capable of delivering up to high-speed VDSL services. Certain higher-level services such as VoIP and Video-on-demand require, amongst other things, higher level quality requirements. The performance of the MPF may influence either the access seeker or customer's selection of networks and consequently the access seeker needs information on individual MPFs which could be used to supply the services.

30.6 The objective of this process is to ensure that:

(a) Access seekers have the network information reasonably required to:

(i) make choices about using MPF/NDSL services to provide the service required by a customer;

(ii) plan service continuity; and

(iii) identify and minimise installation costs.

(b) Information about a customer's services is not provided to an access seeker when the customer has not authorised access to that information;

(c) The results from a pre-order enquiry should not return any information which gives the requestor any form of information about a competitor's services.

Pre-order Triggers

30.7 A pre-order enquiry may be made by the access seeker to the access provider as a result of:

(a) An access seeker's existing customer wanting to connect new sites or add additional services;

(b) A prospective customer 'window shopping' around various access seekers to compare prices;

(c) Access seekers wanting to market services to potential customers wanting to ensure in the first instance that the network is capable of providing the service. For example they would not wish to promote broadband or video-on-demand where the MPF would not support these services; and

(d) The initial bulk migration by an access seeker establishing its LLU-related customer services, where access seekers will wish to ensure a customer's lines are compatible with their new equipment/service offering to avoid transferring customers and encountering service failures.

30.8 An access seeker must have a signed contract with the access provider before pre-order information can be requested.

Customer Authorisation

30.9 In the majority of cases a pre-order enquiry will not require customer authorisation as no customer or competitor information is being provided. However if any pre-order enquiry does result in the need to

disclose customer or competitor information, such as a site survey, then explicit customer authorisation will be required. Refer section 32 for further detail on the requirements relating to customer authorisation.

Service Identification

30.10 NDSL is a service provided via an equipment port connected to an MPF. However an MPF can exist on its own in the LLU environment. Therefore these may be identified separately in the access provider's back-office systems. However when requesting activity on such services only the agreed identifier need be submitted. Further work on defining this will need to be undertaken in phase 2.

30.11 As the MPF service represents a physical path between an address and the access seeker's handoff point then the following conditions will apply:

(a) When a customer transfers between access seekers the service identifier shall change;

(b) When a customer moves address the service identifier shall change; and

(c) When a customer changes from LLU service whilst remaining with the same access seeker the service identifier shall change.

30.12 As the NDSL service represents connection of a network equipment port through to a customer's modem then the following conditions will apply:

(a) When a customer transfers between access seekers the service identifier shall change;

(b) When a customer moves address the service identifier shall change;

(c) When a customer changes from UBS to NDSL the service identifier shall change; and

(d) When a customer changes from NDSL to UBS the service identifier shall change.

30.13 The service identifier relates to a connection of a service from one point to another. If the service termination point changes at either end, a new service identity is required. This allows the MPF/NDSL history to be maintained which is essential in maintaining billing integrity and to assist in the resolution of disputes.

Obtaining the Unique Service Identifier

30.14 The unique service identifier is likely to be a technical identifier that is not commonly divulged to end-users.

30.15 Access seekers may attach their own identifiers (such as a phone number or circuit identifier) to a service, but the access provider will not be aware of the relationship of this identifier to the unique MPF or NDSL service identifier.

30.16 For an address which does not currently have any active services, no current service identifier is available. However the access provider maintains records as to the location of the local loop, and which physical addresses it runs past or into.

30.17 The TCF has agreed that where an access seeker requires information on the local loop availability for a given site, they will supply physical address.

Pre-Order Enquiry

30.18 At present customers can make enquiries via an online website "line checker" or by a customer service representative using a similar tool on behalf of a customer. The line checker will tell the customer if broadband is capable of being provided on the MPF requested. However it does not tell them the number of MPFs available or the MPF attenuation.

30.19 In most instances, only a small amount of information will be required by the access seeker from the access provider. If an enquiry relates to a potential new customer, the customer is likely to have one MPF that is currently working into their premises, which they wish to migrate over to the new access seeker.

30.20 For some customers, notably larger business customers, there will be the requirement to know a lot more about the customer's site, in order to prepare the best overall service offering - for example, a business with 5 MPFs currently may want to move to change providers and take up a broadband service. The access seeker will need to confirm that at least one of the 5 MPFs is capable of broadband, and may also want to determine how many potential MPFs are available – so they can pre-establish full or partial phone service prior to the current services being stopped to enable a smoother transition.

30.21 Two pre-order enquiry types have been considered:

(a) Service Availability Enquiry: This enquiry type would allow access seekers to determine what services over MPF the site was likely to be capable of, and the current maximum MPF capacity to the site. It would not return any information about which MPFs were in-use. No customer authorisation would be required. The request would be made against a physical site address, and would return:

(i) a single total number of available MPFs which could be readily delivered to the premises as at the date the response is provided. This includes the number of both in-use and

potential MPFs. The potential MPFs may or may not require a lead-in to be built; and

(ii) calculated MPF attenuation at the agreed frequency.

(b) Authorised Pre-order Enquiry: This enquiry type would provide further information about a specific site following authorisation from the customer. This would allow access seekers to obtain the service identifiers needed for placing transfer orders, and additional information which may affect service delivery options. The request would be made against a physical site address, and would return:

(i) total number of in-use MPFs, and their unique service identifier;

(ii) calculated MPF attenuation at the agreed frequency; and

(iii) number of intact, but inactive MPFs (if recorded).

30.22 Where a customer has multiple in-use MPFs, the customer or gaining access seeker may wish to selectively cutover particular MPFs to their network, in order to pre-establish some services to reduce customer downtime. Further work is required in phase 2 to consider how gaining access providers or customers can obtain the MPF identifier (e.g. "the MPF used for broadband") that relates to particular service offerings from the losing access seeker.

30.23 No information will be provided on the identity of the customer's current access seeker and the MPFs would not be "held" as a result of the enquiry. Consequently the information on the number of available MPFs is only correct at the time it was provided.

Site Investigation

30.24 An access seeker may require more information about the:

(a) Available service company installation appointments for a particular customer site;

(b) The number of in-use and spare MPFs to the customer's site; and

(c) The measured attenuation of the useable MPFs.

30.25 As noted above, customer authorisation will be required before an access seeker can request this information and the information may need to be released upon appropriate authorisation from other access seekers directly.

30.26 The process for the provision of this information is yet to be worked through and it will be further considered in phase 2.

Recommendations

30.27 The TCF recommends that:

(a) A pre-order process is included in the code based on the high level design outlined above and that further work is undertaken in phase 2 to develop a process to apply where site investigation is required; and

(b) A process is developed in phase 2 for the provision of pre-launch information.

31 Ordering

Scope

31.1 An ordering process is required to enable an access seeker to contract the access provider to install, change, and disconnect services for end-users of the access seeker. The ordering process involves several elements, including receiving, validating, processing, confirming, establishing date due changes, and completing orders[91].

Objectives

31.2 The ordering processes must be consistent with the objectives outlined earlier, in particular they must:

(a) Be robust and accurate;

(b) Minimise time and costs consistent with service levels required by access seekers and their customers; and

(c) Provide equivalent for all access seekers and the access provider.

Principles

31.3 The TCF agreed the following key principles in relation to various transactions:

(a) The gaining access seeker is responsible for obtaining the necessary information and authorisation from the customer;

(b) The losing access seeker (if applicable) needs sufficient information to validate an order without it being overly onerous for the gaining access seeker to provide;

(c) The processes should be consistent with the processes in other TCF Codes;

(d) It is the responsibility of the customer's gaining access seeker to continue to communicate with the customer during a transfer; and

(e) A simple and efficient means for processing orders and monitoring the order status is required.

[91] "Operational Implications of Local Loop Unbundling and the Need For Technical Co-Ordination", Gilbert & Tobin and Political Intelligence, September 2001, page 101

Order scenarios

31.4 In excess of 120 customer scenarios for service have been identified, when looked at across all products and combinations of change that may be encountered. All of these will need to be performed by an order and tracking system. On closer analysis, including a comparison with other jurisdictions, it became clear that these scenarios are actually made up of nine core transactions, which can be summarised as:

(a) MPF:

(i) New connection (Figure 12);

(ii) Relinquishment (including jumper removal) (Figure 13);

(iii) Transfer of customer from access seeker to access seeker (Figure 14);

(iv) Move Address (Figure 15);

(b) NDSL service:

(i) New connection (Figure 16);

(ii) Relinquishment (Figure 17);

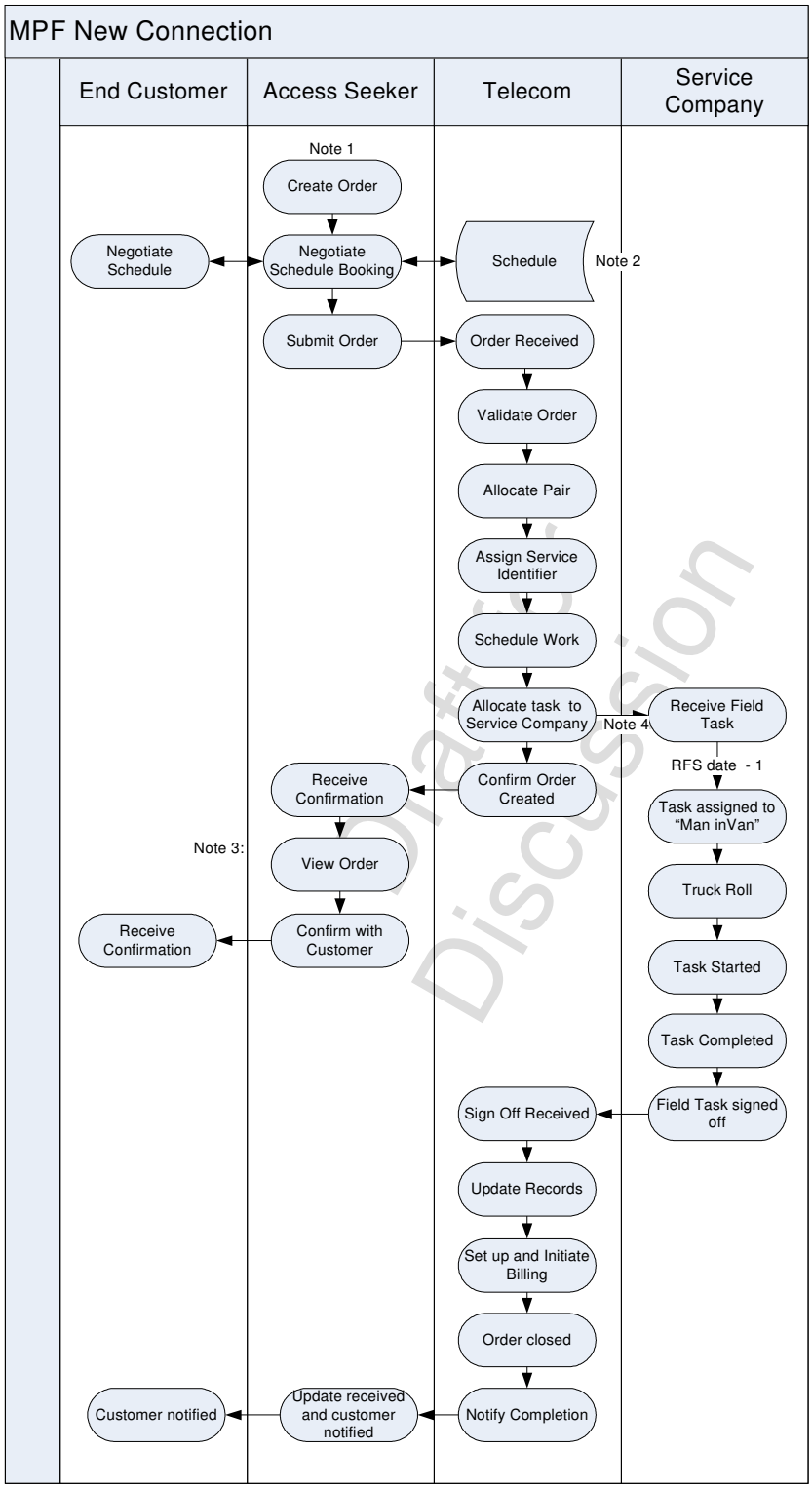
(iii) Move Address (Figure 18);

(c) Transfer of customer from full service (POTS plus UBS) to NDSL (Figure 19);

(d) Transfer of customer from NDSL service to full service (Figure 20).

31.5 The TCF considers that these 9 activities will support all of the customer transaction scenarios when combined with the access seeker's specific actions. The diagrams below outline these core processes and the table in section 31.6 illustrates how combinations of these processes make up various scenarios.

Figure 12: MPF New Connection



Scenario Notes:

- η Customer wants a service to an address that requires a new cable pair.
- η Minimal co-ordination is required to ensure service is not lost (no cut over action where existing service is disrupted)
- η Service cut over on RFS date and billing commences irrespective of AS using the pair
- η It is assumed that no trenching is required on site, and that no installation work other than connection of the MPF from the exchange to the Demarcation point is required. A separate order activity should be arranged by the Customer to have the correct site installation activity undertaken during the building / trenching phase.
- η The Access Seeker will be able to view the order status at any time once it has been submitted.
- η Assumption is that the order submitted is submitted for the correct customer and Authorisation has been obtained.

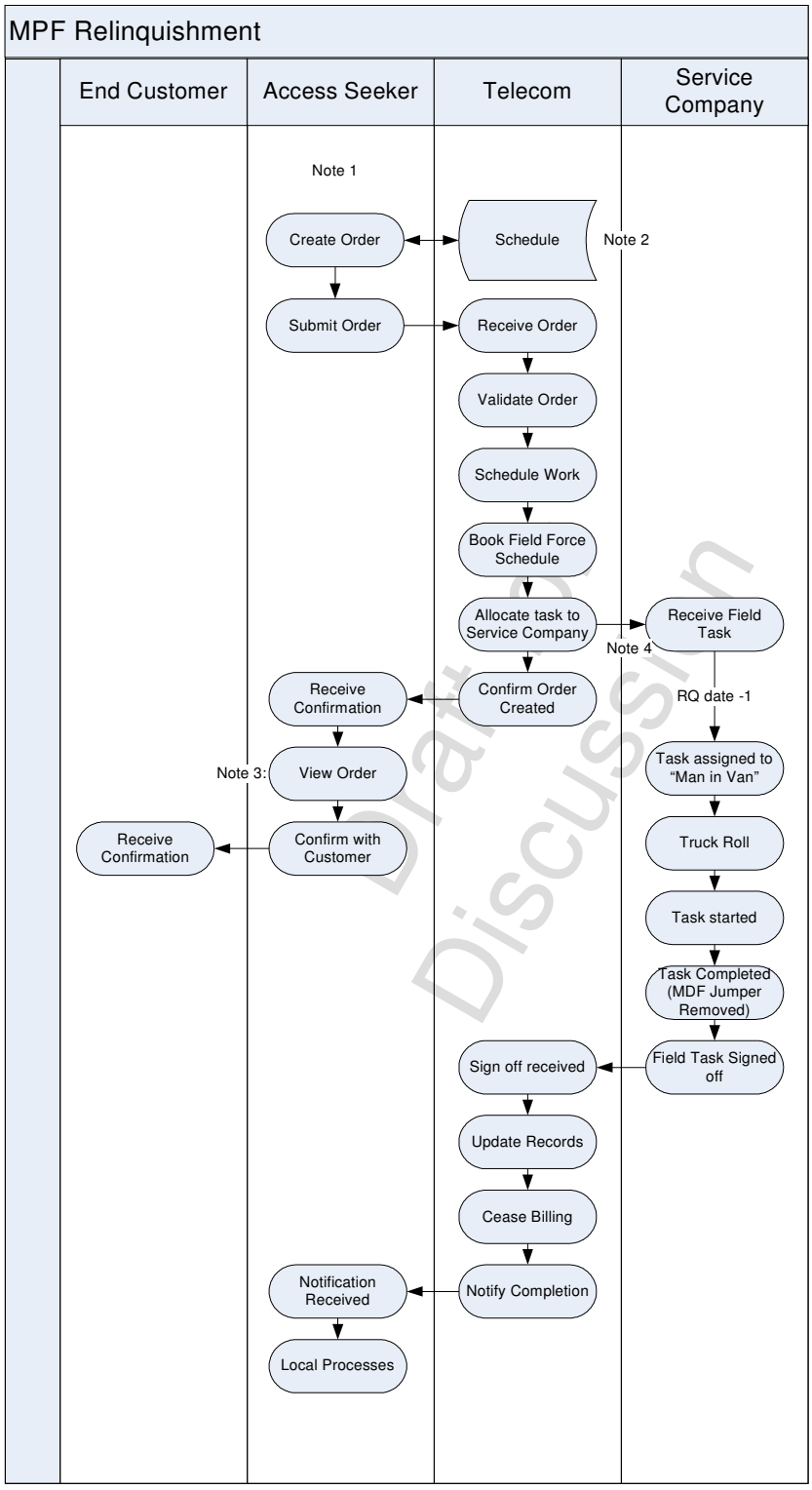
Note 1: It is assumed that the Access Seeker has completed Pre-Qualification to their satisfaction, and that Authorisation has been received from the Customer prior to the order being submitted.

Note 2: Visibility of the schedule available only (yet to be enabled) No ability to book a schedule at this point, this will happen with the submission of the order. (Schedule works on AM / PM basis)

Note 3: In the case that the details of the order confirmation do not correspond with the order requirements, a manual update will need to be initiated.

Note 4: The task is allocated to the Service Company as soon as possible but always by 1500 the day prior to the RFS

Figure 13: MPF Relinquishment



Scenario Notes:

- Customer wants his entire LLU based services relinquished but has not requested connection to another Service Provider.
- Minimal co-ordination is required as work will be undertaken as per the requested "time slot" on the schedule
- Billing will cease on the date requested
- The Access Seeker will be able to view the order status at any time once it has been submitted.
- Assumption is that the order submitted is submitted for the correct customer and Authorisation has been obtained.
- MPF will be left connected to the house through the Cabinet (if applicable)) but not terminated to any exchange equipment. (pre-jumpered)

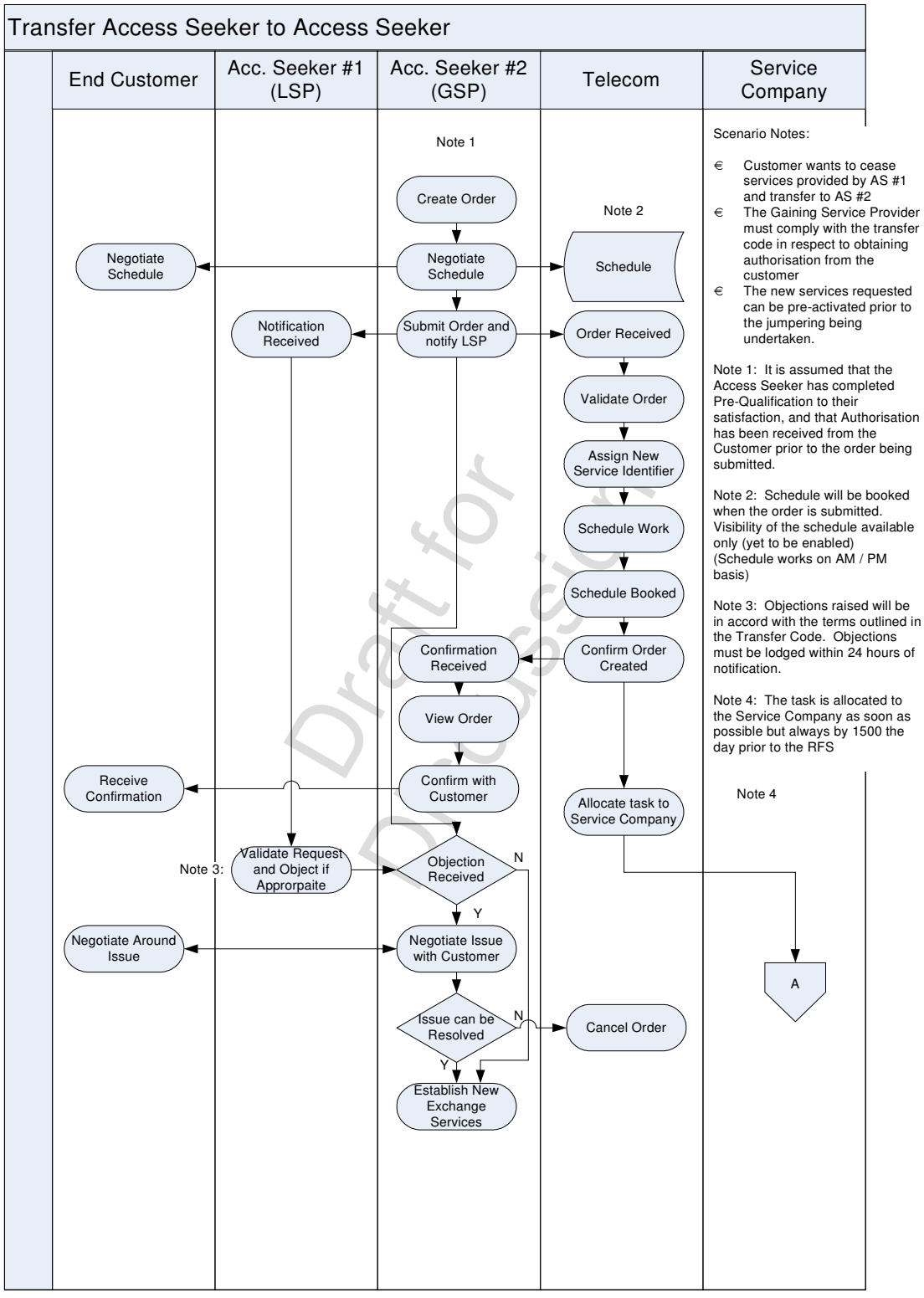
Note 1: It is assumed that Authorisation has been received from the Customer prior to the order being submitted.

Note 2: Visibility of the schedule available only (yet to be enabled) No ability to book a schedule at this point, this will happen with the submission of the order. (Schedule works on AM / PM basis)

Note 3: In the case that the details of the order confirmation do not correspond with the order requirements, a manual update will need to be initiated.

Note 4: The task is allocated to the Service Company as soon as possible but always by 1500 the day prior to the RFS

Figure 14: MPF Transfer



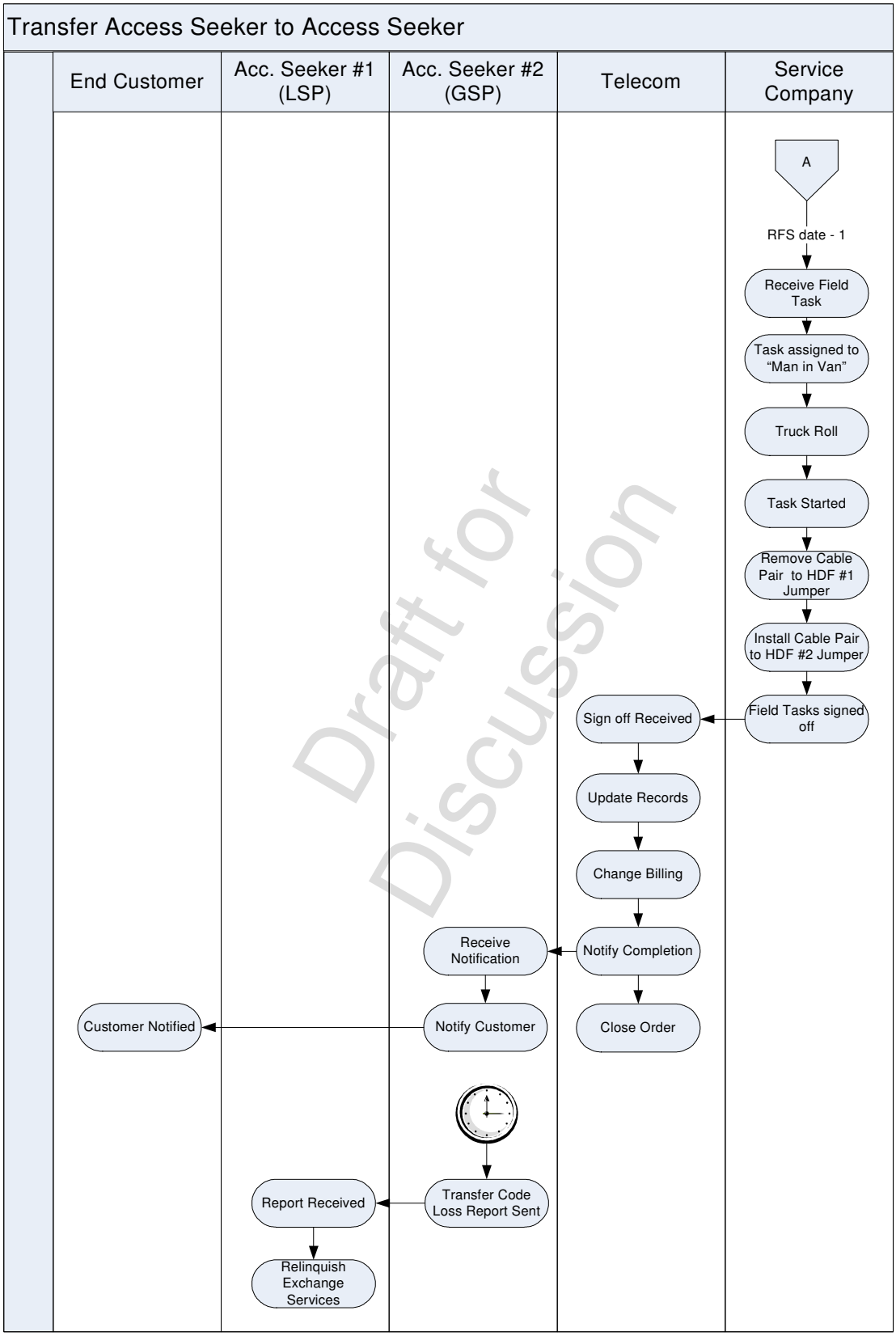
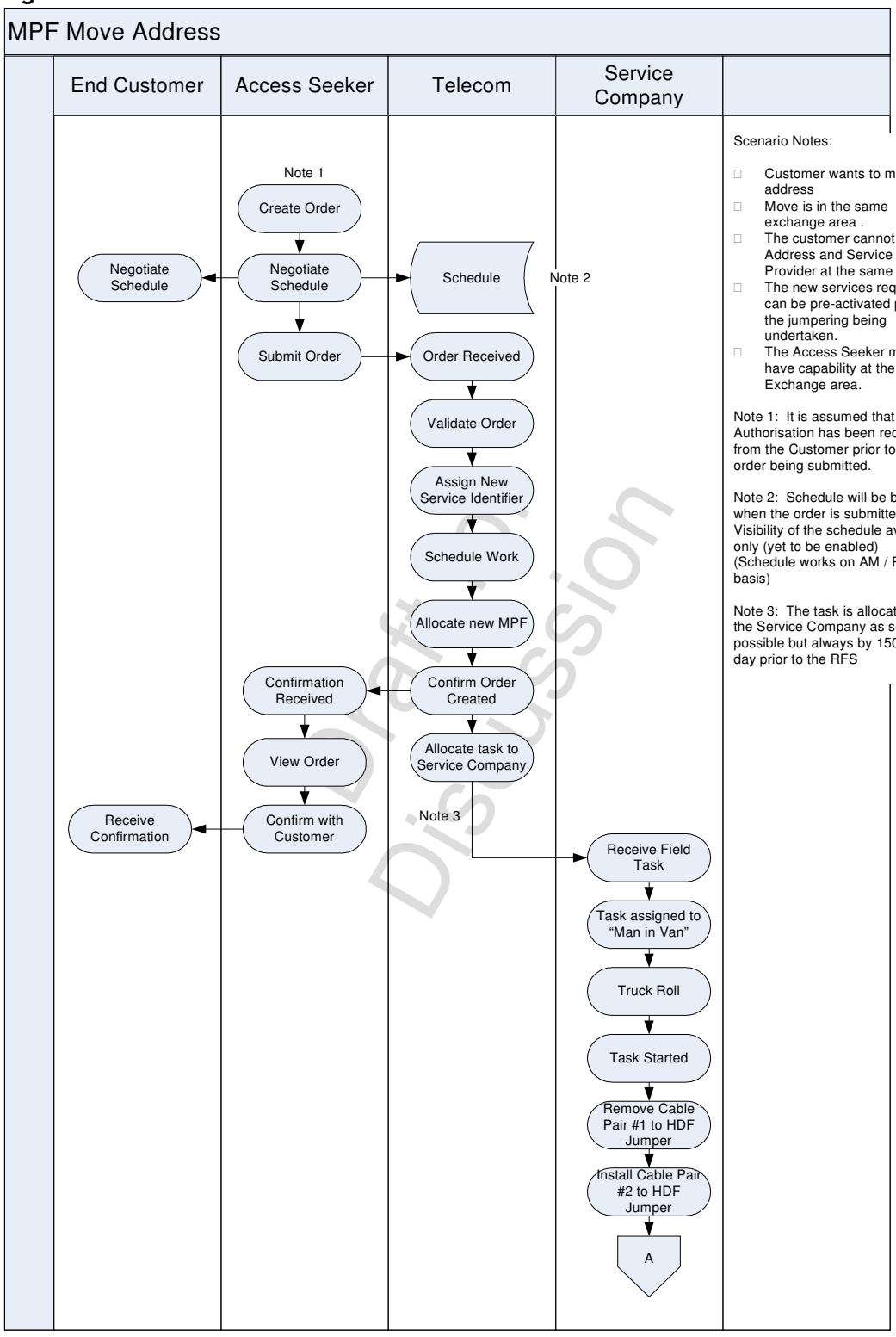


Figure 15: MPF Move Address



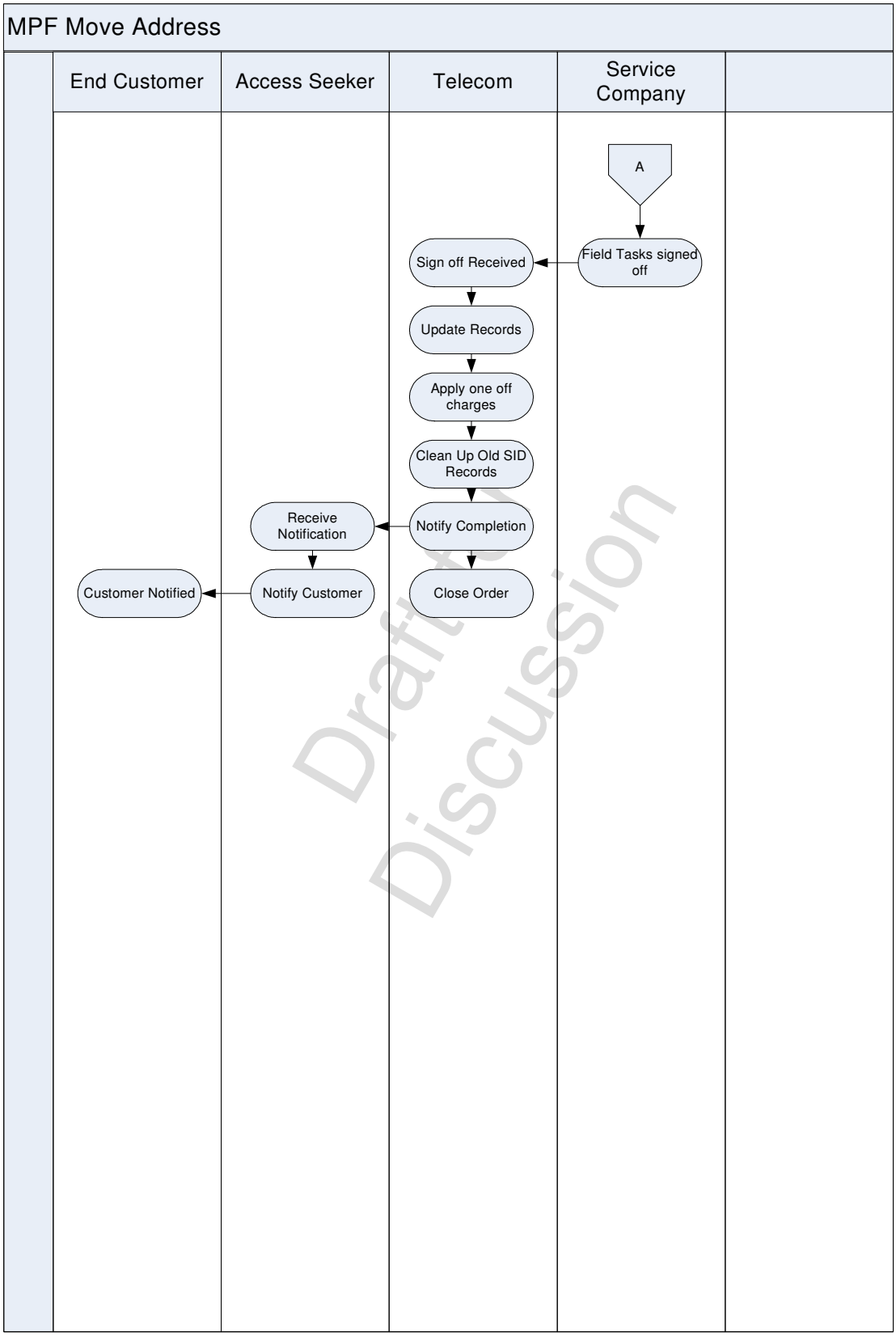
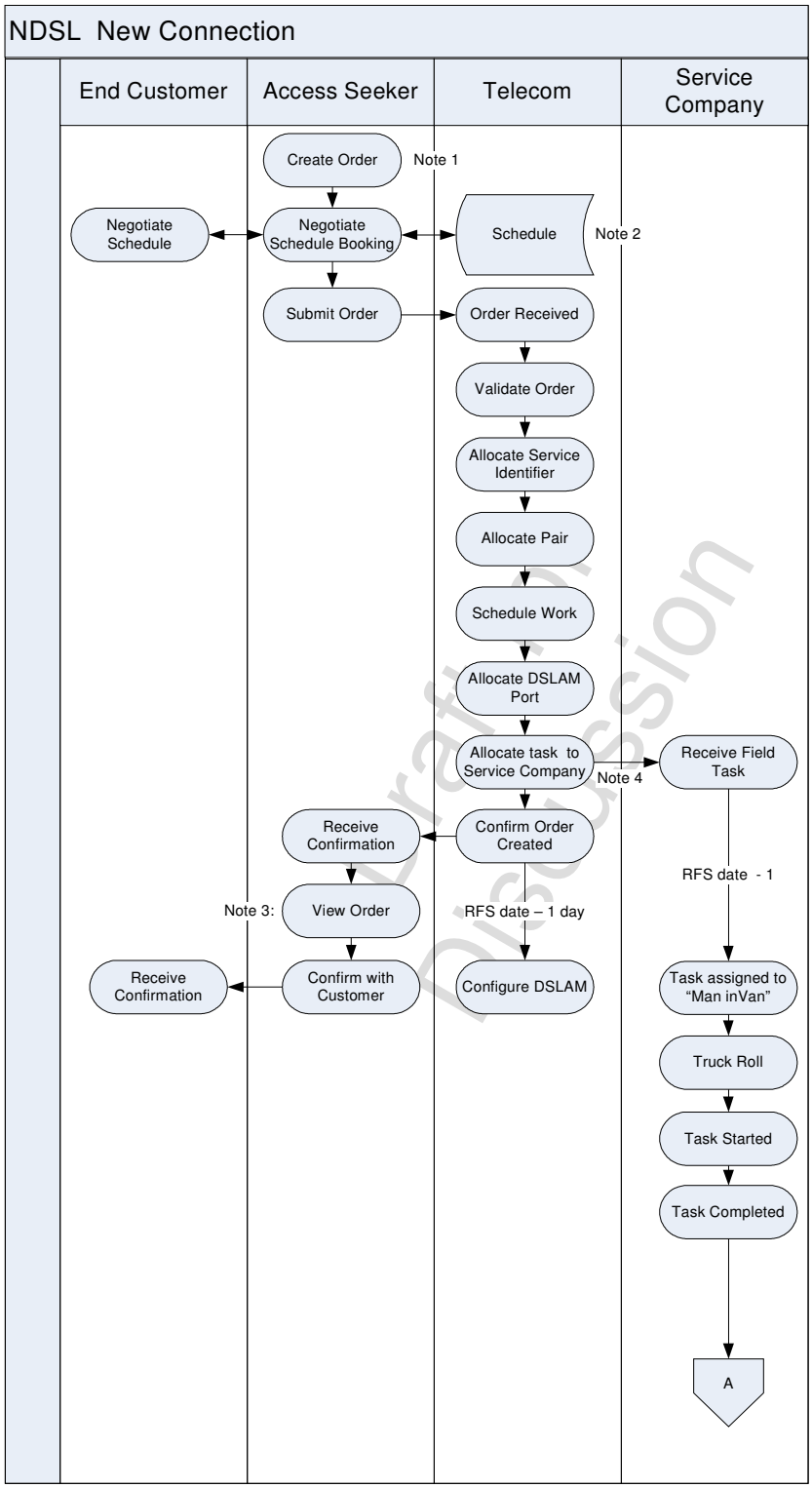


Figure 16: NDSL New Connection



Scenario Notes:

- Customer wants NDSL Service to an address that requires a new cable pair.
- Minimal co-ordination is required to ensure service is not lost (no cut over action where existing service is disrupted)
- Service enabled on RFS date and billing commences irrespective of AS using the pair
- It is assumed that no trenching is required on site, and that no installation work other than connection of the MPF from the exchange to the Demarcation point is required. A separate order activity should be arranged by the Customer to have the correct site installation activity undertaken during the building / trenching phase.
- The Access Seeker will be able to view the order status at any time once it has been submitted.
- Assumption is that the order submitted is submitted for the correct customer and Authorisation has been obtained.

Note 1: It is assumed that the Access Seeker has completed Pre-Qualification to their satisfaction, and that Authorisation has been received from the Customer prior to the order being submitted.

Note 2: Visibility of the schedule available only (yet to be enabled) No ability to book a schedule at this point, this will happen with the submission of the order. (Schedule works on AM / PM basis)

Note 3: In the case that the details of the order confirmation do not correspond with the order requirements, a manual update will need to be initiated.

Note 4: The task is allocated to the Service Company as soon as possible but always by 1500 the day prior to the RFS date

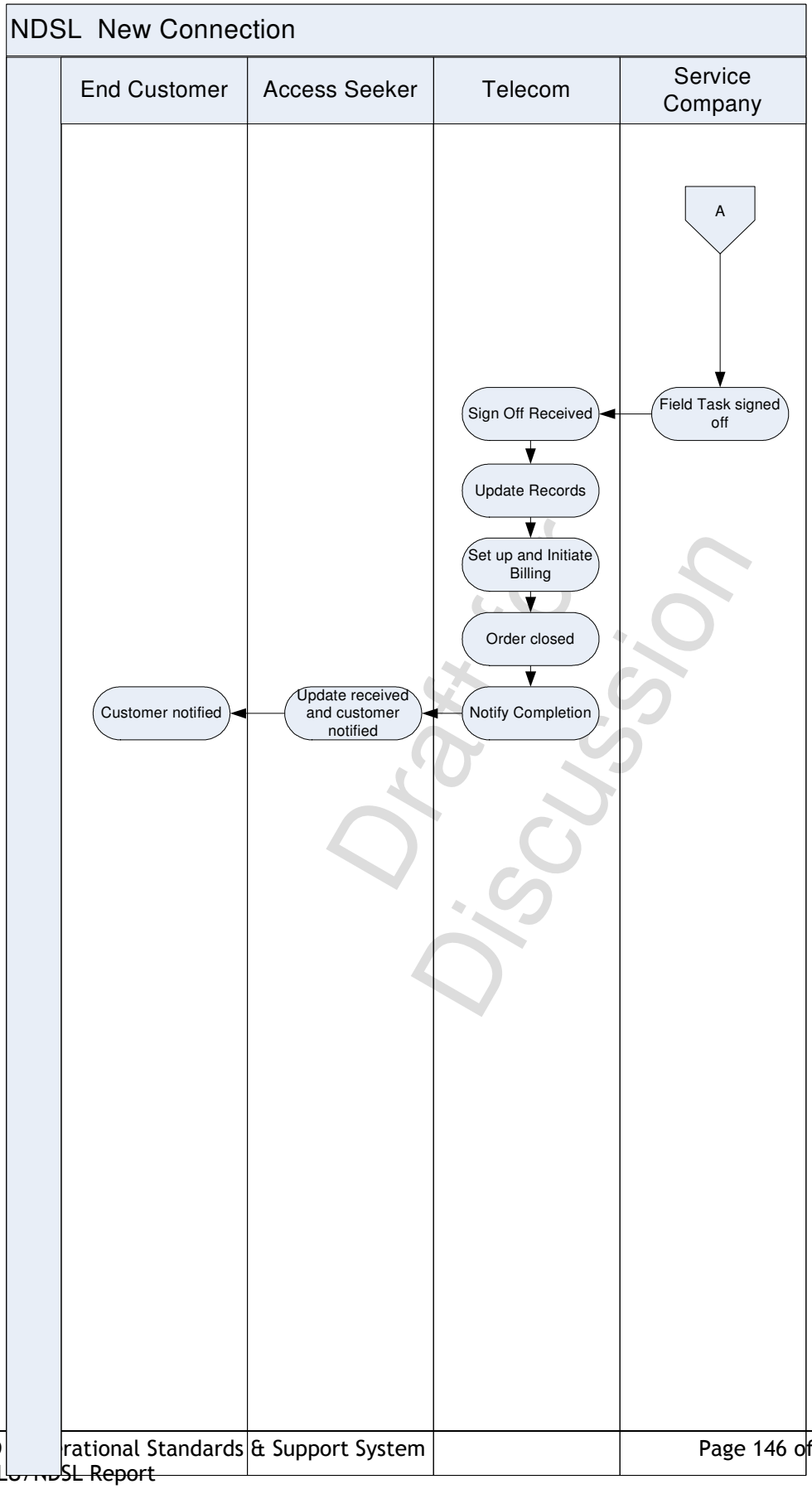
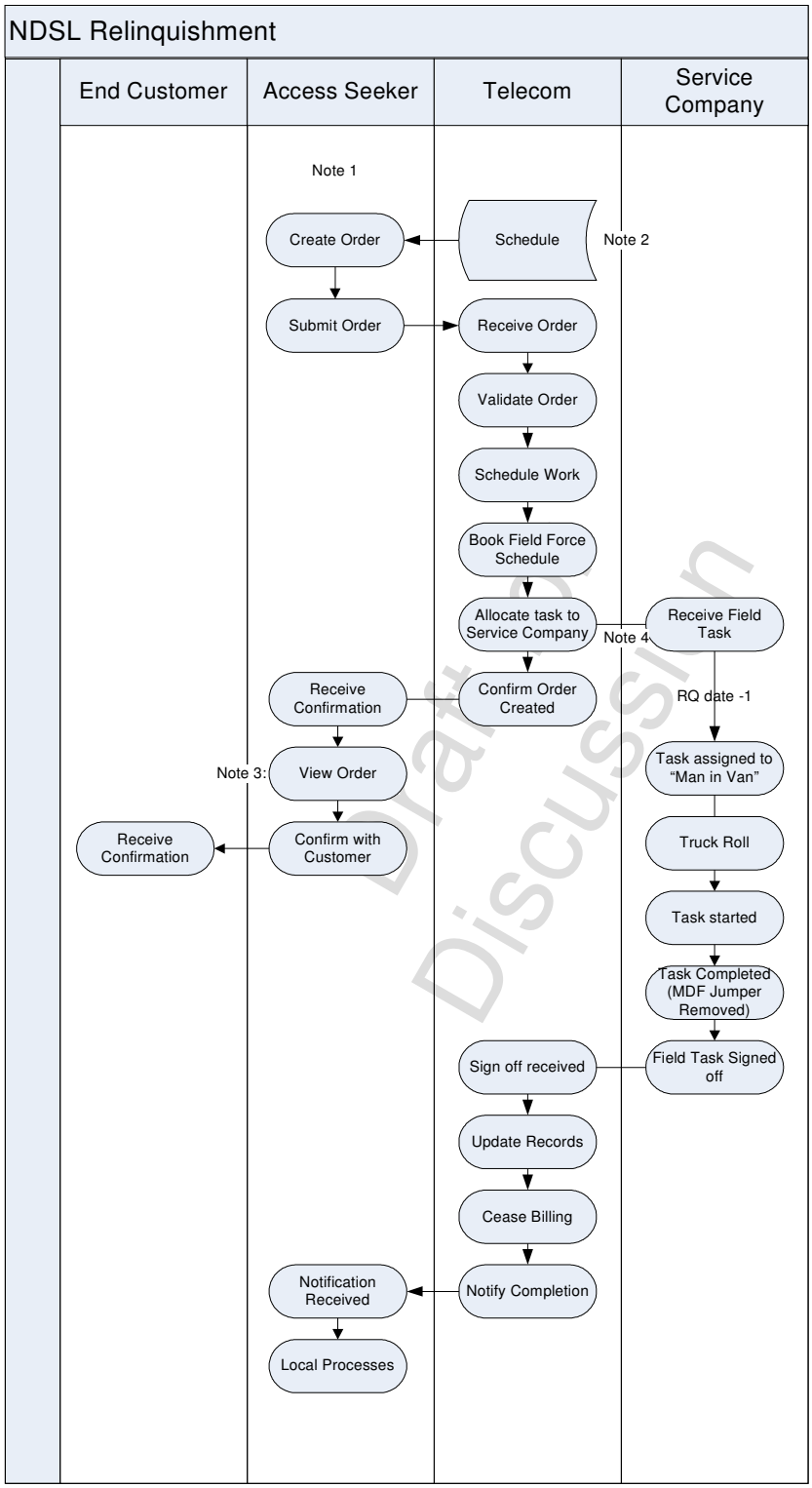


Figure 17: NDSL Relinquishment



Scenario Notes:

- Customer wants his entire LLU based services relinquished but has not requested connection to another Service Provider.
- Minimal co-ordination is required as work will be undertaken as per the requested "time slot" on the schedule
- Billing will cease on the date requested
- The Access Seeker will be able to view the order status at any time once it has been submitted.
- Assumption is that the order submitted is submitted for the correct customer and Authorisation has been obtained.
- MPF will be left connected to the house through the Cabinet (if applicable)) but not terminated to any exchange equipment. (pre-jumpered)

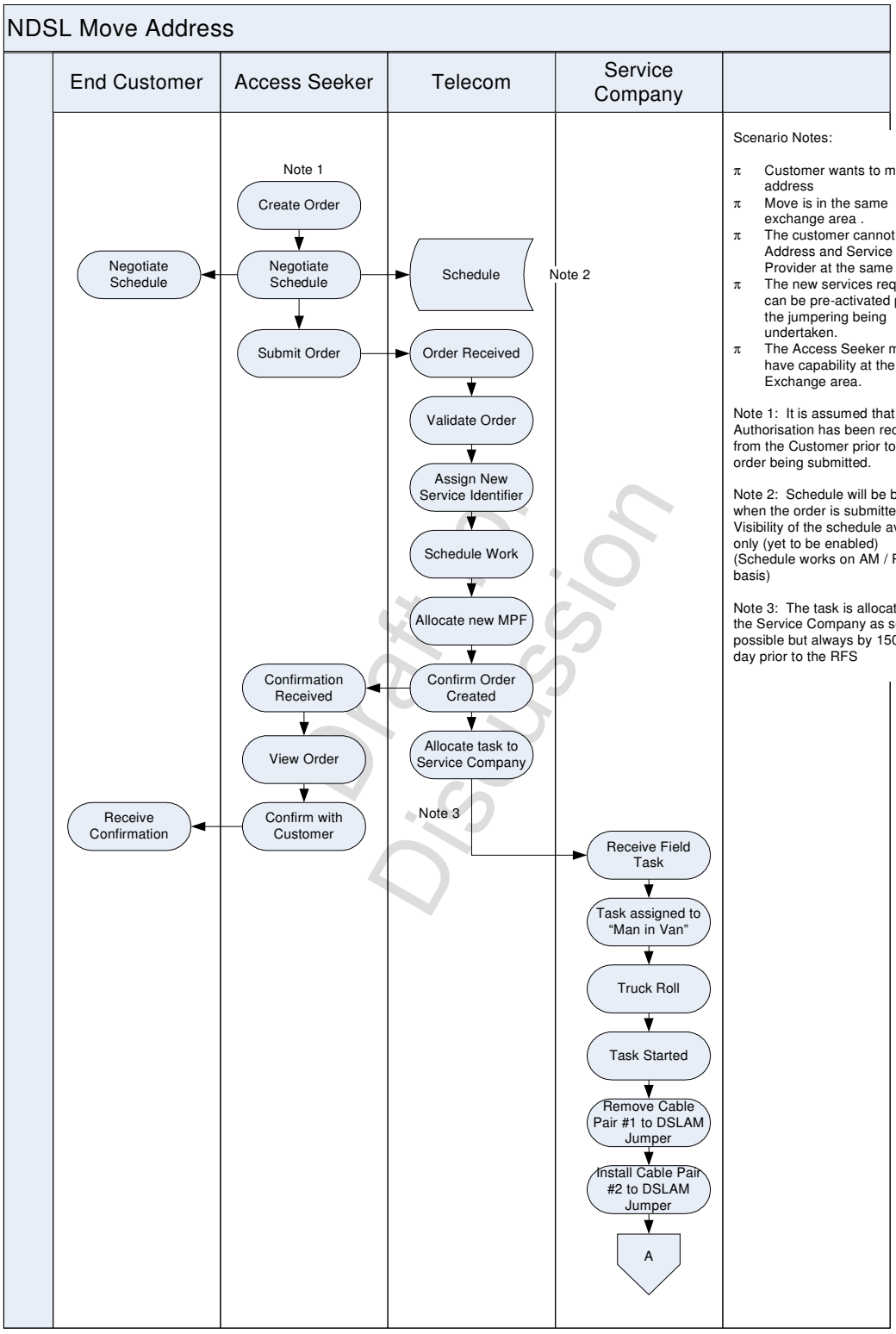
Note 1: It is assumed that Authorisation has been received from the Customer prior to the order being submitted.

Note 2: Visibility of the schedule available only (yet to be enabled) No ability to book a schedule at this point, this will happen with the submission of the order. (Schedule works on AM / PM basis)

Note 3: In the case that the details of the order confirmation do not correspond with the order requirements, a manual update will need to be initiated.

Note 4: The task is allocated to the Service Company as soon as possible but always by 1500 the day prior to the RFS

Figure 18: NDSL Move Address



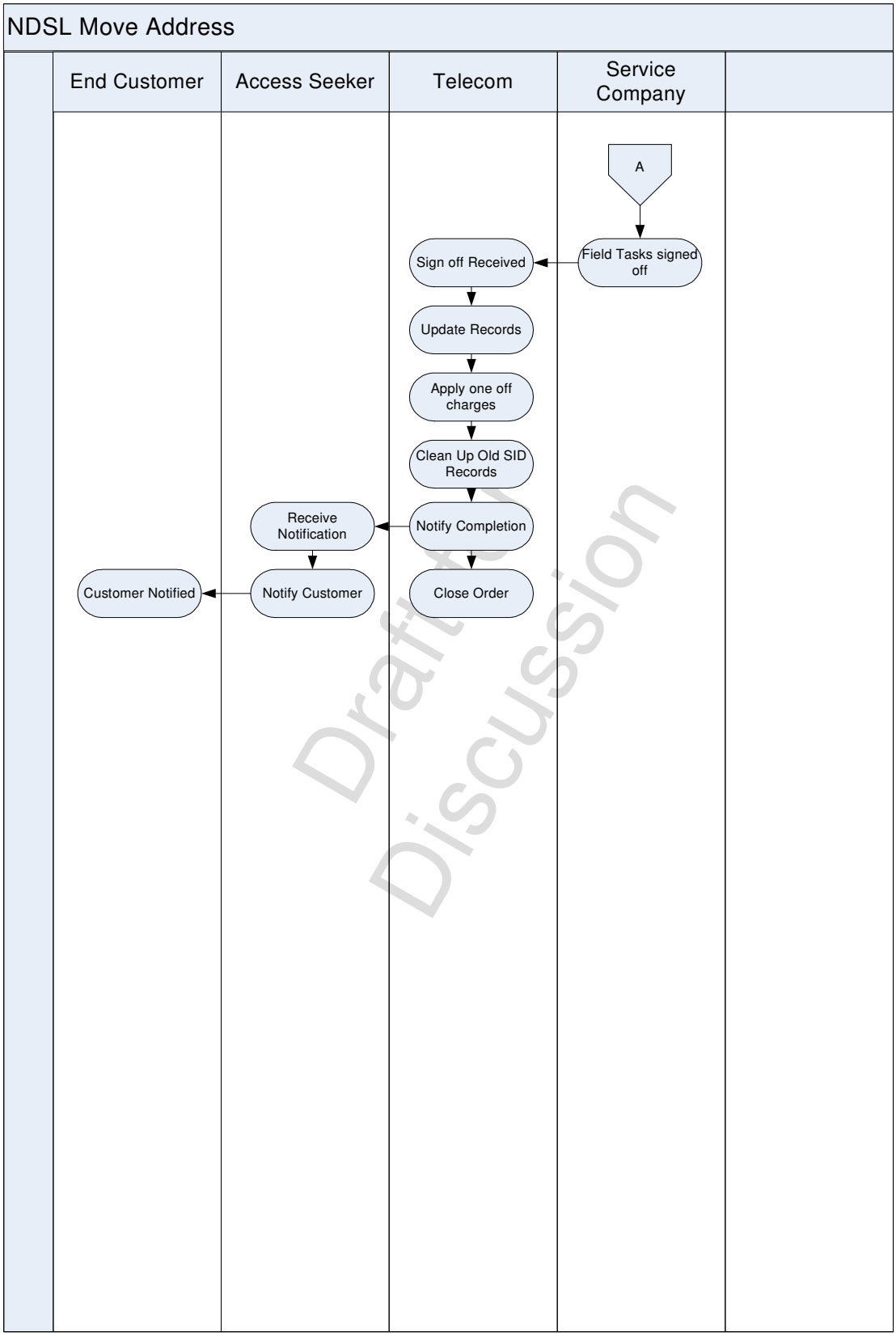
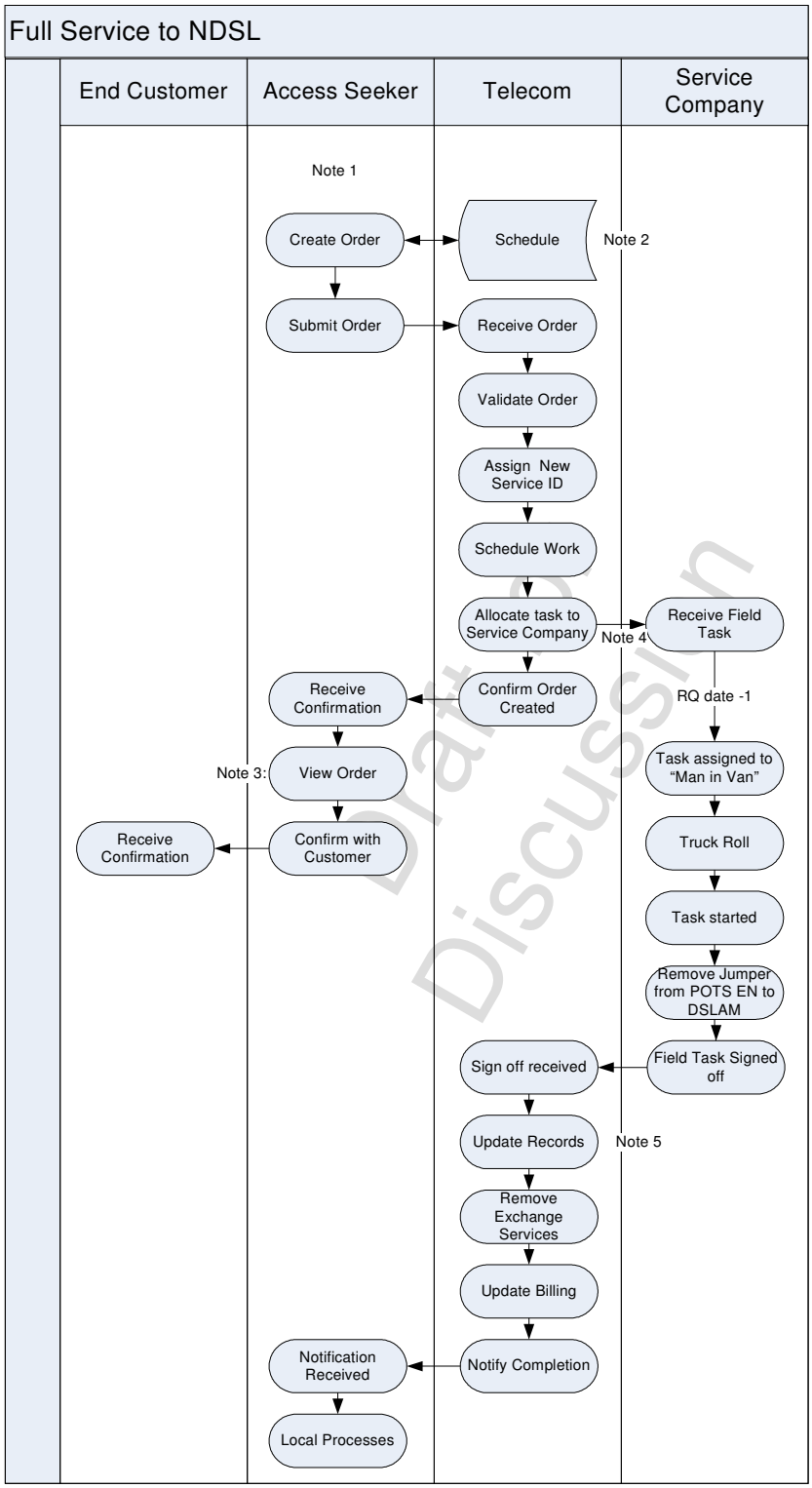


Figure 19: NDSL Conversion – Full Service to NDSL



Scenario Notes:

- Customer wants to change service from POTS plus UBS to NDSL
- Minimal co-ordination is required as work will be undertaken as per the requested "time slot" on the schedule
- Billing will updated on the date requested
- The Access Seeker will be able to view the order status at any time once it has been submitted.
- Assumption is that the order submitted is submitted for the correct customer and Authorisation has been obtained.

Note 1: It is assumed that Authorisation has been received from the Customer prior to the order being submitted.

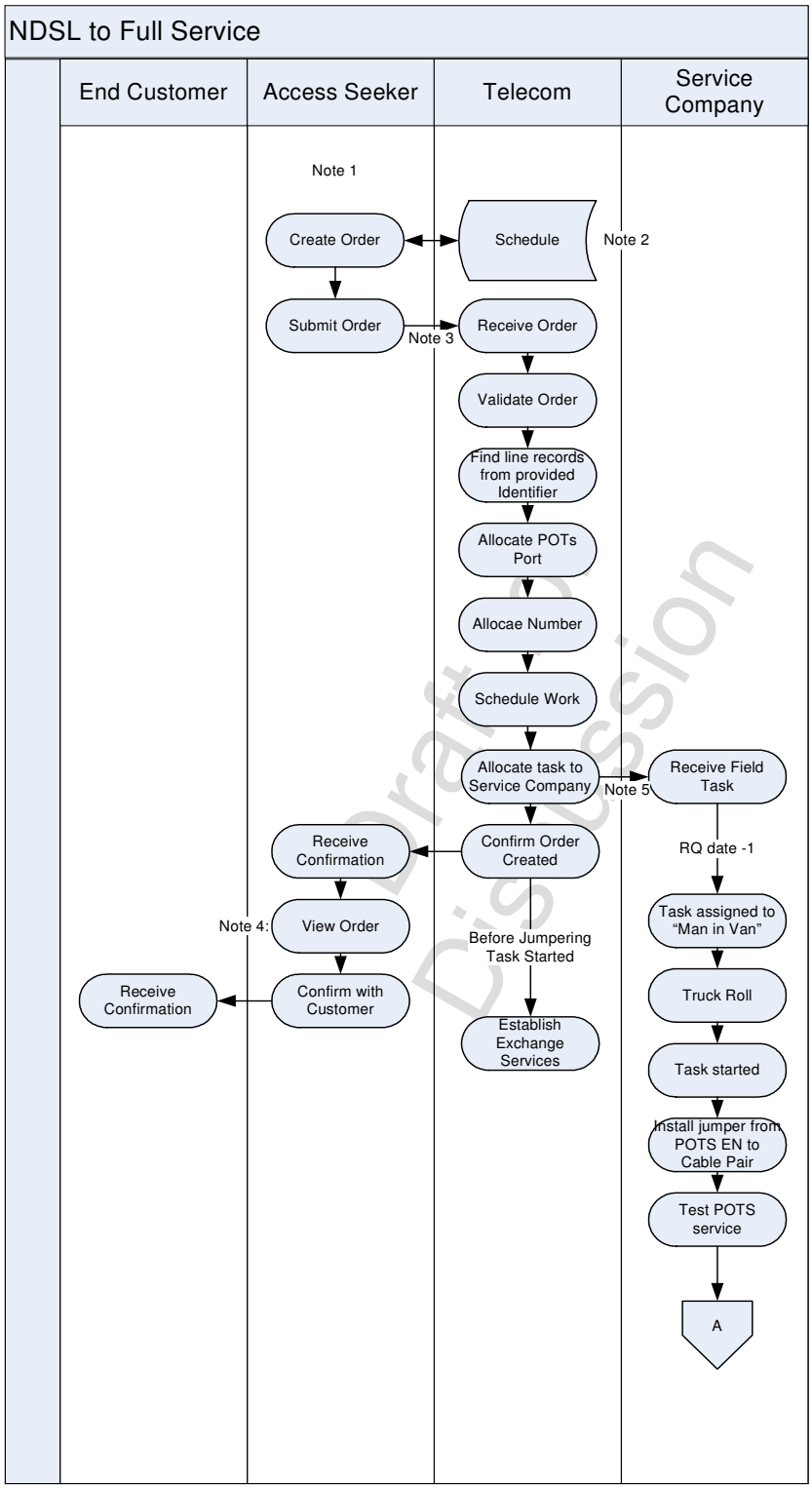
Note 2: Visibility of the schedule available only (yet to be enabled) No ability to book a schedule at this point, this will happen with the submission of the order. (Schedule works on AM / PM basis)

Note 3: In the case that the details of the order confirmation do not correspond with the order requirements, a manual update will need to be initiated.

Note 4: The task is allocated to the Service Company as soon as possible but always by 1500 the day prior to the RFS

Note 5: This will include the clean up of the old Service ID

Figure 20: Transfer of NDSL to Full Service



Scenario Notes:

- Customer wants to change service from Naked DSL to Full Service (POTS and UBS)
- Minimal co-ordination is required as work will be undertaken as per the requested "time slot" on the schedule
- Billing will updated on the date requested
- The Access Seeker will be able to view the order status at any time once it has been submitted.
- Assumption is that the order submitted is submitted for the correct customer and Authorisation has been obtained.

Note 1: It is assumed that Authorisation has been received from the Customer prior to the order being submitted.

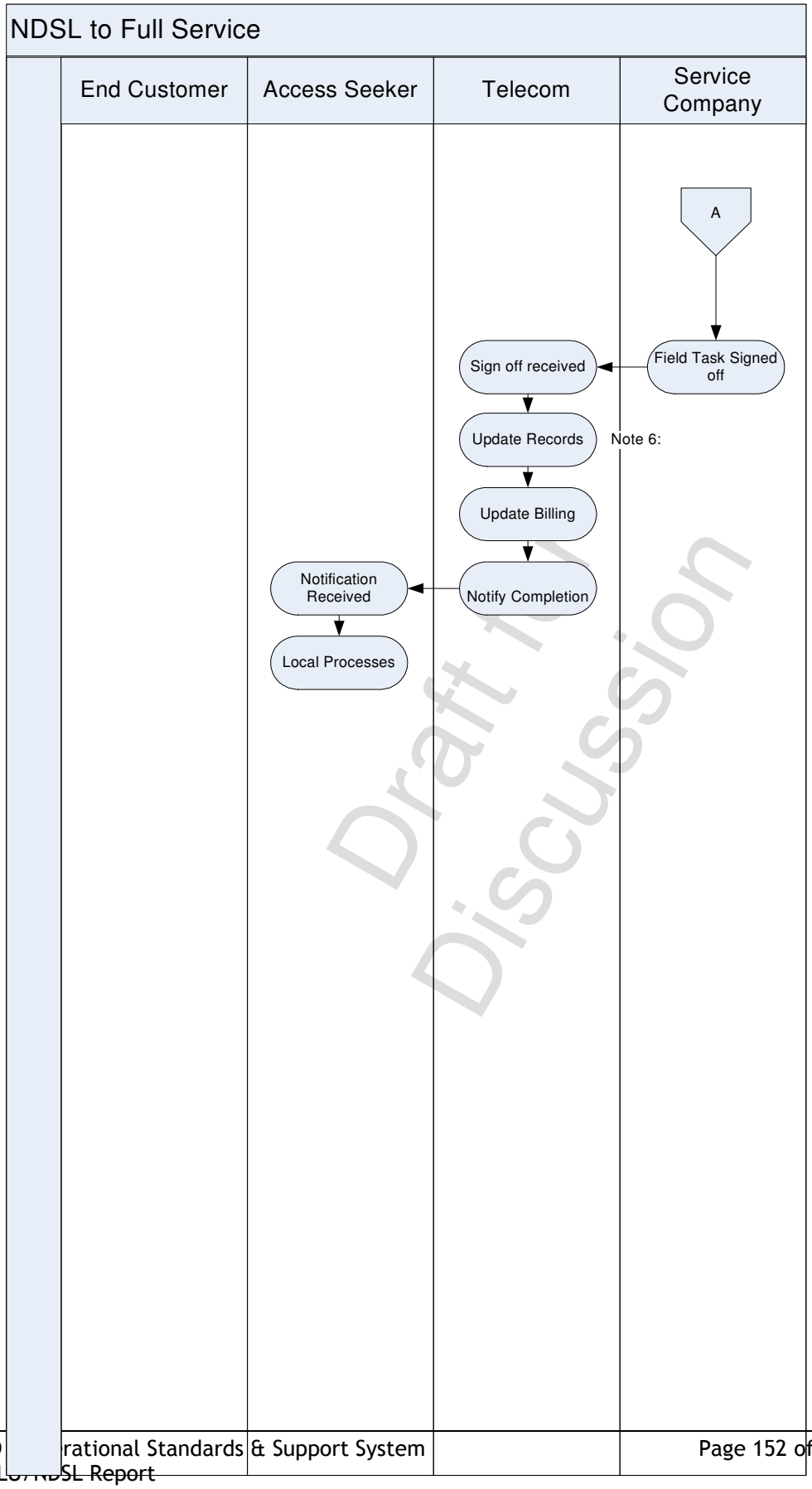
Note 2: Visibility of the schedule available only (yet to be enabled) No ability to book a schedule at this point, this will happen with the submission of the order. (Schedule works on AM / PM basis)

Note 3: Order must include Access Service ID, not Access Seekers service ID

Note 4: In the case that the details of the order confirmation do not correspond with the order requirements, a manual update will need to be initiated.

Note 5: The task is allocated to the Service Company as soon as possible but always by 1500 the day prior to the RFS

Note 6: This will include a clean up of the Old Access Service ID



Sample Mapping of Service Scenarios and Order types

31.6 This table below outlines which of the various scenarios referred to in section 31.4 are required for the sample of transactions listed below. The numbers in the table indicate the relevant diagram referred to in this report and the other key activities required (refer to the key below the table for further assistance):

Existing Service Type	POTS	POTS and BB	POTS and W/S BB	POTS and UBS	Data / Misc	Complex Voice	NDSL
Service Scenario							
Bulk Migrations	3+10+11	3+10+11	3+10+11	3+10+11	3+10+11	3+10+11	3+10+11
Transfer to Naked DSL (From LLU)	NA	NA	8	8	3+8	NA	NA
Transfer TNZ to access seeker	3+10+11	3+10+11	3+10+11	3+10+11	3+10+11	3+10+11	NA
Transfer access seeker to TNZ	3+10+11	3+10+11	NA	NA	3+10+11	3+10+11	3+10+11
Transfer access seeker to access seeker	3+10+11	3+10+11	NA	NA	3+10+11	3+10+11	NA
New LLU MPF	1+11	1+11	NA	NA	1+11	1+11	NA
RQ LLU MPF	2+10	2+10	NA	NA	2+10	2+10	NA
Transfer UBS to NDSL	5+10	5+10	5+10	8+10	NA	NA	NA
NDSL to UBS	NA	NA	NA	NA	NA	NA	9

Figure Key	Description
12	New Connection (MPF)
13	Relinquish (MPF)
14	Transfer MPF between access seekers
15	Move Address: Same Exchange 1 Truck Roll
16	NDSL New Connection
17	NDSL Relinquishment
18	NDSL Move Address
19	Transfer, UBS to NDSL
20	Transfer, NDSL to UBS
Other Activities Required	
10	LSP Relinquish Exchange Service's
11	GSP New Connection Exchange Service's
12	Losing Carrier Deletes Services
13	Gaining Carrier Creates Service

Duplicate Orders

31.7 Cases can occur where a customer might approach several access seekers around the same time and "sign up" with them. This can result in the access provider receiving conflicting orders for the same customer. Four options have been identified to address this situation;

(a) Reject all orders;

(b) Action both / all orders in order received;

(c) Action last order received; or

(d) Action first order received.

31.8 It was agreed that the access provider will process the first order received and reject successive orders based on the following rationale:

(a) The access provider may not have a relationship with the customer so identifying what the customer actually wants should lay with the access seeker who is establishing that relationship;

(b) Sorting out these issues would incur cost on the access provider and could potentially be open to abuse;

(c) Only valid authorised orders should be submitted to the access provider; and

(d) The first order may already be in the process of being actioned and it may be difficult to reverse the order once it has commenced.

31.9 Therefore the onus is on the access seeker to ensure that there are no other orders submitted for services on the customers MPF prior to accepting and processing a request. If an access seeker's order is rejected due to duplicate orders being received by the access provider, the access seeker will need to resolve this with the customer.

31.10 The customer will need to advise which new access seeker they wish to supply their telecommunication services and advise the other access seekers that their services are no longer required. The access seekers whose services are no longer required must immediately notify the access provider that their orders for this customer are withdrawn.

31.11 The issue of what happens when an access seeker does not withdraw their order will need to be further considered in phase 2.

Provisioning Timeframes

31.12 Existing contractual arrangements between the access provider and contractors are such that they manage their resources to meet standard targets for provisioning activity. Agreed provisioning timeframes are required to enable jobs and resources to be appropriately scheduled and so that resources are efficiently allocated.

31.13 The TCF have agreed the following indicative time frames (for normal provisioning activity):

(a) Order submission via an electronic interface, 24 hours per day, 7 days a week;

(b) Orders containing a manual component (outside the jumpering component) will be processed during business hours on business days;

(c) Order fulfilment (jumper activity carried out) will be schedule dependent[92 and 93];

(d) Minimum lead time may be required on order submission, to allow the access provider to schedule resources. Initially this period may be 1-2 days, due to the way scheduling is done with external contractors;

(e) Orders which reserve copper capacity (e.g. New Connection) must be scheduled within a fixed period of order placement. The

[92] Schedules currently vary on a regional basis and work density ranging up to 6 days per week.
[93] Schedules are based on forecasted volumes

suggested period at this stage is one month. This ensures copper resource is available for use by other access seekers[94]; and

(f) Orders which utilise existing copper capacity (e.g. transfers within the same exchange) can be scheduled at any time, subject to minimum lead times, as requested by the end-user. The rational for this that it is not preventing other access seekers from providing services to customers.

31.14 As resources will have been allocated, orders cancelled within a specified number of days prior to the request for service date may incur a charge.

Information Requirements

31.15 In addition to the information currently provided through the order interface for service requests, it will be necessary to provide a unique identifier for the MPF, information to enable connection to the access seeker's equipment, an indication of the request for service date and an appropriate level of approval (in accordance with the TCF Customer Transfer Code).

31.16 Full analysis of the information required will need to be undertaken as part of phase 2, however a list of the additional information potentially required (over and above that required for current provisioning) between the access seeker and the access provider across the relevant service types is:

(a) Exchange name;

(b) Footprint number;

(c) Tie cable number;

(d) Tie cable pair number;

(e) Unique service identifier number; and

(f) Site name (Cabinet).

31.17 In addition, the access provider will provide information to the losing access seeker once the transaction is complete to enable them to relinquish existing services and terminate billing. The process to be followed will be consistent with the TCF Customer Transfer Code.

31.18 A concept for consideration in phase 2 is the possibility of creating a centralised system for the communication of authorisations between losing and gaining access seekers, taking into account the centralised

[94] The ordering system should reject orders requested for beyond this period. If an access seeker requires a guarantee of copper availability, the access seeker needs to place an order within the fixed period, and pay for the MPF from that date.

system being used for local and mobile number portability, on the basis that it may improve efficiency and lower total costs for all access seekers.

Recommendations

31.19 The TCF agrees with the principles set out in section 31.3 and recommends that:

(a) The OSS is developed in accordance with the high level design specifications set out in Figures 12 to 20;

(b) Where there are duplicate orders the access provider will process the first order received and reject successive orders unless that first order is withdrawn in time;

(c) In phase 2 the code will need to further develop these design specifications and set out the actual service levels for provisioning timeframes. The indicative timeframes in section 31.13 reflect the TCF's understanding of current practice and broad expectations; and

(d) Further consideration needs to be given to the possibility of creating a centralised system for the communication of authorisations between losing and gaining access seekers.

32 Customer Authorisation

Background

32.1 Customer authorisation is required to ensure a seamless experience for all parties involved in the transfer of a customer's services from one access seeker to another. The customer authorisation process reduces the risk of a customer being incorrectly transferred, either because the wrong customer's details were provided at the time of the transfer or because the customer did not wish to be transferred at that time. They may for example only be making general enquiries to see what various parties could offer, without actually making any decision at that time about whether or not they wanted to move to a new access seeker.

32.2 Section 30 and 31 of the report sets out when a customer authorisation is required and this section sets out the actual customer authorisation process.

32.3 In this section of the report, the term "transfer" is referring to the transfer of a customer's telecommunication services from one access seeker to another.

Objectives

32.4 The objective of this process is to ensure that:

(a) Customers understand the choices they are making;

(b) Only customers intending to transfer to a new access seeker are transferred;

(c) The information the access seeker is required to provide to the access provider is sufficient to enable the access provider to validate the transfer without being unreasonably onerous;

(d) The losing access seeker cannot stop a customer transferring unless the information provided suggests the request is not authorised by the customer.

Options

32.5 The TCF agreed earlier on that it is assessment as the industry has recently agreed a customer authorisation process which applies in both the TCF Customer Transfer Code and the Local and Mobile Terms for Number Portability, in order to streamline processes it would be more efficient if the same process applies to LLU/NDSL. Consequently no other options were considered.

Recommendations

32.6 The TCF recommends the customer authorisation process in the TCF Customer Transfer Code and the Local and Mobile Terms for Number Portability is used. This process is set out below.

Obtaining Customer Authorisation

(a) The gaining access seeker bears sole responsibility for ensuring that prior to commencing a transfer it has a valid and complete customer authorisation;

(b) A customer authorisation must contain, at a minimum, the following:

(i) The customer's details, including name or business name, and contact name and the phone number of authorised representative, where applicable;

(ii) Acknowledgement from the person communicating that they are either the customer or the authorised representative and so entitled to request a Transfer in respect of the services referred to in the customer authorisation;

(iii) The customer's agreement to the transfer to the GSP;

(iv) The date of the customer authorisation;

(v) The customer's acknowledgement that they have been informed by the GSP of, and accept the information set out in section 32.61.0.24.1(a); and

(vi) Confirmation from the customer that the information provided by the customer to the GSP is true and correct.

Informed Customer Authorisation

(a) In the process of obtaining the customer authorisation, a GSP must inform the customer:

(i) That the customer is transferring a telecommunications service or services from their existing access seeker to the GSP;

(ii) That the customer might continue to have outstanding obligations to the LSP and it is the customer's responsibility to check the terms and conditions of its existing contracts relating to the services being transferred;

(iii) Any terms and conditions, and the costs associated with the transfer, and where the customer may find the full terms and conditions;

(iv) That by transferring the customer's telecommunications services:

- The telecommunications service(s) associated with that unique service identifier might be disconnected from the Losing ASD or LSP and might result in finalisation of the customer's account for that service; and,

- There may be services that might not be able to be supported by the Gaining ASD or GSP (if applicable).

Customer Authorisation validity period

(a) Unless agreed otherwise with a customer, to be valid, a transfer request must be made within thirty (30) days of the date of the customer authorisation.

(b) A LSP may request a copy of the customer authorisation, provided such request is made within twelve (12) months of the completion of the transfer. The GSP must provide a copy of the relevant customer authorisation to the LSP within five business days, if requested by the LSP for the purpose of resolving a customer complaint.

(c) The GSP must retain all customer authorisations for a period that allows them to meet their obligations in (a);

Bad Debts are not a reason to Reject a Transfer

(a) The fact that a customer has a bad debt or unpaid invoice with the LSP is not in itself sufficient grounds to reject the transfer of that customer.

33 Batch Processing – Bulk Migration and Special Projects

Background

33.1 An LLU environment can give rise to situations where a large number of customers need to be transferred at the same MDF or newly connected by one or more access seekers. For example:

(a) an initial bulk migration by an access seeker establishing its initial bow wave of LLU-related customer services;

(b) an access seeker ceasing operation in a particular location; and

(c) an access seeker transferring from MPFs to NDSL services or vice versa; and

(d) a targeted sales initiative resulting in volumes of new connections or transfers from one access seeker to another that would exceed forecasts.

Objectives

33.2 The objective is to:

(a) Develop a transition process for large volumes of transfers at the same time for the same exchange which access seekers can choose to use and which:

(i) Provides comparatively timely and seamless service transfer for end customers, minimising adverse impact on customers (especially where number portability is involved);

(ii) Optimises resources and costs for all parties; and

(iii) Is equivalent in timeliness of cut-over for all access seekers;

(b) Provide a process which access seekers can request from the access provider to facilitate high-volume provisioning activity in a particular location;

(c) Ensure integrity and quality of the system as a whole; and

(d) Ensure all access seekers normal business-as-usual activity continues without interruption.

Options

33.3 The TCF considered whether, in relation to batch processing:

(a) To use existing single line transfer process; or

(b) To develop a special process, and if so, whether to use a manual or automated process; and

(c) Whether the process should be the same for all forms of batches outlined in 33.1.

Evaluation and Proposal

33.4 A single line transfer process is not the most efficient means of handling these transactions as it does not make the most effective use of access seeker's and access provider's resources. Nor does it deliver to customer's timely service. However the TCF agreed it is important a similar process is used to maintain system integrity and to assist with order and tracking. Accordingly the TCF agreed that the processes should be electronic and that essentially the same process as that used for single orders would apply, with the added capability of the ordering system to distinguish orders placed as part of a batch.

33.5 For the situations outlined in section 33.1, access seeker will have the choice of using the batch-orientated process, or processing single orders as per BAU.

33.6 The TCF also agreed that the process for batch processing arising for an access seeker first establishing an LLU capability, will be different from processing "batches" arising from targeted sales drives. The rationale for the different process is that:

(a) The targeted sales drives are really business as usual but they may create peaks in the volumes in excess of forecasts. Receipt of sufficient pre-notification will enable all groups involved to better manage this type of abnormal peak activity. These batches will be treated as special projects. The agreed process for special projects is outlined in section 33.18.

(b) Other transfers being processed via batches are for customers already supplied by the access seeker, with the only change being that there are large volumes of them being migrated to terminate on that access seeker's equipment. This is not the case with targeted sales drives - where the transfer process will involve multiple access seekers and may include new connections. Batches relating to customers already serviced by an access seeker will be treated as bulk migration. The key design elements for bulk migration of MPFs from the access provider to the access seeker are outlined in section 33.8 and the agreed process for a bulk migration is outlined in section 33.14.

33.7 The batch sizes for bulk migration and special projects are yet to be agreed and service levels will also need to be established for each scenario. For special projects the service levels will be agreed on a bilateral basis, and for bulk migration, these will be agreed on an exchange by exchange basis with all the relevant parties.

Key Design Elements

Bulk Migration

33.8 The TCF agreed that the bulk migration process needs to satisfy the following criteria:

(a) Orders are to be submitted via an electronic interface;

(b) MDF activity should be arranged to deliver "time in motion" efficiency: Orders may be grouped by:

(i) MDF blocks (horizontal and/or vertical);

(ii) Transfer type (simple, complex);

(iii) access seeker (all access seekers' orders together or allocated work session for each access seeker).

(c) Pre-planning will require:

(i) Good forecasting and a need to "lock-down" orders within a reasonable time frame prior to RFS date, (after which time orders can be removed but not added). This timeframe is required to enable planning for the resource necessary to complete the pre-work required in time for the RFS date;

(ii) The access seeker to have completed their pre-planning ready for bulk migration;

(iii) Resource management – scheduling extra field force resource; and

(iv) Pre-jumpering may be an option to be investigated (site dependent).

33.9 Maximum batch sizes will vary by exchange depending on work space around an MDF and also MDF design (case by case).

33.10 This bulk migration process is designed to achieve the objectives set out in section 33.2.

33.11 Rules will be required for prioritising which exchanges are implemented first.

33.12 Time for completion of migration will depend on the access seeker's expectations and the capability for resources to support this.

33.13 Migrations will take place during normal business hours unless by prior arrangement.[95]

33.14 The following outlines the features of an agreed bulk migration capability;

(a) Orders will be managed via the same systems and processes as a single line transfer and order status will be visible as with the existing processes;

(b) A bulk "pre-qualification" capability may be provided;

(c) The access seeker will group orders as directed by the access provider into batches based on the key design elements. The access seeker can choose whether or not they wish to use the batching facility;[96]

(d) Management of the orders into logical groupings or any other special requirements should be external to the system (pseudo project based);

(e) Orders under each of the bulk groupings must be for customers at the same exchange site and must relate to the customer's same physical address. It is important to note that bulk migration does not enable the provision of LLU services on spare MPFs;

(f) A view of a special "pre-arranged" schedule will be exposed to enable access seekers to manage customer expectations (based on a dedicated contractor resource);

(g) A minimum "lock down" period for orders (a reasonable timeframe prior to the RFS date) is needed to ensure there is maximum opportunity to pre-jumper the work so maximum volumes can be achieved on a daily basis;

(h) Pre and post testing should be undertaken to ensure integrity of work being done where possible;

(i) The same processes, systems and rules should be used / apply to all access seekers (including Telecom for its retail customers) to ensure equity;

(j) Any customer site activity must be managed outside this process;

(k) The times booked for the cutover need to be adhered to and the access seeker needs to be notified as soon as possible after the

[95] Work requested to be undertaken at times outside normal provisioning business hours (this does differ nationally) will be by special arrangement with a relevant cost scale.

[96] The way the batches are put together and the batch size's needs to be worked through. They will depend on the physical constraints of the site, but are also likely to be based around a "daily" total.

cutover is complete so that they can transition their customer's services.

33.15 For the complex orders (i.e. those involving number portability) it is recommended that a project team be established.

33.16 This approach was agreed based on the following benefits;

(a) This will result in better levels of record integrity due to the BAU LLU systems being used to process orders;

(b) By utilising a "single process" for both single and bulk transfers, all BAU disciplines will apply to ensure overall quality of work undertaken;

(c) A dedicated resource at the exchange will enable higher than normal volumes to be achieved in any set timeframe, thus accelerating initial uptake of LLU.

33.17 Provisioning failures resulting from bulk migration activity will be treated in accordance with existing "failed install" procedures currently used for UBS. These are not considered faults under the conditions outlined in this section 34.

Special Projects

33.18 The key features of a process that will be the same as those applicable to bulk migration with the following differences/additional requirements:

(a) Pre-ordering will be provided one at a time and not via a bulk pre-qualification capability;

(b) Orders will need to be identified as "special project orders". The access seeker can choose whether or not they wish to use this facility for any given order;

(c) No pre-jumpering will be undertaken for this type of transfer;[97]

(d) Commitments for transfer will be on an "at" basis (i.e. a set RFS date);

(e) The existing a.m. / p.m. scheduling granularity will be used;

(f) In the case a dedicated resource is supplied, orders should be intercepted and directed to the on-site service person as appropriate;

[97] Due to the unknown volumes and the physical location on the MDFs, pre-jumpering is not a practical option

(g) Pre and post testing should be undertaken to ensure integrity of work being done where possible;

(h) Creation of a specific project team to manage this work if appropriate; and

(i) Up-selling of services may require site work at the customer's premises in order to gain optimal performance (installation of a splitter etc). This will need to be managed outside the transfer process as a separate service request.

33.19 Requests for a dedicated field force resource to support this type of transfer must be for a "defined" period.

Recommendations

33.20 The TCF recommends the objectives set in section 33.2 and recommends that a batch process be developed:

(a) Using the same electronic interface as the single line transfer;

(b) Which enable orders to be grouped into batches depending on whether they relate to bulk migration or special projects; and

(c) In accordance with the key design principles outlined above.

34 Faults Management

Background

34.1 This section provides an overview of the fault reporting and rectification process for LLU/NDSL. It describes the proposed roles and responsibilities of both the access provider and the access seeker.

34.2 A fault is defined as loss or degradation of service to a point that renders the service unusable. A fault may also arise from interference from sources external to the access provider's network and therefore outside the reasonable control of the access provider. Faults resulting from interference have not been addressed in this report, however the procedures for dealing with such faults will need to be addressed in any Codes produced as a result of this report.

34.3 Service expectations from customers create strong incentives on access seekers to rectify faults in a timely manner. In the mass market, minimum service levels need to be established across providers given the function of a common local network. Higher service levels may be demanded by some customers on a tailored commercial basis.

34.4 For LLU-based services, the access provider will lose normal diagnostics ability over an MPF, as the access seeker is responsible for the signalling and customer relationship. The access seeker will therefore assume greater responsibility in respect to fault detection and possible rectification than is the case with other wholesale relationships with the access provider.

34.5 The TCF has agreed that the current process for fault resolution of UBS services will form the basis of fault management for NDSL services. Modifications may be required, especially where there is no phone number on the line.

Overseas practice

34.6 The TCF obtained some information on overseas approaches to faults, which is summarised below.

(a) In Australia, faults must be repaired in a manner consistent with standard access obligations. The faults management centre must be available 24/7. Enhanced service levels are available [on commercial terms];

(b) In the United Kingdom, Openreach's field force repair faults on MPFs, but not equipment at the ends of a MPF;

(c) In Ireland, fault performance is set out in service level agreements;

(d) In France, faults service for and by access seekers must be comparable to France Telecom; and

(e) In Germany, there is a 24 hour service timeframe for fault repairs.

Objectives

34.7 The TCF agreed that the main objectives for fault management and notification processes in an LLU environment are:

(a) Equivalence and non-discrimination among access seekers and access providers;

(b) Clear allocation of responsibilities between access seeker and access provider;

(c) Efficient rectification of a fault to ensure the least customer disruption as possible; and

(d) Provision of information so that access seekers can keep customers informed.

Principles

34.8 The TCF agreed the following key principles in relation to faults:

(a) Access seekers must take all steps possible to ensure their customer's contact them to report faults;

(b) Access seekers must take all steps to ascertain the nature of the fault until they determine it is outside their control;

(c) Access seekers must collate as much relevant information as is possible to assist the access provider in rectifying the fault;

(d) The access provider must proactively notify access seekers about a fault on its network which may impact that access seeker as soon as they become aware of the fault;

(e) There should be an agreed set of fault categories for efficient processing and reporting purposes;

(f) It is the responsibility of the customer's access seeker to continue to communicate with the customer during a fault situation;

(g) The access provider must provide a simple and efficient means for faults to reported by access seekers, and for the access seekers to be able to monitor the fault status;

(h) Access providers must ensure that all LLU/NDSL faults are repaired in a consistent manner with regards to faults reported by their own retail customer's;

(i) Appropriate service levels for faults management need to be set and monitored.

Issues

34.9 An LLU environment gives rise to particular issues in relation to faults because several parties are using a single local network. These issues include:

(a) Correct identification of the source of the fault;

(b) Symptom identification;

(c) Inability for the access provider to test the MPF without disconnecting the service temporarily;

(d) Reporting and tracking faults;

(e) Cooperation to rectifying a fault;

(f) Escalations procedures in the event the fault is not being rectified within agreed service levels;

(g) Equivalence for fault rectification; and

(h) Options for the access seeker to obtain prioritised fault rectification services for their customers.

Proposals

34.10 Correct identification of the source of the fault: In the majority of international examples reviewed, there is an obligation placed on the access seeker to make efforts to sectionalise the fault, ensuring that there are no faults in the customer's network or customer's premises equipment, or on the access seekers own network or equipment. Once the access seeker has identified that these are all clear, then the fault can be logged with the access provider.

34.11 Symptom identification: To enable an efficient process, it was agreed a standard specification for fault symptoms should be used. This would take the form of codes or agreed wording. There is likely to be an agreed list of information that must be provided with a fault report to enable the access provider to act promptly.

34.12 Reporting and tracking faults: The TCF agreed that the preferred option for reporting and tracking is electronic, as it provides an auditable record of the fault report. The TCF agreed faults should be able to be

reported on a 24 hours / 7 days a week basis and the operating hours for the actual fault rectification should be no less than the service the access providers give to their own customer's.

34.13 The reporting and tracking process must also provide for communication to be provided back to the access seeker by the access provider. Initially the access provider should as soon as possible, advise the access seeker that they have received the fault report, and provide an indication of when the access provider will begin work on the fault. The process should also enable the access provider to advise the estimated restoration time when it becomes available. Following the rectification of the fault the access provider should report that it is cleared as soon as is practicable either before the service is restored, or immediately it is returned to service.

34.14 Classification of Faults and Status Updates: Both the classification of types of faults and the frequency of updates on the faults status will need to be agreed in phase 2.

34.15 Cooperation to rectify the fault: In a particular fault instance, there may be a need for the parties to cooperate in rectifying the fault. As part of this, the access provider may need to temporarily disconnect the MPF/NDSL service to either ascertain the reason for the fault, or to limit any effect of interference on other users' services. If the access provider advises "no-fault found", the access seeker will be charged for the cost incurred by the access provider investigating the fault. The TCF also discussed the possibility of a service being provided by the access provider on a commercial basis, where the access provider's contractor remains on site to assist in identifying the nature of the fault.

34.16 Escalation where service levels not met: There may be cases where fault rectification does not occur in line with agreed service levels and therefore an escalation path needs to be included in the process. There may also be commercially agreed arrangements in place where a customer's faults can be given higher priority for fault resolution.

34.17 Equivalence of fault rectification: There will be a specific obligation on the access provider to ensure that all faults are handled in a consistent manner in relation to the process it uses for its own customer's faults. This can either be achieved through:

(a) Reporting on relative performance: This would be a process where the access provider is required to report regularly on its relative performance in processing fault reports for access seekers and its own customer's. The paucity of the results from this would be dependant on the nature of the reporting system i.e. an electronic based interface would be capable of time stamping and tracking, whereas a telephone based system would be dependant on the people involved ensuring they recorded interactions; or

(b) Target service restoration times to apply to all access seekers. The service levels would be set based on the access provider's restoration times for analogous services rather than reporting on relative performance.

34.18 Prioritisation of fault response: Where possible, the access provider should provide on commercial terms, options for expedited responses to fault. This may include shorter response times, or response outside of normal fault handling periods.

34.19 Service Levels: A coherent set of performance measures will be set for the key faults functions that the access provider and access seeker are expected to carry out. Performance against these measures will be monitored and reported.

34.20 Proactive Notification: In a situation where the access provider identifies a fault that may significantly impact the service delivered to access seekers customers, it is desirable for the access provider to provide proactive notification to that access seeker. This proactive notification will enable the access seeker to manage the relationships with their customers as they see fit. It will also enable the access seeker to minimise the number of faults reported into the access seekers support teams.

Recommendations

34.21 The TCF recommends:

(a) The objectives and principles set out above;

(b) The development of protocols for proactive diagnosis and management of faults in an LLU environment be explored in phase 2;

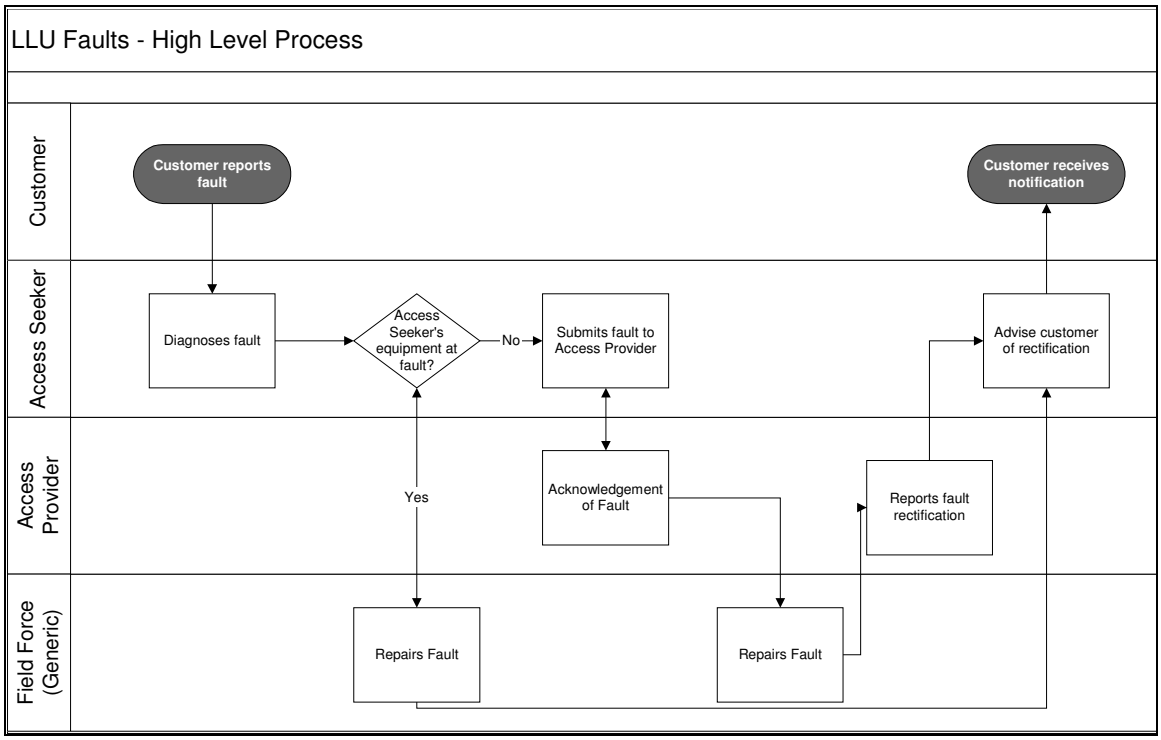
(c) The fault process illustrated below to apply for LLU;

(d) The current process for fault resolution of UBS services will form the basis of procedures for NDSL services;

(e) Further discussion is required on the definition of "no fault found" and the arrangements for the access provider to co-operate with the access seeker to remedy such faults and on the preferred approach for classification and monitoring the prioritisation of faults;

(f) As noted in section 34.2, faults resulting from interference have not been addressed in this report, however the procedures for dealing with such faults will need to be addressed in any codes developed in phase 2; and

(g) The current process for fault resolution of UBS services will form the basis of procedures for NDSL services.



35 Planned Maintenance and Permit to Work

Background

35.1 The introduction of LLU/NDSL will result in parties co-locating at the access providers exchanges and cabinets and connecting to the access provider's network. An agreed permit to work procedure will be required to maintain network and site integrity, minimise customer disruption and assist with proactive notification of planned outages.

35.2 The permit to work procedure sets out the process for obtaining authorisation to work on the access provider's network or site and the protocols for notifying the parties who may be impacted by the work being undertaken.

35.3 Telecom has an existing permit to work process which the TCF has reviewed and agreed that the concepts are sound. Accordingly the TCF has considered the existing permit to work procedure in the context of LLU.

Objectives

35.4 The object of a permit to work is to:

(a) maintain network and site integrity for all parties working at a site;

(b) provide an efficient "change management" capability;

(c) minimise the number and duration of customer interruptions;

(d) pro-actively notify access seekers and other interested parties so that they have visibility of planned outage's which may affect them, to assist them in managing customer enquiries; and

(e) Ensure equivalence across all access seekers, which means the process needs to be common to all access seekers.

Principles

35.5 The TCF agreed the following key principles in relation to the permit to work. The agreed process needs to:

(a) Minimise customer disruption by timing and enforcing standard work practices;

(b) Provide access seekers with advice of service affecting events at a site;

(c) Remove conflict at the same or associated sites by rescheduling work;

(d) Provide all parties with a time scheduled work load or activity which will result in the customer's telecommunication service being lost or disrupted; and

(e) Provide all parties with a real time view of planned work which poses a threat to, or service loss of the network.

Issues

35.6 Access seekers will need to be involved either because they need to be aware of planned work on the Network or Site, they wish to undertake work on a Site or they need to approve work on the Site. The key issue is whether:

(a) to extend Telecom's existing permit to work process to include access seekers under LLU; or

(b) design and implement a new authorisation scheme.

Permit to Work Scheme

35.7 At a high level, the key features agreed for the permit to work process are:

(a) An access seeker or provider wishing to do some work that requires a permit submits a request to the access provider's permit to work team via the web portal;

(b) The request is acknowledged by the access provider's permit to work team (submitter is notified);

(c) The request is processed and an impact report is created and distributed to those identified as directly impacted by the planned work;

(d) Conflicts are identified and resolved (possibly by re-scheduling or combining activities);

(e) Approve / decline notification sent to requestor;

(f) When the time comes for the permitted planned work to be undertaken, those performing the work notify the access provider's Network Operation Centre (NOC) prior to starting the work and again on completion;

(g) If it is found the work is not needed or it is going to run overtime, the access providers NOC must be notified;

(h) The access providers NOC will contact all access seekers whose service may be affected; and

(i) Facilities are available for emergency requests and requests generated after-hours.

Recommendations

35.8 The TCF recommends modifying Telecom's existing permit to work process to extend to cover access seekers in an LLU environment.

36 Billing

Background

36.1 Billing data allows for all the services subscribed under the LLU/NDSL environment to be supplied by the access provider to access seekers, to allow them to on-bill or reconcile these charges against their own customer billing.

36.2 The Customer Transfer Code sets out provisions relating to the protocols for billing customers when they move from one access seeker to another. These protocols should equally apply to LLU/NDSL.

36.3 This section sets out the billing requirements in an LLU/NDSL environment.

Objectives

36.4 The TCF agreed that the main objectives for billing is to:

(a) Ensure it is efficient, timely and accurate;

(b) Minimise the requirement for manual billing processes (or make them more efficient);

(c) Minimise the time spent investigating billing enquiries or discrepancies; and

(d) Ensure billing data is easy to reconcile with service orders or faults records.

Types of Billing Data

36.5 For a given service, there are various types of billing data:

(a) Rental charges;

(b) Usage charges (if applicable);

(c) MAC charges (if required);

(d) One-off service charges ("specials"); and

(e) Other billing adjustments (if applicable).

36.6 The platform used by the access provider for billing will be vital for billing efficiency. This includes the consideration of multiple versus single billing cycles, consistent approaches for billing adjustment, and time spent on investigating billing issues.

Key Design Elements

36.7 The TCF agreed that the billing data needs to satisfy the following business requirements:

(a) The billing data should be timely, traceable, accurate and consistent;

(b) Provided electronically;

(c) Each charge should be able to be readily matched against the service request it relates to;

(d) The unique service identifier needs to be used on the billing record as it assists with potential billing and fault enquiries and enables the access seeker to link the access provider's charges with its customer billing records. Lump sum/batch billing adjustments to multiple products/services should be avoided as they are generally vague and are not easily reconciled against products/services;

(e) All LLU/NDSL products and services will be assigned service identifications for billing and reporting purposes. Examples of the service group identification are the SPOT codes;

(f) The Product and service type identifier appearing on the access provider's invoice will need to coincide with their LLU product/service price list, with each LLU product/service billing component having a unique Price ID associated with it. Similarly the description of the product/service on the price list needs to match what appears on the bill;

(g) Any changes in LLU product/service billing description should have new Price IDs associated with them rather than changing the existing descriptions on the existing Price IDs;

(h) The services order numbers/references quoted to access seekers for all Moves, Adds and Changes (MACs) for LLU/NDSL products/services must appear on the invoice against the associated unique identification; and

(i) The billing data should clearly reflect other potential billing related requirements and/or regulatory determinations.

36.8 Inclusion of the following billing elements should also form part of the billing data:

(a) Customer number;

(b) Account number;

(c) Statement date;

(d) Invoice component;

(e) Unique Service Identifier;

(f) Quantity;

(g) Rental from and to dates;

(h) Dates for MACs;

(i) References for MACs;

(j) Billing/service description;

(k) Service group identification e.g. SPOTs;

(l) Amount incl GST;

(m) Amount excl GST; and

(n) GST.

Recommendations

36.9 The TCF recommends:

(a) The billing data provided in an LLU/NDSL environment is delivered in a manner consistent with the key design principles outlined above; and

(b) Further work will be required in phase 2 to more clearly define the nature and format of the information to be provided.

PART E – INFORMATION REQUIREMENTS

37 Overview of Information Requirements

Background

37.1 Equivalent and timely access to certain types of information is critical to the successful implementation and operation of local loop unbundling. Both access providers and access seekers require some network information in order to fully maximise the possibilities that LLU/NDSL offers.

37.2 Access providers require forecasting information in order to meet access seekers' requirements for the provision of co-location services and provision of NDSL and MPFs. This information is required in a timely manner, and access seekers need to know enough about the network and MPF characteristics to be able to determine the business case for potential deployment of NDSL or LLU-based services. In addition, an access seeker will need to be able to access to sufficient information on the characteristics of individual MPFs to determine what services they should be able to offer to a specific address.

37.3 It is expected that access seeker considering making use of LLU at an exchange or cabinet will require more information regarding that exchange or cabinet and the MPFs connected to the exchange or cabinet than an access seeker considering offering NDSL-based services, as LLU will imply location of some access seeker equipment in the exchange or cabinet and therefore require knowledge of the co-location options at that location.

Objective

37.4 The objective is to put in place an information provision regime that is consistent with the purpose in section 18 and applicable access principles in the Act. In particular, information exchange between access seekers and the access provider needs to:

(a) Be timely to meet potential consumer demand;

(b) Equivalent between access seekers and the access provider;

(c) Cost-effective;

(d) Facilitate competitive offering of LLU and NDSL; and

(e) Respect customer privacy and valid commercial confidentiality.

Issues

37.5 The TCF has identified a range of key issues relating to information provision, including:

(a) Precisely what information is required by each party?

(b) At what point in the process is the information required?

(c) What are the prerequisites and/or customer authorisation that are required before the information is provided?

(d) Who is responsible for providing the information?

(e) Who is entitled to have access to that information?

(f) What is the most cost effective way of gathering and storing the information?

(g) How accurate must the information be, and who bears the risk if the information is inaccurate?

(h) How frequently would the information be updated?

(i) What service levels apply to information provision, and what are the remedies if the service levels are not met?

37.6 The cost allocation related to the gathering and supply of information has not been considered as this is outside the scope of the TCF.

Types and timing of information

37.7 Information exchange will be critical at least five key functions:

(a) Pre-launch – when an access seeker is considering whether to provide LLU-based or NDSL–based services at a particular exchange or cabinet location;

(b) Pre-ordering – when an access seeker is in a position to offer services from an exchange or cabinet, and requires individual MPF information;

(c) Forecasting – where access seekers provide information to the access provider on their expected requirements for LLU co-location space, backhaul, and MPFs;

(d) MPF operation and maintenance – which covers information required in relation to the operation and maintenance (including faults management) of MPFs that have been unbundled; and

(e) Performance monitoring – which covers information required by access provider, access seeker and regulatory authorities to

monitor the performance of the LLU and NDSL processes and uptake.

General requirements

37.8 Information requirements will be either one-off relating to a specific and immediate information requirement, or periodic where there is an ongoing requirement for information that changes on periodic basis.

37.9 For each piece of information required by either access provider or access seeker, the following parameters need to be defined:

(a) How accurate does the information need to be - can it be estimated or calculated based on network records, or does it need to be measured?

(b) Is the information compulsory for all requests, or does it only need to be provided if available?

(c) Is the obligation mutual e.g. do access seekers need to provide it to each other and to the access provider, or is it only an obligation on one party?

(d) Are service levels required, and if so, what are the remedies if the service levels are not met or the information is not accurate?

(e) Where the requirement is ongoing, the frequency of updates also needs to be considered.

Recommendations

37.10 The TCF recommends the high level objectives set out above and has factored these into its discussions when recommending the proposals set out in this Part E.

38 Pre-Launch Information

Background

38.1 When considering whether to take up LLU or NDSL at a particular exchange or cabinet, access seekers are likely to require some information regarding the addressable market for the services the access seeker intends to provide, and sufficient information to allow them to estimate the likely access provider-related costs of utilising LLU or NDSL from any particular network location.

38.2 The access provider will require forecasts of which locations each access seeker wishes to utilise LLU services, and the volume of LLU requests at each site in order for resource requirements to be managed.

Types of pre-launch info

38.3 A range of possibilities exist for information that may be required by access seekers. Potential candidate information identified is:

(a) Location of exchanges and cabinets using copper, the area of coverage and whether they have already been configured for LLU/NDSL;

(b) Co-location details of exchanges and cabinets for LLU. Details may include co-location features (e.g. air conditioning, power supplies), availability of space, the type of co-location available at the exchange or cabinet, the access provider's likely site preparation time and the anticipated deployment complexity (i.e. easy, medium or complex);

(c) Information about plans by the access provider to upgrade the MDF, the site and/or the MPFs serviced by that MDF;

(d) The number of usable MPFs for LLU/NDSL at the MDF;

(e) General characteristics of the cable/MPFs served by the MDF; and

(f) Applicable process and technical documentation (e.g. spectrum management plan, process manual).

Typical prerequisites

38.4 Some network information may be considered to be sensitive for commercial or security reasons. In this case, the provider of the information may require some form of agreement with the receiving party to be in place before the releasing information.

38.5 The options identified are:

(a) Public information, no agreement required;

(b) Non-disclosure agreement (NDA) between the parties required;

(c) Signed reference offer/contract for the provision of LLU/NDSL services.

Network information

38.6 The TCF agrees that the following information should be provided by the access provider once a non-disclosure agreement has been signed:

(a) List of exchanges and cabinets, with their location (grid reference) and number of MPFs terminating on the MDF, and

(b) The geographic boundary of pairs serviced by each exchange and cabinet.

38.7 Telecom provided the information set out in section 38.6(a) to the members of the TCF Working Party who signed a non-disclosure agreement and they are undertaking work at the moment to provide those parties with the information referred to in section 38.6(b).

Options

38.8 A number of options exist regarding the provision by the access provider of co-location details of exchanges and cabinets:

(a) Option 1: Co-location details are available for every exchange and cabinet in New Zealand immediately i.e. an audit of every exchange and cabinet is required upfront, or

(b) Option 2: Co-location details are available for any particular exchange or cabinet on request within a given timeframe i.e. an audit will be carried out on an exchange or cabinet on request, or

(c) Option 3: Co-location details immediately for some exchanges, with the remainder of exchanges and all cabinets provided on-request within a given timeframe i.e. the most likely candidate exchanges for LLU are audited upfront, with the remainder done individually.

Option 1: Audit of every exchange and cabinet up front

38.9 The advantage of this option is that information on all exchanges and cabinets is available assisting an access seeker or potential access seeker to develop a business plan for any region at any number of sites without needing to give any indication of their rollout plans to the access provider or any other access seeker.

38.10 The disadvantage is that it is likely that many exchanges and cabinets will be audited that are not part of any access seeker's plans, thereby

driving unnecessary industry cost, and potentially delaying the audits of sites that are high priority for access seekers.

Option 2: Audit exchanges on request

38.11 Provision of collocation details only available on request has the advantage that it is cost-efficient from a site audit cost point of view, as only sites that are of interest to access seekers would be audited. However it may potentially introduce delays in the provision of site information compared with proactively auditing some sites that have a high likelihood of being of interest to access seekers.

Option 3: Audit some exchanges up front, with the remainder available on request

38.12 This option is a combination of the two previous options, where a number of sites are audited up front, with the option of having any other exchange or cabinet audited on request. This option requires the specific sites and the number of sites to be audited up front to be determined, and it is envisaged that this would be produced on consultation with access seekers to determine the highest priority sites. To avoid visibility of one access seeker's plans to other access seekers and potentially the access provider, the consultation and co-location of the combined list of sites to be audited could be done by an independent party if required.

Recommendation

38.13 The TCF recommends option 3 (auditing some exchanges up front with the remainder on request). Further work is being undertaken at this time to identify the first 20 exchanges which should be audited with the intention of commencing the audits early in the New Year.

39 Pre-Ordering Information

Background

39.1 This stage occurs when an access seeker is in a position to offer services from an exchange or cabinet, and requires individual MPF information. The information requirements are end-user site-specific. As set out in Part D section 30, the pre-order enquiry may be made by the access seeker to the access provider as a result of:

(a) an access seeker's existing customer wanting to connect new sites or add additional services;

(b) a prospective customer 'window shopping' around various access seekers to compare prices;

(c) access seekers intending to market services to potential customers wanting to ensure in the first instance that the network is capable of providing the service; and

(d) the initial bulk migration by an access seeker establishing its LLU-related customer services, where access seekers will wish to ensure a customer's lines are compatible with their new equipment/service offering to avoid transferring customers and encountering service failures.

Typical prerequisites

39.2 General MPF information should be available to support a particular customer query or pre-sales investigation. Customer authorisation is not required for this, however some level of authentication or customer approval is required before MPF information on another party's (either access provider or access seeker) customer can be provided.

39.3 The options for authentication or customer approval considered were:

(a) For a MPF currently in use by another access seeker:

(i) The party requesting the MPF information must provide an address and a customer specific identifier that could only have been obtained from the customer such as their account number with their existing access seeker; or

(ii) Only an address is required, so market potential can be assessed without having to contact the customer.

(b) For a MPF that is not in use, only the address information is required.

39.4 The access seeker needs to have its LLU capability in-place prior to making pre-order enquiries and consequently they will already have a contract with the access provider covering confidentiality. The nature of any agreement, if any, required between access seekers will be discussed in the next phase of this project.

39.5 The TCF agreed that in order to assess the level of authorisation required at the pre-ordering stage, it is necessary to first determine the type of information being provided. This is discussed further below.

Range of pre-ordering information

39.6 The TCF considered the following categories of information:

(a) The number of MPFs available a particular location, and whether that information should separately identify in-use and potential MPFs;

(b) The physical characteristics of the MPF, including:

(i) MPF length;

(ii) Service identifiers for in-use MPF/NDSL services, for use when ordering an MPF/NDSL transfer;

(iii) conductor diameter;

(iv) loop resistance; and

(v) attenuation (at one or more frequencies)

Issues

39.7 The key issue in relation to information on the numbers of MPFs was whether the information provided should enable an access seeker to be able to know the number of MPFs a potential customer is currently using.

39.8 The key issue in relation the supply of service identifiers for existing MPF/NDSL services, was how this information could be supplied while protecting against 'fishing' for competitor information.

39.9 A secondary issue in relation to the supply of service identifiers, was how to determine which one of multiple MPF identifiers was associated with an individual service a customer may want transferred (e.g. the customer wants to migrate their broadband service only, and keep their other phone lines with their current provider). The key issues in relation to information on the characteristics of the MPF include:

(a) Should MPF information be calculated based on network records or sourced from MPF measurements?

(b) How much data is required for each MPF?

(c) If measured results are used, are access seekers required to provide MPF information, or is only the access provider?

Information

39.10 Data calculated based on network records has the advantage that provision of the data should be near to real time, but has limitations due to the lower accuracy of calculated or records-based data compared with measured data. In some cases, records are incomplete.

39.11 Measured data may have the advantage of better accuracy, but limitations due to requiring remote MPF test capability to be in place on all MPFs or requiring truck roll for each enquiry have industry cost implications.

39.12 Service identifiers may not be readily available to customers requesting transfers between access seekers. Without an automated enquiry option to identify the MPF/NDSL service, the losing service provider may need to be contacted by the customer or gaining service provider. The TCF discussed whether a list of identifiers for MPFs could be made available as a secondary enquiry option, which could be used by the gaining service provider after receiving customer authorisation.

How much data?

39.13 Two approaches were identified for determining the data required for each MPF:

(a) Only key information (and any underlying assumptions or calculation methodologies) required to categorise the MPF and allow an access seeker to determine which services they will offer the customer would be provided; or

(b) Most or all known data about a MPF could be provided allowing an access seeker to perform their own calculations or estimations.

Access seeker to provide information

39.14 The access provider will lose the ability to measure MPF characteristics once a loop is unbundled as only the access seeker operating the MPF will have this ability (potentially, depending on whether the access seeker has MPF test equipment). The TCF discussed whether access seekers should provide MPF measurement data to an authorised requesting party (another access seeker or the access provider) if it is available on request, however it is noted that there is currently no regulatory requirement for access seekers to provide any MPF information.

39.15 If access seekers do supply MPF data, the options for storing MPF measurement data discussed are:

(a) Separately stored by each access seeker providing the service over MPFs, for the MPFs that they operate, or

(b) In a centralised database managed by an independent party, or

(c) In a centralised database managed by the access provider.

Recommendations

39.16 The TCF recommends that:

(e) Until a customer authorisation has been provided, the access seeker will only be provided with the total number of available MPFs that could be readily delivered to the premises. This number will include both in-use and spare MPFs but they will not be separately identified.

(f) Further work is undertaken in phase 2 to consider options which allow the MPF identifiers for in-use MPFs to be obtained without the need to request this manually from the losing service provider. Consideration will need to be given to the level of customer authorisation required, and how to protect against competitor abuse of this information.

(g) Data calculated based on network records will be provided as the minimum requirement, with the ability for access seekers to have MPFs measured as an option, to be provided based on commercial terms.

(h) Only key information will be provided about the MPF, as the attenuation of the MPF (at one or more frequencies) was the only relevant and useful parameter, and providing full physical characteristics would drive cost through additional data management and/or testing requirements for little perceived incremental benefit.

39.17 The requirement for an access seeker to provide information on the characteristics of a MPF be further considered in phase 2. It is agreed, however, that if access seekers are required to provide measured MPF data, a key objective should be to minimise the industry cost to manage this data.

40 Forecasting

Background

40.1 Forecasting relates to:

(a) Volumes of MPFs and NDSL services;

(b) Volumes of other OSS transactions; and

(c) Co-location requirements.

40.2 Forecasting information requirements are driven by the need for the access provider to understand transaction volumes in advance, in order to be able to manage resources to meet the agreed service levels. Therefore forecasting information is primarily provided by access seekers to the access provider.

40.3 The access provider also needs to forecast any changes in the network that will materially affect the number of MPFs that are terminated on any MDF that is used for the provision of LLU services, as described in the pre-ordering section above.

Objectives

40.4 Within the overall objectives outlined earlier, key objectives in relation to forecasting are to ensure that:

(a) The access provider has timely and accurate information necessary to plan resources to meet expected access demands for MPFs, NDSL services, space and other LLU/NDSL related services in an efficient manner;

(b) The process is not used in an anti-competitive manner by access seekers or the access provider;

(c) The process allows reasonable flexibility for access seekers in evolving their LLU plans; and

(d) Adverse impacts due to over or under forecasting are minimised.

Issues

40.5 A key issue is how risks relating to forecasting error are allocated between access seekers and the access provider. In particular the:

(a) Level of accuracy required from access seekers;

(b) Level and nature of any penalties for material differences between forecast and actual;

(c) Adverse impacts due to over-forecasting;

(d) Limitations due to out-of-date exchange or cabinet information from the access provider; and

(e) Impacts on access seekers' ability to adjust forecasts to meet changing customer demand.

Key variables

40.6 Forecasting variables include:

(a) Periodicity – how often forecasts are provided;

(b) Time period covered – how far forward the forecast covers;

(c) Geographic breakdown – to what degree is the forecast broken down by region; and

(d) Accuracy requirements and implications if these are not met.

40.7 Internationally, MPF and NDSL service forecasts are typically provided at least quarterly, with increased requirements (accuracy/timeline) for any planned bulk migration. The time period covered is driven by the lead time and resource requirements of the activity e.g. new co-location requests are typically forecast for the following 12 month period as preparing a new exchange for co-location is typically a longer lead time activity, compared with securing resources to manage an increase in MPF/NDSL OSS volumes.

40.8 Forecasts are also typically provided on a regional basis, as the technical resource required for MDF jumpering is regionally based and managed, and co-location requests are by their nature required to be site specific.

40.9 The accuracy requirements on forecasts are linked to the required service levels that the access provider must met, and what the implications are if the service levels are not met. More stringent service levels and or more severe implications for failing to meet an agreed SL will drive more stringent accuracy requirements as forecast accuracy will be a key determinant in the ability of the access provider to meet the agreed service levels.

Overseas experience

40.10 Two different approaches have been adapted to forecasting. The United Kingdom and Australian approach is to establish an industry process with long forecasting time frames and regular detailed updates. The Irish approach is for the incumbent to work with the access seekers to meet their requirements on a one on one basis.

Australia

40.11 The standard requirement is for monthly (by exchange), quarterly (by State) and annual (national total) forecasts (covering the next 3 month, 12 month and 3 year periods respectively) of single MPFs for service qualification requests, firm orders and required service assurance option percentages.

40.12 The forecast for managed network migration (bulk migration of end users from Telstra's network to the access seeker's network) requires 84 day (monthly quantity of firm MPF orders by exchange), 8 week (weekly quantity of firm MPF orders by exchange) and 20 day forecasts.

40.13 Co-location (TEBA) orders are forecast in terms of jobs per region, per month, every 6 months for a 12 month rolling window.

40.14 There are no penalties in Australia, however charges apply in the case of bulk migration if Telstra incurs losses as resources are not required.

United Kingdom

40.15 No later than 30 working days prior to a quarter the operator shall provide:

(a) a forecast for MPFs setting out the ordering intentions of the operator for a rolling period of twelve months commencing on the first day of a quarter, including any intended bulk migrations;

(b) an advanced capacity planning forecast for co-location setting out the ordering intentions of the operator for a period of twelve months commencing on the first day of a quarter. The first quarter of the ACPF shall include the:

(i) MDF sites where the operator intends to request co-location;

(ii) Co-location product type(s) at each of the MDF sites; and

(iii) Week when each request will be made.

Ireland

40.16 Eircom and access seekers shall work closely together during the initial launch period to ensure that Eircom has sufficient warning of large volumes of surveys.

France

40.17 Every three months a forecast of access orders for each district over the next three months. On first signing of a contract for access with France Telecom, access seekers provide forecasts for the next six months.

40.18 Access seekers selecting data transport services in IP mode provide France Telecom every three months with a forecast of data traffic for the next six months.

Telecom's current UBS approach

40.19 Currently Telecom's UBS service provisioning has the following forecasting requirements:

(a) The access seeker must provide Telecom with a three month forecast on a month-by-month basis. The forecast must detail monthly requirements for each "Type of Request";

(b) Each forecast must be provided at least one month before the start of the forecast period;

(c) Under forecasting: If the actual order was greater than forecast by a specified margin, then there is no requirement on Telecom to meet the agreed service levels; and

(d) Over forecasting: Telecom has the ability to recover costs if the actual order is below the forecast by a specified margin.

Proposal

40.20 Two scenarios need to be addressed – 'business as usual' forecasting, and 'bow wave' forecasting. In both cases the access seekers would provide forecasts covering:

(a) Physical resources - floor space, power, air conditioning, cable tray space, frame space, and so on; and

(b) OSS activity – expected MPF and NDSL provisioning requirements.

Bow wave

40.21 Access seekers will provide their forecast for the initial bulk migration within an agreed timeframe prior to the cut over date. Access seekers also provide a list of their deployment priorities for the exchanges with the forecast.

40.22 Where there are no limitations on the space, the access provider will allocate the resources on the basis of firm commitments. The approach where space is limited is discussed in PART B section 7.27. If no space is available then the access provider will propose the most cost effective solution and the time frames for achieving the solution. The issue of resolving competing priorities between access seekers will need to be addressed in phase 2.

Business as usual

40.23 There are three business as usual scenarios:

(a) New sites requiring co-location facilities;

(b) Existing co-location sites where there are no physical resource constraints; and

(c) Existing co-location sites where there are physical resource constraints.

40.24 Forecasts are required to provide the information necessary to assist in planning the resources to meet expected demands and consequently, at some stage the forecasts need to become a firm commitment. The timeframes for provision of the forecasts and the requirement for a firm commitment will depend on the scenario to which the forecast relates.

40.25 Under "business as usual", access seekers will provide long term forecasts for physical resource and shorter term rolling forecasts for OSS activity.

40.26 Some parts of the forecast may become binding as a firm commitment to enable the access provider to commence provisioning for floor space, power, air conditioning, cable tray space and frame space.

40.27 The access provider will invoice the access seekers and if it is not paid within a pre-agreed time, the access seeker is free to reallocate the unused space to other parties who require space or claim reasonable costs incurred.

40.28 For MPF and NDSL volumes monthly forecasts will be required for on a regional basis. In the event that an access seeker does not provide an updated forecast, the most recent month's forecast will be the base line forecast around which forecast accuracy service levels will be determined. There will be no over or under forecasting consequences if the actual order varies by an agreed margin (±X%) from the forecast. Any under forecasting outside the error margin will result in best effort services. Any over forecasting will result in the access provider recovering any reasonable costs, recognising that these costs may be mitigated through any additional take-up by an access seeker, and that individual access seekers should be incentivised to accurately forecast without relying on under or over forecasting by other access seekers. Access seekers should have the ability to independently audit these costs. Access seekers should have the ability amend forecasts during regular updates without any penalty.

Other elements

40.29 Forecasts should be submitted before a deadline. The consequences of inaccurate forecasts will be considered further in phase 2.

40.30 The access provider will equitably allocate the requirements based on the original forecast. If the original forecast is not taken up by the access seeker and no other access seeker takes up the capacity then the original access seeker has to pay the access provider's actual & reasonable direct costs in preparing to provision that capacity.

40.31 If the access provider is not able to meet the space requirements then it will notify the access seekers with the space requirements the access provider can meet, in addition remote co-location options could be available in line with the options outlined in PART B (Technical Standards) section 7.27. The access provider will also provide access seekers with updated information on a regular basis reflecting what space is available based on the forecasts submitted.

Recommendations

40.32 The TCF recommends

(a) The proposal set out in sections 40.20 to 40.31 which includes:

(i) Access seeker providing forecasts for initial bulk migration within an agreed timeframe;

(ii) A set of forecast requirements in relation to business as usual scenarios; and

(iii) Distinction between space requirements and expected MPF and NDSL provisioning requirements.

(b) The details of this proposal will be further developed in phase 2.

41 Service Level Setting, Monitoring and Reporting

Background

41.1 Service levels are the agreed measures or timeframes within which activities or tasks are to be performed by the access seekers or access provider. Service levels need to define the service being provided, the associated metrics, acceptable and unacceptable thresholds, liabilities on the part of the access seekers or access provider, and actions to be taken if the service levels are not met.

41.2 Access seekers and the access provider will set up their business processes and procedures based around the agreed service levels and rely on them for resourcing purposes and managing customers' expectations.

41.3 The service levels need be monitored and reported against in order to determine a parties' actual performance against the agreed service levels. These reports can then be used to identify systemic issues and improve processes or as the basis for determining liability for non-performance where a party has failed to meet the service levels.

41.4 The setting of service levels relates to many aspects of LLU and NDSL.

Objective

41.5 The key objectives in relation to service levels are to ensure:

(a) Service levels are set and adjusted on an on-going basis to reflect customer preferences in relation to quality and cost;

(b) The access provider and access seeker have a clear understanding of the timeframes and accuracy of information necessary to plan resources and design systems and processes to:

(i) meet expected demands in relation to pre-launch, pre-ordering, ordering, billing, faults management and maintenance of the LLU/NDSL services and other related matters in an efficient manner; and

(ii) manage customer and access seeker and access provider expectations.

(c) Equivalence between access seekers and the access provider;

(d) Adverse impacts due to over or under achievement of service levels are minimised.

Issues

41.6 The TCF identified a range of key issues relating to the setting and reporting of service levels including:

(a) What are we trying to measure: Measurement criteria should to be supported by the intention of the measurement, to allow future reviews to refine, replace or remove the metrics. In an LLU environment, a large component of the variables which affect service levels comes down to human resource planning and physical infrastructure planning. Below is a subset of some of the specific issues to be considered:

(i) Provisioning workflows will involve a number of steps to form an end-to-end process, and service levels need to consider both the end to end process, and the various process steps making up that end to end process;

(ii) Service levels for fault handling need to include the maximum time-to-repair, the response times for diagnosis and mechanisms to enable timely communication back to the customer to advise when the service is restored. Incentives also need to be in place for faults to be diagnosed and fixed first time – often referred to as "first-touch, last-touch". The access provider also wants to ensure that the access seekers are being responsible with their end of the fault-management processes and are pre-diagnosing faults correctly;

(iii) The access provider should also be incentivised to minimise the number of faults occurring within their network, consistent with efficiency and cost and reflecting the long term nature of the asset and customers' willingness to pay over the medium term;

(iv) Timeliness and accuracy of the bill is critical to allow access seekers to manage their invoicing process. It is also important that charges related to network activity (provisioning/faults) are raised on the access seeker's bill as soon as possible after the activity occurred, so an access seeker can ensure it has accounted for all service fees in its customers most recent invoice.

(b) How the service levels will be chosen and agreed, including determining the acceptance thresholds (e.g. the % of time each target needs to be achieved). Overseas jurisdictions tend to measure timeliness based on minimum service levels. Consideration needs to be given to monitoring and reporting the actual service performance against the agreed service levels (i.e. a party achieving under or over the agreed level);

(c) Setting the levels too tightly drives unnecessary cost whereas setting them too loosely does not provide the correct incentives;

(d) Who is responsible for achieving the service levels?;

(e) The responsibility for measuring and reporting and the entitlement to receive the reports needs to be clearly defined. Duplication of effort should be avoided, to reduce costs. Consistency of measurement may also be a concern if the measurements come from multiple parties. Measurements may also include competitive information, requiring confidentiality to be maintained. However at times access to this information may be required in order to identify and provide evidence for an operational or technical issue;

(f) Where will the service level standards be recorded?;

(g) Who is going to fund the collection analysis and reporting of this data?

Next Steps

41.7 There are a number of existing level service metrics and criteria outlined in overseas jurisdictions which could be considered for use as baseline measurements. However the relevance of some of the overseas measurements to the New Zealand environment is unclear at this stage, and highlights the importance of ensuring any determined measurements are relevant and useful.

41.8 The TCF's focus in phase 1 has been to scope the technical requirements and high level OSS processes. This needs to be completed before the TCF can fully consider the options for setting and reporting on the service levels. Accordingly while the TCF has set out the issues which need to be addressed, the options for addressing the issues identified will be addressed in phase 2.

41.9 In developing the service levels, consideration needs to be given to the range of interested parties and potential users of that information, which is likely to include providing:

(a) Individual orders relevant to particular access seekers (with such information only being available to that access seeker);

(b) Results in aggregate for all access seekers;

(c) Overall LLU/NDSL performance for the regulator.

41.10 All measurements pertaining to service levels which are not commercially sensitive should be made available to all interested parties. This could extend to the public.

41.11 Commercially sensitive information (e.g. the access seekers statistics which include actual numbers as opposed percentages) should remain confidential between the access provider and the relevant access

seeker. If oversight groups (which may include industry representatives) require access to competitor information, the access seekers will need to agree to this disclosure on a case-by-case basis.

Recommendations

41.12 The TCF recommends that:

(a) LLU/NDSL process performance reporting is expected to be predominantly reporting around the agreed service levels relating to the key technical and operational processes and interactions required between access seekers and the access provider, and any additional requirements of the regulator.

(b) In phase 2 service levels and associated monitoring and reporting requirements are established, including what the consequences may be of not meeting those service levels.

APPENDICES

Appendix 1: TCF LLU Working Party Project Scope

Telecommunications Carriers' Forum Incorporated
Project Proposal for a LLU/Naked DSL
Technical Standards Working Party

Name of Proposer's: CallPlus, Orcon, TelstraClear, Telecom

Date Submitted: 17 August 2006

Issue Identification

A Bill is with the Select Committee recommending that Local Loop Unbundling (LLU) services be added to the Telecommunications Act 2001 as designated services. In anticipation of LLU being introduced, the industry needs to work together to develop a co-ordinated approach to the operation of services over Telecom's copper access network to minimise the risk of interference between different services (spectrum management rules) and agree the other technical specifications for the service. The development of performance requirements governing network deployment and compatibility will benefit all end-users, not only LLU service users, as it will reduce the likelihood of interference and service incompatibility.

It is recommended that a working party be established with the aim of completing the specifications for the LLU and Naked DSL service in accordance with the Standard Access Principles in the Telecommunications Act 2001 (as amended from time to time) ("the Act") available nationally by 30 June 2007, subject to the Working Party's Phase 1 report confirming this timeframe.

Background

The Telecommunications Amendment Bill was introduced into Parliament on 26 June 2006. This Bill will implement the Government's Telecommunications Stocktake announcements of 3 May 2006, including the proposed regulation of Local Loop Unbundling (LLU) services at both the exchange and the cabinet. It is anticipated that the Amendment Bill will be passed by the end of the year. However, potential access seekers, the Commission, the Minister, and Telecom have all expressed an interest in the industry working together prior to the legislation in the interests of bringing forward the date by which the new regulated services can be implemented.

Telecom held a "kick off" meeting on 7 July 2006 with its wholesale customers to discuss what form industry Working Parties on the new broadband services might take. At that it was agreed that TCF Working Parties would be an appropriate body to

develop LLU/Naked DSL technical and operational standards in advance of the legislation being passed.

Proposal

The proposal is to constitute a LLU/Naked DSL Technical Working Party that will involve two distinct phases. The first phase is the discovery phase and will produce a report outlining a suggested approach on technical issues and high-level draft design specifications. The second phase is to develop voluntary code(s) of practice that will form the basis of any commercial offers presented by Telecom to Access Seekers.

An implicit assumption in relation to the scope of both phases is that they are limited to developing code(s) for the implementation of the LLU and Naked DSL services, and associated ancillary services, which are the subject of the Bill referred to above.

The outputs from Phase 1 will be inputs into Phase 2. The design specification and code(s) will cover the following:

Network and Service Information Disclosure	Issues related to information on existing Telecom network and service assets – Working Party access to information necessary to complete its objectives, as well as procedures for Access Seekers to request information as required.
Backhaul	Backhaul technical issues and requirements covering issues such as availability and capacity; transport technologies; handover and interconnect points; intermetro backhaul; quality of service; backhaul to subtended cabinets; access by third party backhaul providers.
Colocation	Determine colocation requirements, covering issues such as space availability; site auditing; exploration of options for colocation such as co-mingling, caging, hostelling; strategies for dealing with colocation in subtended (streetside) cabinets, etc; rack design and installation; seismic requirements.
Engineering Services	Determine engineering services requirements such as air conditioning; power delivery and capacity, including access by third party power suppliers; Uninterrupted Power Supply (UPS) services and capacity; and building and compliance requirements, as well as permit and/or certification requirements for site access and Access Seeker use of services companies that are bound by existing and exclusive service agreements with Telecom.
Spectrum and Interference Management	Spectrum and interference issues and requirements – determine requirements for development of a spectrum management code(s) specific to the New Zealand LLU environment. It is likely that given the specialist nature of spectrum and interference management, a separate group of internal and external experts will be called upon to complete this section of Phase 1.
Cabling Management	Cabling-related issues such as access to MDF/HDF frames; existing capacity; jumpering standards and access; cable trays; cabling requirements; etc.
Other	Other technical requirements as agreed by the Working Party.

Phase 1

In Phase 1 the Working Party will:

(a) listed above. This brief will identify the scope and depth of work required to specify the technical and business requirements in each area, and develop a high level draft design brief covering each area, including a suggested spectrum management approach - in accordance with the Standard Access Principles in the Act. The intention is for the service to be

available nationally. Where full agreement cannot be reached by the Working Party, the report is to include the most likely alternative approaches and the rationale for those alternative approaches;

(b) draw on overseas experience, utilise Working Party members "internal" expertise and use independent technical experts as necessary and look to adapt that experience to the New Zealand LLU/Naked DSL environment;

(c) the report prepared from this phase will also identify any 'quick win' opportunities and identify a list of issues, risks, and unknown items which will need to be addressed during the second phase;

(d) recommend whether the Working Party should continue produce a report for the Board, outlining a suggested approach to each of the areas to Phase 2 and if it does recommend the Working Party continue, review and confirm:

(i) the timetable for the delivery of the voluntary code(s) to be prepared in Phase 2 having regard to the draft design brief referred to in (a);

(ii) the funding required for the Independent Chair, Forum Administrator and Independent Technical Experts and related costs for Phase 2.

A subgroup of this Working Party will focus on spectrum management. This group will be made up of members own internal experts.[98]

Multilateral issues, such as spectrum management, will form the basis of a separate draft code for submission to the Commission to ensure it is enforceable multilaterally. The Draft code submission process is not included in the projects timetable.

Phase 2

If the Board and Working Party approves work proceeding to Phase 2, in Phase 2 the Working Party will:

(a) take the report prepared during Phase 1 and develop a set of voluntary code(s) of practice setting out deployment rules which will form the basis of any commercial offers presented by Telecom to Access Seekers. The code(s) of practice will cover:

(i) Detailed designs covering each area

(ii) Detailed test plans and schemes

(iii) Trial options

(iv) Systems and processes

[98] Refer Resource section

(v) Technical and product implementation guides

(b) Scope timeframes and a high level plan for development and build work required by both the access provider and access seeker.

Exclusions from Scope

The following are excluded from the scope of this Working Party:

(i) Detailed design (behind the interface); and

(ii) Implementation

Nothing prohibits the report produced in Phase 1 and the voluntary code(s) of practice developed in Phase 2 being used in regulatory proceedings in the future, however this is not included in the project timetable.

Expected Deliverables

A report at the end of Phase 1, setting out a suggested approach on each of the technical issues, including spectrum management, and high-level draft design specifications and at the end of Phase 2, voluntary code(s) of practice covering the technical areas which will form the basis of any commercial offers presented by Telecom to Access Seekers.

Refer Appendix 1 for the information that applies to both LLU/Naked DSL Working Parties.

Recommendation

CallPlus, Orcon Internet, TelstraClear and Telecom recommend that the Board:

1. **Approve** this Project Proposal;

2. **Acknowledge** that by approving the project proposal the Board is agreeing that the report referred to in Rule 7.1(k) is not required;

3. **Agree** that a separate project scope shall not be required for this Working Party and that approval of the project proposal shall be deemed to be an approved project scope; and

4. **Note** that a Confidentiality Agreement will be required.

Telecommunications Carriers' Forum Incorporated

Project Proposal for a LLU/Naked DSL

Operational Standards Working Party

Name of Proposer's: CallPlus, Orcon, TelstraClear, Telecom

Date Submitted: 17 August 2006

Issue Identification

A Bill is with the Select Committee recommending that Local Loop Unbundling (LLU) services be added to the Telecommunications Act 2001 as designated services. In anticipation of LLU being introduced, the industry needs to work together to develop operational processes, procedures and specifications, such as for ordering, provisioning and customer transfer. The LLU operational processes and procedures will need to be co-ordinated with number portability operational rules and the customer transfer code, so are best developed at an industry level to ensure consistency.

It is recommended that a working party be established with the aim of completing the specifications for the LLU and Naked DSL service in accordance with the Standard Access Principles in the Telecommunications Act 2001 (as amended from time to time) ("the Act") available nationally by 30 June 2007, subject to the Working Party's Phase 1 report confirming this timeframe.

Background

The Telecommunications Amendment Bill was introduced into Parliament on 26 June 2006. This Bill will implement the Government's Telecommunications Stocktake announcements of 3 May 2006, including the proposed regulation of Local Loop Unbundling (LLU) services at both the exchange and the cabinet. It is anticipated that the Amendment Bill will be passed by the end of the year. However, potential access seekers, the Commission, the Minister, and Telecom have all expressed an interest in the industry working together prior to the legislation in the interests of bringing forward the date by which the new regulated services can be implemented.

Telecom held a "kick off" meeting on 7 July 2006 with its wholesale customers to discuss what form industry Working Parties on the new broadband services might take. At that it was agreed that TCF Working Parties would be an appropriate body to develop LLU/Naked DSL technical and operational standards in advance of the legislation being passed.

Proposal

The proposal is to constitute a LLU/Naked DSL Operational Working Party that will involve two distinct phases. The first phase is the discovery phase and will produce a report outlining a suggested approach on operational issues and high-level draft design specifications The second phase is to develop voluntary code(s) of practice covering these areas that will form the basis of any commercial offers presented by Telecom to Access Seekers.

An implicit assumption in relation to the scope of both phases is that they are limited to developing code(s) for the implementation of the LLU and Naked DSL services, and associated ancillary services, which are the subject of the Bill referred to above.

The outputs from Phase 1 will be inputs into Phase 2.

The design specification and code(s) will cover the following operational processes:

1. Wholesale support arrangements (e.g. operational support arrangements as set out in the Operations Manual section of Telecom's Wholesale Supply Agreement);

2. Supply issues; pre qualification testing, reservation, waiters and wanters;

3. Telecom and Access Seeker OSS requirements;

4. MACs;

5. Faults, repair, service restoration;

6. Compatibility with customer transfer code;

7. Compatibility with number portability;

8. Compatibility with other outstanding codes;

9. Billing data;

10. Network and process performance, measurement, and reporting;

11. Other operational processes as agreed.

It will also:

Identify the public policy issues such as emergency services calling and lawful intercept requirements.

Determination of forecasting requirements (scope, scale, etc) process and rules.

Phase 1

In Phase 1 the Working Party will:

(a) produce a report for the Board, outlining a suggested approach to each of the areas listed above. This report will identify the scope and depth of work required, specify the operational and business requirements in each area, and develop a high-level draft design brief covering each area - in accordance with the Standard Access Principles in the Act. The intention is for the service to be available nationally. Where full agreement cannot be reached by the Working Party, the report is to include the most likely alternative approaches and the rational for those alternative approaches;

(b) draw on overseas experience, utilise Working Party members "internal" expertise and use independent technical experts as necessary and look to adapt that experience to the New Zealand LLU/Naked DSL environment;

(c) the report prepared from this phase will also identify any 'quick win' opportunities and identify a list of issues, risks, and unknown items which will need to be addressed during the second phase;

(d) recommend whether the Working Party should continue to Phase 2 and if it does recommend the Working Party continue, review and confirm:

    (i) the timetable for the delivery the voluntary code(s) to be prepared in Phase 2 having regard to the draft design brief referred to in (a);

    (ii) the funding required for the Independent Chair, Forum Administrator and Independent Technical Experts and related costs for Phase 2.

Phase 2

If the Board and Working Party approves work proceeding to Phase 2, in Phase 2 the Working Party will:

(a) Take the report prepared during Phase 1 and develop a set of voluntary code(s) of practice setting out deployment rules which will form the basis of any commercial offers presented by Telecom to Access Seekers or an agreed multilateral code in the case of multilateral issues, e.g., customer transfer rules. The code(s) of practice will cover:

(i) Detailed Test Plans and Schemes

(ii) Trial Options

(iii) Operational and product implementation guides

(b) Scope timeframes and a high level plan for development and build work required by both the access provider and access seeker.

Exclusions from Scope

The following are excluded from the scope of this Working Party:

(a) Detailed design (behind the interface); and

(b) Implementation

Nothing prohibits the report produced in Phase 1 and the voluntary code(s) of practice developed in Phase 2 being used in regulatory proceedings in the future, however this is not included in the projects timetable.

Expected Deliverables

A report at the end of Phase 1, setting out a suggested approach on each of the operational issues and high-level draft design specifications and at the end of Phase 2 voluntary code(s) of practice covering the operational aspects which will form the basis of any commercial offers presented by Telecom to Access Seekers or an agreed multilateral code in the case of multilateral issues, e.g., customer transfer rules.

Refer Appendix 1 for the information that applies to both LLU/Naked DSL Working Parties.

Recommendation

CallPlus, Orcon, TelstraClear and Telecom recommend that the Board:

1. **Approve** this Project Proposal;

2. **Acknowledge** that by approving the project proposal the Board is agreeing that the report referred to in Rule 7.1(k) is not required;

3. **Agree** that a separate project scope shall not be required for this Working Party and that approval of the project proposal shall be deemed to be an approved project scope; and

4. **Note** that a Confidentiality Agreement will be required.

Project Proposal for a LLU/Naked DSL Working Parties

The information contained in this Appendix forms part of the project proposals for both Working Parties.

Working Party Membership

It is recommended that the following parties be invited to join the Working Parties:

Working Party Members:	
TCF Members	All TCF Members
Interested Parties	New entrants and existing telecommunication providers who are not TCF Members.[99]
	ISPANZ members who are not TCF Members.[99]
	TUANZ representative
	InternetNZ representative
	Other parties who can demonstrate a legitimate interest (to be approved by the Board on a case by case basis).
Observers	Commerce Commission
	Ministry of Economic Development

To ensure the smooth operation of the Working Party and to assist it with meeting the tight timeframes, potential working party members must advise the Forum Administrator by 31 August 2006 if they wish to join the Working Party and participate at the first Working Party meeting. In accordance with clause 7.4 of the TCF Handbook, applications received after this date will require approval of the Board.

Working Party members[100] are expected to:

(a) attend all of the meetings for their Working Party;

(b) have reviewed all documents in advance of the meeting;

(c) actively and constructively participate; and

(d) complete agreed action points on time.

[99] If a telecommunications provider or ISPANZ member is entitled to be an eligible person or is an eligible person, they will be required to join the TCF in order to participate in the Working Party.

[100] Includes TCF Members, Interested Parties and Observers invited to join the Working Party.

Upon a recommendation by the Independent Chair of the Working Party, the Board may remove Interested Parties from a Working Party if they are not meeting the requirements set out in the project proposal(s).

With the exception of the independent resource referred to below, all Working Party members will bear their own costs and expenses of participation.

Confidentiality

Working Party members may choose to provide commercially sensitive information to the Working Party. Prior to joining the Working Party, all Working Party members will be required to sign a confidentiality agreement protecting that information. It is the responsibility of each Working Party member to clearly identify any commercially sensitive information that should be protected by that confidentiality agreement. If the standard form of that confidentiality agreement is not in place in time for the first meeting of the Working Party, Rule 26.2 shall apply in its place. Working Party members will be required to sign the confidentiality agreement within 3 working days of it being made available to them.

Liaison between the Working Parties

The LLU/Naked DSL Technical and Operational Working Parties will liaise with each other to ensure consistency in the work of both groups and to ensure the outputs can be delivered on time.

Voting

The TCF Rules and Handbook will apply in relation to voting by the Working Party with the amendments/clarifications to the clauses 12.4 and 12.7 to 12.12 of the TCF Handbook as follows.:

(a) A simple majority vote will be required for all decisions by the Working Party members present and entitled to vote;

(b) There will be one equal vote per Working Party member who is entitled to vote. Where a Working Party member has more than one representative on a Working Party, the member will only be entitled to one vote.

(c) The Working Party members entitled to vote must be active Working Party members who are likely to become parties to an access agreement with Telecom which would incorporate the voluntary code(s) referred to in the project proposals and who are:

  i. TCF Members; or
  ii. New entrants and existing telecommunication providers who are not TCF Members[99]; or
  iii. ISPANZ members who are not TCF Members[99].

(d) Proxy votes will not be permitted;

(e) For the avoidance of doubt, the Independent Chair, Technical Experts, and Forum Administrator will not have a vote.

(f) Unless a shorter time frame is agreed by the Working Party, where voting is via email in response to a circulated resolution, a response must be received by the Forum Administrator within 3 working days. The Forum Administrator will issue a reminder notice to the Working Party prior to the end of that 3 day period. The vote will be passed if the votes of those Working Party members who voted within the 3 working day period meet the voting threshold.

By approving these project proposals for LLU/Naked DSL the TCF Board is approving the changes to the TCF Handbook relating to Working Party voting for these Working Parties.

Project Timetable

Activity	Completion date
Board approval of Project Proposals/Scopes	17 August 2006
Phase 1 commences	5 September 2006
Phase 1 Reports completed and provided to the TCF Board	15 December 2006
Consultation on Phase 1 Reports commences	20 December 2006
Submissions due from the consultation on Phase 1 Reports	19 January 2007
Board approval required to proceed to Phase 2	25 January 2007
Phase 2 commences	1 February 2007
Phase 2 completed to the point where the voluntary codes are available for use (this date is indicative only – it will be reviewed and agreed as part of the output from Phase 1).	By 30 June 2007

7.1 (k) Report

By approving these project proposals, the Board are agreeing to waive the requirement for the report referred to in Rule 7.1(k).

Independent Resource

The Working Parties will require the following external resources:

1. An Independent Chair
2. Independent Technical experts
3. Forum Administrator

An allowance is also required for the travel and other incidental costs for the above resources.

Independent Chair

The Independent Chair will be a named individual and will be identified and appointed as soon as possible. The same Independent Chair will chair both LLU Working Parties.

The Independent Chair can speak on behalf of the TCF in relation to the TCF's LLU work streams with the approval of the TCF Chair.

Independent Technical Experts

Independent Technical experts will be identified and agreed as soon as possible. It is anticipated that the technical expertise will be provided by a single organisation, if one can be found with the necessary range of skills and expertise required. Otherwise, different expertise may need to be engaged on different issues Technical prime(s) from contracted organisations will be identified to attend Working Party meetings when required.

The intention is that Working Party members will provide their own technical experts and that the independent technical experts will be available to the Independent Chair on an as required basis - within the approved budget. It will be the Independent Chairs responsibility to determine what action points are allocated to the Independent Technical Experts and what action points are allocated to Working Party members.

Budget and Cost Allocation

A combined budget estimate has been prepared to cover the cost of phase 1 and 2 of both LLU/Naked DSL Working Parties. The budget is:

LLU/Naked DSL Technical Standards and Operational Working Parties.	Total Budget
Phase 1	$150,000
Phase 2 (indicative)	$200,000[101]
	$350,000

This budget will be dedicated and ring fenced to the LLU project for the specific purpose of paying for the external resources identified above. The Forum Administrator will be responsible for administering the budget and providing reports to the TCF Board each month. The Independent Chair will be responsible for ensuring the project stays within the approved budget.

[101] As set out in the project proposals, the budget for Phase 2 will be reviewed and confirmed as an output from Phase 1.

Allocation

In accordance with Rule 6.3, these costs will be paid by TCF Members in addition to annual TCF Membership Fee. The costs will be allocated using the same methodology as that used to calculate the TCF Membership Fee but applied specifically to the cost of the project. The allocation would be as follows:

LLU/Naked DSL Project costs (covers both working parties)				
Allocation				
	Phase 1	**Phase 2**[102]	**Total**	**Percentage Share**
Tier 1				
Telecom	60,000	80,000	140,000	40.00%
TelstraClear	37,500	50,000	87,500	25.00%
Vodafone	37,500	50,000	87,500	25.00%
Tier 2 & 3				
Compass	1,667	2,222	3,889	1.11%
Callplus	1,667	2,222	3,889	1.11%
Ihug	1,667	2,222	3,889	1.11%
Orcon	1,667	2,222	3,889	1.11%
TeamTalk	1,667	2,222	3,889	1.11%
Woosh	1,667	2,222	3,889	1.11%
WorldxChange	1,667	2,222	3,889	1.11%
BCL	1,667	2,222	3,889	1.11%
Vector	1,667	2,222	3,889	1.11%
	150,000	**200,000**	**350,000**	

The normal TCF Membership Fee structure includes a cap of $5,000 for Tier 2 and 3 members. While the above costs do not exceed the cap, if at any stage the Working Party was to seek additional funding for these working parties, the cap would apply to the cost of the project.[103]

The intention is to hold all meetings face to face in Auckland and Telecom has agreed to provide the meeting room facilities.

TCF Members will be invoiced for their share of the Phase 1 costs on approval of the project proposal by the Board and the invoices will be payable within 10 working days

[102] This allocation will only apply if there is unanimous agreement by the Board to approve the Working Parties completing Phase 2.

[103] The share of the costs paid by a TCF member for this project will not be taken into account when the annual TCF membership fee is calculated.

of the date of receipt of that invoice. TCF Members will be invoiced for their share of the Phase 2 costs on approval by the Board to commence Phase 2 and the invoices will be payable within 10 working days of the date of receipt of that invoice.

The Board is requested to approve the budget for Phase 1 of these Working Parties by approving the project proposals. The Board is being requested to note the expected budget for Phase 2. Phase 2 will only be initiated by the TCF if the Board approves it (by a simple majority vote) at this time. For the avoidance of doubt, at the time the decision is being made whether or not to commence Phase 2, Rule 9.1(f)(ii)[104] relating to funding will not apply to these projects. If, after approving the project proposals a Tier One Board Member or Group Board representative votes against the Working Parties continuing to Phase 2 then that member's organisation (or in the case of the Group Board representative, those members they represent who voted against continuing to Phase 2) will not be required to pay their share of the costs for Phase 2 and will be refunded any monies left over at the completion of Phase 1 in the same proportion to the amounts paid by those members.

The project will be completed when the Board advise the working party that they are disbanded. Any monies left over at the completion of the project will be refunded to TCF members in the same proportion to the amounts paid by those members for the relevant phases.

[104] Rule 9.1(f)(ii) requires unanimous agreement of the Board for the setting of fees and budgets for the Forum and the use of Forums budget for the carrying out any studies, consultancies or use of external expert advisors.

Appendix 2: Crosstalk of spectrally symmetric and asymmetric systems[105]

Background

1. The calculations in this paper are based on the Australian Communications Alliance (formerly ACIF) Spectral Compatibility Tool with all assumptions as defined in Code 559. Note that the assumed cable is Australian 0.40mm PIUT and the crosstalk levels used are a little higher than in American NIPP/NAI spectrum management documents, when the 99th percentile of the power sum crosstalk over the different cable binder sizes are calculated.

2. C559 includes deployment limits for various technologies that are required to prevent unacceptable degradation of Basis Systems below the agreed benchmarks. Calculations that are required in C559 to ensure that benchmarks are satisfied must be based on 4 within unit (10-pair unit) disturbers of the same type as the basis system (i.e. 50% fill of that system type) along with 4 disturbers of the system under test (40% fill). Note that the assumptions in the crosstalk theory depend on power summation of many disturbers and calculations with very small numbers of disturbers (1 or 2) do not result in the assumed Gaussian statistics of the power sum crosstalk.

3. As an example of the relative capabilities and impact of crosstalk on spectrally symmetric and asymmetric systems, two commonly used systems are considered in this paper.

Symmetric (SHDSL – 2312 kbit/s)

4. This commonly used symmetric system uses the same power spectral density (PSD) in each direction, and hence suffers NEXT from other SHDSL systems in the same cable binder. That system is a Basis system with specified benchmark performance of 26.5 dB at 388 kHz or 1.71 km of 0.40mm PIUT with 6 db margin. Analysis of cases with 8 SHDSL disturbers, 4 SHDSL and 4 ADSL, and with 8 ADSL disturbers gives the ranges in Table 1 for 6 dB deployment margin against the SNR that corresponds to a bit error ratio (BER) of 10^{-7}. Because SHDSL is a fixed rate system that fails to operate successfully if there is inadequate signal to noise ratio (SNR), a deployment margin is usually applied to account for variance of cable parameters from nominal values used in design calculations (about 10%), and variance in other parameters such as cable length, receiver sensitivity, unexpected bridged taps, aging etc.

[105] Prepared by Dr Phil Potter of Telstra for the TCF

5.

Disturbers	Range (km)	Loss at 388khz (dB)
8 SHDSL	1.81	28.0
4 SHDSL and 4 ADSL	1.75	26.5
8 ADSL	2.15	33.1
4 SHDSL	1.97	30.3

Table 1: SHDSL range with 6 dB margin with ADSL and SHDSL disturbers

6. A key observation from these results is that ADSL and SHDSL disturbers have roughly similar impact on the SHDSL basis system, although the ADSL really only impacts on the upstream SHDSL channel. The similarity of the power spectra of these disturbers in Fig. 1 is consistent with that observation.

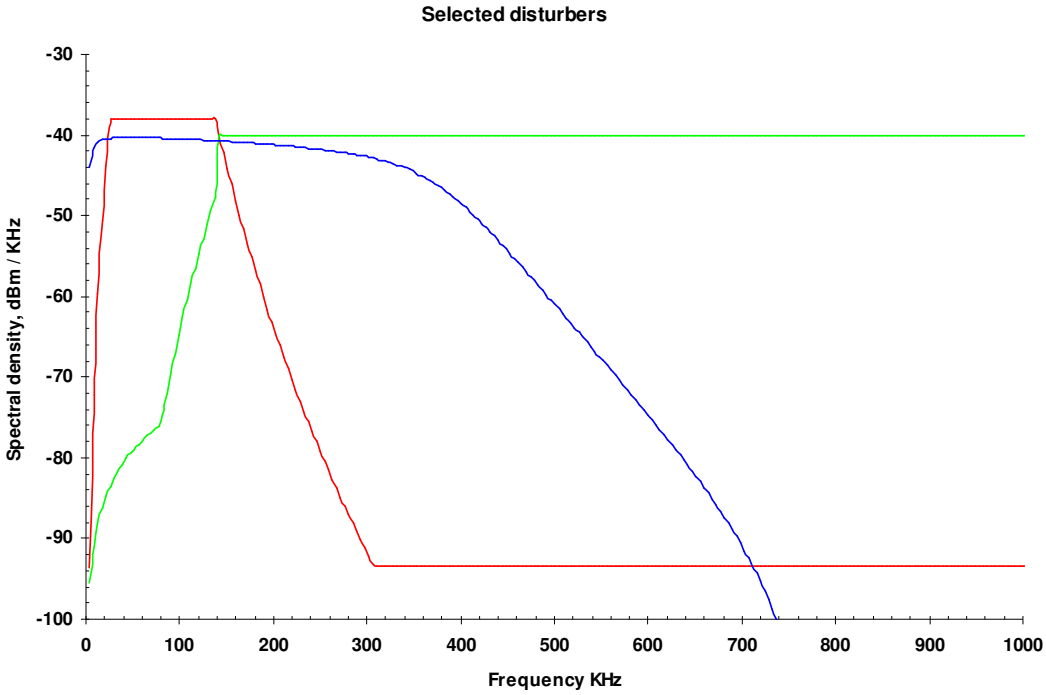


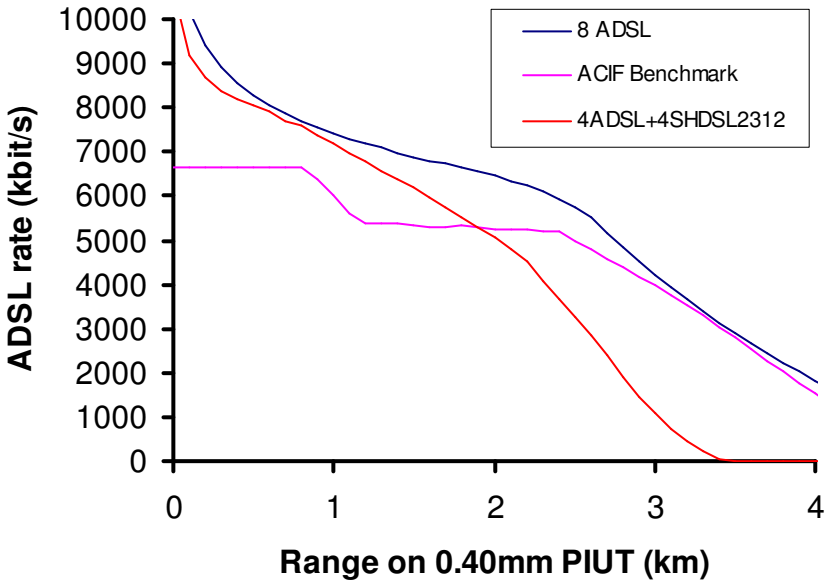
Figure 1: Power spectral density of ADSL up (red) and down(green) and of SHDSL 2312 kbit/s (blue)

7. For reasons given below the SHDSL 2312 kbit/s system must be constrained in C559 to a deployment limit of 1.9 km or 29.3 dB at 388 kHz.

8. SHDSL systems have limited coverage of the access network which has a design range in Australia of 4.2km on 0.40mm copper pair.

Asymmetric (ADSL)

9. This most common DSL system uses frequency separation of the two directions of transmission, and hence avoids NEXT. During training it also adapts its rate to the interference on the line. Hence the benchmark performance is expressed as rate vs range on the standard 0.40mm PIUT cable. Fig. 2 shows the rate versus range for an ADSL Basis System when interfered with by 8 ADSL disturbers, 4 ADSL and 4 SHDSL, along with the ACIF benchmark that is based on the worst ADSL performance over all permitted interference environments. It is important to understand that the ADSL rates in the figure are the nominal performance of the modem on the line and do not include a 6 dB deployment margin as used for SHDSL. This convention is adopted because the ADSL is rate adaptive and we are not considering the threshold at which it does not train up at all.



10. Figure 2: ADSL Basis System downstream performance with ADSL and SHDSL disturbers

11. It is clear from Figure 2 that in order to protect the benchmark, the SHDSL 2312 system must be restricted to no further that 1.9 km from the exchange. Beyond that range limit of 1.9 km the ADSL SNR due to SHDSL cannot deteriorate further. What can also be seen is that the ADSL system has already suffered a considerable reduction in potential performance in order to permit the deployment of SHDSL 2312 and similar systems. For a 6 Mbit/s ADSL service, the achievable range is more than 1 km shorter than would be achievable with ADSL alone in the cables.

Probability of System Failure

12. Whereas ADSL systems will generally only suffer a reduction of rate, SHDSL systems may fail to operate or may operate with unacceptable error rate if the margin is eaten up by some of the many possible degradations that can occur. There are 4 key factors to understand in that respect.

13. The calculations in the ACIF code are all based on 1% worst case crosstalk with a full complement of disturbers; that is , at 0 db margin, there is 1% probability of a randomly chosen system having error rate worse than 10-7. The standard deviation of the total crosstalk power from many disturbers is typically about 4 to 5 dB. Conservatively with 4 dB standard deviation, the noise must be 4dB worse to have a 10% probability of failure and 9 db worse to have 50% probability of failure.

14. In most SHDSL deployments, the number of crosstalk disturbers in the binder is lower than the number assumed in the design calculations.

15. The 6 dB implementation margin may occasionally be used up by the sources of variance. Cases where the margin is used are likely to represent less than 1% of situations.

16. Implementations of SHDSL systems are rarely at the design limit but follow the (truncated) distribution of line lengths in the network. Hence for every 4 dB (or about 100m) reduction in range from the design limit, the probability of failure reduces by the effect of one standard deviation on the normal distribution. Therefore any assessment of impact on SHDSL failures must distribute the probability over the range of line lengths.

17. The net effect of these four factors is that there is definitely room for designers of SHDSL to exceed the benchmark limit of 1.71 km in the ACIF code, with minimal probability of failure until that limit is considerably exceeded. This was recognised in determining the compromise deployment limit of 1.9 km for SHDSL at 2312 kbit/s in C559.

Statistical Performance of ADSL

18. The ADSL benchmark performance does not include any implementation margin, so that there is a probability that some systems will suffer worse performance than the benchmark plot. However, because of the large 4-5 db standard deviation of the power sum crosstalk, most systems are expected to achieve performance significantly better than the 1% worst case benchmark for the given range.

Appendix 3: Further notes on crosstalk characteristics[106]

1. Individual pair-to-pair crosstalk is very sensitive to minor inaccuracy in the twisting of the pairs and the resultant crosstalk has high variance from one pair combination to the next. Typical measured standard deviation of pair-to-pair crosstalk within a binder is 8 to 10 dB. That means between roughly 36 and 46 dB (or a factor of 4000 to 40000) between the 1st and 99th percentiles of the statistical distribution of pair to pair crosstalk. When we consider the total (power sum) interference from many crosstalk disturbers within the binder, the standard deviation is 4 to 5dB, resulting in about 20 dB (factor of 100) between 1st and 99th percentiles of the crosstalk distribution.

2. Added to that wide statistical variation in interference when the crosstalkers are all present, there is further statistical variance due to the differing interferer counts in different binders across the network. Statistical sampling of ADSL performance in the Australian network allows us to infer a statistical range of 30-40 dB in interference environments. The worst of the lines at 20 dB (at 300 kHz) from the exchange have lower achievable rate than the best of the lines at 50 dB from the exchange.

3. That statistical nature of the crosstalk interference leads to a requirement for statistical design. Designers must select a design range for the DSL system that results in an acceptable proportion of failures overall, with that proportion being based on the cost of rework for failures compared to the revenue opportunity from offering the service to more customers. Traditionally, transmission designers have set the design limit conservatively at 1% probability of failure at the design limit. This is what ACIF assumes. It results in an overall failure probability of less than 0.1%. Most failures are then due to fault conditions rather than the statistical crosstalk environment. Another consequence of the highly variable interference environment is that exceeding the design limit results in only a gradual increase in the probability of failure, and it may be possible to design at significantly longer range and tolerate a higher failure rate.

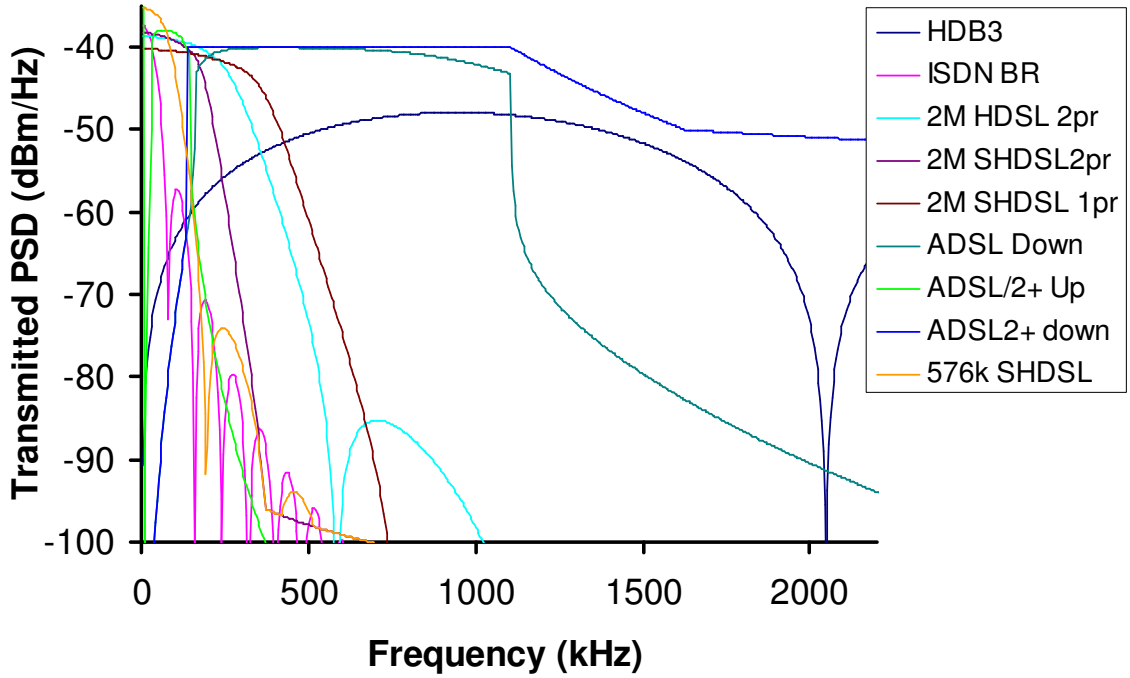
4. The traditional transmission design outlined above applies to services that have a defined failure event; for example SHDSL services have a fixed rate and must achieve a bit error ratio (BER) better than 10-7 to continue to work to specification. For services such as ADSL that are rate adaptive to a target BER, failure to achieve a given rate (unless it is the absolute minimum in the profile) generally does not result in an unworkable service. If ADSL is treated as a best-effort-rate service with a fairly low guaranteed rate then the number of failures can be controlled to within acceptable bounds for the business, while the majority of customers can achieve high rates.

[106] Prepared by Dr Phil Potter of Telstra for the TCF

5. To perform adequate statistical measurement of the crosstalk between just one pair of system types in one direction (e.g. ADSL impact on HDB3 return) would require a very large sample of pair combinations (e.g. more than 1000 measurements to accurately estimate the 1% failure probability) repeated for a range of attenuations of the HDB3 system. That is clearly impractical for the wide range of system combinations that must be addressed. The only viable approach to a priori design is to characterise the crosstalk interference statistically and then add modelled crosstalk to the receiver input in a simulation. Telstra has performed laboratory tests with shaped Gaussian noise to represent the crosstalk added to the receiver input to confirm its simulation results. Telstra has also confirmed the power sum behaviour of crosstalk in the laboratory and in the field through barrage testing of HDB3 systems.

Appendix 4: Shared use of same spectrum[107]

1. The following figure illustrates the shared use of the same spectrum by many different types of systems in use on access twisted pair cables. The spectral usage reflects the useful frequencies at different ranges. Typically systems that work over 4 km can use only the frequencies below about 400khz as the higher frequencies are too attenuated and too susceptible to crosstalk and external interference at that range. Systems that work over 2 km can use up to about 1 MHz, etc. The HDB3 system that uses spectrum up to 2 MHz is limited to about 1 km transmission range between regenerators. ADSL and ADSL2+ systems can adapt their spectral usage to the attenuation and the interference on the line, so that all frequencies are used on shorter lines and only the lower frequencies are used on longer lines.



[107] Prepared by Dr Phil Potter of Telstra for the TCF

Appendix 5: Types of transmission system

1. The table below summarises the current range of broadband transmission systems that need to be considered in developing a plan for managing crosstalk.

2. xDSL technology, which permits high speed data services to be provided over copper networks, has been around since approximately 1991. Some xDSL varieties are widely used standards, some are proprietary and others are purely theoretical. Each variety is best categorised by the modulation method used to encode the data[108].

3. The maximum range of frequencies and power levels to be used by each xDSL technology is largely fixed by relevant ITU standards. The technologies of interest cover a wide range of overlapping frequencies.

Name		Description	Speed	Distance (0.4mm cable)	Applications
Systems currently deployed in NZ					
HDB3	High density bipolar 3 coding	E1 symmetric 4 wire but each direction on its own pair.	Fixed 2048Kb/s payload rate	1400m	E1 trunk. PSTN interconnection (voice and dial data). Primary rate ISDN Cellular backhaul. Enterprise data services.
BR-ISDN	Basic rate Integrated services digital network	2B1Q Symmetric 2 wire	Fixed 160kb/s payload rate	4.5Km	Small PABX voice trunks. Video conferencing 64Kb/s dial-up data
HDSL	High bit rate digital subscriber line	2B1Q high speed symmetric 2 wire	32Kb/s to 2320Kb/s	2-5Km	E1 trunk. PSTN interconnection (voice and dial data). Primary rate ISDN. Cellular backhaul. Enterprise data services.
SHDSL	Symmetric high speed digital subscriber line	Symmetric 2 wire G991.2 Annex B 16-TCPAM	192Kb/s to 2312Kb/s	2-5 km	E1 trunk. PSTN interconnection (voice and dial data). Primary rate ISDN. Cellular backhaul. Enterprise data services
ADSL1	Asymmetric digital subscriber line	Asymmetric multi carrier 2 wire ITU-T G992.1	Downstream: 32Kbps-8 Mbps Upstream: 32 Kbps – 800Kbps	1-5km	Internet access. Small enterprise site data.

[108] Gilbert + Tobin supra

Name		Description	Speed	Distance (0.4mm cable)	Applications
Existing systems not deployed in NZ					
SDSL	Non standard Predecessor to SHDSL	Proprietary, not used in NZ			
VDSL	*No deployments in NZ* Very high bit rate digital subscriber line	Single carrier 2 wire	Downstream: up to 52Mbps Upstream: up to 12 Mbps Up to 26 Mbps symmetric	300m	Multimedia Internet Access, HDTV program delivery

Name		Description	Speed	Distance (0.4mm cable)	Applications
New systems not deployed in NZ					
ADSL2 and 2+	Asymmetric digital subscriber line	Asymmetric multicarrier 2 wire ITU-T G992.5	Downstream: 32Kbps-24Mbps Upstream: 32Kbps – 1.2 Mbps	0.1-5km	Internet access. IP TV. Small enterprise site data
VDSL2	Very high bit rate digital subscriber line	Asymmetric multicarrier 2 wire G993.2	Up to 200 Mbps symmetrical	50M DS/10M US 700m 100M/100M 150m	Multimedia Internet Access. HDTV Delivery. Ethernet data. Video conferencing
eSHDSL	Enhanced Symmetric high speed digital subscriber line	Symmetric 2wire G991.2 Annex F 32-TCPAM	768 Kbps to 5696 Kbps	1-5Km	Ethernet over copper. Enterprise data

Appendix 6: Interference management – symmetric v asymmetric technology cross impacts[109]

Description

1. This appendix examines the relative cross impact of:

2. A spectrally asymmetric technology (e.g. ADSL) on a spectrally symmetric technology (e.g. SHDSL); and

3. A spectrally symmetric technology on an spectrally asymmetric technology.

4. Estimates are based on mathematical simulations of:

   (a) How the working range (of a 6Mb/s downstream line rate service and a 512 Kb/s downstream line rate service) of a single ADSL1 line would change with an increasing number of symmetric SHDSL interferers in the same binder operating at a 2316Kb/s payload rate.

   (b) How the achievable performance (working range) of a single 2316Kb/s SHDSL line would be affected by an increasing number of ADSL1 lines operating in the same binder.

   (c) The cross impacts of ADSL on other earlier generation spectrally symmetric technologies has not be analysed but it can be expected to be at least similar, if not greater.

   (d) The cross impact of SHDSL on ADSL2+ and VDSL2 will be similar or less than that for ADSL1 for the cases considered because the enhanced performance of ADSL2+ and VDSL2 is achieved by using frequencies well outside the operating frequency range of existing SHDSL systems.

Background

5. The practical working range of SHDSL is impacted by Near End interference (NEXT) because of the spectrally symmetric nature of the technology.

6. Asymmetric systems, like ADSL, avoid self-NEXT by using different go and return frequencies, but they are still impacted by NEXT from unlike systems such as SHDSL which uses transmitters operating in the same frequency band in the immediate vicinity of a co-located ADSL receiver.

[109] Prepared by Telecom as at 28 November 2006 for the TCF

7. The ANSI T1.417 approach to interference simulation is to assume all interferers are collocated at both the exchange and customer premises. This simplifies the calculation.

8. ACIF in Australia have also adopted a similar approach when developing C559.

9. The consequence of this "short cut" is that the NEXT impact, at the customer premises end of a link, of one or more SHDSL upstream transmitters on the ADSL downstream receiver is an extreme case scenario. But this scenario could, in practice, occur.

10. The "collocated customer end" approach becomes unrealistic when calculations are being carried out at cable ranges that are beyond the achievable working range of the interfering technology. This situation would never occur in a real world scenario because the interfering technology would simply not function at all at that range.

11. Because the ACIF simulation model and approach is familiar to most parties in the working group, this model has been used for the calculations in this paper. However the maximum "deployment limit" of the interfering SHDSL disturbers has been set at the maximum predicted working range of SHDSL in the presence of the number of disturbers under consideration in each case (the deployment limits used are detailed on slide 5).

SHDSL impact on ADSL

12. A single ADSL1 victim link is considered in this case in a binder with a varying number of 2316Kb/s SHDSL links.

13. The maximum working range the SHDSL disturbers will be limited by interference from the ADSL victim and any other SHDSL disturbers in the binder.

14. To model valid real world scenarios, the maximum working range of the SHDSL disturbers must be determined and the modelling of the disturbers limited to this when using the ACIF interference model.

15. The maximum working range of the SHDSL disturbers for this comparison has been determined as the range at which a zero dB noise margin on the SHDSL links would be expected to occur given the number of SHDSL links in the binder but ignoring the ADSL (except in the 1 SHDSL disturber case where the sole limiting disturber is the ADSL link). This range has been used as the "deployment limit" of the SHDSL disturbers in the model in each case.

16. It is unlikely that any operator would actually operate SHDSL at a zero dB noise margin range, but the links would function if operation was attempted.

17. Where a zero dB noise margin could not be achieved, it has been assumed that the SHDSL links would simply not synchronise and so operating beyond that range would not practically ever occur.

18. ADSL is typically used for variable bit rate services.

19. For the purposes of this comparison, it is useful to assess the predicted reach of ADSL services for defined line bit rates.

20. Three line rates have been determined and plotted:

    (a) Reach of a 6 Mb/s downstream line rate is plotted to simulate effects on "premium" ADSL services

    (b) Reach of a 512KB/s downstream line rate is also plotted. 512Kb/s downstream is the minimum speed for broadband as defined by the European Union.

    (c) Reach of a 512Kb/s upstream line rate is plotted to assess impacts on use of ADSL for reasonable upstream performance.

21. Maximum SHDSL disturber ranges used in determining SHDSL impact on ADSL are:

Number of disturbers	Systems operating in the binder	SHDSL "deployment limit" used (Km of 0.4mm cable)
One SHDSL	One ADSL1 and one 2316Kb/s SHDSL link	3.4 Km
Three SHDSL	One ADSL1 and three 2316Kb/s SHDSL links	2.5 Km
Eight SHDSL	One ADSL1 and eight 2316Kb/s SHDSL links	2.3Km

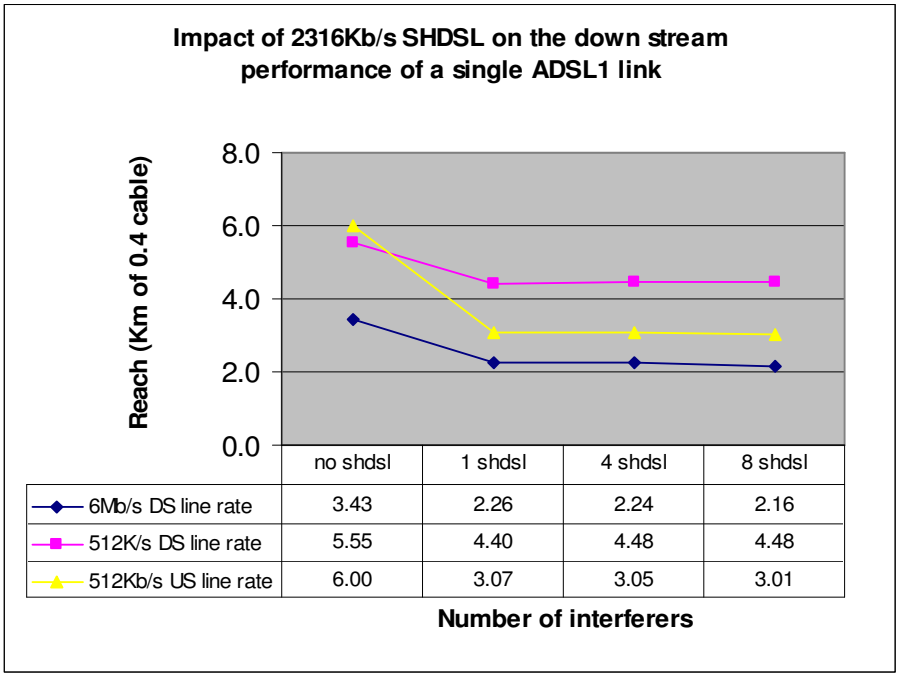
ADSL impact on SHDSL

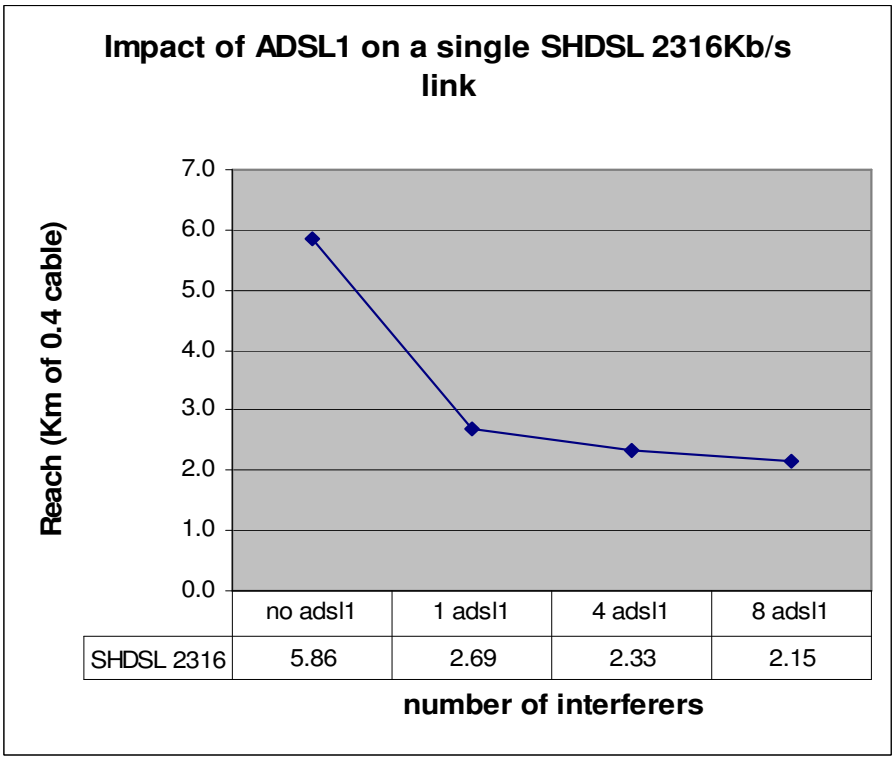
22. A single 2316Kb/s SHDSL victim line is assumed.

23. Because the working range of the ADSL is always greater than the working range of the victim SHDSL link, no ADSL "deployment limits" need to be used in the ACIF model for these scenarios.

24. The range is that at which a 6dB noise margin can be expected to be achieved on the victim SHDSL link.

Simulation Results





Summary and Conclusion

25. The reduction in reach of each victim system is summarised in the following table:

Reach reduction	No disturbers to 8	1 disturber to 8 disturbers
SHDSL on ADSL 6M DS	37%	5%
SHDSL on ADSL 512 DS	19%	-2% [110]
SHDSL on ADSL 512 US	50%	2%
ADSL on 2316 SHDSL	63%	20%

26. An increasing number of ADSL disturbers in a binder has a higher relative impact on SHDSL reach than the impact that a rising number of SHDSL systems has on ADSL reach.

27. The ADSL upstream performance is impacted more by rising numbers of SHDSL interferers because the upstream link is impacted by the NEXT effect of the SHDSL transmitters operating at the wire centre in the same frequency range as the ADSL upstream wire centre receiver(s).

28. The impact of SHDSL on ADSL upstream is still less in relative reach than the reach impact that ADSL has on SHDSL performance.

[110] The predicted improvement in ADSL reach is assumed to be a result of the reducing interference at that range. This is because the operating range of the SHDSL reduces because of the self limiting of SHDSL on itself as the number of SHDSL systems in the binder increases

Appendix 7: Overseas interference management practices

Australia

1. Spectral compatibility benchmarks for defined technologies: ACIF code (C559) sets out spectral compatibility benchmarks for defined technologies (basis systems – see next bullet point). These benchmarks are only used as measures of interference from other systems when deployed according to their deployment rules and do not constitute a restriction *per se* on the performance or deployment of a similar system.

2. Technologies protected: Basis Systems – ADSL, ADSL2+, SHDSL, ISDN, legacy HDB3

3. System constraints: PSD masks for Deployment Classes based on ITU.

4. Types of deployment rules: Each deployment class has a set of deployment rules including length of deployment and pair separation requirements (only for legacy HDB3). Effectively 100% fill if no HDB3.

5. Approach to cabinet deployments: Rules require reduced power transmission from remote nodes in Deployment State A to protect exchange-fed DSL - default. Full power transmission at remote nodes addressed in Deployment State B – rules agreed but not default.

6. Approach to legacy systems: E1 (HDB3) protected

7. Approach to new systems: A system must not be deployed if it causes any basis system to be degraded below predefined performance benchmark.

8. The goal in the Australian approach is to select a limited set of spectrally compatible technologies that provide all of the necessary speeds, ranges and characteristics for the required service set (e.g. "VDSL2 only", "ADSL2+ and SHDSL"). As the set is allowed to broaden, there is a general reduction of performance for all as more interference cases are permitted and must be designed for.

France

9. Technologies protected: Not stated.

10. System constraints: By implication – none is rigorously protected.

11. Types of deployment rules: An operator may deploy a standardised technology that complies with the PSD masks. Operators can deploy broadband technologies over every copper pair regardless of (a) location of the pair in the cable; and (b) regardless of their length.

12. Approach to cabinet deployments: NIL

13. Approach to legacy systems: ART recommendations allow for the review of existing technologies according to their impact on the spectrum management plan.

14. Approach to new systems: An operator wishing to introduce a new technology that is not compatible with the current PSD masks, must first request a modification to the masks.

UK

15. Technologies protected: Not stated. By inference ADSL, ADSL2+, VDSL2.

16. System constraints: One generic PSD mask for each range grouping.

17. Types of deployment rules: For short, medium or long (based on estimated line losses as limited records), allow any system that complies with the generic mask.

18. No pair separation because HDB3 in separate cables already. Allows for 100% fill

19. Approach to cabinet deployments: Mandate PSD modification (reduced power) for downstream DSL from remote cabinets to ensure DSL from exchange is protected.

20. Approach to legacy systems: None to protect

21. Approach to new systems: Only if meet generic PSD masks. No interference metric for assessing new systems.

22. Note that there is no E1 HDB3 deployed in the access network in the UK

Ireland

23. Technologies protected: Not stated

24. System constraints: Specific PSD masks for each technology class.

25. Types of deployment rules: Specific technologies permitted in short, medium and long classes (based on calculated line losses). No pair separation. Allows for 100% fill.

26. Approach to cabinet deployments: Allows transmission of ADSL and ADSL2+ at full power from a remote node. Could degrade performance of exchange fed systems.

27. Approach to legacy systems: NIL

28. Approach to new systems: Specified PSD masks only. No interference metric for assessing new systems.

29. Note that Ireland deploys 2 wire HDSL for E1 systems. (Telecom only ever deployed 4 wire HDSL so the existing working ranges and line bit rates differ).

USA

30. Technologies protected: Basis Systems – ADSL, ADSL2+, HDSL, SHDSL, etc with performance benchmarks

31. System constraints: Specific masks for deployment classes based on ITU

32. Types of deployment rules: Deployment limits aligned with CSA size. Pair separation from legacy T1

33. Approach to cabinet deployments: NIL

34. Approach to legacy systems: Legacy T1 protected.

35. Approach to new systems: FCC codified rules governing when loop technology is presumed acceptable for deployment:

    (a) complies with existing industry standards;

    (b) approved by industry standard body; or

    (c) successfully deployed by another carrier without significantly degrading performance of other services.