COMMERCE COMMISSION NEW ZEALAND

Project no. 13.07/12813

# High speed broadband services demand side study

## Issues paper 1: technical issues

Date: 19 December 2011

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## Tables and figures

## Executive summary

1. The Commerce Commission (Commission) is carrying out a high speed broadband services demand side study (study) to identify and inform on any factors that may impede the uptake of high speed broadband services in New Zealand.[1]

2. This study is conducted under Section 9A of the Telecommunications Act 2001, which empowers the Commission to conduct inquiries, reviews and studies into any matter relating to the telecommunications industry or the long-term benefit of end-users of telecommunications services within New Zealand.[2]

3. This issues paper is the first of three papers that the Commission plans to issue before *The Future with High Speed Broadband: Opportunities for New Zealand* conference. In this paper the Commission sets out the technical issues it has identified as being relevant to the uptake of high speed broadband services.

4. Two additional papers will be issued: Paper 2: '*e-health/e-education*' in late January 2012 and Paper 3: '*willingness to pay, content and applications*' in early February 2012 – setting out issues that will be considered in depth at the conference.

5. The Commission does not expect the technical issues dealt with in this paper to be discussed in detail at the conference. These technical issues will be referred to in the Commission's draft report to be issued after the conference, which will be subject to a formal consultation process.

6. The technical issues discussed in this paper are:

   - The cost of non-standard connections, premises re-wiring and the provision of customer premises equipment:
     i. The cost to residential and business customers of paying for non-standard connections is likely to be a significant barrier to uptake of high speed broadband. It is unclear how many consumers and businesses will face these costs and how great the costs will be.
     ii. Premises re-wiring and cost of CPE replacements may be significant barriers to the uptake of high speed broadband. It is unclear how many consumers and businesses will face these costs and how great the costs will be.
   - National transit: competition for national transit has increased since 2008. The Commission is currently conducting a review of national transit.
   - International connectivity: the price of international connectivity has fallen significantly since 2008 as the wholesale market has become more competitive.
   - Peering and IP interconnect: evidence to date suggests that peering and IP interconnect do not currently pose a significant problem for the uptake of high speed broadband in New Zealand.

[1] A copy of the terms of reference for the study is at http://www.comcom.govt.nz/high-speed-broadband-services-demand-side-study/.

[2] Telecommunications Act 2001, subpart 2, section 9A.

- Network neutrality should not be an issue if Internet Service Providers (ISPs) are transparent about the limitations or restrictions placed on their broadband services. There are sufficient competing ISPs for customers to switch relatively easily to a provider that does not impose those restrictions.
- Data caps:
  i. Surveys undertaken for the high speed broadband services demand side study indicate that most consumers and SMEs are satisfied with their data caps.
  ii. Data transmission costs have been steadily falling and data caps and unmetering of content increasing in the last couple of years. If these trends continue, data caps should not inhibit the take-up of high speed broadband services.
  iii. Data transmission issues will be addressed further at the Commission conference during a presentation by Dr Robert Pepper, VP Global Technology Policy at Cisco, on future data needs and a panel discussion on new transformational technology.

7. After the release of the three issues papers, the Commission will hold a conference on 20 and 21 February 2012, followed by the publication of the report. You are encouraged to comment on the issues papers either directly to the Commission (telco@comcom.govt.nz) or using any of the media that the Commission has made available, including LinkedIn, Twitter and Facebook. We also encourage you to participate in the conference and engage in the formal consultation on the report.

8. Table 1 below details the timeline for the high speed broadband services demand side study project.

**Table 1: High Speed Broadband services demand side study project timeline**

| Date | Activity |
|---|---|
| 19 Dec 2011 | Publication of Technical Issues Paper |
| 24 Jan 2012 | Publication of e-Learning/e-Health Issues Paper |
| 7 Feb 2012 | Publication of Willingness to pay, content and applications Issues Paper |
| 20-21 Feb 2012 | The Future with High Speed Broadband: Opportunities for New Zealand Conference |
| 9 April 2012 | Publication of the Study Draft Report |
| 4 May 2012 | Due date for submissions on the Draft Report |
| 28 May 2012 | Publication of the Study Final Report |

## Glossary

| Term | Definition |
|---|---|
| 3G | Third Generation. A term commonly used to describe the third generation of technology used in a specific application or industry. In cellular telecommunications, third generation systems use wideband digital radio technology as compared to second generation narrowband digital radio. |
| 4G | Fourth Generation. 4G wireless networks are networks with bandwidth reaching 100 Mbps. This bandwidth will enable three dimensional (3D) renderings and other virtual experiences on the mobile device. |
| Byte/ bits relationship | 1 byte (B) = 8 bits (b). |
| Bitstream | A stream of compressed data. |
| Caching | The storage of data closer to the end user, for use at a later time. |
| CIR | Committed information rate. CIR is a guaranteed minimum data transmission rate of service that will be available to the user through a network. Applications that use CIR services include voice and real time data applications. CIR can be measured in bits per second, burst size, and burst interval. |
| CPE | Customer Premises Equipment. CPE is all telecommunications terminal equipment located on the customer's premises, including telephones, private branch exchanges (PBXs) and data terminals. |
| Dimensioning | Dimensioning the capacity of a link determines the maximum amount of traffic that can flow over that link during a given period. |
| EUBA | The regulated enhanced unbundled bitstream access service. |
| FDS | First data switch. |
| Fibre access point | The point at which a fibre lead-in is jointed to the distribution network fibre. |
| Fixed wireless | Fixed wireless is the use of wireless technology to provide voice, data, or video service to fixed locations. Fixed wireless services include wireless local loop (WLL), point-to-point microwave, wireless broadband, and free-space optical communication. Fixed wireless systems may replace or bypass wired telephone service, high-speed telephone communication links, and cable television systems. |
| FTTP | Fibre to the premise is a distribution system that uses fibre optic cable to connect telephone networks to nodes that are located within businesses and homes. |

| Term | Definition |
|---|---|
| GB | A gigabyte is one billion bytes of data. When a gigabyte is used to identify the amount of data storage space (such as computer memory or a hard disk), it commonly refers to 1,073,741,824 bytes of information. |
| GSM | Global system for mobile communication (GSM) is a wide area wireless communications system that uses digital radio transmission to provide voice, data, and multimedia communication services. A GSM system coordinates the communication between a mobile telephones (mobile stations), base stations (cell sites), and switching systems. |
| Handover point | The point of interconnection between networks at which traffic is handed from one network to the other. |
| HD | High definition. HD television is the resolution of enhanced analogue television and digital television. The resolutions of HD range from 480/60p-480 pixels (vertical) by 728 pixels (horizontal) with 60 progressive fields (60p) per second to 1080/60p-1080 pixels (vertical) by 1920 pixels (horizontal) with 60 progressive fields per second. |
| HFC | The hybrid fibre coax (HFC) system is an advanced CATV transmission system that uses fibre optic cable for the head end and feeder distribution system and coax for the customers end connection. |
| IEEE 802.16 | 802.16™ is an IEEE standard that defines the network management information base (MIB) parts that are used for the 802.16 WiMax system. |
| IEEE 802.11n | An IEEE 802.11 wireless network standard that increases transmission speeds to 300 Mbps and beyond. Because 802.11n works in both the 2.4 GHz and 5 GHz frequency bands, it is compatible with legacy 11a and 11b/g users. |
| IP | Internet protocol. IP is low-level network protocol that is used for the addressing and routing of packets through data networks. IP is the common language of the Internet. The Internet protocol only has routing information and no data confirmation rules. To ensure reliable data transfer using Internet protocols, higher level protocols such as TCP are used. IP is specified in RFC-791. |
| IPTV | Internet protocol television. IPTV is the process of delivering television (video and/or audio) services over Internet protocol (IP) networks. These IP networks initiate, process, and receive voice or multimedia communications using Internet protocol. These IP systems may be public IP systems (eg, the Internet), private data systems (eg, LAN based), or a hybrid of public and private systems. |

| Term | Definition |
|---|---|
| ISP | Internet service provider. An ISP is a company that receives and converts (formats) information to and from Internet connections to Internet end users. An ISP purchases a high-speed link to the Internet and divides up the data transmission to allow many more users to connect to the Internet. |
| Jitter | The short-term variation of transmission delay time for data packets that usually results from varying time delays in transmission due to different paths or routing processes. |
| kbps | Kilobit per second. kbps is a measure of data transmission equal to one thousand bits per second. |
| Latency | Latency is the amount of time delay between the initiation of a service request for data transmission or when data is initially received for retransmission to the time when the data transmission service request is granted or when the retransmission of data begins. |
| Lead-in | The lead-in cable is the cable from the fibre or copper access point to the customer's premises. |
| LFC | Local Fibre Company. |
| LTE | Long term evolution, a 4$^{th}$ generation mobile technology. Relative to 3$^{rd}$ generation wireless, the LTE specification enables 100 Mbps+ data transmission rates, increased system capacity and shorter transmission latency times. |
| Massively multiplayer online gaming | A massively multiplayer online game (MMO or MMOG) is a multiplayer video game which is capable of supporting hundreds or thousands of players simultaneously. |
| MB | Megabyte. A megabyte is one million bytes of data. When megabyte is used to identify the amount of data storage space (such as computer memory or a hard disk), a megabyte commonly refers to 1,048,576 bytes of information. |
| Mbps | Megabit per second. A measurement of digital bandwidth where 1 Mbps =1 million bits per second (1,000,000 bits per second). The word 'mega' is sometimes used to describe the nearest integral power of 2, namely 1,048,567. |
| OECD | Organisation for Economic Co-operation and Development. |
| OTT services | Over the top services are applications, and their associated communication transmission, provided for the benefit of the user through the use of underlying services. An example of an over the top service is a telephone or television service that is provided over an Internet connection. |

| Term | Definition |
|---|---|
| P2P | Peer to peer is the exchange of information between devices or systems that are capable of operating as both a server (provider) of information and a client (consumer) of information. |
| POI | Point of interconnect. The geographical location where two networks interconnect and exchange traffic. |
| Primary links | Primary links are the backhaul links between the small exchanges and the main exchanges. |
| PSTN | Public Switched Telephone Network. |
| QoS | Quality of service (QoS) is an attribute of desired performance and priorities of a communications system. QoS measures may include service availability, maximum bit error rate (BER), minimum committed bit rate (CBR) and other measurements that are used to ensure quality communications service. |
| RBI | Rural broadband initiative. |
| SD | Standard definition. SD television is the resolution of traditional analogue television. Standard definition for PAL/SECAM is 576 lines with 50 interlaced fields (50i) per second. |
| SDSL | Symmetrical digital subscriber line. |
| Secondary links | Secondary links are the backhaul links between Telecom's 29 points of interconnect (POI). |
| SME | Small and medium business. A SME business is a business with 19 or fewer employees which also meet at least one of the following criteria:<br>▪ annual expenses or sales subject to GST of more than $30,000<br>▪ 12-month rolling mean employee count of greater than three<br>▪ part of a group of enterprises<br>▪ registered for GST and involved in agriculture or forestry<br>▪ over $40,000 of income recorded in the IR10 annual tax return (this includes some units in residential property leasing and rental). |
| UFB | Ultra-fast broadband. |
| VDSL | Very high speed Digital Subscriber Line. |
| VOIP | Voice Over Internet Protocol (VoIP) is a process of sending voice telephone signals over the Internet or other data network. If the telephone signal is in analogue form (voice or fax) the signal is first converted to a digital form. Packet routing information is then added to the digital voice signal so it can be routed through the Internet or data network. |

| Term | Definition |
|---|---|
| WCDMA | Wideband code division multiple access is a 3rd generation mobile communication system compatible with GSM mobile radio communication system. |
| WiMAX | WiMAX is a wireless communications standards-based technology that is used in Point-to-Point and Point-to-Multipoint wireless networks. WiMAX is based on the IEEE 802.16 standard and the name WiMAX is a marketing term coined by the WiMAX Forum. |

## High speed broadband definition and Network Map

### High speed broadband

9. For the purpose of this study the Commission has defined high speed broadband as a broadband service capable of a peak speed of at least 50/50 Mbps with sufficient other technical characteristics to deliver the applications and content in the following table.

10. High speed broadband is not a static concept; it will evolve over time, as applications, content and needs change.

**Table 2: High Speed Broadband Applications and Content**

| Bandwidth (upstream and downstream) | Example applications and content |
|---|---|
| 500 kbps – 1 Mbps | ▪ Voice over IP<br>▪ Email<br>▪ Basic web browsing<br>▪ Streaming music (cached)<br>▪ Low quality video |
| 1 Mbps – 5 Mbps | ▪ Email with large attachments<br>▪ File sharing (small – medium)<br>▪ Remote surveillance<br>▪ IPTV Standard Definition (SD)<br>▪ Streaming music |
| 5 Mbps – 10 Mbps | ▪ Telecommuting (converged services)<br>▪ IPTV SD (multiple channels)<br>▪ HD video downloading<br>▪ Gaming<br>▪ Medical – file sharing and remote diagnosis (basic)<br>▪ Remote education<br>▪ Building control |
| 10 Mbps – 50 Mbps | ▪ Telemedicine<br>▪ Education services<br>▪ IPTV – HD (2-3 channels)<br>▪ Gaming (complex)<br>▪ Telecommuting with HD video<br>▪ HD surveillance<br>▪ Smart building control |

## Network map

12. We use the simplified network map below as a guide throughout this paper. The map shows the components of a broadband internet service from the end-user to the IP interconnect point: home network and wiring, local access network, exchange facilities, domestic and international backhaul and the Internet. The map is technology neutral, eg, the local access components could be either fixed or wireless.

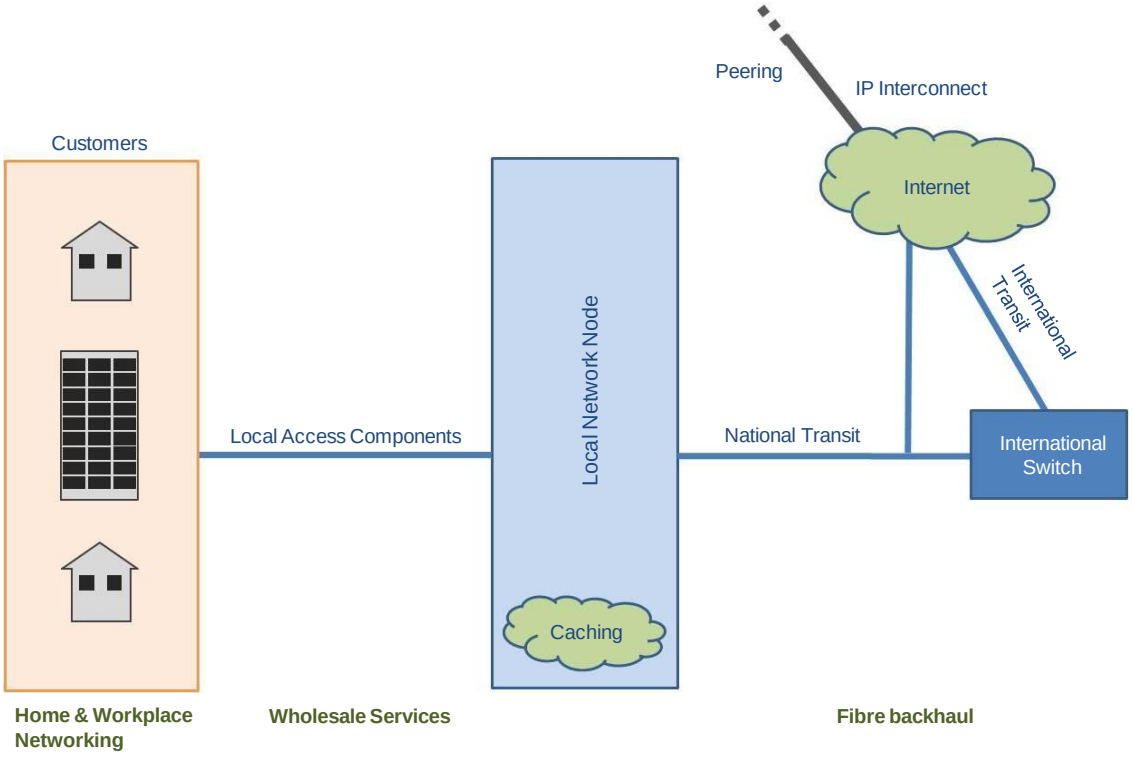
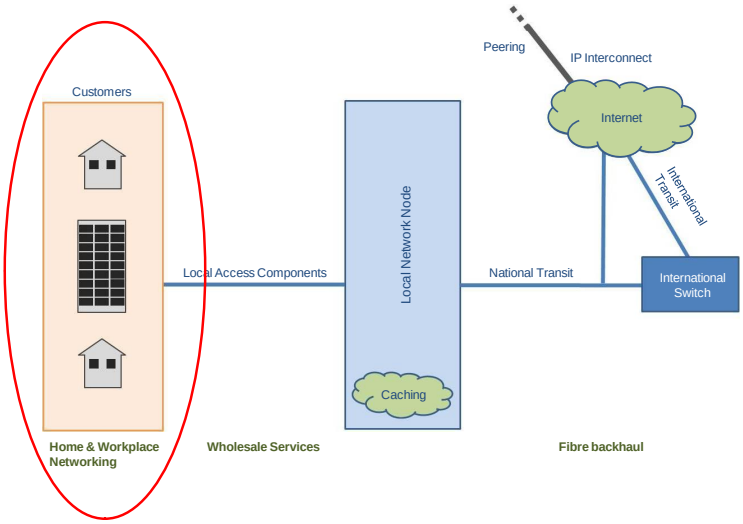



*Figure 1: Network map*

## Home and workplace networking

13. Our definition of home and workplace networking includes lead-ins (to the workplace or home), home and business wiring and customer premises equipment. This part of the high speed broadband network is highlighted in the diagram below.




14. There are issues in all three areas grouped under the home and workplace networking umbrella. These issues largely arise due to the shift from analogue to digital connections that will happen once premises are connected to the UFB network.

**Lead-ins**

15. The lead-in cable is the cable from the street to a customer's premises (as shown in figure 2 below).[3]

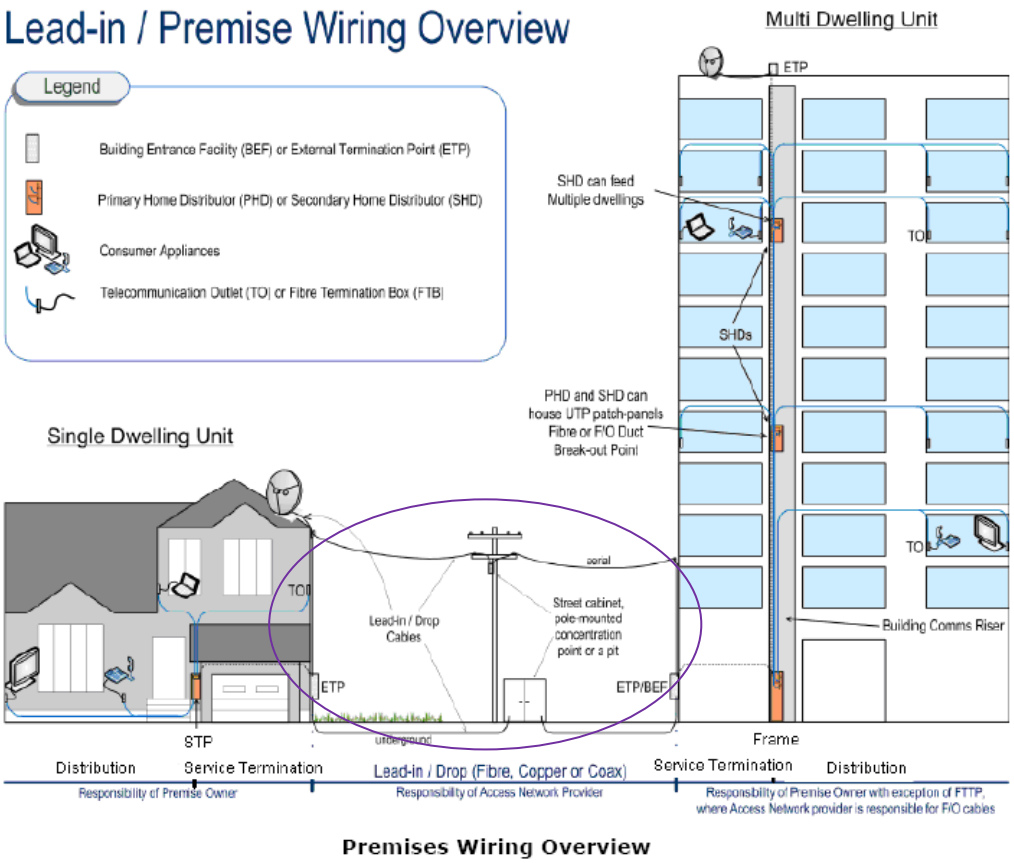



*Figure 2: Lead-in / Premise wiring overview*

16. The cost of connecting 'standard' residential customer premises to the network will be met by Chorus and the LFCs. Non-standard residential connections (where the connection distance is longer than an agreed distance, see below, or conditions are 'unusually' difficult) and business customers will have to contribute to the cost of the connections.[4]

17. The Commission understands that in the UFB contracts a standard connection is defined as that where the lead-in is:

    - overhead and up to 30 metres in length / single span of aerial drop lead
    - underground and up to 15 metres in length

    from the fibre access point (the access point for connecting and maintaining the lead-in to the distribution network fibre) to the External Termination Point (ETP) on the premises agreed with the customer. A number of key points remain unclear, for example:

[3] Source: Chorus.

[4] Grant Samuel Report, *Telecom scheme booklet*, page 369.

- where fibre access points will be situated in the relation to the ETPs of the premises they serve (i.e. where the 15 or 30 metres will begin)
- for properties on back sections, if the 15 or 30 metres will commence at a fibre access point beyond the boundary of the property in front.

18. As an example, the table below shows Chorus' and NorthPower's (NP) connection prices for UFB services:

**Table 3: Prices for connection to UFB services**

| Type of UFB service | Standard connection | Non-standard connection | | Percentage of non-standard connections |
|---|---|---|---|---|
| | Chorus and NP | Chorus | NP | |
| Residential | $0 | $85 per hour & materials | $60.50 & per metre cost[5] | Unknown. Could be significant. |
| Business GPON | 1 x monthly rental | | | Unknown. Could be significant. |
| Business P2P | 2 x monthly rental | | | Unknown. Could be significant. |

19. There is no data available on the number of residential and business customers with non-standard connections. For these customers the additional cost to connect to the UFB network could be material. There is a perception that there are no connection charges for households.[6]

20. The consumer and SME surveys commissioned for this study suggest that cost of re-wiring is seen by both consumers and, to a lesser extent, SMEs as a significant barrier to the uptake of high speed broadband services. Consumer and SMEs are likely to view non-standard connections costs as an equally significant barrier.

**Key Points**

It is not clear how many consumers and businesses will have non-standard connections or who will pay for them.

Where customers have to pay for non-standard connections, this is likely to be a significant barrier to uptake.

5 NorthPower's additional per metre cost is $22.79 per metre underground and $159.04 per additional span overhead.

6 Ministerial press statement, 24 May 2011 http://beehive.govt.nz/release/ultra-fast-broadband-deal-puts-nz-ahead-pack.

**Customer premises equipment (CPE)**

21. Customer premises equipment is the telecommunication equipment (faxes, phones, security systems, alarms TVs, set top boxes, game consoles etc) that end-users have in their houses or businesses. Most of this equipment is designed to run over copper and may not work reliably when connected to fibre.

22. In a document provided to the Minister of Communications and Information Technology on 31 March 2011, Telecom estimated that 1.6-1.7 million customers could be impacted by having to move to an IP environment. Telecom also estimated[7] that replacing the impacted CPE equipment at $811m, as shown in figure 3 below.[8]

| Application | No. of users | Unit cost | Replacement cost ($ x Vol) | Comments |
|---|---|---|---|---|
| Fax | 447,000 | $250[31] | $112m | Newer faxes supporting V.34 suffer greater degradation |
| Sky (for video on demand) | 557,000 | $225[32] | $125m | MySky STB supports native IP, other STBs do not |
| Security alarms | 100-200,000 | $1650[33] | $248m | IP solutions not widely supported by industry |
| Medical alarms | 50,000 | $1293[34] | $65m | No IP solutions currently available |
| EFT-POS | 60,000[35] | $1500[35] | $90m | Many terminals recently replaced to support smart cards[35] and which don't support IP |
| Deaf Relay Service (TTY) | ~900 | - | - | Not quantified |
| Dial-up Internet access | 350-400,000 | $455[36] | $171m | IP alternatives readily available |
| Totals | 1.6-1.7m | | $811m | |

[31] Average of three options on dse website: http://www.dse.co.nz/dse.shop/en/catalog/CTG0000048_lp
[32] Average of three cheapest Freeview HD receivers (as proxy for Sky receiver with Ethernet port) on http://www.freeviewnz.tv/products_and_retailers/listing/hd/digital_receivers
[33] Mid point of NZ Police estimates: http://www.police.govt.nz/safety/home.burglar.alarms.html
[34] Assumes: $20 weekly cost, 50% hardware, 3 year lifecycle, discount rate of 10% (for NPV)
[35] See "All NZ Eftpos terminals to get upgrade before 2011", NZ Herald Tuesday May 25, http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10647300
[36] Assumes: $10 monthly broadband cost and 5 year NPV (10% discount rate)

*Figure 3: Telecom estimation of selected copper to fibre migration costs*

23. The Commission understands that there are solutions that would enable current equipment to work in an IP environment, eg, analogue telephone adaptors. However, these solutions may not be suitable for some applications (including medical and security alarm monitoring) due to reliability problems.

**Key Points**

It is not clear whether equipment designed to run over copper will work reliably in an IP environment. This may be a significant additional barrier to uptake of high speed broadband.

[7] These figures are likely to be overstated, as some upgrades would occur independently from the move to an IP environment (eg, old or broken equipment being upgraded). In addition upgrades typically are not just a cost but also include some benefits, such as enhanced quality and longer life.

[8] http://www.med.govt.nz/upload/78162/Variation%204%20PSTN%20Migration%20(White%20Paper).pdf.

**Home and workplace wiring**

*For consumers and SME rewiring is the most significant barrier*

24. The Commission surveyed consumers and SME on likely barriers to upgrading to a faster service (see figures 4 and 5 below). The surveys found that for both groups, the most significant barrier was the cost of rewiring premises.

25. 66% of the consumers surveyed thought that the cost of rewiring premises was a significant barrier to the uptake of faster broadband.

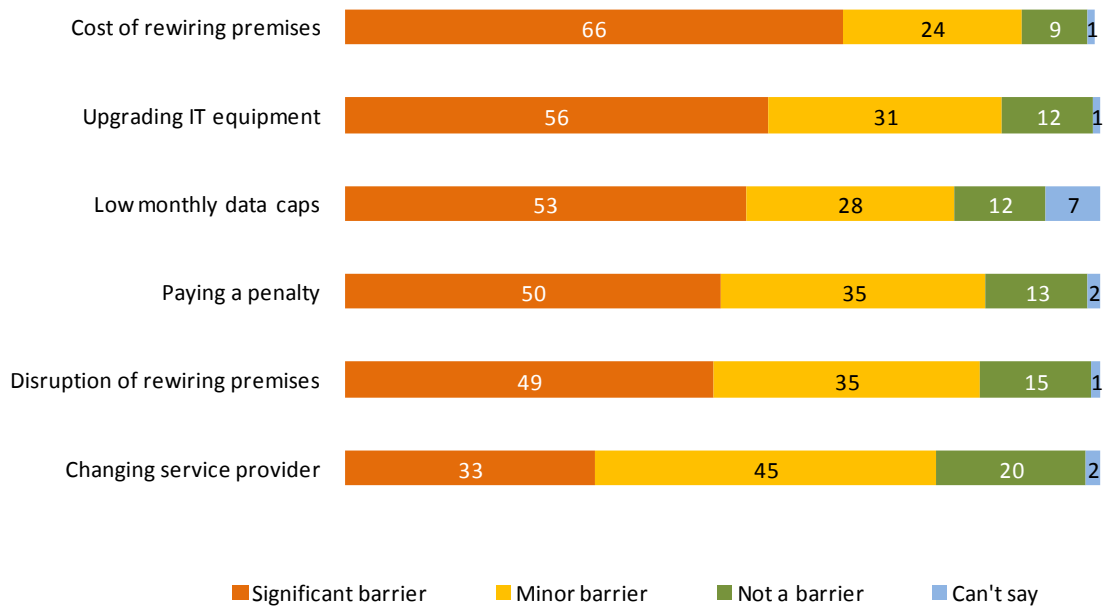



*Figure 4: Barriers to high speed broadband uptake, source: Roy Morgan consumer survey 2011*

26. SMEs also thought that the cost of rewiring would be a barrier to upgrading to a faster broadband service. For almost half of the SMEs sampled, rewiring would be a definite barrier if it meant that they were unable to work while the rewiring took place. The percentage dropped to 32% if only some inconvenience was caused by the re-wiring work. This is shown in figure 5 below.

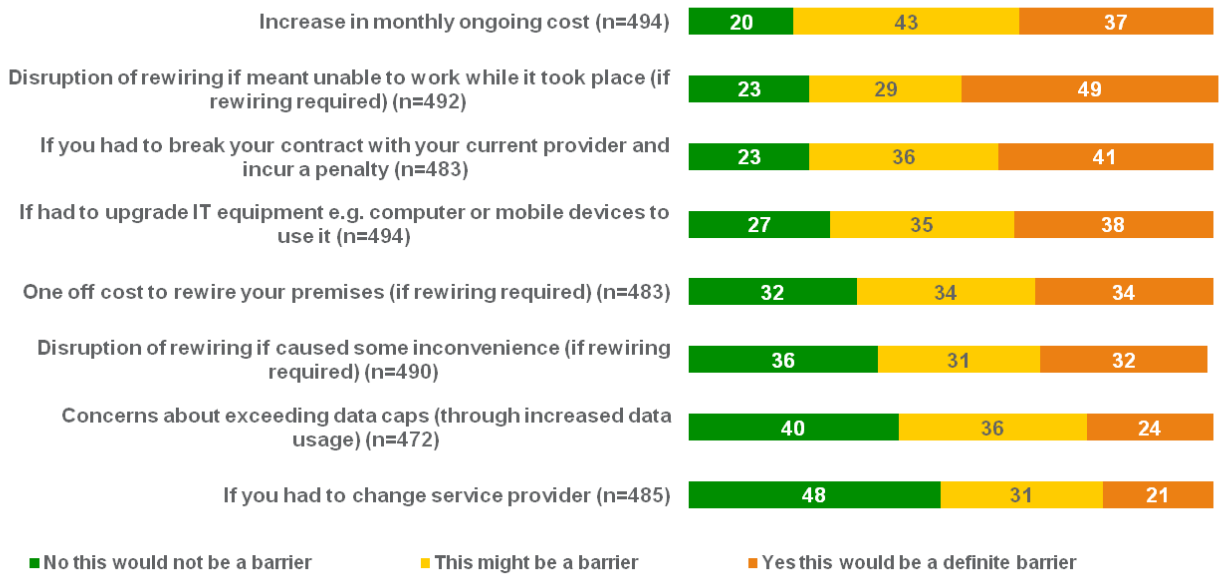



*Figure 5: Barriers to high speed broadband uptake, source: Nielsen SME survey 2011*

*Premises wiring issues*

27. The issues related to in-house wiring vary depending on whether the premises are:

    - existing homes
    - new homes
    - homes in apartments blocks (multi-dwelling units).

28. Chorus indicated that the only truly fibre-ready homes today are new homes that have cat 5/6 wiring. In all other instances there are likely to be issues related to home wiring.

*Existing homes*

29. The Commission understands that wiring in the majority of existing homes will not be able to carry high speed broadband traffic. These homes are not 'fibre-ready' and, if connected to the UFB network, are unlikely to truly experience high speed broadband. The cost of rewiring a house to make it fibre ready could vary between a few hundred and a few thousand dollars, depending on each specific situation. None of the stakeholders surveyed by the Commission provided specific information on the cost of rewiring.

*New homes*

30. Fewer wiring issues might be experienced in new homes, as these should be built with the latest fibre-ready technology. However this is not always the case and the Commission understands that there have been instances where inadequate wiring was installed in new developments. These inadequate installations could be an

indication that builders/electricians are not aware of fibre requirements or that substandard cabling might be installed as a money saving solution.

*Multi-dwelling units*

31. We understand that Chorus and the LFCs have agreed to take the lead in installing infrastructure to support connections to the UFB network in multi-unit complexes where retail service providers have identified demand for UFB services. However this might not extend to an obligation on Chorus and LFCs to deploy this infrastructure and it is not clear who will be responsible for meeting the costs of these deployments (eg, retail service providers or building owners).

32. There are similar issues with business premises.

*Wireless networks*

33. It has been suggested that re-wiring of premises could be avoided by using wireless networks, eg, IEEE 802.11n, however the Commission's understanding is that, currently, wireless networks do not provide reliable support for high speed broadband services.

*Ownership issue*

34. Chorus and the LFCs are not responsible for the home wiring; they are only responsible for getting the fibre to the premises. Home owners are responsible for the wiring within their house (where the wiring will go, how many access points are required, understanding the equipment that will be used etc). Retail service providers could assist with this; however they seem to be slow or reluctant to take ownership of the coordination of the home wiring.

**Key Points**

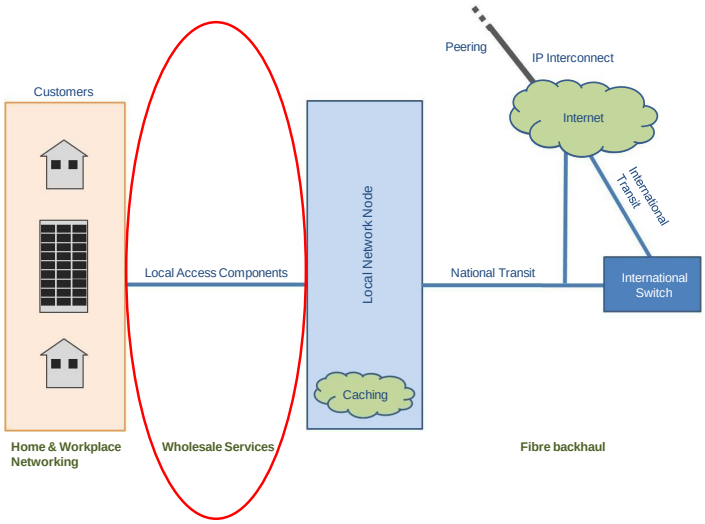
Premises re-wiring may be required to enable users to experience the full benefits of high speed broadband.

For both consumers and businesses the cost of premises re-wiring will be a significant barrier to uptake of high speed broadband.

These wiring issues need to be addressed to ensure that consumers and businesses are fully informed about the costs involved and the implications of not re-wiring.

## Local Access Network

35. The local access network includes the connection by a transmission medium (such as copper wire, optical fibre, mobile, wireless or satellite) between each subscriber and a local network node, commonly known as an exchange or central office.




36. Table 4 below examines whether these local access networks are capable of being used as a component of delivering retail high speed broadband services.

37. The local access network in itself is not a high speed broadband service. The delivery of high speed broadband services requires other components, such as sufficient capacity for national and international transit. So, for example, a retail broadband service using a 50/50 Mbps fibre-to-the-premises local access component would not be high speed broadband if the retail service provider provisioned insufficient capacity for national and international transit.

**Table 4: Local access network components as input into retail high speed broadband services**

| Local access network component | | Example of each access component | As an input into retail high speed broadband services (eg, 50/50 Mbps) | | Comment |
|---|---|---|---|---|---|
| | | | Possible? | Currently provided? | |
| 1 | Regulated UBA (ADSL2+) | EUBA | ✗ | ✗ | The regulated UBA service is not capable of supporting a high speed broadband retail service. |
| 3 | Commercial bitstream (VDSL) | VDSL | ✗ | ✗ | Telecom is soft launching a commercial bitstream service using VDSL which will not be capable of supporting retail high speed broadband services. In the future, it is possible that technologies such as vectoring may change this. |
| 4 | SDSL | SDSL | ✓ | ✗ | A symmetrical digital subscriber line (SDSL) product would be technically capable of supporting retail high speed broadband services. |
| 5 | HFC (Hybrid Fibre Coax) | TelstraClear cable | ✓ | ✗ | The HFC local access component can be used to provide retail high speed broadband services. TelstraClear trialled high speed broadband services earlier this year but did not proceed to offer retail services citing low demand. However, it has recently announced it may re-launch them. |
| 6 | FTTP (Fibre to the premises) | UFB Services | ✓ | ✓ | Both P2P and PON FTTP services can be used to provide retail high speed broadband services. |
| 7 | 3G Mobile | WCDMA | ✗ | ✗ | Existing 3G technology cannot be used to provide retail high speed broadband services. |
| 8 | LTE/4G Mobile | None yet in NZ | ✓ | ✗ | LTE is likely to be technically capable of supporting retail high speed broadband services. |
| 9 | Fixed Wireless | WiMAX | ✗ | ✗ | Existing wireless technology cannot provide high speed broadband. Next generation wireless may be technically capable of doing so. |
| 10 | RBI fixed wireless | Vodafone RBI | ✗ | ✗ | The RBI service is restricted to a maximum speed per end user of 5 Mbps and the radio resource is dimensioned at 90kbps per end-user. |

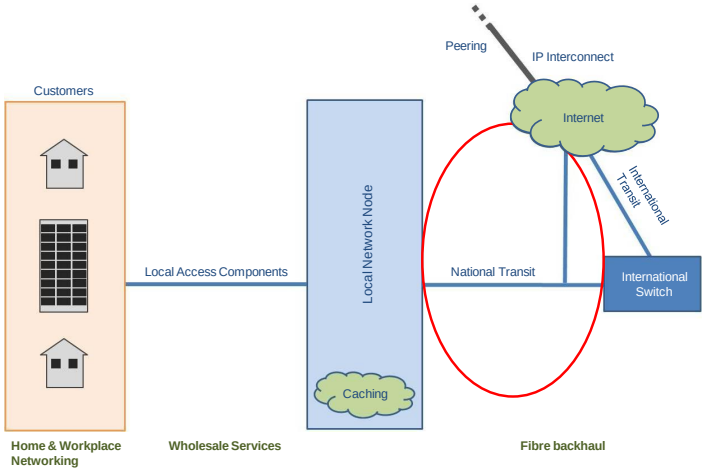
## Key Points

SDSL, HFC, FTTP and LTE/4G are the local access components capable of providing inputs into high-speed broadband services. Of these, FTTP should be the most significant.

## National Transit

### Description of national transit

38. National transit refers to data transmission between local network nodes within New Zealand using the network components highlighted in the diagram below:




### State of competition for national transit

39. Most ISPs purchase national transit from third party suppliers. The Commission regulates national transit services that support UCLL and UBA, exempting competitive links from regulation. The Commission has found that competition for national transit has increased since 2008 with the number of competitive links increasing substantially. These findings are summarised in Attachment A.

40. Competition is likely to increase further because of recent market developments including:

- as demand for high speed broadband increases, the incentives to invest in infrastructure to provide national transit should increase
- FX Networks (FX) intends to build out to and interconnect at:
  a. UCLL exchanges – FX currently interconnects at 21 exchanges and intends to build out to more; and
  b. most of the UFB POIs
- it was recently reported that China Telecom has invested in a cable from Auckland to Whangarei together with Datalight and Maori Interests[9], and that further such investments are possible.[10]

9 http://www.nbr.co.nz/article/snubbed-government-iwi-secure-china-telecom-funding-auckland-whangarei-cable-ck-85258.

10 http://computerworld.co.nz/news.nsf/news/national-backhaul-may-be-next-for-chinese-investors.

41. The Commission is currently conducting a review of the regulated national transit services. There will also be a discussion of transformational technology and future data needs at the conference on 20 and 21 February 2012 following a presentation by Dr Robert Pepper, VP Global Technology Policy at Cisco, where national transit issues will be addressed.[11]

**Key Points**

The Commission has found that competition for national transit has increased since 2008 and recent developments may increase competition further.

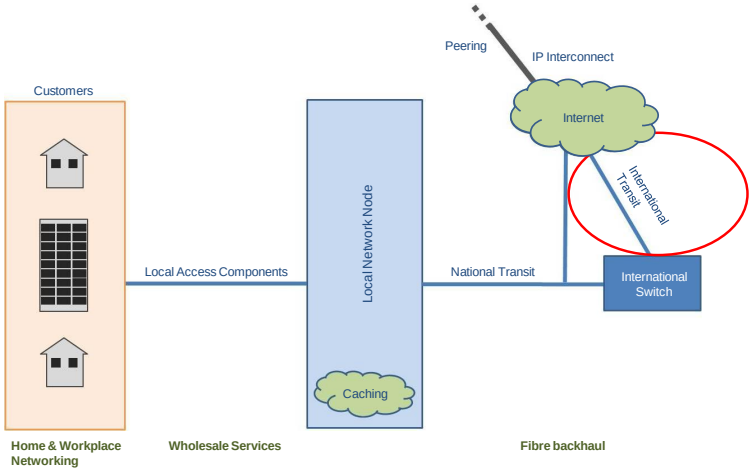
The Commission is conducting a review of national transit.

[11] The conference programme is available at: http://www.futurebroadband.co.nz/programme

## International Transit

### Description of international transit

42. International transit refers to data transmission from New Zealand's international switch to other countries, and data transmission within those countries, using the network components highlighted in the diagram below:




43. Almost all of New Zealand's international connectivity is provided by the Southern Cross Cable.[12] Alternative international cables have been proposed, with current attention focused primarily on Pacific Fibre and China Telecom as the most likely new entrants. Kordia has recently put on hold its planned OptiKor cable, citing that 'the market isn't quite ready for the cable'.[13]

44. There is ongoing concern about international transit because of New Zealand's heavy reliance on data sourced internationally (historically about 90%).

*The Southern Cross Cable*

45. The Southern Cross Cable forms a 'figure of eight' with southern and northern loops linking New Zealand and Australia to Fiji, Hawaii and the United States. Southern Cross is owned by Telecom (50%), SingTel (40%), and Verizon (10%). Southern Cross says that its prices in New Zealand are benchmarked against the prices it offers in Australia.

*Developments*

46. Pacific Fibre intends to build an international cable via Sydney/Auckland/Samoa/Los Angeles to be completed by the end of 2014.[14] China Telecom has recently announced

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12 There is a second Trans-Tasman cable which has very limited capacity and is operated by Telecom. It is, therefore, generally discounted from analyses of New Zealand's international connectivity market.

13 http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10753031.

14 http://pacificfibre.net/.

that it may invest in a Trans-Tasman cable in partnership with Huawei to be laid by the end of 2012.[15]

**International connectivity markets**

47. The structure of the New Zealand wholesale market for international data capacity is shown in the simplified diagram below (a comprehensive map of New Zealand international connectivity is provided in Attachment B).

48. While there is a single international cable, there are a number of wholesalers providing wholesale data transmission services to retail service providers. At the right edge of the diagram in figure 6 below is Southern Cross, which operates the Southern Cross international cable. The wholesalers sell wholesale services denoted in Mbps to ISPs. The ISPs use those wholesale services as inputs into their retail broadband services.

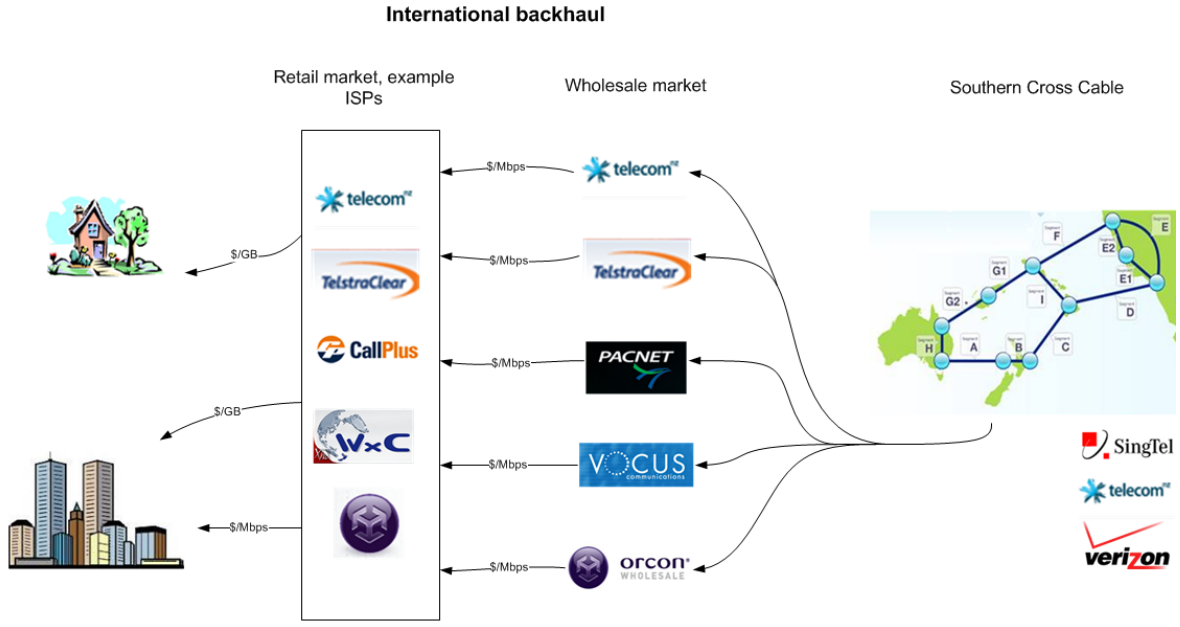


*Figure 6: International connectivity markets*[16]

**Analysis of competition in the wholesale market**

49. In the last couple of years there has been evidence of significantly greater competition in the wholesale market including:

- significant falls in prices paid by retail service providers (see figure 7 below)
- new entry in the wholesale market
- the ability of retail service providers to switch between wholesale providers

15 http://www.nbr.co.nz/article/bombshell-ck-p-100737.

16 Orcon Wholesale operates in the wholesale market through Odyssey Networks. It was stated in the October 2011 edition of *Spectrum* that Odyssey sub-leases cable capacity to provide international transit services. Orcon is owned by Kordia.

- evidence of some flow-on effects to down-stream markets, such as reduced retail prices and higher data caps.

50. The price of international transit has fallen significantly in recent years. For example the graph below shows the relative changes in the price of international transit per Mbps/month observed by two ISPs between 2006 and 2011:[17]

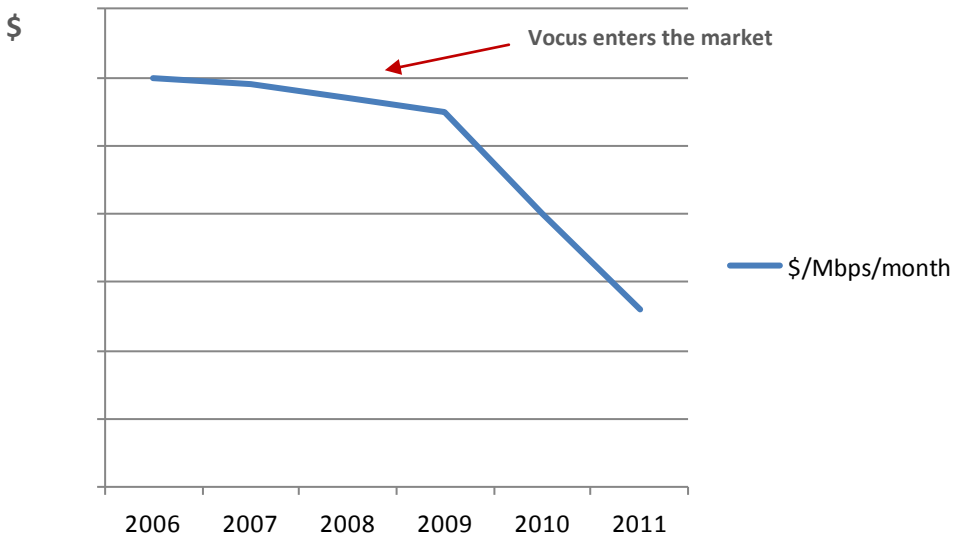


*Figure 7: Effective price ($) of international transit purchased at the date indicated*[18]

51. The price of international connectivity may continue to fall further with continued competitive pressure on the wholesale market and two possible infrastructure new entrants (Pacific Fibre and China Telecom).

52. As noted above, there will also be a discussion of transformational technology and future data needs at the conference on 20 and 21 February 2012 following a presentation by Dr Robert Pepper, VP Global Technology Policy at Cisco, where international transit issues will be addressed.[19]

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17 The dollar amounts on this graph have been removed because they were sourced from commercially sensitive information provided to the Commission.

18 Because ISPs have purchased capacity at earlier dates, the effective price they pay will be higher than the market price.

19 The conference programme is available at: http://www.futurebroadband.co.nz/programme.

**Analysis of the retail market - from Mbps to GB**

53. ISPs generally purchase international connectivity in Mbps/month and provide retail broadband services denoted in GB to residential and some business customers.

54. There is not a simple, direct relationship between international connectivity costs (which are measured in Mbps) and customer data costs and data caps (which are denoted in GB).

55. In fact, retail data caps can be increased without additional costs to the ISP up until the point at which they impact quality of service (eg, because they materially increase peak time usage). At that point, the ISP will have to increase its international and/or domestic backhaul provisioning to maintain quality of service; although even then it will not necessarily be a 1 to 1 relationship with the increase in retail data usage/caps.[20]

**Key Points**

The price of international connectivity has fallen significantly since 2008 as the wholesale market has become more competitive.

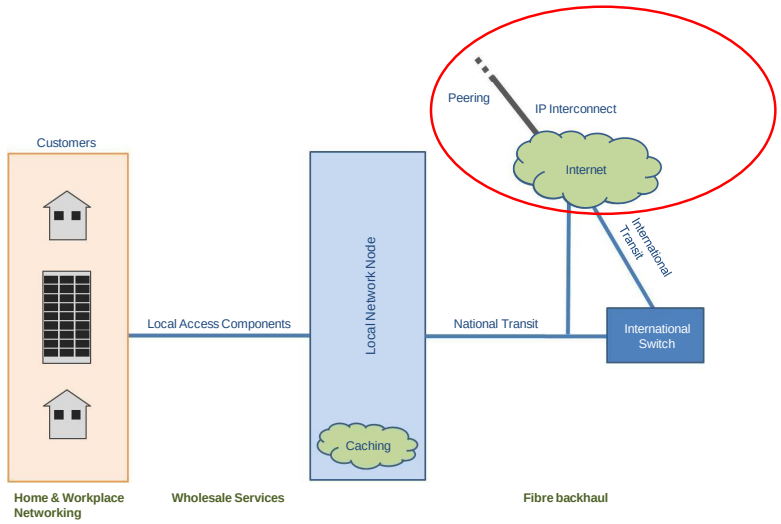
Two companies have announced intentions to build additional international cables.

[20] Although, note that provisioning of backhaul is 'lumpy' because backhaul must be provisioned in xx Mbps and relies on forecasting of customer demand.

# Peering

## Definition

56. Peering is the interconnection of two separate internet networks, enabling the customers of each network to exchange traffic.




57. Peering enables Internet networks to communicate with each other, as demonstrated in figure 8 below. Traditionally peering is on a 'bill and keep' basis (i.e. each network agrees to terminate traffic from the other network at no charge).

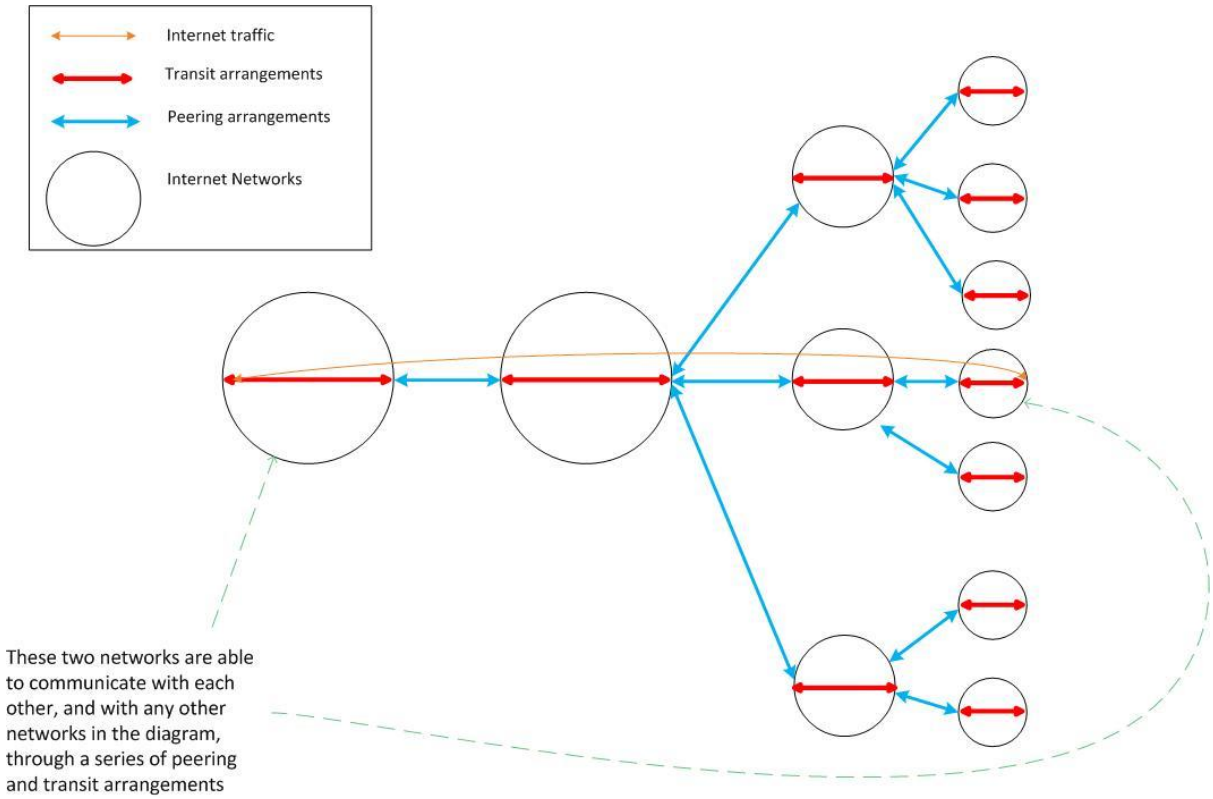



*Figure 8: Explanation of peering*

**Concerns about peering**

58. It has been reported that there are issues with peering in New Zealand, with reports of networks taking local traffic off-shore (usually to the West Coast USA) to peer, since this was preferable to peering on-shore. This could indicate a problem with peering in New Zealand; however facts to back up these reports have been elusive.

59. A possible explanation has been advanced, suggesting that web-hosting can be purchased more cheaply in the USA than in New Zealand, and that some US hosting services also offer free peering with the US internet backbone, an otherwise expensive facility.

60. It is possible therefore that some .nz websites are hosted in the USA for economic reasons and that there is actually no local traffic to peer with, as the traffic is coming from the US.

## Key Points

Evidence to date suggests that peering is not a problem in New Zealand.

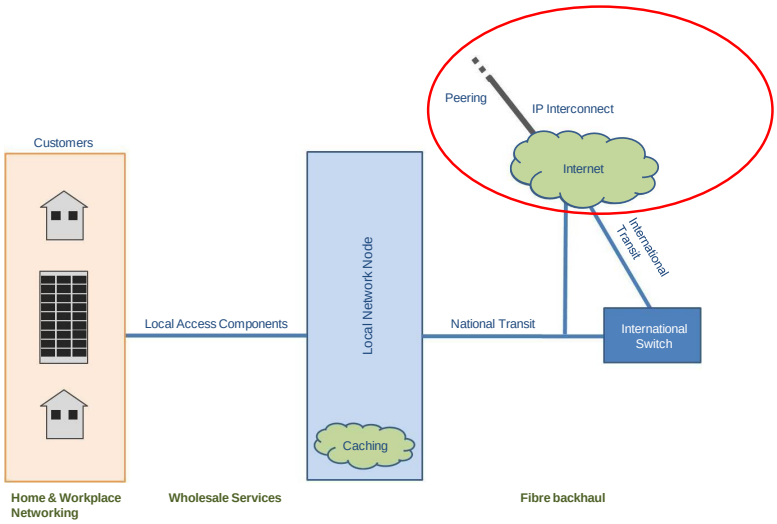
A possible explanation for 'the problem of peering' might be the hosting of many NZ website in other countries. This may be an issue, however we have not addressed it in this issues paper as it is outside the scope of the study.

## IP interconnection

### Definition

61. IP interconnection refers to:

- the physical interconnection of IP infrastructure belonging to two or more carriers
- the interworking of services (such as IP voice calls) enabling effective communication between the customers of competing retail service providers.




### IP interconnection in New Zealand

62. In June 2008, the Telecommunication Carrier's Forum (TCF) established the IP Interconnection working party (IPIWP) to provide a forum for Telecom to consult with industry on IP interconnection issues (as part of its Operational Separation Undertakings), and to develop an industry code of practice for IP Interconnection

63. In 2010 the scope of the IPIWP was revised to cover three key areas of interconnection of VOIP only:

- commercial principles
- technical standards
- technical trial and/or pilot.

64. To date, the IPIWP has focused on a trial using 'Minimum Technical Standards' required to pass IP voice calls. The minimum standard specifies interconnection of voice converted to ITU-T G.711 standard for interconnection (PSTN standard), with all other options to be negotiated on a bi-lateral basis.

65. Due to a perceived lack of value in trialling, most existing VoIP providers have pulled out of the process, citing resource issues and a view that the trial results will be irrelevant by the time there is significant migration of PSTN customers to IP.[21]

**Next steps for IP interconnection**

66. In the longer term, it is likely that mainstream voice services will evolve and diverge from the PSTN service description. Changes may include:

- no requirement for conventional telephone numbers/dialling
- the integration of video, messaging and other information (such as location) into the call
- higher or lower quality/price options under user control.

67. IP service interconnection to support innovation and the evolution of future IP services is outside the scope of current commercial or standardised IP interconnection schemes.

## Key Points

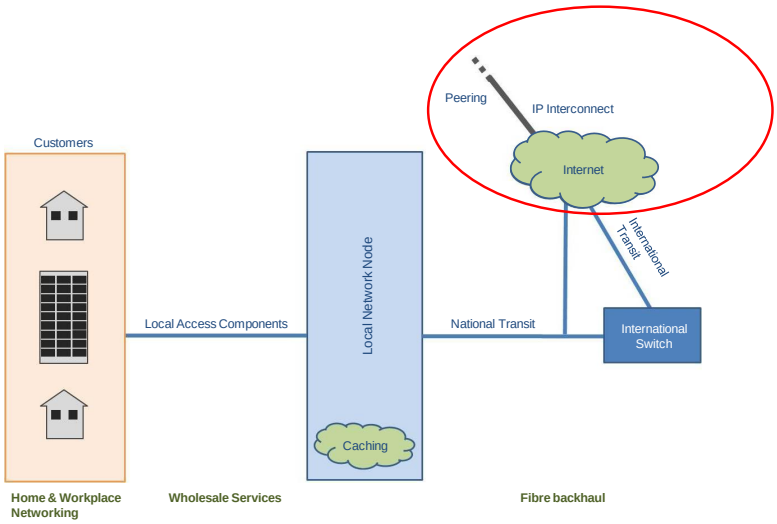
IP interconnect does not seem to pose a significant problem at the moment. As the number of IP services increases it is likely that IP interconnect will become an industry issue, if not solved commercially.

[21] There is currently no forecast for this migration except for a general understanding that the PSTN platform is nearing the end of its viable lifetime, and that migration will ultimately be required.

## Network Neutrality

### Definition of network neutrality

68. Net neutrality is the principle that ISPs will handle all network traffic in a non-discriminatory manner. The key to the network neutrality debate is about which forms of network discrimination are appropriate.




### Different forms of network discrimination

69. Network discrimination can take a number of different forms including differentiation by:

- service – eg, prioritising real-time services such as VoIP
- participant (i.e. IP address) – offering a different QoS to different customers
- volume or density of traffic – time of day charging, unmetering of specific content or sites
- bans on servers – eg, blocking P2P traffic
- application level filtering – filtering suspicious traffic, such as traffic containing viruses.

### The net neutrality debate

70. The proponents of net neutrality consider that:

- allowing ISPs and network operators to discriminate against competing or unaffiliated content and services damages competition in downstream content and applications markets
- failure to mandate net neutrality would mean the Internet would cease to be free and open, which would stifle innovation and prevent the emergence of new highly valued content.

71. Opponents of net neutrality consider that reducing the ability of ISPs to manage their networks would be inefficient and undermine their ability to offset the high investment costs of upgrading and expanding their networks.

72. Most commentators agree that differentiation required for network management is likely to be appropriate. The key concern is that ISPs may block or discriminate against certain users or applications in order to give an advantage to their own services and making commercial deals with content providers to give preferential access to content in 'walled gardens'.

**Network neutrality in New Zealand**

73. Stakeholders interviewed by the Commission generally considered that net neutrality was not a significant issue in New Zealand.

74. Network neutrality should not be an issue if ISPs are transparent about the limitations or restrictions placed on their broadband services. There are sufficient competing ISPs for customers to switch relatively easily to a provider that does not impose those restrictions. The Commission also has powers under general competition law to intervene to prevent anti-competitive behaviour.

75. Encouraging or requiring ISPs to disclose to consumers in a comprehensible way the limitations or restrictions on their retail services would assist these competitive processes.

## Key Points

Network neutrality should not be an issue if ISPs are transparent about the limitations or restrictions placed on their broadband services. There are sufficient competing ISPs for customers to switch relatively easily to a provider that does not impose those restrictions.

Encouraging or requiring ISPs to disclose the limitations or restrictions on retail services would assist these competitive processes.

## Fixed Line Data Caps

### Why data caps are important

76. One potential key driver of ultra-fast broadband services is content such as HD movies.[22] This content requires large blocks of data to be downloaded and may lead consumers to hit data caps. Some of the stakeholders interviewed by the Commission believed that data caps discourage consumers from downloading content for the fear of exceeding data caps. Several mentioned bill shock as potential issue for consumers.

### What are data caps for?

77. Some stakeholders considered that data caps were a way of managing limited capacity. Given capacity limits are generally restricted to peak times of day, while data caps are usage over a set period, data caps are unlikely to efficiently manage peak time capacity usage. This may be because management of usage at particular times of day is more difficult for consumers to understand than a flat cap over a set period.

78. An alternative explanation is that data caps provide a method for ISPs to differentiate their packages to consumers and is a form of yield management.[23] This alternative can be beneficial to both broadband suppliers and consumers in circumstances where it allows for the provision of low price entry packages with small data caps because it would increase the number of households subscribing to a broadband package.

79. Attachment C discusses these issues in more depth.

[22] The issues relating to content will be discussed in Paper 3, which will be published in early February 2012.

[23] Yield management is where companies differentiate their products in order to charge more to those consumers who value their services more. In competitive markets this is usually efficient as it can allow companies to recoup their fixed costs without pricing some consumers out of the market.

**Where does NZ stand?**

80. The OECD has published international comparators on data caps. Among the comparable countries, New Zealand has one of the highest prevalence of data caps and lowest levels of caps. Snapshots of industry data caps in 2010 are illustrated in figures 9 and 10 (caps have increased from these levels – see the discussion in the next section). The Commission's analysis of the historical reasons for the development of fixed line data caps in New Zealand is set out in Attachment C.

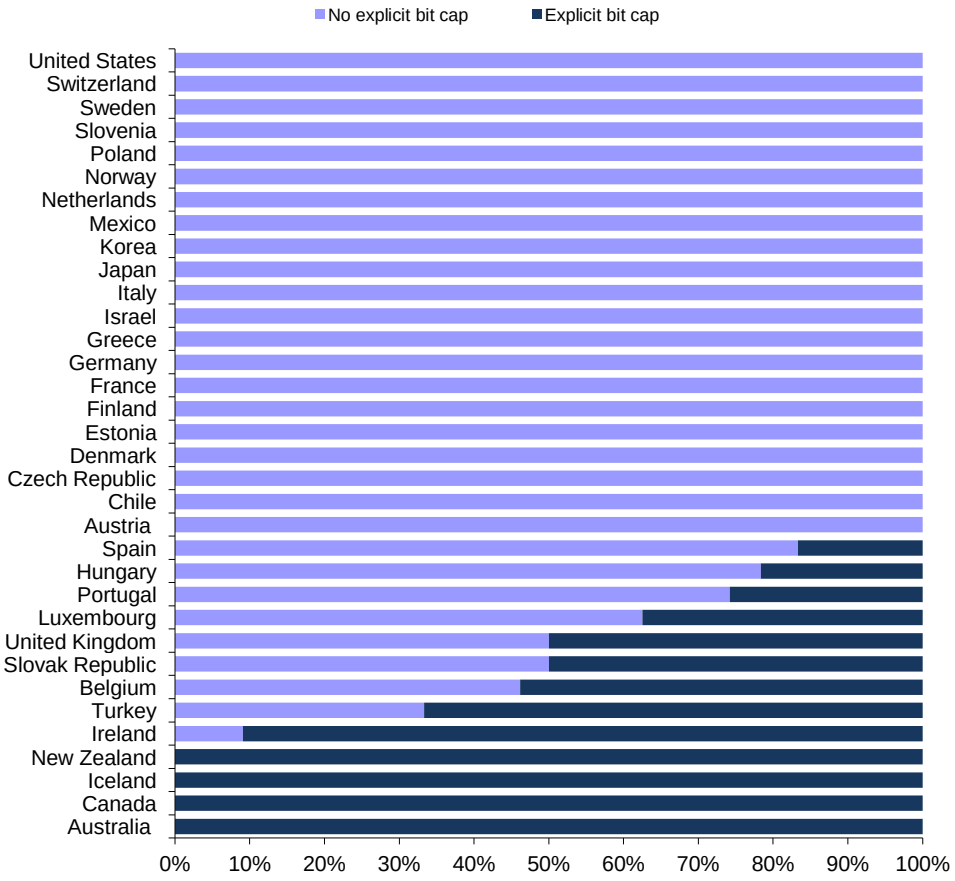



*Figure 9: Prevalence of data caps among surveyed offers*[24]

[24] OECD Broadband statistics, http://www.oecd.org/document/54/0,3746,en_2649_34225_38690102_1_1_1_1,00.html.

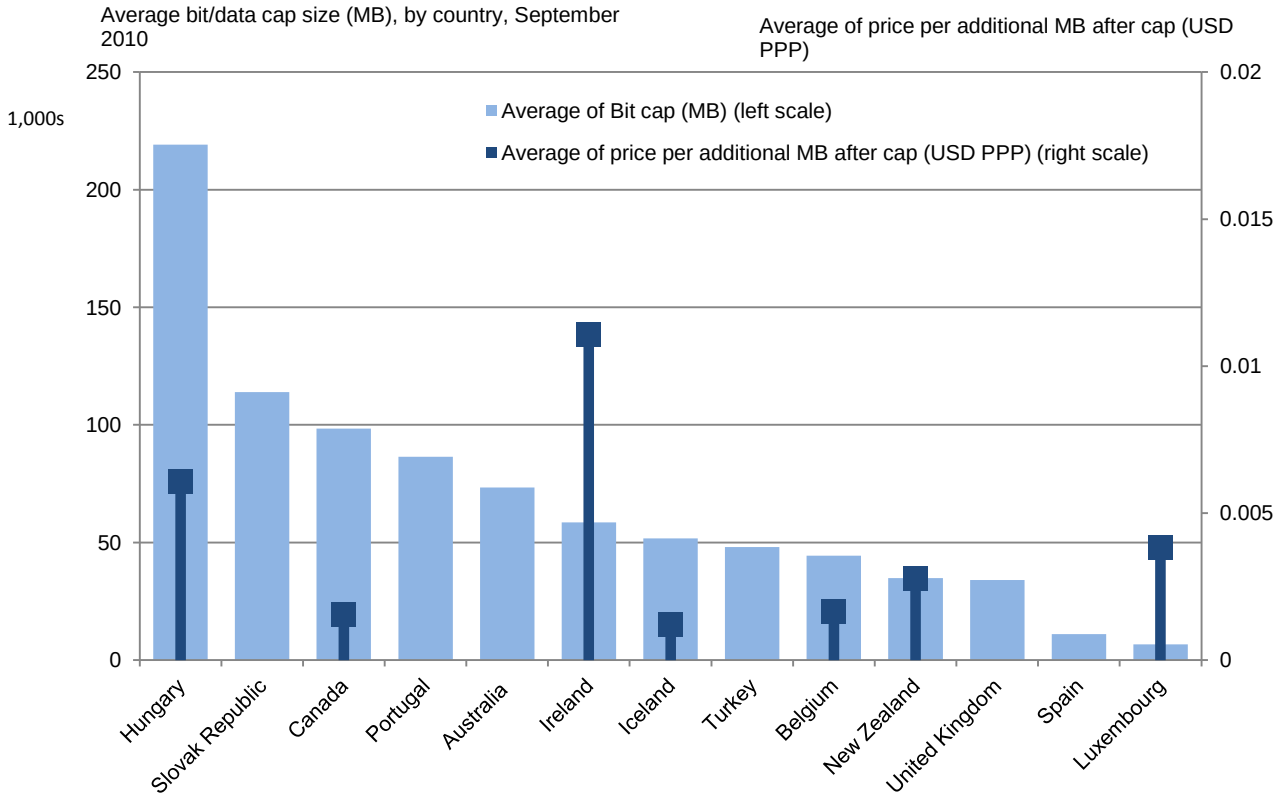



*Figure 10: Average data cap size and 'overage' price by MB*[25]

81. The most common alternative to data caps appears to be fair use policies which throttle users who are deemed to be excessive users. The issue with this type of policy is how 'fair use' is defined. In practice, fair use policies may just be an opaque data cap although typically with much higher usage levels than explicit data caps.

82. An analysis of the impact of data caps is set out in Attachment C.

**Data transmission costs falling and data caps and unmetered content increasing**

83. Data caps offered by New Zealand ISPs have increased significantly over the last year. For instance, several ISPs have doubled the data caps on some of their packages while retaining the same price structures.[26]

84. The increase in data cap size is also reflected in consumer data. A recent survey by Statistics New Zealand reports large increases in consumer data caps. Over the course of a year, the number of subscribers on caps between 20GB and 50GB is reported to have grown from 175,400 to 410,500.[27]

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[25] OECD Broadband statistics, http://www.oecd.org/document/54/0,3746,en_2649_34225_38690102_1_1_1_1,00.html.

[26] For example Telecom's Total Home package increased its data cap from 10GB to 20GB, Orcon's new Genius product can be taken with a 30GB data cap as standard and CallPlus has doubled its smallest data cap whilst increasing its largest data cap from 40GB to 250GB.

[27] http://www.stats.govt.nz/browse_for_stats/industry_sectors/information_technology_and_communications/ISPSurvey_HOTPJun11.aspx.

85. As discussed above, this increase in data caps has been occurring in the context of a trend of significant falls in the costs to ISPs of purchasing international capacity.

86. Overall, New Zealand data caps still compare poorly to the data caps and costs elsewhere in the world.[28] However, this situation is improving and could be expected to improve further with increasing competition.

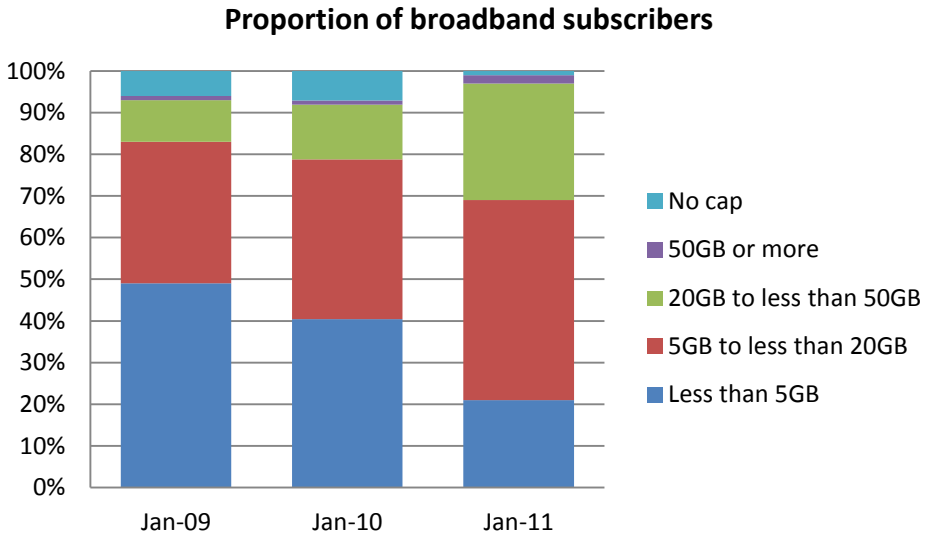


*Figure 11: Magnitude of data caps by broadband subscribers (source: Statistics New Zealand)*

87. It is also important to consider usage as well as the data cap allowance. Statistics New Zealand found that the average data usage by New Zealand broadband subscribers was 9 GB per month[29]. By comparison in Australia, while data caps have increased dramatically in recent years, it appears data usage has not kept pace, suggesting ISPs have been increasing caps ahead of customer demand. This is shown in the estimates by Market Clarity in figure 12 below.

[28] Commerce Commission, International Price Comparison Fixed Line and Mobile Services 2011, page 19.

[29] http://www.stats.govt.nz/browse_for_stats/industry_sectors/information_technology_and_communications/ISPSurvey_HOTPJun11.aspx.

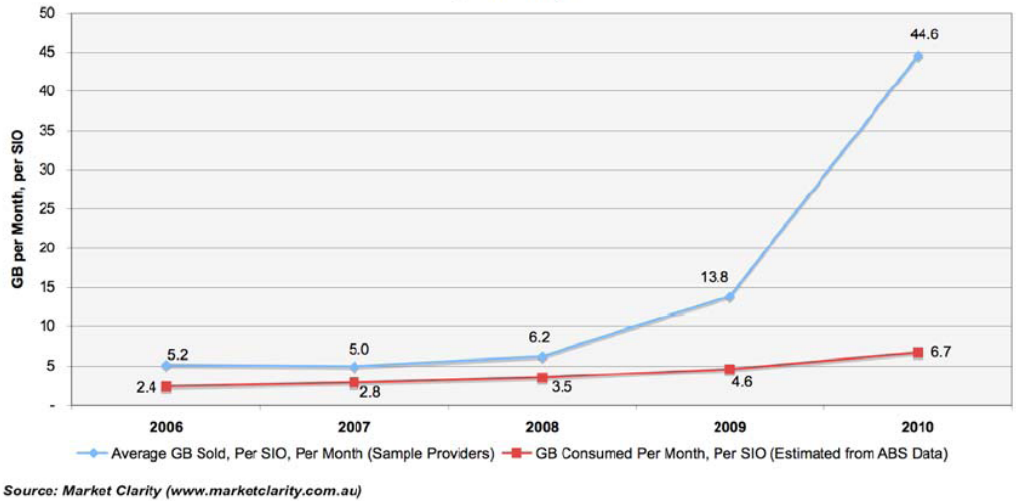


*Figure 12: Growth in Residential Downloads Sold vs. Downloads Used, 2006 - 2010*[30]

88. The amount of content that can be accessed as unmetered data has also been increasing. Data is unmetered if it is not directly charged to subscribers and metered against a data cap.

89. In the year to June 2011, Statistics New Zealand found that the average amount of unmetered data consumed per subscriber was 0.8 GB per month or about 10% of all data consumed. This percentage is likely to increase, as more content is cached in New Zealand.[31]

[30] Market Clarity, *Broadband Download Behaviour in Australia: the Disconnect Between Allowance and Usage*, January 2011. Note the data used for this graph excludes a small population of very heavy users that would distort the results if included.

[31] http://www.stats.govt.nz/browse_for_stats/industry_sectors/information_technology_and_communications/ISPSurvey_HOTPJun11.aspx

**Most survey respondents do not consider data caps a significant issue**

90. The findings of the Roy Morgan consumer survey undertaken for the demand side study show that, at the moment, data caps do not pose a significant problem. The graph below shows that 65% of the consumers are satisfied with their data caps, compared to 10% who are unsatisfied. Price and speed were more significant

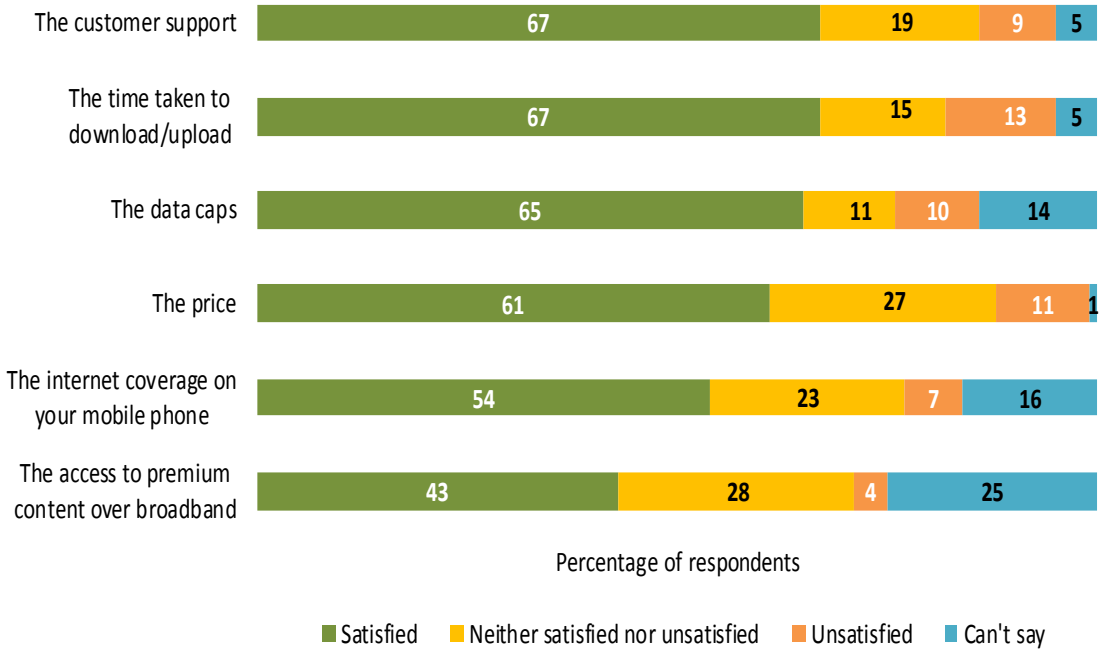


*Figure 13: Consumer satisfaction with aspects of current broadband services, source: Roy Morgan 2011 Consumer survey*

91. The Nielsen SME survey had similar findings with 68% of SMEs satisfied with their data caps, compared to 13% who were dissatisfied. Again, price and speed were more significant concerns.

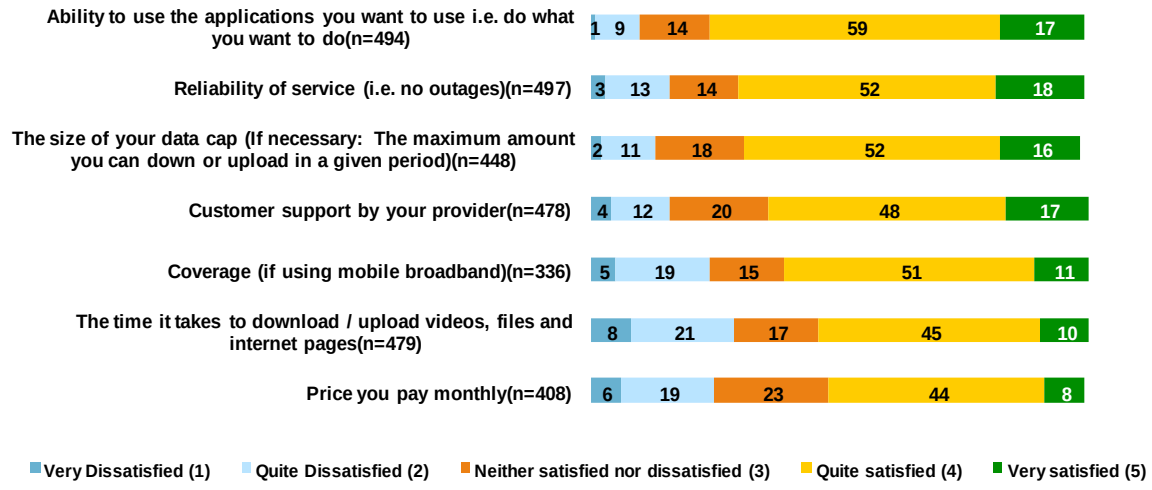


*Figure 14: SME satisfaction with aspects of current broadband services, source: Nielsen 2011 SME survey*

92. If data transmission costs continue to fall, data caps continue to be increased in response to demand, and locally cached content is increasingly unmetered, data caps should not inhibit the take-up of fixed line high speed broadband services.

**Key Points**

Surveys undertaken for the high speed broadband services demand side study indicated that most consumers and SMEs are satisfied with their data caps.

Data transmission costs have been steadily falling and data caps and unmetered content increasing. If these trends continue, data caps should not inhibit the take-up of high speed broadband services.

## Mobile data caps

93. Mobile technology may be able to deliver high speed broadband in the future, at which point mobile data caps may become a significant issue for the take-up of high speed broadband. Mobile data caps, both in NZ and internationally, are much smaller than fixed broadband data caps. For example, Telecom offers 0.75, 2 and 4 GB monthly consumer mobile broadband data packages.

94. Mobile data caps are becoming more prevalent throughout the world as mobile voice revenues decline and mobile data traffic increases substantially. New Zealand is still behind many comparable countries in overall data traffic but is experiencing substantial growth in mobile data volumes.

95. The mobile data traffic growth is being driven by new applications and hardware such as smartphones and tablets, machine to machine requirements such as security surveillance and greater use of laptops to access the internet.

96. The key differences between mobile and fixed broadband networks are capacity and the marginal cost of network infrastructure. This means that the need for data caps to manage capacity limits is more significant for mobile broadband than fixed broadband.

97. One area where data caps have raised concern internationally on mobile networks is the context of bill shock. Exceeding data caps can lead to significantly higher usage charges for 'overage'. There has been work among mobile providers to prevent bill shock by providing more up to date information to consumers on how close to their data limit they are.

### Key Points

The reasons for mobile data caps tend to be different to the reasons for fixed data caps.

If mobile technology becomes capable of delivering high speed broadband, mobile data caps may become an issue for take-up.

## Attachment A – Competition for national transit

1. In June 2008 the Commission published the UCLL Backhaul service Standard Terms Determination, in which 57 primary links and 38 secondary links[32] were assessed to determine whether the links were competitive. The Commission assessed the competitiveness of primary and secondary links on three other occasions. Details of each decision are included in the sections below. Overall we have observed that the number of competitive primary and secondary links has increased greatly, as shown in the figure below.

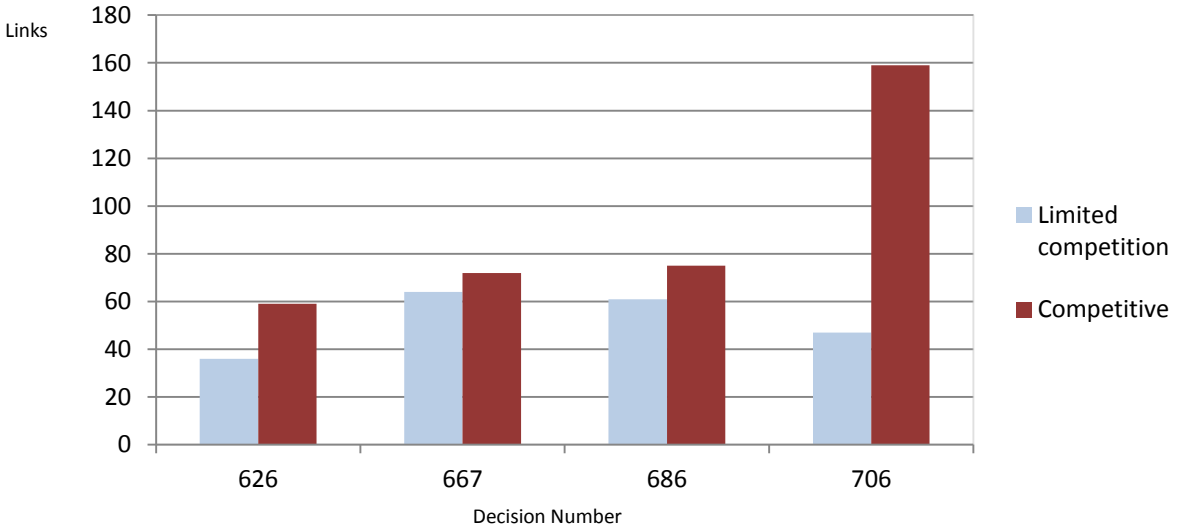


*Figure 15: UCLL backhaul links competition status*

### UCLL Backhaul STD (Decision 626)

2. In June 2008 the Commission assessed 57 primary links and 38 secondary links. After the review, it was concluded that 37 of the 57 primary links and 22 of the 38 secondary links were competitive.

### Decision 667

3. In April 2009 the Commission reviewed an additional 41 primary links, as well as the original 57 primary links. It was found that 49 of the 98 primary links reviewed were competitive.

### Decision 686

4. In March 2010, the Commission re-assessed the 98 primary links that were reviewed the previous year. It was found that the number of competitive primary links where Telecom faced insufficient competition increased from 49 to 52.

[32] Primary links are the links between the small exchanges and the main exchanges. Secondary links are the links between the Telecom's 29 points of interconnect.

**Decision 706**

5. In March 2011 the Commission re-assessed the 98 primary links as well as an additional 70 primary links and 38 secondary links. It was found that 110 of the 168 primary links and 32 of the 38 secondary links were competitive.

## Attachment B – Map of New Zealand International Transit Arrangements[33]

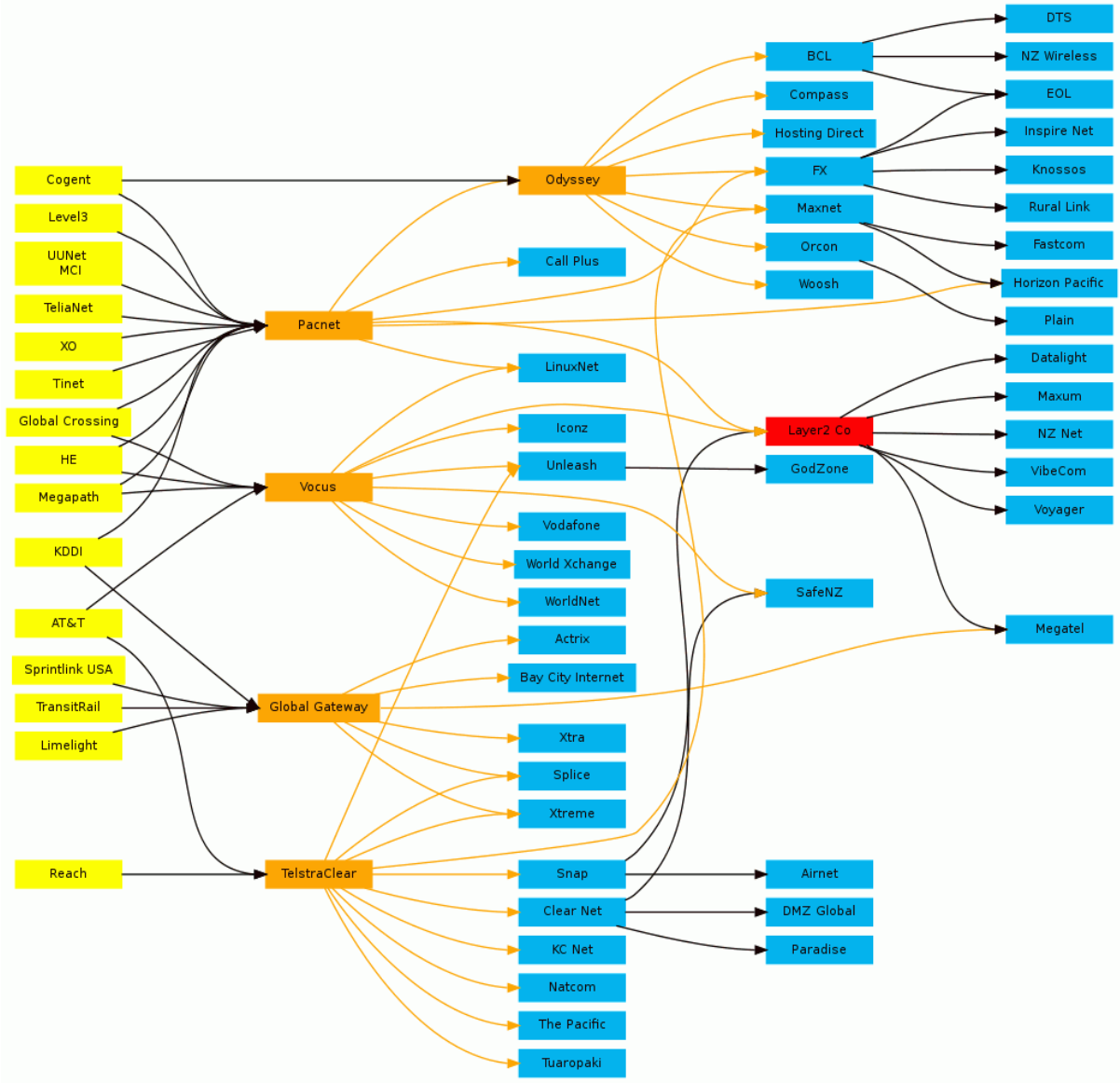


*Figure 16: Map of international transit arrangements*

[33] This map is reproduced from http://www.ispmap.co.nz/.

# Attachment C – Data caps

## The impact of data caps

1. Data caps are not unique to New Zealand and are becoming more common throughout the world. There are many views on the impact and use of data caps in both fixed line and mobile data plans. The potential benefits and drawbacks of data caps are summarised. This draws down upon the information provided to the Commission from a survey of ISPs and others as well as the Commission's own expertise.

*Means of controlling costs for backhaul*

2. The choices broadband providers make in how many subscribers they have per megabit per second capacity combined with their usage patterns[34] partially determines the speed of their broadband line. In maintaining a quality of service to its subscribers, a broadband provider needs to maintain sufficient backhaul at peak usage times.

3. Data caps are an indirect means of controlling these costs. By pre-committing to a fixed monthly fee and a data cap, a provider is able to commit to supplying broadband services at a certain speed by limiting the total usage by subscribers.

*Means of allocating capacity*

4. Without additional usage based costs, end-users have no incentive to moderate their use of the internet.[35] Where capacity is limited, this can impose costs on all end-users as service quality worsens with congestion. The level of congestion is linked to how much capacity exists. For mobile networks which have greater capacity constraints, data caps are more prevalent and are lower.[36]

*Ease of understanding by consumers and predictability*

5. Data caps have the advantage of being simple to convey to consumers and easy to check.[37] This allows a simple comparison by consumers of different broadband plans being marketed. It also provides consumers with certainty of the monthly costs they will incur (as long as they stay within their data cap).

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[34] When they use their broadband service and what type of services they use will also be important. For example internet browsing may only use capacity at the time a page is downloaded (as opposed to read) whereas downloading large files will use capacity over the entire time it is being used.

[35] Moderation is likely to see users restrict their lowest value use and thus welfare overall should increase over a given capacity.

[36] For mobile users with smart phones, there can be substitution from downloading data over a mobile link or over a land link via wi-fi. Hence a tight data cap can change behaviour to encourage greater use of wi-fi.

[37] What information is provided to consumers is important here. Consumers which go over their data cap face reduced speed of service (throttling) or higher costs (overage charges). Hence the marginal price/quality they receive depends on their previous consumption within the month. This means users need to be able to monitor their use to make informed decisions.

6. Where consumers are more concerned about high bills in light of difficulties in predicting their use of the internet, a fixed tariff for a set data usage can be an optimal outcome. This is reflected in the wide array of consumer goods which are offered on a flat tariff which does not reflect cost structures (for example travel passes, amusement parks, and all you can eat buffets).

7. Greater certainty occurs as long as the end-user stays within their data cap. High overage charges can mean significantly higher bills occur if data caps are exceeded. For at least some plans, consumers can opt to have speeds throttled rather than incur additional charges.

*Impact of data caps on usage*

8. Data caps are likely to moderate at least some end-users usage of the internet. They are a blunt instrument, as it is peak hour usage that matters most whereas a blanket data cap is likely to moderate usage across all times of the day.

9. In this sense data caps are inefficient as there will be times of the day where a provider has spare capacity to provide additional data usage at no extra cost. Data caps may prevent this spare capacity from being utilised.

*As a differentiator of quality between providers*

10. Comparison of data caps may be easy for consumers but such comparison fails to inform them of differences in speed provided.

11. The Commerce Commission's latest broadband quality report noted significant differences between:

    - cable based broadband which showed the highest performance
    - copper based broadband provided over UCLL which showed a significantly higher performance than services provided via Telecom's wholesale products.

12. Such differences are likely to become more widespread and more important with the advent of fibre based services. The key benefit of ultra-fast broadband services is the additional speed the network will provide. Without information of the incremental benefits to alternative services or between fibre based providers, consumers will be unable to make an informed choice between them.[38]

*Impact of data caps to incentivise local caching of content*

13. The Commission understands that content providers face higher costs if they choose to cache their content locally rather than offshore (typically in the US). Local content provides a faster service to end-users and frees up international capacity reducing ISPs' costs. However ISPs do not necessarily incur the costs of caching content.

[38] Differences can occur where some providers are using fibre to provide broadband whilst others use the existing copper network. It can also occur due to the choice of national and international capacity made by individual service providers which will affect the speed the end-user experiences.

14. Where ISPs provide data cap exemptions to local content this is likely to lead to extra demand for that content and thus a greater incentive to cache content locally. In practice data cap exemptions are limited to specific deals struck with content providers.[39] This is one way in which content providers compete. To the extent that local content is not data cap exempt, ISPs may partially enjoy the benefits of an investment made by another company and that could lead to sub-optimal levels of local caching.[40]

**Cited reasons for fixed-line data caps**

15. The reasons generally cited for data caps are:

- the cost of international transit
- the cost of national transit
- traffic management
- product differentiation
- ease of understanding, certainty for ISPs and customers, customers expectations
- the connection speeds of the local loop network
- to avoid spend down.

16. These cited reasons are analysed in detail below.

*The costs of international transit*

17. As discussed earlier, the cost to retail service providers to source international connectivity from the wholesale market has fallen considerably in recent years.

18. To the extent these cost reductions have been passed on to customers, retail service providers appear to have generally done so in the form of lower retail prices rather than increased provisioning of backhaul per customer because:

- retail service providers often have capacity contracted at prices higher than the current market prices
- retail products are focused on data caps which can be increased without additional costs to the ISP up until the point at which they impact quality of service (eg, because they materially increase peak time usage)
- even where increased dimensioning of the handover point for the access component can easily be performed (eg, on a UCLL connection, TCL's cable network), it is hard to monetise the benefits due to the lack of customer understanding of the value of greater backhaul dimensioning.

19. The Commission considers that the price of international connectivity was an historical driver of low data caps in New Zealand but is not a driver of low data caps at present.

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39 This is not true for all service providers.

40 This situation is complicated by national transit costs which may, but not always, be incurred by the Service Provider. Where a local content provider directly connects to a Service Provider's network such costs would not be incurred.

*The cost of national transit*

20. National transit costs as a proportion of the retail price vary depending on the location of the end-user. For example, an end-user in Auckland requires much less national transit than an end-user in Masterton who requires national transit to Wellington (or further) for peering and most cached content, and to Auckland for international traffic.

21. As described in Attachment A, the Commission has found that national transit is largely competitive with competition increasing.

*Traffic management*

22. Data caps are sometimes cited as necessary to control traffic. For many broadband services this function is already performed by the dimensioning of the handover point at the first data switch.

23. Data caps do control usage of a small number of extreme users who gravitate to 'unlimited' plans as they are announced. However, this purpose would be met by much larger data caps than those that are currently offered. In addition, other measures, such as throttling, per GB pricing, or time of day pricing, can also be applied to manage traffic.

*Product differentiation*

24. Broadband services can be differentiated in a number of ways including: price, data caps, maximum speed, minimum speed, guaranteed bandwidth, latency and jitter, unmetered data, etc.

25. Broadband services overseas are often differentiated on price and maximum speed.

26. The ability to differentiate products on other key characteristics such as minimum speed, dimensioning of backhaul, is generally limited by customer understanding, and the difficulty in providing service guarantees.

27. In New Zealand, product differentiation of retail broadband services to residential and SME customers focuses on price and data caps (and the associated unmetered data), as differentiation on maximum speed is not economically viable (apart from a few entry-level products) because the key wholesale service (UBA) is full speed/full speed; eg, it requires the same UBA input to provide a full speed/full speed retail service as it does to provide a half speed/half speed service. This appears to have resulted in a much greater focus on data caps to differentiate broadband services to residential and SME customers.

*Ease of understanding, certainty for retail service providers and consumers, customers' expectations*

28. Another reason cited for data caps is certainty for:

- retail service providers, who can accurately forecast revenue and the recovery of set-up costs from term plans
- customers who wish to avoid potential bill shock from 'pay as you go' data plans.

29. Data caps have the advantage of being simple to convey to consumers and simple to check.[41] This allows an easy comparison by consumers of the different broadband plans being marketed. It also provides consumers with certainty of the monthly costs they will incur (as long as they stay within their data cap).

30. A fixed tariff for a set data usage can be an optimal outcome for consumers concerned about high bills in light of difficulties in predicting their use of the internet. This is reflected in the wide range of consumer goods which are offered on a flat tariff which does not reflect cost structures (for example travel passes, amusement parks and all you can eat buffets). In effect customers are insuring against bill shock.

31. Customers have also been accustomed to buy telecommunications services sold in volume buckets, for example free local calling and 'talk for as long as you like' tolls, making data caps natural for them.

32. Such differentiation also allows for price differentiation by retail service providers to customers. Those customers who most value broadband are more likely to take higher data caps and pay more. This may allow retail service providers to recover their fixed costs (for example of backhaul links) in a way which does not price off those consumers whose value of access to broadband is lower. If this is the case, this can benefit both broadband suppliers and customers.

*The connection speeds of the local loop network*

33. In a recent draft report, Internet NZ indicated that 'if speed and terms of access to the local loop is the main determinant of data caps we should expect little change in the caps in the short term.'[42] Telecom dimensions the first data switch (FDS) handover for UBA at 45 kbps or 75 kbps per connection with a commercial upgrade of an additional 100 kbps available.

34. Until recently, the FDS handover for almost all UBA connections was dimensioned at 45 kbps per connection. Therefore, 45 kbps is the relevant figure for an historical analysis of the development of data caps.

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41 What information is provided to consumers is important here. Consumers which go over their data cap face reduced speed of service (throttling) or higher costs (overage charges). Hence the marginal price/quality they receive depends on their previous consumption within the month. This means users need to be able to monitor their use to make informed decisions.

42 Internet NZ, *Draft report: Barriers to Unmetered National Internet Traffic*, 11 July 2011.

35. The diagram below shows an indicative example of the impact of the 45 kbps limit on data usage by calculating the theoretical maximum through-put of 1000 UBA connections handed over at a first data switch.[43]

*Assumptions:*
*(1) the access seeker has 1000 UBA connections handed over at a first data switch (FDS)*
*(2) the 45 kbps service is assumed to be symmetrical (i.e. a total of 90 kbps)*

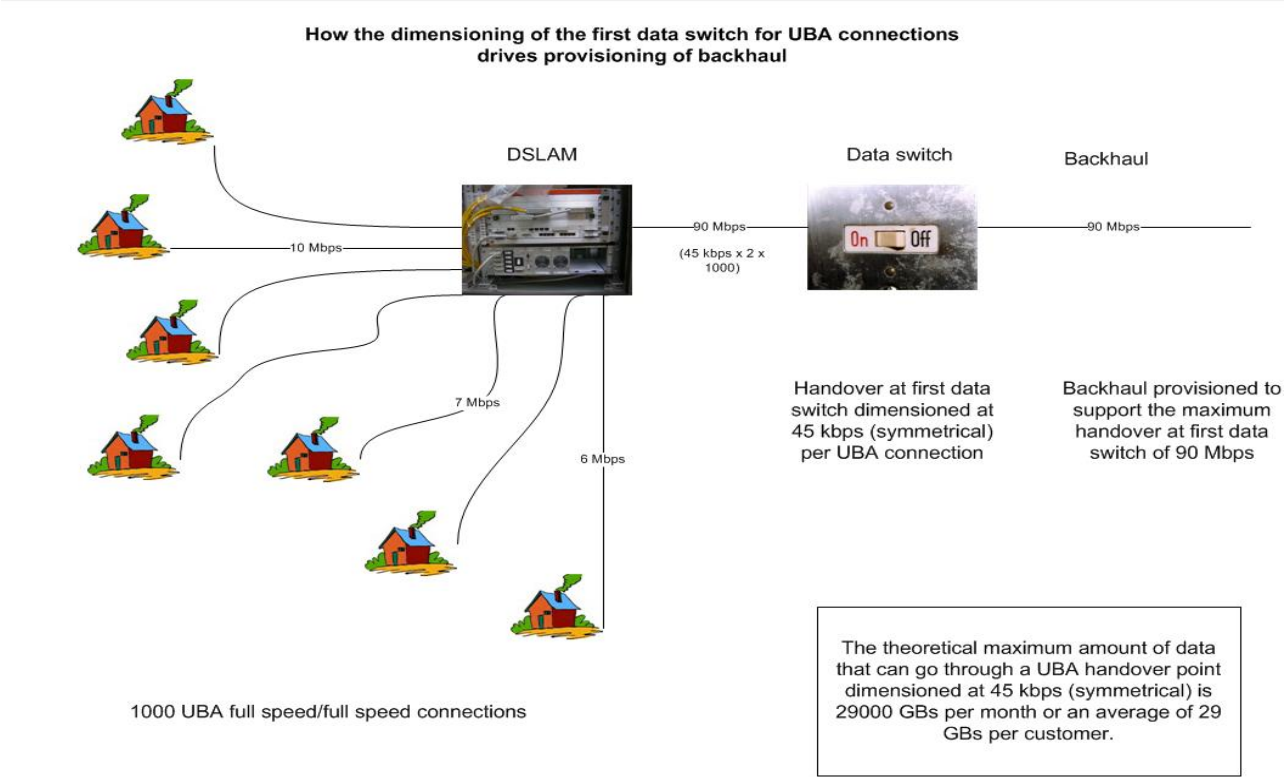


*Figure 17: Theoretical maximum through-put of 1,000 UBA connections*

36. This demonstrates that the maximum theoretical through-put in a month of 1,000 45 kbps symmetrical UBA connections handed over at a first data is about 29,000 GBs. The maximum theoretical download throughput is 14,500 GBs.

43

| | | | |
|---|---|---|---|
| Dimensioning of FDS handover | 90.00 | Mbps | |
| Max data through-put of FDS per second | 11.25 | MB | using 8 bits in a byte |
| Max data through-put of FDS per hours | 40500.00 | MB | |
| Max data through-put of FDS per day | 972000.00 | MB | |
| Max data through-put of FDS per month | 29160000.00 | MB | using 30 days in a month |
| Max data through-put of FDS per month | 29160.00 | GB | |

37. This results in a theoretical monthly data cap of 29,000 GBs or 29 GB per user and a theoretical download cap of 14,500 GBs or 14.5 GBs per user. However, the effective data cap is likely to be significantly lower because the network is likely to have significantly less than 100% utilisation.

38. It is important to note that there were incentives on Telecom not to increase the dimensioning of the FDS handover for Telecom Retail's UBA services, because it would increase data usage by Telecom Retail resulting in a lower UBA wholesale price. This is because increased data usage would have lead to a greater value being deducted for data costs when calculating the retail-minus UBA price.

39. However, now that the UBA price has been frozen (and is no longer linked inversely to data usage), Chorus is incentivised to increase the dimensioning of the handover per UBA service as much as it can without increasing its costs, so it is able to compete more effectively with non-Chorus networks, eg, HFC, UCLL, mobile, wireless, etc.

*Spend Down*

40. Before ISPs increase data caps they consider the following two factors:

    - the additional national and international transit costs from increased usage
    - the potential spend down to lower value plans.

41. Spend down refers to customers who receive larger data caps changing to lower value plans because they do not need the larger data allowance. Spend down is by far the more significant of the two considerations, as the resulting reduction in ARPU is worth much more than additional transit costs. Spend down is particularly significant when the retail service with increasing data caps cannot be improved (eg, because the dimensioning is fixed) so increased usage can only occur if there are changes in usage patterns.

## Attachment D – Draft Conference Programme, 20 & 21 February 2012


# The future with high speed broadband

## Opportunities for New Zealand

Auckland - 20th February 2012

Draft programme

| | |
|---|---|
| 09.00 – 09.15 | Introduction and Overview: **Dr Ross Patterson, Telecommunications Commissioner** |
| 09.15 – 09.30 | Introduction of conference facilitator: **David Havyatt, Havyatt Associates, Sydney** |
| 09.30 - 10.30 | International key note speaker – **Gerd Leonhard, mediafuturist.com, Basel** |
| 10.30 – 10.45 | Coffee break |
| 10.45 – 11.45 | Future Data Needs – **Dr Robert Pepper, VP Global Technology Policy, Cisco, Washington** |
| 11.45 – 12.45 | Panel Discussion: New Transformational Technology |
| 12.45 – 13.30 | Lunch break |
| 13.30 – 14.30 | Digital citizen and convergence review – **Richard Bean, Deputy Chair, ACMA, Sydney** |
| 14.30 – 15.30 | UK demand side study – **Antony Walker, CEO Broadband Stakeholder Group, London** |
| 15.30-15.45 | Coffee break |
| 15.45-16.45 | Consumer segment issues – **Prof Dwayne Winseck, Carleton University, Ottawa** |
| 16.45 – 17.45 | Panel Discussion: International experience and lessons for NZ |
| 17.45 – 18.00 | Summing up – **David Havyatt** |


# The future with high speed broadband

## Opportunities for New Zealand

Auckland - 21st February 2012

Draft programme

| | |
|---|---|
| 08.15 – 8.30 | Introduction and welcome – **David Havyatt** |
| 08.30 – 9.00 | NZ focus discussion – **Richard Fraser**, VP Solutions and Marketing, Alcatel-Lucent Australia, New Zealand and Pacific Islands |
| 09.00 – 09.30 | Ministerial address |
| 09.30 – 10.15 | Demand Side segmentation<br>Consumers and SMES Survey presentations by Roy Morgan Market Research and Nielsen |
| 10.15 – 10.30 | Coffee break |
| 10.30 – 12.00 | Panel Discussions- Drivers of demand in New Zealand- Consumer |
| 12.00 – 12.45 | Lunch break |
| 12.45 – 13.45 | Panel Discussions – Drivers of demand in New Zealand - SME |
| 13.45 – 14.45 | Panel Discussions – Drivers of demand in New Zealand - Rural |
| 14.45 – 15.00 | Coffee break |
| 15.00 – 16.00 | E-Health and E-Education – **Dr Kate Cornick, Executive Director, IBES, Melbourne** |
| 16.00 – 17.20 | Panel Discussions – Drivers of demand in New Zealand – e-health and e-education |
| 17.20 – 17.40 | Summing up and conclusions – **David Havyatt** |
| 17.40 – 18.00 | Finish – **Dr Ross Patterson, Telecommunications Commissioner** |