



Telecom New Zealand Limited

**Submission in respect of the Commission's draft
determination on the application for access to and
interconnection with Telecom's fixed PDN service
("Bitstream Access")**

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Public Version

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A EXECUTIVE SUMMARY

1. The growth of broadband acquisition by New Zealand end users from both Telecom and wholesale customers is continuing to swell, as evidenced by the latest broadband monitoring results. As at 31 March 2005 there were 169,937 residential broadband customers using services supplied over Telecom's network,¹ which means that New Zealand is well on its way to having 20% of all New Zealand households using broadband. Annex G of these submissions details the existing wide range of broadband offerings to New Zealand consumers.
2. Among the 47,132 new connections added during the three months to 31 March, 23% were through wholesale customers under the commercial UBS service and wholesale broadband plans. This is despite the fact that TelstraClear has not yet taken up the commercial UBS service. There are now three residential UBS plans with downstream speeds of 256Kbps, 1Mbps and 2Mbps available to wholesale customers. 1Mbps and 2Mbps business UBS plans along with their retail counterparts are due to be released shortly in response to industry demand.
3. Telecom has undertaken development of UBS services for the industry and has entered into several commercial arrangements as fast as has been practically and sensibly possible. Wholesale uptake has enabled early delivery of a range of options to New Zealand end-users.
4. Telecom has undertaken a fair and workable approach to the New Zealand regulatory regime. The development of the commercial UBS service was part of this approach as well as Telecom's commitment to negotiating commercial arrangements rather than waiting for regulatory outcomes. Telecom has always remained open to additional UBS variants if approached by wholesale customers. Telecom's commitment to launch a 1Mbps and 2Mbps business UBS plans is an example.
5. Telecom continues to proactively advance wholesale broadband options. As part of this continuing commitment to its wholesale customers Telecom has reviewed and reduced the churn fee. A "UBS Flow Through Policy"² has also been issued in order to inform wholesale customers how the determination might affect them. Initial reactions from the industry are very positive³.

A proactive way forward for the industry

6. Positive and proactive industry arrangements will continue. In this submission, Telecom puts forward a fair and workable proposal which has the following characteristics:

¹ There are of course broadband services being provided over other networks in New Zealand.

² http://www.telecom.co.nz/binaries/ubs_flow_through_policy.pdf

³ The Line, 11 May 2005

- (a) A selection of speed options with a different price set for each speed option within the residential and business areas. This is consistent with overseas practice (see Annexes B and G);
 - (b) The speed options would be 256kbps, 1Mbps, 2Mbps and a "full speed" option for both residential and business;
 - (c) The "full speed" option would be to the maximum downstream speed that complies with the standard access principles and the purpose of the Act, and which can be supplied in a stable and sustainable way (See Section C). The practical maximum is likely to be around 3Mbps for the reasons detailed in this submission and would be a speed that is in line with high-end plans overseas;
 - (d) The options are L2TP (as confirmed by TelstraClear and the Commission);
 - (e) The uplink will be 128kbps as in the designation;
 - (f) The retail minus approach mandated by the Act is approached as intended for each of the speed variants (Telecom would ensure that reference retail prices were available);
 - (g) A measurement and reporting regime will be implemented in order to report on consistency in line with the objectives set out in the draft report (but will, in the case of this proposal) be meaningful in terms of consistency;
 - (h) Telecom's industry proposal to set the churn fee at TSLRIC rather than incremental cost. (The churn fee was under review prior to the launch of the draft determination and has now been reduced to TSLRIC effective 30 May 2005); and
 - (i) A realistic timeframe is set to enable Telecom to deliver this proposal to TelstraClear and the industry in a similar timeframe.
7. This proposal is aimed at delivering a workable outcome that meets the intent of the draft determination and the Act and anticipates the demands from the industry. It pushes the asymmetry boundary between the upstream and downstream speeds to the practical maximum that is workable. The proposed menu of speeds is workable in terms of profiles and would enable retail and wholesale comparability and thus permit workable pricing and reporting on consistency. It will avoid many of the difficulties with the proposal in the draft determination, in a context where those difficulties outweigh any perceived benefits.

The draft determination is not workable and is to the detriment of end users

8. Telecom's proposal is put forward to the Commission and the industry because Telecom considers that the draft determination is not in the long term best interests of end users and is not workable:

- (a) Requiring a single UBS product to be sold at a single price in residential and business markets undermines value based pricing in an industry that has high fixed and common costs. The consequences of this approach will be to reduce broadband uptake - the exact opposite of the Commission's stated innovation aim.⁴ There will instead be a reduction in product innovation as the market converges to a single product at a single price as a matter of commercial common sense.⁵ This in turn means prices will be rebalanced such that the lowest priced broadband service (where the majority of uptake has occurred⁶) will increase in price and reduce demand. (This is at a time when the Minister is seeking a \$30 broadband service to make demand "explode"⁷). This will reduce consumer welfare, reduce investment incentives and will be directly at odds with the best interests of New Zealand end-users.
- (b) Unconstrained services will result in increased noise in cable sheaths leading to an unavoidable trade off where, to manage noise, reach is reduced. Reduced reach is inconsistent with Telecom's current approach to provide as much reach as possible, the Government's broadband growth policy and is not in the best interests of end-users, particularly those in the rural community, some of whom may be deprived of economic broadband access;
- (c) Finite resource in the DSLAM and cable sheath will be wasted by the implementation of unconstrained services. This cannot be alleviated by TelstraClear applying shaping (if it chooses to do so). This raises efficiency issues required to be considered under section 18;
- (d) There is the potential for a DSLAM input buffer to overload affecting more than just TelstraClear's customers with the unconstrained service. End users may experience short duration outages, including those who are supplied other services that share the resource in the DSLAM. This potentially raises issues around service levels already committed to end users (See Section C1);
- (e) While the theoretical maximum downstream is 7.6Mbps, in practice the majority of customers will not receive this. Furthermore, there is an asymmetry issue with the upstream designated by the Act. (See section C1). The technical and operational issues identified above outweigh any perceived benefit of mandating a theoretical maximum over and above the practical maximum suggested in Telecom's workable solution;
- (f) Telecom does not have operational experience with interleaving turned off, so there is no evidence that provides Telecom with any level of confidence that the Commission's proposal will have no impact on the

⁴ The evidence supporting this view is detailed throughout these submissions and in Professor Hausman's paper at Annex C.

⁵ For example, Quicksilver currently has nine broadband offerings in the market (see Annex H). This could reduce to three if an unconstrained service is mandated.

⁶ 67% of residential broadband uptake were on 256kbps plans at 31 March 2005.

⁷ The Line, 16 May 2005

network and ultimately end users. However, there are known line stability issues with interleaving turned off;

- (g) In terms of the requirement to have interleaving turned off, this should, in theory, only affect the line to which that option is applied. However, international experience appears to indicate that other lines, and thus other customers, may also be impacted. Telecom's view is that it is not prudent to progress an interleaving option without proper testing. In the absence of this the Commission will have insufficient evidence that its proposal will have no impact on the network. Telecom requests that it be provided with an opportunity to test the requested interleaving off option.⁸ After that time Telecom would seek to discuss the option with the industry. If agreement could not be reached, the matter could be returned to the Commission for a determination in the usual way.
 - (h) These network issues arising from an unconstrained service and an interleaving off option are very likely to affect all end users (whether customers of Telecom, TelstraClear or other members of the industry).
 - (i) While Telecom endorses consistency, it is impossible to report consistency between Telecom retail services and the service proposed in the draft determination because apples are being compared with pears. Consistency reporting will be possible if there are comparable services;
 - (j) In several respects,⁹ the draft determination will drive unnecessary costs and inefficiencies and will dampen investment (the very incentive sought to be preserved by a retail minus regime);
9. Rather than simply critique the draft proposals, Telecom is proactively offering up to the Commission and the industry as a whole a workable way forward.

Retail minus pricing protects investment incentives

- 10. In addition to having section 18 concerns about the proposed application of the initial pricing principle, Telecom considers that the Commission's application of that principle is flawed as it fails to have regard to a comparable service and it moves towards a cost based approach in the context of a retail minus requirement.
- 11. Telecom agrees with the Commission that the basis for the retail price should come from within the JetStream suite of services. Telecom believes however that the Commission is incorrect to consider that all Jetstream ADSL services can be used in the imputation exercise regardless of their speed. Telecom is extremely concerned that the Commission has erred in its approach to the

⁸ If the Commission proceeds without testing then it must provide Telecom with the ability to manage adverse impacts (eg: the ability to turn interleaving back on if instability arises or to disconnect a service).

⁹ For example, refer to paragraphs 102 to 119 below.

initial pricing principle by focusing on cost issues when the pricing principle is retail minus.

12. The evidence shows that it is recognised overseas that value based pricing across UBS and broadband services is accepted. Retail minus pricing is equally noted as the most appropriate approach to protect incentives to invest. If New Zealand departs there will be reduced uptake of broadband services, a reduction in consumer welfare and detriment to the long term benefit of end users.
13. Telecom agrees that a regression analysis is appropriate but considers that the analysis set out by the Commission is flawed. Telecom provides a revised analysis to assist the Commission.
14. Telecom's workable proposal will enable the Commission to deliver a tool in the form of a pricing methodology in order that bitstream access prices can be revised in line with retail prices at regular intervals going forwards.

Other parts of the draft determination strike a sensible balance

15. Telecom agrees with the approach of the Commission in the draft determination in relation to the following:
 - (a) Detailed implementation matters relating to OSS should be left to the industry and, in relation to churn, should be dealt with by the TCF and the churn code;
 - (b) There should be consistency between provisioning and fault repair such that these processes are colourblind between retail and wholesale;
 - (c) Early advice as to ADSL upgrades will be available to wholesale customers via the current wholesale Jetstream & UBS Line check Toolkit;
 - (d) Pro-rata billing should occur. This can be implemented when the current IAF billing system (the existing operational limitation) is replaced with Singleview;
 - (e) Reassignment and MAC charges should be recoverable on a retail minus approach. These are discussed in Section F;
 - (f) A regression approach is appropriate;
 - (g) A defined mechanism to revise bitstream access prices as retail prices change is appropriate to take into account changes in the retail market; and
 - (h) The minimum necessary in terms of reporting in order to ensure transparency that consistency is achieved will be provided if the

Commission considers this is required¹⁰. A baseline report could be developed in approximately 90 days. Telecom discusses reporting at Section C3.

Market definition and competition assessment

16. A case for regulation should not be based upon the flawed proposition that Telecom faces limited competition in a national market for the supply of wholesale broadband access services. Even if the Commission were right, which Telecom submits it is not, the Commission must still have regard to the level of competition in the metropolitan areas before it can satisfy itself that regulation is in the long term benefit of end users.
17. The pricing of Telecom's commercial bitstream products is constrained by effective and lively competition in the retail market for broadband internet access services in metropolitan areas of New Zealand.
18. The Commission should not assess the state of competition for the provision of broadband services at (a) solely the wholesale market level and (b) at a national geographic market level. Telecom accepts that it faces limited competition when selling retail and wholesale broadband internet access products in non metropolitan areas of New Zealand, but it does not face limited competition in metropolitan areas.
19. The Commission itself, in 2003, took the view that broadband customers in metropolitan areas of New Zealand enjoyed the benefits of effective competition.¹¹ Telecom questions how the evidence of intensifying competition since 2003 can be reconciled with a draft finding in 2005 of limited competition for wholesale broadband access services at a national level.
20. The Commission should revise its market definition and competition assessment as discussed in Section D.
21. The remainder of these submissions are divided into the following sections:
 - (a) Section B – Legal framework for the determination
 - (b) Section C – Technical and operational issues around the proposed bitstream services
 - (c) Section D – Market definition and competition assessment
 - (d) Section E – Application of the initial pricing principle
 - (e) Section F – Sundry charges
 - (f) Section G – Non price terms

¹⁰ Telecom considers that the costs of probes should be shared equally between TelstraClear and Telecom for UBS & Jetstream respectively but that additional costs for reporting be borne by TelstraClear given that this is an additional requirement over and above consistency demonstrated in the first instance by engineering design and network management.

¹¹ TCL Wholesale Determination, May 2003 ("Decision 497").

(g) Section H – Workable way forward

B LEGAL FRAMEWORK FOR THE DETERMINATION

B1 The onus on the Commission

22. The Commission is required by section 19 of the Act when considering a determination to:
- (a) consider the purpose in section 18 which requires that the determination promotes competition for the long term benefit of end-users of telecommunications services within New Zealand;
 - (b) make a determination which best gives, or is likely to best give, effect to that purpose; and
 - (c) consider any applicable additional matters set out in Schedule 1 concerning the application of section 18.
23. In relation to the UBS service designation in the Act, the Commission is required to comply with:
- (a) the conditions in relation to the state of competition in the market;
 - (b) the standard access principles set out in clause 5 as required by section 29; and
 - (c) the limits on those standard access principles set out in clause 6 as required by section 29.
24. The onus and burden of proof as to the satisfaction of all of these requirements is on the Commission.
25. The Commission's draft determination is not consistent with all of these requirements. In particular, the Commission's draft is inconsistent with sections 18 and 19 of the Act and misapplies the initial pricing principle.

B2 Section 18

26. As noted above, the Commission must make a determination which best gives effect, or is likely to best give effect to the section 18 purpose. Telecom considers that the Commission's proposed determination is demonstrably inconsistent with the purpose of promoting competition for the long term benefit of end-users of telecommunications services in New Zealand in two significant respects:
27. *First*, the decision is likely to lead to a single bitstream offering to business and residential customers, reduce product differentiation, remove the benefits of

price based discrimination and lead to impacts on prices which ultimately reduce the quality and scope of broadband penetration.

28. This conclusion follows from the second order effects of the Commission's decision to impute a single price for business users and a single price for residential users irrespective of speed. In the view of Professor Hausman, and in Telecom's own view, the likely outcome of this proposed regulation is that there will only be a single bitstream offering to residential customers and a single bitstream offering to businesses.¹² Hence, product differentiation will reduce - contrary to the aim of the Commission.¹³ In addition, the benefits of price discrimination for a range of services will be lost. Professor Hausman explains why if, regulation causes no price discrimination to occur for broadband services, consumer welfare will be lower than if price discrimination is permitted.¹⁴
29. Furthermore, there is an undesirable impact on prices for broadband services. Given the substantial overhead and common costs associated with providing broadband services, it is likely that the price for high speed plans will decrease, as Telecom's competitors with lower overheads can afford to undercut Telecom on those services. For low speed plans, the prices will tend to increase as Telecom will be incentivised to seek a higher contribution to its fixed costs from customers of lower speed plans (which are currently priced only slightly above marginal cost).¹⁵ The effect of all of this is that broadband penetration could be reduced compared to a regulated solution that recognised the diversity of Telecom's current offerings.¹⁶ This reasoning is explained in detail in section E of the submissions and in the report of Professor Hausman.
30. *Second* the technical implications of having an unconstrained service are that, to reduce noise, the reach of the service will need to be reduced. Thus fewer end users will be able to obtain broadband services over Telecom's existing assets.
31. As explained in detail in section C of this submission, requiring the provision of an unconstrained service will aggravate the existing problems associated with noise on the network. Noise is undesirable as it degrades the service to all customers. Telecom's preferred means to manage noise is to copper rate limit (or rate shape). But, if rate limiting is not permitted, as the Commission orders an unconstrained downstream speed, then the other way to manage noise on the network is to reduce reach. In practical terms this means that fewer people (especially in rural areas) will have access to broadband over Telecom's existing assets. This outcome is irreconcilable with the

¹² Refer Hausman paragraphs 17-18,

¹³ Refer Telecom paragraph 335, CC paragraph 163

¹⁴ Refer Hausman, paragraph 10.

¹⁵ Refer Telecom paragraph 345

¹⁶ Refer Hausman, paragraph 18.

government's broadband growth policy and the interests of the end users of telecommunications services. In addition, there is a reduction in the efficiency of the use of resources if the service is unconstrained as Telecom must provision for the maximum speed even if it is not used. That means fewer customers are able to use the resources.

32. The Commission is required under section 19(b) to make a determination which best gives, or is likely to best give, the effect to the purpose of the Act. It cannot be said that the Commission's proposed determination satisfies this test, particularly when the Commission's solution is weighed against the workable way forward proposed by Telecom in section H of this submission.

B3 Initial pricing principle

33. Quite apart from the section 18 problems created by the application of the initial pricing principle, Telecom considers that the Commission has misapplied the principle in two respects:
 - (a) it has had regard to services which are not "comparable services"; and
 - (b) it has not fully applied a retail minus test, as it has in part relied upon cost based comparisons.

Retail price of a comparable service

34. The initial pricing principle requires the Commission to impute a retail price having regard to any comparable service. The Commission has acknowledged that its goal here is to determine the retail price which Telecom is likely to charge if it offered a comparable service at retail.
35. The starting point to the retail minus formulation is finding a comparable service (or perhaps comparable services) upon which the imputation of the retail price for the designated bitstream access service should be based. The Commission has indicated in the draft determination that the basis for the imputation should be the Jetstream suite of services:

"The Commission understands that the cost of supply of a bitstream access circuit is not materially affected by the downstream and upstream speeds provided on an individual circuit.... Accordingly, in imputing the retail prices, the Commission has considered all Jetstream services, including those with downstream and upstream speeds different from that requested in the Application."¹⁷

36. Telecom agrees that the basis for the imputation should come from within Telecom's broadband suite of services but Telecom believes that the

¹⁷ At paragraph 159 of the draft determination.

Commission is incorrect to consider that all Jetstream ADSL services can be used as the basis for the imputation regardless of their speed.

37. Telecom does not believe that any of the services within the Jetstream suite of services are in any relevant sense comparable to the non speed restricted service sought to be designated by the Commission. There must be comparability across key service specifications in order for a service to be considered comparable and in New Zealand and overseas speed is the fundamental factor upon which high speed internet offerings are differentiated.

Retail Minus v Cost Based Approach

38. The only basis put forward by the Commission for its finding that it is entitled to consider all Jetstream services regardless of their speed is that they have a comparable cost. Identification of a comparable retail service should focus on the comparability in terms of the service experience and quality, not cost.
39. The initial pricing principle is a retail minus approach. The retail minus approach is consistent with the Commission's recommendation in the Local Loop Unbundling report:

"The Commission considers that a retail minus pricing principle provides the most appropriate initial and final pricing principle for the ADSL bitstream access service. Such a service utilises assets within the fixed PDN for which Telecom is likely to continue to make ongoing investments and may rely on Telecom's IP network. Accordingly, the Commission considers that retail minus pricing is warranted."¹⁸

40. In making this recommendation the Commission correctly recognises that a retail minus approach is far preferable to a cost based approach insofar as the encouragement of further investment is concerned. Telecom agrees that it is an appropriate pricing formulation for a bitstream access service and notes that such an approach is consistent with overseas regulatory practice. In particular Telecom notes the views of Ofcom in relation to the pricing of wholesale broadband access in the United Kingdom:

"Ofcom considers that retail minus is the most appropriate pricing approach. Ofcom fully recognises that many respondents would prefer that LRIC-plus was used to set the charges in the markets covered by this review. It is clear that respondents think it will provide them with greater transparency, stability and certainty. There is also the perception that it may, in some cases, lead to lower prices. Ofcom believes that, given the nature of the market, a correct and reliable assessment of the cost and of the rate of return would be difficult and that there is **too high a risk of incorrectly determining a charge so as to be materially damaging to the prospects for competition in the market.** Ofcom's view is that the main concern is that, since BT is vertically integrated, it could squeeze the margin between the wholesale products, in whose provision it has market power, and the downstream ones, thus preventing other operators from competing in downstream markets. Hence Ofcom believes that retail minus is the most appropriate pricing approach since it addresses the primary

¹⁸ At paragraph 812 of the Commission's Local Loop Unbundling Report.

concern about the margins between the relevant products rather than absolute level of charges. In addition, **retail minus avoids the risk of adversely affecting investment in wholesale broadband access markets.**¹⁹

41. Despite all of this, the Commission, by taking the view that all Jetstream services are comparable services or otherwise relevant to the retail price imputation process simply on the basis that they have comparable costs, seems to be seeking to move away from a retail minus approach and towards a pricing principle based on or certainly strongly influenced by cost recovery. This is compounded when the Commission proposes to set a single price regardless of speed rather than setting different prices for different speed variants because this ignores the value attributed to speed by the customer and more importantly the ability of a hypothetical retailer of a bitstream access service to reflect that value in the retail price. Such an approach runs an unreasonable risk of materially damaging the prospects for competition and investment.
42. If the regulatory regime had been intended to create anything more than a level playing field the designation of access to the fixed PDN would most certainly have expressly mandated a cost based pricing principle such as those used in relation to the designation of interconnection with the fixed PSTN. However a cost based approach was consciously eschewed for access to the fixed PDN. Telecom is concerned that the Commission's proposed approach errs in law and in policy.

B4 Standard access principles and limits

43. The Commission is required to make a determination bearing in mind the standard access principles set out in clause 5 of Part 1, subpart 2 of Schedule 1 (hereafter referred to as "clause 5" or "SAPs") and the limits on those principles in clause 6 (hereafter referred to as "clause 6 limits"). The proposed service creates several difficulties in terms of those provisions.

Clause 6

44. The Commission's proposed determination is not consistent with the "reasonable technical and operational practicability" limitation in that:
- (a) increased noise caused by requiring an unconstrained downstream service creates operational issues associated with having to reduce reach to customers.²⁰
 - (b) operational issues are caused by having to allocate resources of the DSLAM in a way that is not fair to all users.²¹

¹⁹ Office of Communications *Review of the Wholesale Broadband Access Markets* at paragraph 4.71 (emphasis added).

²⁰ Refer paragraphs 74 to 87 below.

²¹ Refers paragraphs 98 – 101.

(c) interleaving being turned off creates instability in the system that needs to be managed.²²

45. Telecom is concerned about the combined effect of these factors on its operations, particularly since some of the possible impacts (especially regarding interleaving) are not yet known as the proposed service differs so significantly from the services Telecom currently manages.

46. Telecom also considers that the DSLAM buffer overload effects may well affect service level commitments to PON and One Office customers. This is inconsistent with section 6(c) of the Act, which sets a limit where there is a likely inability to meet defined levels of services to existing customers.²³

SAP 3

47. The term “equivalence” has been adopted in the draft determination along with references to “no material difference” to denote SAP 3. It is important to note that SAP 3 requires consistency. It does not require an identical level of services, reporting or provisioning. As “consistency” is not defined, its ordinary meaning must prevail. The legislator has specifically chosen not to use the word “identical” because it is recognised that limitations may mean that this is not always possible.

48. Telecom is committed to the principle of consistency. As outlined later in these submissions, Telecom’s approach to engineering design and network management promotes first order consistency, provisioning and operational requirements are colourblind between wholesale and retail (with only unavoidable differences being present) and Telecom is offering up a level of reporting in its fair and workable proposal to demonstrate this commitment.

SAP 1

49. The provision of a mandated designated service is guided by SAP 1. Telecom is committed to this SAP but notes that it is subject to the clause 6 limits. Telecom must therefore be provided with sufficient implementation time in relation to any final determination. Telecom is unable to commence implementation until the final determination is delivered given that what is exactly being mandated is not yet known.

B5 Market definition and competition assessment

²² Refer section C2.2.

²³ Refer paragraphs 88 – 95.

50. In order to regulate, the Commission must find that:
- (a) Telecom faces limited, or is likely to face lessened, competition the market for the designated bitstream service; or
 - (b) Telecom does not face limited, or is not likely to face lessened, competition for the designated bitstream service, and the Commission has decided to require the service to be wholesaled.
51. In the Commission's decision to investigate, the Commission stated that it considered that in relation to the designated bitstream services, there is either a national or sub-national market. On either basis, the Commission stated that it considered that only Telecom has the network infrastructure to support bitstream services such that Telecom faces limited competition.
52. If, as the draft determination proposes, the Commission intends to move away from previous views on the relevant market and state of competition the Commission has a duty to provide detailed reasons and provide parties an opportunity to comment. The draft determination is inconsistent with previous Commission views on the same retail markets. The opportunity to respond is hindered by the Commission's lack of reasoning around its proposed departure on the definition of the retail market or how (if it has not departed from earlier views on the retail market) the wholesale market can differ given the derived demand from the retail market. These points are elaborated on in section D.

B6 The role of commercial outcomes

53. The key foundation of the Act is that commercial negotiations should take primacy. The regulator provides a backstop when negotiations are not successful. The Act therefore recognises that market outcomes should not generally be substituted for regulatory ones. Accordingly, Telecom supports the Commission's approach to return matters back to the parties once guidance has been provided as set out in the draft determination.
54. With the draft determination and the guidance of the Commission, the parties will be able to enter into fresh negotiations as to detailed implementation matters, thereby preserving the benefits of commercial arrangements. If those negotiations do not conclude, then either party has the option to make a new application to the Commission for determination of remaining terms. Such an approach is consistent with approaches of regulators taken overseas (for example in the UK).
55. Telecom encourages the Commission to provide guidance to the industry and incentives to reach commercial solutions wherever possible and for this reason

Telecom endorses the proposal by the Commission to intervene on certain technical issues (e.g. selection of an auditor) only if the parties cannot agree.

C. PROPOSED BITSTREAM SERVICE

56. In this section, Telecom addresses three aspects of the non-price terms section of the Commission's draft determination: speed configuration; request for service consistency; and interleaving.
57. The draft determination requires Telecom to provide a bitstream access service to TelstraClear with:²⁴
- (a) a non rate shaped downstream speed up to the maximum capacity of the DSLAM and an upstream speed of 128kbps ("non rate limited service" or "unconstrained") (paragraph 228 of the draft determination);
 - (b) the ability to turn interleaving on or off on a per port basis (paragraph 266 of the draft determination); and
 - (c) no material difference between the network based characteristics supplied to TelstraClear and the bitstream used by Telecom to supply its own retail services ("consistency of service")(paragraph IV of the Executive Summary to the draft determination).
58. Issues with these requirements mean that they may not be technically or operationally possible and end user experience may be detrimentally affected.
59. This section is structured as follows:
- (a) a discussion of the proposed non rate limited service and the issues that such a service presents in terms of the limits on application of the standard access principles and reporting to ensure consistency of service;
 - (b) a discussion of the requirement to turn interleaving off for single ports and the issues that this presents in terms of reporting to ensure consistency of service; and
 - (c) a discussion of some additional issues relating to the reporting regime proposed by the Commission.

²⁴ By email dated 26 April 2005 Telecom sought clarification of whether the draft determination required Telecom to provide a layer 2 service or a L2TP service. The Commission by email dated 27 April 2005 confirmed that the draft determination required Telecom to provide a L2TP solution. This submission has been prepared on the basis Telecom is required to provide a L2TP solution.

C1 Unconstrained Downstream Service

C1.1 Introduction

60. The draft determination provides that:
- (a) the Commission is satisfied that a bitstream service with a non rate-shaped downstream speed, and an upstream speed limited to 128kbps falls within the service description (paragraph 226 of the draft determination);
 - (b) TelstraClear will obtain a bitstream access service to the maximum downstream speed of which the relevant DSLAM is capable. TelstraClear may use the "raw" bitstream to perform rate-shaping to provide the variants of downstream speed it requires (paragraph 227 of the draft determination); and
 - (c) Telecom should apply rate-shaping to the bitstream service in respect of the upstream speed of 128kbps only. Telecom may not apply rate-shaping the downstream speed (paragraph 228 of the draft determination).⁸⁷
61. In order to manage congestion events within the shared elements of Telecom's network it is necessary to have some form of shaping or policing. Telecom understands that:
- (a) by "rate shaping" the Commission actually means copper rate limiting (or any interference with the copper line between the end user and the DSLAM); and
 - (b) the Commission is not prohibiting traffic management (shaping) at the ATM aggregation or in the L2TP origination.⁸⁸
62. Telecom's submissions below are therefore premised on it being the case that references to an "unconstrained" or "non rate shaped" service are actually references to a "non copper rate limited" service.⁸⁹ The term "unconstrained" is principally used throughout these submissions but is considered equivalent with these other terms.
63. A non rate limited configuration raises technical and operational issues which impact both the network and ultimate end-users of a DSLAM (whether Telecom's or another operator's customer) that require careful consideration as discussed below. Telecom's comments are necessarily preliminary given that such matters have not been fully investigated before.

⁸⁷ Refer paragraphs 220 – 231 of the draft determination.

⁸⁸ See Slide 22 of the technical presentation at the workshop on 11 February. As Telecom has previously submitted, shaping at the ATM aggregation point and/or the L2TP origination is required to manage traffic congestion and ensure fairness for all users of the DSLAM and associated infrastructure. (For ease of reference Telecom has in a number of places footnotes references to the technical set of slides presented at the workshop).

⁸⁹ Telecom notes that the Commission was not talking exclusively about copper rate limiting but Telecom's submissions apply equally to any other form of managing the interference with the copper line between the end user and the DSLAM.

64. Furthermore, the reporting objective in the draft determination is unworkable. To produce a meaningful comparison of the two services against common service parameters, it is necessary for the two services to be comparable to begin with. The Commission is, however, proposing a UBS service which is significantly different from Telecom's own retail services. The performance of a UBS non rate limited service is essentially random due to the randomly distributed nature of synchronisation rates on copper cable pairs connected to a given DSLAM. In addition, the impact of non copper rate limiting (as opposed to copper rate limiting) will create quite different performance in terms of delay variation and latency. This means that a non rate limited service is significantly different to the service which Telecom provides to itself, and as a result, it will not be possible for Telecom to demonstrate consistency of service.
65. Telecom reiterates that consistency of its approach to engineering design and traffic management provides a first order demonstration of consistency. This approach will continue under Telecom's proposal for a menu of retail and wholesale UBS variants. As previously submitted, there are minor technical differences between Telecom's commercial UBS service and the Jetstream services.⁹⁰ Telecom's proposal would enable this network consistency (and the ability to measure it) to continue. Any differences are those which are simply unavoidable (e.g. the difference between L2TP and layer 3 or variances between DSLAMs.⁹¹)

Cost implications

66. If the Commission requires Telecom to provide a non rate shaped service, it will consume greater quantities of network resources which needs to be reflected through into the pricing equation.

Utility of the proposed service

67. In practical terms the scope for additional innovation provided by a non rate limited service is limited compared with Telecom's proposal for a menu of speeds.
68. These points are elaborated on below.

⁹⁰ Paragraphs 56 to 60.

⁹¹ Customer experience within a DSLAM will be consistent but there may be variance between customer experiences on different DSLAMs.

C1.2 The adverse effects of an unconstrained bitstream access service

Introduction

69. Copper rate limiting of the downstream speed in relation to a particular copper access line can be performed independently of copper rate limiting of the upstream speed. It is therefore theoretically possible for Telecom to provide a service with a non rate limited downstream speed configuration, while retaining the rate limited upstream speed of 128 kbps.
70. In practice, however, a non rate limited service raises issues of technical and operational practicability (particularly with DSLAMs and efficient spectral management), and potential adverse impacts on others users of the DSLAM (whether Telecom customers or customers of other operators) and potentially on existing contractual arrangements to such users through noise, spectral pollution and reduction in reach. These are explained in detail below.

Why copper rate limit?

71. To understand the technical issues associated with operating a non rate limited service, it is important to consider why Telecom applies copper rate limiting in the first place.
72. Copper rate limiting is a form of policing which is applied on each copper access line connected to the DSLAM. Copper rate limiting achieves the following outcomes, which have a positive impact for all users of Telecom's network:
 - (a) it stops customers using more resource (spectrum, DSLAM capacity and backhaul) from the ADSL modem to the first ATM switch, than their access provider has purchased from Telecom and enables Telecom to ensure that shared resources are fairly and efficiently allocated between services. In other words, copper rate limiting avoids some customers using all of a finite resource or more than their share to the detriment of other customers;
 - (b) it reduces the power spectral density for a given service per copper cable pair, within a given cable sheath and hence reduces the impacts of cross-talk in the copper cable network. By managing power spectral density Telecom can ensure the greatest possible reach for the greatest number of customers; and
 - (c) it reduces the number of re-synchronisation events by improving the noise margins for any given service.⁹²

⁹² Refer Slide 28 of Telecom's technical presentation at the 11 February 2005 workshop.

73. In very simple terms spectrum resource in the cable sheath and resources in the DSLAM are finite. A cake can be divided in many ways. If a large piece is taken by one customer there is less left for other customers. The size of the cake does not change. Such a high level analogy can be made with the spectrum that must be allocated in the cable sheath and the resources in the DSLAM. With this in mind, the problems associated with an unconstrained service (one without copper rate limiting) are set out below.

Increased Noise

74. The management of noise and interference is one of the key issues facing DSL providers globally. The risks increase as penetration grows and differentiated services appear. A number of industry forums have this issue high on their agenda including the following:
- (a) ATIS (American Telecommunication Industry Standards);
 - (b) ACIF (Australian Communications Industry Forum);
 - (c) ITU (International Telecommunications Union); and
 - (d) ETSI (European Telecommunications Standards Institute).
75. Noise is a real and present issue in Telecom's network and will increasingly become more of an issue as uptake in services increases. By way of example, Alcatel carried out a small service test in relation to []TCNZRI exchange. In a period of three years the average line rate performance has []TCNZRI. (See Annex D). Alcatel noted that the network performance was becoming []TCNZRI. This is evidence that, due to the increased number of customers, there is an increasing issue with noise on lines.
76. Higher downstream speeds create greater noise interference. This is because the DSLAM is required to transmit at a much higher power in order to achieve the necessary speed. A high downstream speed which is not rate limited will increase the power spectral density per copper pair within a given cable sheath, meaning that the impacts of cross-talk in the copper cable network are increased. Increased cross-talk is likely to increase the frequency of resynchronisation events and cause packet loss. This will in turn degrade the service obtained by all other users of the copper cable sheath.
77. An unconstrained service will synchronise to the maximum speed that is capable of being achieved on the cable pair feeding the end user. If the synchronised speed is the same as the purchased speed then we have an efficient use of the spectral resource. On the other hand, if the purchased service's speed is less than the synchronised speed then the difference

represents wasted resource that reduces the utility of the cable sheath for all customers.

78. When broadband was introduced, Telecom had a number of unconstrained services. Telecom is moving away from this approach due to the detrimental impact of noise which is aggravated by higher speeds and higher volumes.
79. Telecom retail is [

] TCNZRI

80. Copper rate limiting was introduced as a response to the issues associated with noise. Telecom has also committed substantial investment [] **TCNZRI** to the investigation of the impact of noise on copper cables because it is recognised that deterioration is occurring. Telecom is also considering committing further investment [] **TCNZRI** in a tool to assist it with spectral management. The Commission's draft proposal for an unconstrained service will fuel these issues in the wrong direction, for the reasons set out above. This will be to the detriment of the network, the industry and ultimately to the end-users of New Zealand.
81. Telecom, in line with internationally recognised network management issues and in order to maximise overall performance for all customers on a cable, currently tries to keep access speeds as manageable as possible across all of its services. This provides the lowest possible power spectral density consistent with providing the required service within each copper cable sheath, and therefore reduces the impact of cross-talk. This is consistent with the approach adopted by access providers in other jurisdictions, many of which have 3 Mbps plans as their "high bit rate" internet plans.⁹³
82. If downstream speeds cannot be kept low and there is no copper rate limiting, then the next logical way to manage the power spectral density problems is to limit reach, that is, to limit the number of customers who are able to be served. In other words, the maximum distance at which each speed (256 kpbs, 1 Mbps, 2 Mbps) can be achieved will be reduced, and customers furthest from the DSLAM will no longer be served. Turning

⁹³ For example, ntl in the UK, Eircom in Ireland (2Mbps is the highest), SBC yahoo in the US and Singtel in Singapore.

back to the simple analogy, some end users will simply not be able to seek a piece of the cake or will have the size of their piece reduced.

83. Alcatel has carried out a simple lab trial which provides some guidance on the trade off between speed and reach. By restricting a line rate to all users in a 0.4 mm cable to 256kbs/s a reach improvement of 800 feet is gained using ADSL 1. A reach improvement of 1300 feet is gained using ADSL 2.⁹⁴
84. Based on this information Telecom has carried out an analysis of existing lines. If the lines continue to be rate shaped and kept below or around 3 Mbps, then, in the immediate future:
 - (a) an additional 6800 (7%) of farmers and rural lifestylers could be offered basic broadband service (the total number of lines serving such customers is 95,000); and
 - (b) across the country as a whole, the number of lines that could be offered basic broadband service could be very significantly increased by approximately 49,000 lines.
85. To date, Telecom's approach has been to provide as much reach as possible, to ensure that broadband internet access services are available to as many New Zealand end users as possible. Telecom considers that any limitation in reach is not only inconsistent with section 18 and the long term interests of New Zealand end users but, it is also inconsistent with the Government's (and Telecom's) broadband growth policy.
86. Telecom is committed to offering up a "full speed" service that is constrained only to the extent that the detriments do not outweigh the benefits. Initial indications are that a 3Mbps downstream speed maximises the speed/reach equation.
87. Telecom notes that while in some instances higher downstream speeds are provided overseas they are generally accompanied by both an increased upstream speed (to deal with the asymmetry issues) and they have traded off reach.

Risk to non TelstraClear customers of DLSAM input buffer overloading

88. If a given line synchronises at a downstream speed that is less than the nominal PIR of the service TelstraClear offers over that line, the end user will be able to download traffic at a rate that is greater than the line speed, thereby potentially throwing more traffic at the DLSAM than it can actually support. This may cause the DSLAM's input buffer to overload.

⁹⁴ ADSL 2 is currently being commercially deployed in New Zealand and ADSL 2 modems are now on the New Zealand retail market. ADSL 1 equipment may no longer be produced internationally beyond the end of this year. ADSL 2 provides a 10.4db improvement in reach (measured at 1024 KHz).

89. Telecom has three main types of DSLAM – ASAM's, Nokia's and Conklins. Telecom does not have evidence that enables it to be confident that other end users (and potentially customers of Telecom or other carriers) will not be impacted by the existence of a TelstraClear customer with an unconstrained service on all types of DSLAMs. Preliminary views are set out below and indicate that the supply of unconstrained services by TelstraClear raises a risk of impacting not only on TelstraClear's services but on other services being provided from the DSLAMs.
90. The buffer allocation in an ASAM (Alcatel DSLAM) is based on 12 port segments. In other words, for a 24 port line card there are two independent buffer segments. Within a 12 port buffer segment, the buffer memory is allocated using a priority relative to the ATM class of service with CBR having highest priority and UBR (Jetstream and UBS) having lowest priority. For UBR services the buffer is allocated on an equal basis to each port. If one UBR port experiences severe overload, as might occur with unconstrained downstream, the buffer allocation associated with that port can become exhausted. At this time, the buffer allocations from other UBR ports will start to be used until all available buffer allocation is exhausted.
91. Once buffer allocation is exhausted, the ports associated with all services using that buffer segment will suffer cell and hence packet loss. Packet loss will be experienced by all services within the 12 port buffer segment, with UBR services being impacted the most. Clearly, other services using the DSLAM (eg PON, One Office), not just TelstraClear's service, may be impacted by a buffer overload. This may cause difficulties with existing service level and contractual commitments.⁹⁵
92. The increased packet loss from the form of buffer overload described above will typically cause the TCP protocol to back off the incoming packet stream on all ports and especially the offending port. This will occur until eventually the buffer is purged of traffic, at which time the process will recommence in a cycle fashion until either the traffic on the offending port(s) is backed off to the peak throughput of the line circuit(s) or the service is adjusted to align with the speed of the line circuit(s).
93. Telecom expects that a similar buffer allocation mechanism will apply for Nokia DSLAMs but at the current time the size of the buffer segment in these DSLAMs is unclear. It is suspected (but not yet known) that due to the age of these DSLAMs, the buffer allocation per port segment will not be as big as that for the newer ASAMs, and so we would expect that buffer overload would occur more frequently on these DSLAMs. Furthermore, there is no implementation of ATM class of service on these DSLAMs so we

⁹⁵ For example, Telecom's One Office has a reliability target which translates to less than two outages per month. If the existence of an unconstrained service caused even a minimal disruption to buffer this may mean that the service delivery levels are not met. This then gives rise to contractual issues.

would expect more interaction between the Jetstream/UBS services (which use UBR) and the PON and One Office services (which use higher ATM service classes).

94. The buffer segment is expected (but needs to be confirmed) to be allocated on an eight port segment for Conklin DSLAMs (this is the port expansion module size). Conklins today support CBR and UBR ATM classes of service and this it is expected that there would also be more interaction between service types than is the case with ASAM DSLAMs.
95. In terms of the impact that buffer issues might have on end user experience, an end user who is web browsing may have their screen freeze for up to a minute, an end user who is watching a streaming video may lose their connection, and an end user who is playing a game may lose their session. One of the services that would be most affected by traffic loss resulting from a DSLAM input buffer overload would be Schoolzone video conferencing.

Asymmetry

96. A service with 7.6Mbps downstream (the theoretical maximum) and a 128 uplink (the maximum specified in the Designation) is likely to result in an unsatisfactory end-user experience. Annexes B and E detail examples of equivalent overseas retail and wholesale broadband and bitstream offerings. It is notable that none of these services that are DSL based contain the asymmetry of TelstraClear's requested 7.6 Mbps/128 kbps bitstream service. With TCP/IP sessions the quantity of acknowledgment packets that the uplink can support will not allow the full download speed to be achieved. The effect on the end-user is a service which is slow or unstable.
97. Telecom acknowledges that alternative protocols (such as UDP) may be successfully used with highly asymmetrical links. However, for reasons that are discussed elsewhere in this submission, Telecom considers that a practical maximum of 3 Mbps will limit the extent of any asymmetry issues as well as maximising the speed/reach equation.

Fairness

98. Each DSLAM and its associated infrastructure is a very complicated shared resource supporting a range of services for a number of different types of customers.⁹⁶ Again, we have cake which must be divided up appropriately and efficiently. These services include Xtra broadband services and dedicated broadband and data services such as Private Office Network and Frame Relay to business customers.

⁹⁶ See slide 3 of Telecom's technical presentation at the 11 February 2005 workshop

99. Under congested conditions, it is essential that of all the different services receive an appropriate amount of resource relative to their defined service characteristics. For example:
- (a) services with a defined committed information rate (CIR) will receive sufficient resource to deliver on this guarantee for better than 99.9% of the time. These are typically high value business grade services with commensurate prices in the market; and
 - (b) services with a defined PIR, no defined CIR and a defined contention ratio (referred to as uncommitted bit rate (UBR) services) need to receive sufficient resource to deliver the defined contention ratio during periods of congestion and the full PIR during periods of no congestion.
100. In addition, service performance should degrade in proportion to the PIR under congestion conditions. The different PIR services all experience bit rate degradation in proportion to their PIR and, delay variation and packet loss performance is distributed in an equitable manner for all services.⁹⁷
101. With respect to fairness in the allocation of shared resources:
- (a) the non rate limited downstream speed leads to greater variation in fairness degradation of performance under conditions of congestion; and
 - (b) operationally, it is difficult to accurately manage fairness with unconstrained services as the synchronised line speed is not known, the shaping performed by the service provider is not known, and the mix of constrained and unconstrained services varies over time due to churn.⁹⁸

Cost implications

102. The draft determination states that the Commission understands that the cost of supply of a bitstream access circuit is not materially affected by the downstream⁹⁹ and upstream speeds provided on an individual circuit due to the configuration of Telecom's network, including aggregation between the DSLAM and the first ATM switch.¹⁰⁰
103. The Commission's understanding is incorrect. The supply of a bitstream access circuit is significantly affected by the downstream speed configuration.¹⁰¹ This consumed resource needs to be factored into the

⁹⁷ See Slide 30 of Telecom's technical presentation at the 11 February 2005 workshop.

⁹⁸ See slides 42-43 of Telecom's technical presentation at the 11 February 2005 workshop.

⁹⁹ The downstream speed also affects resource requirements, but the 128k limit specified in the designation means no issues arise for this determination.

¹⁰⁰ This view is reiterated in the Commission's draft determination correction of 27 April 2004, which states that the Commission understands that the cost of a bitstream access service is not materially influenced by service speed. Refer to paragraph 159 of the draft determination.

¹⁰¹ See slides 37 and following of Telecom's technical presentation at the 11 February 2005 workshop.

consideration of the initial pricing principle and reflected in the price of the service.

104. If Telecom allocated resources to an unconstrained service relative to the theoretical maximum downstream speed of 7.6Mbps, then with a contention ratio of 50:1 (with all ports active) only 987 such connections could be configured per exchange based DSLAM, as compared to 3750 connections with a downstream speed rate limited to 2Mbps. Hence the relative costs of these two cases will vary by a factor of around 4:1 in favour of the rate shaped downstream service.¹⁰²
105. To support 250,000 services defined in this manner, Telecom would require 254 DLSAMs (with 150Mbps backplane). On the other hand, the same number of 2Mbps rate limited connections could be supported on only 67 DSLAMs. In this case the increase in capital cost of providing the unconstrained service as compared with constrained service for the same number of connections is around \$50M.
106. Alternatively, it would be possible for Telecom to allocate resources to the unconstrained service relative to the expected average downstream speed across all access lines, rather than the theoretical maximum downstream speed of the unconstrained service. If this average is around say 3Mbps, then it would be possible to support around 2500 unconstrained downstream services on an exchanged based DSLAM (with 150Mbps backplane). The average in this case would need to be defined by the access seeker as the overall performance exhibited by the resulting unconstrained downstream services is determined by this choice. In the case of an average of 3Mbps, the cost increase over the 2Mbps rate limited downstream service case in the provision of 250,000 connections would be around [] **TCNZRI**.
107. Any line running at an unconstrained line rate will generate a materially higher level of noise than a constrained line. The cost of this is an opportunity cost in that fewer "unconstrained" lines will be able to be operated in that cable before the noise level exceeds a threshold that degrades all services in the cable to sub standard levels. The cost of the cable (capex and opex) needs to be allocated over a smaller number of services for higher line rate services than lower line rate services. The long run average incremental cost of providing any DSL service is therefore a function of the cable spectrum utilisation of that service, in addition to the costs indicated above.

Comparison with BT in the UK

108. As an example of how costs vary with speed, the Commission can look at the prices which BT Wholesale has set (and Ofcom has approved) for BT's

¹⁰² See slide 43 of Telecom's technical presentation at the 11 February 2005 workshop.

ATM Interconnection product.¹⁰³ These prices are available at Section 44 of <http://www.serviceview.bt.com/list/current/download.html>, but are more conveniently summarised in the “BT ATM Price List” section of the spreadsheet at:

http://www.ofcom.org.uk/consult/condocs/adsl_price/statement/wbams.xls

109. These BT charges comprise principally:
- (a) an End User Access charge, which covers the connection from the end user to the DSLAM and is a fixed charge independent of speed; and
 - (b) an ATM Virtual Path rental fee which covers the connection from the DSLAM to and through the ATM network which the access seeker can dimension according to the quality of service it wants to provide to its end users.
110. There are some other components of the BT charges such as EUA Port reservation fees and ATM Port rental fees; however these two charges represent on average about 87% of the total.
111. The End User Access charge is reasonably self-explanatory as a fee per end user and as such has the same structure as the Commission’s proposed charge, although unlike the Commission’s proposed charge it represents from 20% to 73% (depending on speed) of the total charge, rather than all of it.
112. The more significantly different component is the VP rental which represents from 13% to 68% of the total. The VP rental product is offered as an ATM nrt-VBR service in a range of speeds from 0.25 Mbps to 10 Mbps. There are four options - Handover, Local, Regional, and National depending on the length of the link. Within these four options, prices scale reasonably linearly with speed. This proportionality to speed means that products provided using ATM Interconnection need also to be charged for relative to their speeds in order to cover their costs. This applies both to products provided by Altnets (companies who buy BT’s wholesale products and convert them into services for ISPs) and to the product which BT uses to compete with the Altnets, IPStream.¹⁰⁴
113. These ATM Interconnection charges do not in themselves though indicate how the costs of Telecom’s analogous UBS product might also scale with speed. Helpfully, the Ofcom spreadsheet referred to above contains formulas to translate the ATM Interconnection charges into costs for IPStream and therefore assigns costs against products which have a very similar structure to Telecom’s commercial UBS suite of services.
114. The IP Stream “Standard” suite of products is:

Product	Bit rate	Price	ATM Interconnect cost
Home 250	250 / 64 to 250	147.00	100.67
Home 500	500 / 64 to 250	156.00	114.84
Home 1000	1000 / 250	276.00	143.16

¹⁰³ BT’s ATM Interconnection service (a.k.a. DataStream) has quite a different price structure to, but is functionally equivalent to Telecom Wholesale’s UBS and UBR Backhaul products added together.

¹⁰⁴ IPStream is analogous to Telecom Wholesale’s Wholesale Jetstream and Fast IP products combined.

Home 2000	2000 / 250	456.00	199.82
Office 500	500 / 64 to 250	244.92	157.33
Office 1000	1000 / 250	392.68	228.15
Office 2000	2000 / 250	684.00	369.79

115. These prices are expressed as GBP per annum. A conversion to NZD at 0.38 pence per NZD and as a monthly rental gives the following rates:

Product	ATM Interconnect cost	Less Backhaul
Home 250	22.08	20.92
Home 500	25.18	24.02
Home 1000	31.40	30.24
Home 2000	43.82	42.66
Office 500	34.50	33.34
Office 1000	50.03	48.87
Office 2000	81.09	79.93

116. The Less Backhaul column converts the figure to a UBS equivalent by subtracting off the average per-user charge for Telecom Wholesale's UBR Backhaul product (\$1.16 per month) as backhaul is included in the BT product specification.
117. These figures show that there is a material difference in cost between bitstream access products supplied at different speeds. For the Home products (with a 50:1 contention ratio) the cost doubles as the speed goes from 250 to 2000. There is a similar increase for the Office products (with a 20:1 contention ratio) as the speed goes from 500 to 2000. The steeper curve for Office is because of the greater amounts of capacity required to support the lower contention ratio.
118. Telecom is not suggesting that these figures are necessarily representative of the structure of costs in New Zealand. There are a number of country-specific factors which would need to be allowed for if any comparison were to be attempted. One would need to adjust for different equipment configurations, different switch sizes, different contention ratios, different economies of scale etc. Nor do they represent a way that a New Zealand service could be priced as they are not retail minus prices.
119. The point of including this analysis is to illustrate that Telecom's assertion that bitstream access costs vary by speed is supported by international precedent and that accordingly the Commission cannot disregard it as a relevant factor when setting regulated bitstream access prices.

C1.3 Inability to report to ensure consistency of service

120. Standard access principle 3 requires Telecom to offer wholesale access to essentially the same infrastructure that it uses to provides its retail ADSL services. It will not be possible for Telecom to report to ensure consistency of service where the wholesale service (as proposed in the draft determination) is substantially different from Telecom retail services. Even if (ignoring the limitations triggered by an unconstrained service discussed above) comparison of an unconstrained service with an unconstrained service were to occur, there are additional challenges in agreeing the appropriate measurement.
121. The objective of the reporting regime is to produce a statistically reliable means to compare Telecom's service with the designated service. To produce a meaningful comparison against common service parameters it is necessary to have two services which are comparable to begin with. Section C3 of these submissions sets out in detail the ability to meet the reporting objectives of the draft determination if it moves to a final determination that moves towards Telecom's fair and workable proposal. The following paragraphs explain why the objectives simply do not "fit" with the proposed unconstrained service.
122. The performance of an unconstrained service is essentially random (and is dependant on the maximum speed supported by the copper access cable). Thus an unconstrained service is fundamentally different to that which Telecom provides to itself. As a result, it will not be possible for Telecom to demonstrate consistency other than through consistency of design and traffic management.
123. In addition, in order for Telecom to measure the performance of a service, it must know certain characteristics of the service so that it can configure its measurement probes accordingly. For example, to measure throughput, jitter, and even latency, Telecom needs to define the traffic characteristics going into the test circuit so the probe "pings" at a rate appropriate to the PIR of the service being measured.
124. However, if Telecom was required to provide TelstraClear with an unconstrained service, Telecom would not know:
 - (a) the nominal downstream PIR that TelstraClear has defined; or
 - (b) the nature of the shaping (if any) applied by TelstraClear.
125. TelstraClear is likely to view this information as being commercially sensitive and may be reluctant to provide it to Telecom. Without this information, Telecom will be unable to measure the service in a way that produces any meaningful result.
126. This issue can be illustrated using the following simple analogy. Assume that Telecom has been is asked to time a running race with 100 entrants. Telecom will be able to record the time taken from the start of the race until the final entrant crosses the finish line. However, unless the distance of the race is known (ie the nominal downstream PIR defined by TelstraClear), the result will be meaningless. Telecom will not know whether the race has been fast or a slow.

127. In addition, without a defined peak information rate it is impossible to measure contention ratio.

C1.4 Utility of proposed unconstrained service

128. There is little to be gained by mandating an unconstrained service in terms of utility for end users and the promotion of competition for the reasons set out below.
129. Although it is theoretically possible for Telecom to provide a non rate limited service, none of Telecom's copper access lines will synchronise to a downstream speed of more than 7.6Mbps, and then only about 20% will achieve this rate. The actual downstream rate achieved for any given copper access line will vary considerably, with the majority of copper access lines synchronising between 2 Mbps and 4 Mbps (with a good ADSL modem and clean in-premise wiring).¹⁰⁵
130. At the moment Telecom sets a 2 Mbps maximum which can be achieved by 90% of lines with no impact on reach. If the rate is set at 3 Mbps, then 70% of the lines will achieve that rate without the need to reduce reach. However, if 4 Mbps is chosen then only 50% will achieve that maximum. This creates significant operational problems and begins to impact on reach.
131. TelstraClear accepts that the maximum speed profile could only be achieved by a small number of users in close proximity to the exchange.¹⁰⁶ In addition, TelstraClear's consultants, AAS, after commenting that as far as they are aware it is "technically possible" for Telecom to supply a 128kbps upstream service combined with a non-rateshaped downstream service, state that:

"The possible exception to these comments is the mini-DSLAM...The use of mini-DSLAMs in peripheral parts of Telecom's network **may well cause difficulties** for Telecom in meeting TCL's specifications...In areas where service is provided by Conklin DLSAMs, we understand that TCL would accept that the requested service could not be provided to TCL's customers"¹⁰⁷

132. Telecom currently has approximately 1500 DSLAMs. Nearly two thirds these DLSAMs are mini-DLSAMs ("Conklins"). Conklins service approximately 20% of the copper access lines that currently support ADSL services. Each Conklin can support up to 60 end users. However, each Conklin only has a single output, which will support a 8 Mbps circuit between the Conklin DSLAM and the hub DSLAM. At present most Conklins are served by a single 2Mbps or 4Mbps circuit. Telecom is investing nearly [] **TCNZRI** to bring the majority of Conklins up to 4Mbps. For Conklins with a 4 Mbps backhaul the maximum downstream speed that can be obtained by the end user is around 3.4 Mbps. Accordingly, the perceived benefit of unconstrained above Telecom's proposal of around 3 Mbps is minimal. If the adverse impacts outlined above are ignored and Telecom were required to provide an unconstrained service, this would therefore only enable TelstraClear to offer higher downstream speeds to a limited number of end users.

¹⁰⁵ See slide 29 of Telecom's technical presentation at the 11 February 2005 workshop.

¹⁰⁶ Paragraph 229 of the draft determination.

¹⁰⁷ Page 10 annex A to TelstraClear's cross submission.

133. In addition, there is significant potential for the access seeker to differentiate/innovate its retail product by offering differentiating factors beyond the first ATM switch such as:
- (a) national backhaul bandwidth and quality per customer;
 - (b) international bandwidth and quality per customer;
 - (c) authorisation and accounting capability; and
 - (d) dynamic bandwidth control (this includes speed on demand options (ie: throttle customer down, but allow them to purchase speed bumps to allow them to resume the speed of their plan)).
134. These are types of service parameters that can make an appreciable difference to the end user experience and provide a real opportunity for the access seeker to differentiate its retail products.¹⁰⁸ They can differentiate further by offering anti virus, anti spam measures, parental controls (content filtering), offering multiple email addresses, domain names, web hosting, billing options, customer support (extent of) and roaming capability. In addition they can provide very meaningful differentiation via price, eg: overage rates, bump packs (prepay), uploads not included in usage allowance, peak and off peak usage. Scope for differentiation would be further extended by Telecom's fair and workable proposal.
135. In summary, given the technical and operational issues outlined above and the fact that there is significant scope for innovation past the first ATM, Telecom considers that the actual and potential risks associated with the provision of an unconstrained service far outweigh any theoretical benefit that may be obtained by allowing access seekers to offer a broader range of downstream speeds. To go beyond 3 Mbps is not practical or workable considering customer expectations about reliability and the need to maximise reach.

¹⁰⁸ Paragraphs 61-62 of Telecom's Cross Submission.

C2 Interleaving

C2.1 Introduction

136. The draft determination states that the Commission:
- (a) understands that any consequence of not having interleaving turned on will only affect that particular port.¹⁰⁹
 - (b) considers that there is no reasonable technical impediment why a TelstraClear port could not be individually configured for interleaving;¹¹⁰ and
 - (c) requires Telecom to turn interleaving off for an individual port when requested by TelstraClear.¹¹¹
137. It is technically possible for interleaving to be turned on or off on a single port, at a cost. However, Telecom is not be able to predict the impact of an interleaving option on its network. There are a number of potential detrimental impacts that may occur if this were simply mandated without investigation. The key issue will be a further acceleration of noise in the cable sheath. Telecom believes that there may, in practical terms, also be a higher probability of a line becoming unstable than theory might indicate. Telecom has not, to date, had a need to carry out such testing because it has a policy of turning interleaving on.
138. Turning interleaving off will make the performance of bitstream access unpredictable because of the increased impact of noise and interference, and the resulting increase in packet loss and resynchronisation events. This means it will not be possible to gather statistical information in the reporting process which is comparable to the statistical information gathered on Telecom's retail services.
139. Telecom suggests that the necessary testing must be carried out. To mandate an interleaving option without testing is high risk. At that time the Commission would need to consider whether the results demonstrate that requiring interleaving to be turned off would cause adverse impacts on the network and the services offered to end users (and thus whether the limits on application of the standard access principles are infringed).
140. There will also be costs associated with turning interleaving off on a port by port basis, which Telecom will seek to recover.

¹⁰⁹ Paragraph 261 of the draft determination.

¹¹⁰ Paragraph 263 of the draft determination.

¹¹¹ Paragraph 266 of the draft determination.

C2.2 The potential adverse effects of an interleaving option

141. Telecom agrees with the essence of the Commission's summary of interleaving at paragraph 254 of the draft determination.¹¹² It is technically possible for interleaving to be turned on or off at the DSLAM on a per port basis. However, Telecom does not currently have a complete understanding of the cumulative cross impacts that turning interleaving off on a per port basis will have for other users of its network.

An interleaving policy manages interference

142. The ITU DSL specifications include interleaving to enable carriers to better manage the noise and interference present on copper cables. This includes:
- (a) noise;
 - (b) crosstalk from within the copper cable sheath; and
 - (c) interference from external sources.
143. All these sources of interference and noise degrade the performance of ADSL when operating on a given copper cable pair within a defined copper cable sheath. The noise and interference manifest themselves as packet loss as the signal traverses the copper cable between the end user and the DSLAM. Furthermore high packet loss can force the ADSL modem to resynchronise with the DSLAM, which can cause traffic outages of 10-20 seconds. A resynchronisation event will detrimentally impact the end user experience. For example, an end user who is web browsing will find that their screen freezes while the resynchronisation event occurs.
144. In order to properly manage noise and interference to the benefit of all users of the copper cable network, Telecom has implemented a policy of having interleaving always turned on.¹¹³ A policy of having interleaving turned on improves stability and usability. Some lines that would be unstable if they did not use interleaving become stable with interleaving turned on, and therefore become commercially usable. Some lines will become "unusable" (because of instability) if interleaving is turned off.
145. BT has had a policy of having interleaving turned off, and is now moving to turn interleaving on to fix unstable and unusable lines. BT's experience to date is that the performance of lines with interleaving turned on is substantially improving the performance of lines. Telecom understands that Belgacom's experience is similar.

What happens if interleaving is turned off?

146. Telecom itself does not have actual field experience with ADSL services with interleaving turned off, as all of Telecom's current ADSL services use interleaving. International practice has generally been to either have

¹¹² Interleaving is an algorithm used on a per port basis within a DSLAM for improving the performance of the subscriber level. The purpose of interleaving is to make a connection more reliable and extend the geographic range of ADSL services.

¹¹³ See slide 52 of Telecom's technical presentation at the 11 February 2005 workshop. Telecom has previously noted that at some time in the future this policy may change as newer versions of ADSL (eg. ADSL2+), which have improved management features included within the technology, are introduced to better manage the impact of either turning interleaving off or changing its characteristics. See slide 53.

interleaving on for all services or off for all services rather than the hybrid which is the effect of the Commission's draft determination.

147. Telecom is operationally unfamiliar with a hybrid environment. Telecom has no means of predicting the resulting performance on the network by turning interleaving off, particularly in the absence of testing information. Any instability or unusability issues with lines will be difficult to predict prior to turning interleaving off (as the problem is currently hidden by the interleaving) and is not a function of line length. It will be impossible to offer any assurance around packet loss ratio or resynchronisation events under these conditions.
148. Telecom has no control over the interference that will cause a line with interleaving turned off to become unstable. This results from external interference (often inside the customer premises). This might mean that a line with interleaving turned off might work fine for a number of months but could, at any time, suddenly become unstable.
149. Should the Commission proceed with the interleaving proposal in the draft determination, it must enable Telecom to take appropriate action to deal with any instability or other unforeseen issues which might arise as a consequence of having interleaving turned off.

Potential impact on other lines based on international experience

150. In theory, interleaving should not affect the performance of any other line other than the one which actually has interleaving turned off. However, indications from international experience in working with interleaving off show that there is a definite probability of practical impacts which theory does not predict.
151. The most commonly recorded practical impact is that caused by specific makes and models of DSL modem, which when requested to turn interleaving off, also turn off the Reed Solomon coding at the same time. This effect is not a direct consequence of turning interleaving off, but appears to be a popular implementation in a variety of modems. The consequences of turning the Reed Solomon decoder off is a decrease (worsening) of the signal to noise ratio as seen by the modem. The impact of this reduction in signal to noise ratio can result in either of two outcomes:
 - (a) increased errors on the line which will cause the modem and the DSLAM to resynchronise to a lower speed; or
 - (b) in order to offset the reduced signal to noise ratio, the modem will negotiate with the DSLAM to send more power down the line to bring the signal to noise ratio back to a level at which satisfactory operation is possible at the same speed as was possible when the interleaving was on.
152. If (a) occurs, the customer of the interleaving off line will receive reduced performance and the probability that buffer overload will occur is increased on the DSLAM, with its consequential impact on other customers using the same buffer segment.
153. If (b) occurs, then the increased power provided on the interleaving off line will increase the noise in the cable sheath in which it resides, limiting

the reach or the speed for other customers utilising the same cable sheath.

154. Which of these two effects will occur and how often either of them will occur depends on the particular approach taken by DSL modem manufacturers. Telecom has opened up the market for DSL modems in order to increase the competition for the supply of these devices. Hence in New Zealand today we have many different types of modems in operation. Telecom currently has no information on how the many different types of modems will behave when interleaving is switched off. Some are certain to behave in the manner expected with interleaving off, retaining the Reid Solomon coding on. Others are certain to behave in the wrong manner, wherein with interleaving off, the Reid Solomon coding will also be turned off. This uncertainty presents a significant problem. It might be possible to specify a range of modems that will function correctly with interleaving off, but this will require testing to confirm which ones are satisfactory. On the other hand this solution will make the churn of customers from one operator to another more complex and expensive. These uncertainties reinforce the need for more comprehensive testing of the performance of lines and modems with interleaving turned off.
155. In practical terms, if the Commission were to require Telecom to provide TelstraClear with the option of turning interleaving off, Telecom would not be able to predict the impact of this on the network or end users. In Telecom's view, it would not be prudent for a regulator to require interleaving to be turned off without permitting a period of testing and properly considering the results .

Need to test

156. Telecom seeks the opportunity to explore the issue further and identify more reliably what consequences, if any, turning interleaving off may have for other users of its network. Telecom considers that this information is critical to ensure that the Commission makes an informed decision on behalf of New Zealand end users. There is insufficient information available on which the Commission can satisfy itself that there is an acceptable level of risk.
157. Telecom proposes to engage its current hardware supplier, Alcatel, to conduct a formal assessment of the implications of turning interleaving off on a per port basis.
158. A realistic testing environment will need to be established. This is likely to require the tests to be conducted on a live DLSAM, which feeds a reasonably well loaded copper cable. Telecom will need to measure the change in the noise floor of the copper cable as interleaving is turned on and off across an increasing proportion of the line circuits feeding that copper cable. It is likely that laboratory testing will need to be run in parallel with this live testing to measure the potential impacts in extreme cases and to ensure a variety of modems are included in the sample.
159. Telecom's current estimate is that it will take around three months to plan and configure the necessary tests, and a further three months to actually conduct the testing (a minimum of three months worth of data will be required to obtain a statistically valid sample). The cost of this testing is likely to be in the vicinity of [] TCNZRI. This cost should be borne by TelstraClear.

160. Telecom notes that such an approach as proposed here has been adopted by regulators overseas. When considering ATM interconnection in the UK, Oftel (as it then was) considered that a trial should be carried out in the first instance due to uncertainty as to technical feasibility of SDSL. Oftel said:

"There is a greater degree of uncertainty as to the requirements for such a service and what is technically feasible than the Director had originally believed to be the case....BT is then required to conduct a trial for that service....It is not the Director's normal approach to specify the terms and conditions for a trial and he also believes that it would not be appropriate to do so in this case. This is principally because BT, in consultation with the Operators, are developing the detailed product specification and therefore it, rather than the Director, is in the best position to set the terms and conditions for the trial service."¹¹⁴

161. As the effects of interleaving are untested, if it eventuates that turning it off does create instability, then Telecom would want the option of taking the appropriate action to prevent a degradation in customer service and maintain network security.

C2.3 Inability to report to ensure consistency of service

162. As discussed above, turning interleaving off on any given copper access line may significantly reduce the performance of ADSL services provided over that copper access line and will result in service with highly unpredictable performance, especially for longer cable reach situations.

163. With interleaving turned off it will not be possible to gather statistical information in the reporting process which is comparable to the statistical information gathered on Telecom's retail services. This is for two reasons. Fundamentally it is analytically flawed to seek to compare two different services – and the services are fundamentally different with interleaving on and off i.e. we are not comparing apples with apples. Secondly, the only way to get broadly comparable results is to effectively exclude from the measurement of the non-interleaving services the effects of service unavailability due to resynchronisation events by using a much larger sample size. Telecom has two issues with this approach: (1) It is not clear how big the interleaving off sample size would need to be in order for it to be comparable with the interleaving on, and (2) statistically you cannot validly compare two different services based on different sample sizes.

164. The difficulties in obtaining any form of statistically reliable results with interleaving turned off (even with a rate limited service) can be illustrated using the simple running race analogy above.

165. As with the previous example, assume that Telecom has been asked to time a running race with 100 entrants. However, this time assume that Telecom knows that the distance of the race is 10km. In these circumstances, it will be possible for Telecom to record the time taken to complete the race, and to assess whether the race had been fast or slow.

166. Now suppose that the race is repeated a number of times. In any one race, there are likely be a number of entrants who fail to finish. If Telecom knew that three entrants would fail to finish each race, it would

¹¹⁴ Direction to resolve a dispute between BT, Energis and Thus concerning xDSL interconnection at the ATM switch dated June 2002.

be able to adjust the results to account for this, and still be able to obtain a statistically reliable result for the average time taken to complete all races. However, the number of entrants that fail to finish each race will be a random number, in one race three people may fail to finish, while in another race 15 entrants may fail to finish.

167. As the time taken to complete each race will be based on a different number of entrants, it will not be possible for Telecom to obtain statistically reliable results for the average time taken to complete all of the races.
168. With interleaving turned off, it would be impossible for Telecom to offer any assurance around packet loss ratio or resynchronisation events under these conditions¹¹⁵.
169. The only option that could be explored would be to set up a sampling process which enabled lines with interleaving on to be compared. This would require the identification of lines with interleaving left on (and assumes that the services are otherwise consistent, particularly in respect of speed).

C2.4 Cost implications

170. The Draft Determination states that should Telecom consider that it will incur incremental costs in supporting optional interleaving, Telecom may request the Commission to approve an efficient charge for that service.
171. Turning interleaving off will require Telecom to double the number of profiles it currently has. An interleaving on profile and an interleaving off profile will be required for each downstream speed. This is problematic, as Telecom's DSLAMs can only support a limited number of profiles – Telecom has already provided the Commission with information on the maximum number of profiles that each type of DSLAM can support. Dealing with profiles will equate to a set up cost. There will also be a transaction cost equivalent to a MAC.
172. If an end user subsequently wants to switch from interleaving off to interleaving on, an additional provisioning fee will apply. If instability issues arise, Telecom should be able to turn interleaving back on and TelstraClear should bear the additional transaction cost.
173. As an interleaving option is not currently something which occurs today Telecom is not able to quantify exactly what is involved other than what is set out above. If an interleaving option proved technically viable and this was offered at retail then a retail minus approach should apply as proposed by the Commission in relation to MAC charges in the draft determination.

¹¹⁵ See slide 53 of Telecom's technical presentation at the 11 February 2005 workshop

C3 Reporting

C3.1 Introduction

174. The draft determination states that:

- (a) for each designated access service, the access provider must provide the service on terms and conditions that are consistent with those terms and conditions which the access provider provides the service to itself (standard access principle 3). This means that there should be no material difference between the network based characteristics of the bitstream and the characteristics of the bitstream used by Telecom to supply its own retail services.¹¹⁶
- (b) The Commission considers that Telecom should be required to provide regular reporting on key service parameters (specified in Appendix A of the draft determination) to ensure consistency of service is achieved. This is intended to provide transparency for the access seeker.¹¹⁷
- (c) The specific service parameters should be measured on Telecom's underlying network at OSI layer 2¹¹⁸ being common network supporting Telecom's provision of its own layer 3 retail Jetstream service, and bitstream access to wholesale customers at L2TP.
- (d) The Commission requires a baseline report on service parameters to be provided to TelstraClear and Commission within 30 days of the final determination. Telecom is also required to provide updating reports at quarterly intervals.¹¹⁹
- (e) Reports will be subject to external audit and the cost of the audit will be borne equally by the parties.¹²⁰
- (f) Service parameters will be monitored based on a representative sample of each network element, DSLAM, ATM switch and IP router.¹²¹
- (g) The costs of implementing and maintaining the reporting system should be borne by Telecom.¹²²

175. Telecom has outlined in the preceding sections the difficulties around meeting the reporting requirements for an unconstrained service or a service with interleaving off. The "common network" for both UBS and Jetstream services is from the DSLAM to the first ATM node. Measurement to determine consistency can only be performed for UBS services where there is a comparative retail Jetstream service. The draft determination does not consider two key factors in the measurement and reporting – sample sizes and test duration. The draft determination

¹¹⁶ Paragraph 237 of the draft determination.

¹¹⁷ Paragraph 244 of the draft determination.

¹¹⁸ Paragraph 246 of the draft determination. It is unclear what the commission means by "OSI layer 2". The commission clarified in an email dated 27 April 2005 that it was proposing a L2TP service. The only common network is between the DSLAM and the first ATM switch.

¹¹⁹ Paragraph 247 of the draft determination.

¹²⁰ Paragraph 248 of the draft determination.

¹²¹ Paragraph 252 of the draft determination.

¹²² Paragraph 252 of the draft determination.

indicates test nodes on 50 DSLAMs. Telecom does not currently know whether this is a large enough sample size to give the required confidence level for the DSLAMs currently in use or for the number of customers who currently have broadband. The required sample size and test duration (yet to be determined) will be the principal drivers of the eventual cost.

176. This section details Telecom's proposal to meet the reporting aims in a workable way so as to ensure consistency of service.

C3.2 Consistency of service

177. Telecom's current approach to engineering design and traffic management provides a first order demonstration of consistency. This approach will continue under Telecom's proposal for a menu of retail and wholesale bitstream access variants. As previously submitted, there are minor technical differences between Telecom's commercial UBS service and the Jetstream services.¹²³ Telecom's proposal would enable this network consistency (and the ability to measure it) to continue. Any differences are those which are simply unavoidable (eg: the difference between L2TP and layer 3 or variances between DSLAMs¹²⁴).

178. Telecom agrees with the Commission's proposal in the draft determination insofar as it seeks to mandate that the underlying network performance of bitstream access should be consistent (the service equivalence which TelstraClear requested at the workshop). This in turn means that ex ante service specifications setting technical performance characteristics that bitstream access be managed to can be avoided. Telecom supports the Commission's proposal as a measure of good regulatory practice to put in place the minimum requirements necessary to achieve the aim of consistency. Good regulatory practice should avoid driving unnecessary cost and complexity into the industry.

179. TelstraClear and Telecom seem to be agreed that the physical design of Telecom's commercial UBS and retail Jetstream means that the only possible outcome is consistency. If our commercial UBS converges with a workable regulated UBS that is comparable to Jetstream services this will continue to be the case. Accordingly, there is no need for any physical testing to confirm what is the only possible outcome.

180. Nonetheless, the Commission has proposed regular reporting on key service parameters to ensure transparency as to the attainment of consistency of service. Telecom is willing to support a testing process.

C3.3 Ability to report – implementation and cost

181. As discussed in Section C, consistency becomes meaningless if apples and pears are being compared. However, where apples and apples are being compared consistency can be ensured and reported upon. Telecom's fair and workable way forward enable this to occur in a sensible and meaningful way.

182. Telecom has already undertaken some testing on the UBS and Jetstream 256/128 services. This testing, while showing minimal differences

¹²³ Paragraph 56 to 60.

¹²⁴ Customer experience within a DSLAM will be consistent but there may be variance between customer experiences on different DSLAMs.

between the Jetstream and UBS 256/128 service, has highlighted the importance of the sample size and test duration and has raised some previously unexpected technical variables such as differences on individual lines in a DSLAM and RANs which may be due to different hardware deployed e.g. cards. Investigation is underway before further testing is completed.

183. Telecom proposes that two UBS services with comparative retail JetStream services are tested bi-annually – one the lowest specification available, which is currently the 256/128 service, and the second the highest specification available, which is currently 2M/128. Should the higher or lower specification comparative services change then the services measured would also change. If more services are added or the reporting is more frequent (the Commission suggests quarterly), the cost increases. The Commission should strike a reasonable balance bearing in mind the costs.
184. Telecom further proposes that latency, delay variation and packet loss as well as TCP throughput are tested. Latency, delay variation and packet loss would be tested using ICMP pings with packet sizes of 64, 200 & 1472 bytes, and TCP throughput tested both downstream and upstream. Test targets would need to be defined, most likely using a separate test or management VPN to ensure the measurement only reflects performance to the first ATM node. Additionally, to remove the distance variable from the 1st ATM node, a “reflector” would need to be employed, probably centrally based in Wellington, and the test measurements for each DSLAM would need to be calibrated to remove the distance variable.
185. The Commission has set out service measurement parameters at Annex A of the draft determination. As Telecom has previously submitted, these parameters cannot be specified independently of each other or the service being provided. For example, a contention ratio of 50:1 will not work for an unconstrained service.¹²⁵
186. Telecom estimates that it will require 90 days after the Commission’s final determination to prepare a base line report as, until it sees that final determination, Telecom will not know what additional issues will need to be considered as part of the base line report. The parameters for the measures outlined in the previous paragraph would also be determined from the testing for that base line report. The parameters would then be agreed and regular reporting initiated. Telecom currently estimates that an auditable report could be delivered 30 days after the parameters from the base line report were agreed. Following the initial audited report, Telecom proposes Agree Upon Procedures similar to those used for Broadband reporting be used rather than full audits to reduce the cost.
187. Assuming two services are tested, each DSLAM with a test node requires four ports (one UBS and one JetStream for each service). Those ports are unavailable for commercial use. Test nodes or Probes for 50 DSLAMs for the two services proposed are estimated to cost a minimum of [] TCNZRI and 100 DSLAMs estimated at a minimum of [] TCNZRI.
188. Administration of the analysis of tests and audit costs are currently unquantified but, if based on TSO or DSPL, could run between [] TCNZRI and [] TCNZRI per annum.

¹²⁵ Refer to the answers to Question 7 for details.

189. As already noted, the common network is between the DSLAM and the first ATM switch. Telecom's engineering design and network management means consistency is the only outcome. If reporting of that consistency is sought, Telecom will commit to carry this out. TelstraClear should bear the costs at least for the probes for UBS and should bear the full costs of the reporting administration analysis and auditing on an ongoing basis.

Usage limits

190. There are no usage limits in Telecom's commercial UBS service.

C4 Section 18 and Clause 6 Issues

191. As set out in the Legal Framework Section B, the reduction in reach (as a consequence of having an unconstrained service) is inconsistent with sections 18 and 19 of the Act. It is not an outcome that is likely to best give effect to the purpose of the Act. In practical terms it means that fewer people (especially in rural areas) will have access to broadband services over Telecom's existing assets – an outcome which is irreconcilable with the government's broadband growth policy and the interests of end users of telecommunications services. In addition, there is a reduction in the efficiency of the user of resources if the service is unconstrained, as Telecom has to provision for the maximum speed even if that is not used. That means fewer customers are able to use the existing resources.
192. The technical issues outlined above mean that a non rate limited service is likely to transgress the clause 6 limits.
193. The Commission's proposed determination is not consistent with the "reasonable technical and operational practicability" limitation in that:
- (a) increased noise caused by requiring an unconstrained downstream service creates operational issues associated with having to reduce reach to customers.¹²⁶
 - (b) operational issues are caused by having to allocate resources of the DSLAM in a way that is not fair to all users.¹²⁷
 - (c) interleaving being turned off creates instability in the system that needs to be managed.¹²⁸
194. Telecom is concerned about the combined effect of these factors on its operations, particularly since some of the possible impacts (especially regarding interleaving) are not yet known as the proposed service differs so significantly from the services Telecom currently manages.
195. Telecom also considers that the DSLAM buffer overload effects may well affect service level commitments to PON and One Office customers. This is inconsistent with section 6(c) of the Act, which sets a limit where there is a likely inability to meet defined levels of services to existing customers.¹²⁹

¹²⁶ Refer to paragraphs 74 – 87.

¹²⁷ Refer to paragraphs 98 - 101.

¹²⁸ Refer to section C2.2.

¹²⁹ Refer to paragraphs 88 – 95.

D MARKET DEFINITION AND COMPETITION ASSESSMENT

D1 Introduction

196. The relevant economic markets for both the provision of (a) retail broadband internet access services and (b) wholesale broadband access services are not national. The relevant metropolitan markets are effectively competitive. Even if the market were national (which Telecom submits it is not) the Commission must still have regard to the state of competition in the metropolitan areas in order to assess whether regulation gives the best effect to the purpose in section 18 of the Act.
197. Telecom submits that the appropriate market boundaries are as follows:

Product Dimension	Functional Dimension	Customer Dimension	Geographic Dimension
Asymmetric and Symmetric Broadband Internet Access services supplied over ADSL, Fibre, Coaxial Cable, Fixed Wireless Access.	Wholesale, Retail	Residential, Business	Each Metropolitan area, Non-metropolitan

198. The Commission has taken a preliminary view that Telecom faces limited competition in a national wholesale market for the provision of broadband services and, as a consequence, Telecom should be required to provide a regulated residential and a regulated business bitstream access service to TelstraClear.
199. In Telecom's view, the national wholesale market definition arises primarily from an incorrect analysis of the different competitive constraints that operate in the retail broadband internet access markets in metropolitan versus non metropolitan areas of New Zealand.
200. The importance of fully analysing the retail market(s) for broadband internet access and Telecom's view of the competition analysis in the draft determination is set out below.

D2 Relationship between the wholesale and retail markets

201. The draft determination focuses upon the wrong functional level of the market at issue. The Commission has therefore drawn incorrect conclusions on the geographic scope of the relevant economic markets and state of competition in those markets.
202. In terms of the functional level, the Commission has applied the statutory competition test of *whether Telecom faces limited, or is likely to face lessened, competition* to some form of wholesale bitstream access product.¹³⁰
203. However it is incorrect to first analyse the wholesale level of the market for broadband internet access service when considering whether regulatory intervention in the broadband internet access market is in the long term benefit of end users.
204. The Commission instead must start from first principles and consider the state of competition faced by Telecom when selling its retail broadband internet access products in New Zealand. This is for two reasons.
205. First, and most fundamentally, if there is no problem with competition at the retail level of the market, regulatory intervention is not to the long term benefit of end users and is likely to create market inefficiencies and economic disincentives to innovate and invest in new services.
206. Second, it is impossible to correctly analyse the dimensions of the relevant wholesale market without first defining the relevant retail market(s). This is because demand for wholesale broadband access services is derived from the demand for retail products, so necessarily the relevant retail economic markets must be analysed first.
207. The Commission recognised this, in part, in its draft determination. For example, at paragraph 59 it noted that:

“...given that the retail services supplied over the cable network compete with Telecom’s retail ADSL service, indirect substitution may constrain the pricing of a wholesale bitstream service in the **areas served by the cable network**”
208. However, the Commission did not then take the next step and clearly define the product and geographic dimensions of the retail market that it considers constrains wholesale supply of broadband access.
209. Although it is correct to state that retail services will constrain the pricing of a wholesale bitstream service, it is necessary to define the relevant group of the retail services and the geographic scope over which these are supplied. Only then can the Commission correctly identify the relevant wholesale market(s) within which Telecom supplies its wholesale bitstream access services.
210. Telecom’s view that it is necessary to first define the relevant retail market is supported by established overseas regulatory precedent: European Commission Market Definition Guidelines state that the starting

¹³⁰ It is not actually clear which unbundled bitstream access service is being analysed. The Commission refers to the regulated bitstream access product (paragraph 53) – which is yet to be supplied – and also refers to Telecom’s commercial bitstream products (paragraph 91). Telecom requests clarification on this point from the Commission.

point for market definition is an analysis of the retail markets.¹³¹ Ofcom in the UK also supported this approach and has stated that an analysis of retail market definitions is “logically prior” to defining wholesale broadband access markets in the UK.¹³²

211. The Commission’s geographic wholesale market definition is inconsistent with both its previous decisions on the retail broadband markets and the state of competition in the retail broadband internet access markets in New Zealand.
212. Analysing the wholesale broadband access market in relation to the relevant retail markets will change the geographic boundaries of the relevant wholesale market that the Commission has defined. This is explained below.

¹³¹ Recital 7, EC Commission “Recommendation on relevant product and service markets”.

¹³² Paragraph 2.17 “Review of the Wholesale Broadband Access Markets”, Ofcom, 13 May 2004.

D3 Retail Market Definition

D3.1 Product Dimension

213. Telecom continues to consider that the product dimension of the retail broadband internet access market includes retail broadband internet access products supplied over ADSL, Fibre, FWA and Coaxial Cable.
214. It accepts the Commission's draft view that wireless broadband provided over mobile phone technology is yet to become a viable competitor, but notes that rapid developments in wireless broadband services is likely to mean that this situation will change in the near future.
215. These retail products at paragraph 213 compete effectively with each other, as outlined in Telecom's December and January submissions.
216. Price points of the products offered over various technologies are similar and retail broadband internet access products supplied over FWA¹³³ have become a credible option for broadband customers since the Commission originally considered the retail broadband internet access market in its Decision 497.
217. This means that a hypothetical monopolist could not profitably raise the price of retail broadband internet access services supplied over ADSL, as demand and supply-side substitution would occur to act as an effective constraint on any attempted price rise.
218. Several of the Commission's comments in the draft determination imply that it may agree with Telecom's retail product market definition. For instance, the Commission's comment at paragraph 59 implies that it believes that retail broadband internet access services supplied over cable compete with broadband supplied over ADSL, at the very least.
219. Also, the discussion in the draft determination at paragraphs 62-64 implies that the Commission considers that retail broadband services supplied over fibre – both asymmetric and symmetric also compete with retail ADSL-based broadband services.
220. Finally, the Commission implies (paragraph 70) that it believes broadband internet access services supplied over Fixed Wireless Access (FWA) technology also compete with ADSL-based retail broadband services.
221. Putting these pieces together, the Commission's draft determination implies that it considers the product dimension of the relevant retail market includes retail broadband products supplied over ADSL, cable and FWA.
222. Telecom supports this implied definition of the product dimension of the retail product market.

D3.2 Geographic Dimension

223. Telecom does not support the Commission's finding of a national wholesale broadband access market, primarily because it considers it is

¹³³ Primarily supplied by Woosh, who now supplies retail broadband internet access services in Auckland, Wellington, Christchurch and is rolling out network coverage in Dunedin and Hamilton.

clear that sub national retail markets for the provision of broadband internet access are operating in New Zealand. Three key reasons for considering sub national retail broadband internet access markets are operating in New Zealand are set out below.

224. A proposal for determining the boundaries of the retail broadband internet access markets in metropolitan areas of New Zealand is also set out below.

Apparent inconsistency with the previously agreed principles of defining geographic markets

225. The draft determination is inconsistent with the Commission’s previous principles for defining geographic markets put forward by Telecom – and accepted by the Commission - in Decisions 497 and 525. Further, the finding of a national wholesale market is inconsistent with the Commission’s previous findings on the geographic boundaries of the retail broadband internet access markets in Decision 497 and 525.

226. In Decision 497, the Commission defined the relevant markets for broadband internet access as follows:

Product Market	Customer Segmentation	Geographic
Broadband internet access	Residential*, Business	Each Metropolitan area, Non-metropolitan

*Relevant market in that Determination only in respect of non-metropolitan areas

227. The Commission accepted that sub-national markets were appropriate because similar network economics applied as for the local access markets considered in that application. That is, the Commission defined metropolitan and non metropolitan markets based on the level of network rollout in a particular area and the extent of the threat of ‘near-entry’ in the form of extensions to those competing networks.¹³⁴
228. Telecom put forward this proposal at the time of the Determination and continues to support it as a robust way of defining the boundaries of the retail broadband geographic markets.
229. The Commission found that five Exchange Service Areas (ESAs) formed separate geographic markets because the presence of network competition in those areas¹³⁵ differentiated the competitive conditions in those geographic areas to those in other areas of New Zealand.
230. The Commission explains in the draft determination that the extent of network competition was given weight in Decisions 497 and 525 in particular because it had generated geographically differentiated pricing responses.¹³⁶
231. However Telecom has never geographically differentiated the pricing of its retail broadband internet access services and the issue of uniform geographic pricing of broadband services was not considered in Decisions 497 and 525.

¹³⁴ Paragraph 145, Decision 497.

¹³⁵ Telecom also considered that the boundaries should be wider because of the threat of near-entry from FWA entrants, although this was not accepted by the Commission.

¹³⁶ Paragraph 86, UBS draft determination.

232. It is therefore difficult to understand the Commission's explanation of its (apparent) changed view of the geographic dimensions of the retail broadband internet access market and its apparent reversal of the accepted approach to defining geographic markets in Decisions 497 and 525.
233. This lack of clarity is exacerbated by the omission in the draft determination of a full separate analysis of the retail market(s) for broadband internet access services in New Zealand.
234. Telecom considers that the competitive dynamics of the sub national retail broadband markets identified in Decision 497 have not changed to the extent that a national market for retail broadband services is now operating in New Zealand. However, the boundaries of metropolitan markets have expanded, due to the extended coverage and the threat of near-entry from FWA providers. Telecom's view of the appropriate metropolitan boundaries is set out in section D3.3 below.

Undue weight on Telecom's uniform pricing of its retail and wholesale broadband products

235. The draft determination has placed undue weight on the existence of a uniform price for Telecom's retail and wholesale broadband prices¹³⁷ and has incorrectly interpreted this as a "uniform or common pricing constraint".
236. The Commission appears to have qualified its standard test of a geographic market in its discussion of Telecom's uniform prices at paragraphs 91 – 97. The Commission's *Merger Guidelines* signalled an inherent focus upon the competitive constraints operating in a particular geographic area.
237. The Commission defines the geographic dimension of a market to include all of the relevant, spatially dispersed sources of supply to which buyers would turn should the prices of local sources of supply be raised.¹³⁸
238. However, the draft determination (paragraph 85) expresses concern that the Commission's own test of the geographic dimension of a market is not always appropriate. The Commission comments that the focus on whether a SSNIP is sustainable may lead to "extremely narrow markets, possibly at an individual customer level".¹³⁹ It then goes on to say that:

"consideration is therefore usually given to the extent to which there may be a uniform or common pricing constraint, and to determine geographic markets on that basis"¹⁴⁰

239. Telecom has several concerns about this approach.
240. First, the Commission does not appear to have ever raised a concern about its standard test of the geographic market in any previous telecommunications regulatory proceedings. Telecom is also unable to find any previous discussions by the Commission about its concerns about

¹³⁷ The price of Telecom's wholesale Jetstream products are differentiated according to whether the products are being sold into a metropolitan or a non metropolitan areas. Telecom's commercial bitstream access products are currently sold at a standard national price as prices in non metropolitan areas need to be reduced below the level which would otherwise have been applied in order to meet the ambitious broadband wholesale targets Telecom has been set.

¹³⁸ See page 18 of the Commission's Merger and Acquisition Guidelines.

¹³⁹ Paragraph 85, UBS draft determination.

¹⁴⁰ Paragraph 85, UBS draft determination.

its standard geographic SSNIP test or the need to place weight on a uniform or common pricing constraint.

241. Second, the Commission's new qualification of its SSNIP test goes against standard regulatory practice in most other jurisdictions that Telecom is aware of. It is standard regulatory practice in the US, EC and Australia to use the SSNIP approach to define markets.
242. Third, it is incorrect to consider a "common pricing constraint" to be anything other than an application of the standard SSNIP test. As Charles River Associates (CRA) highlighted,¹⁴¹ a uniform price can be indicative of a single geographic market but only when the *competitive conditions* in the market lead to the uniform price. This implies a focus on the demand and supply-side substitution dynamics in a market – i.e. the standard test of a geographic market previously utilised by the Commission.
243. The Commission is correct to state that "the extent to which the prices of products in different geographic areas move in unison" can be an indicator of a single geographic market. However it has interpreted the test incorrectly when applying it to the retail and wholesale broadband markets.¹⁴²
244. Price correlation tests are simply quantitative techniques to test for product or geographic markets i.e. whether a SSNIP is possible in particular areas (or over particular groups of products) – or whether demand and supply side constraints have operated to constrain prices to follow each other. Correlated prices are not a new factor called a "common pricing constraint".
245. CRA quoted the red meat industry as a good example of where prices have moved in unison and settled at a uniform price that *is* evidence of a single geographic market. The uniform price in the livestock market across the North Island is enforced by the possibility of arbitrage between regions if price does get out of line in one region. In other words, the competitive constraints operating in all regions of the North Island are effectively similar.
246. However, as CRA noted, the same cannot be said for broadband access markets – or retail broadband markets. While the price of Telecom's Jetstream products (and corresponding wholesale products) may be uniform across New Zealand, the competitive constraints quite clearly differ between regions, depending on network rollout, population density, terrain etc.

The different options for demand and supply side substitution in metropolitan and non metropolitan areas of New Zealand

247. Supporting CRA's point above, Telecom supplied information to the Commission in its December and January submissions that demonstrates the differing range of retail broadband internet products in metropolitan and non metropolitan areas of New Zealand.

¹⁴¹ Telecom New Zealand's cross-submissions in respect of the TelstraClear UBS and backhaul application, Annex 2.

¹⁴² However, price correlation tests must be applied carefully. For example, a high price correlation may not demonstrate a single market because the underlying cost factors may be moving together.

248. Appendix B of Telecom's December Submission showed the multitude of competitive retail broadband offerings enjoyed by customers in metropolitan areas of New Zealand. This is clear evidence of the demand-side constraints that would operate upon Telecom if it attempted to raise retail broadband internet access prices in metropolitan areas of New Zealand.
249. The supply-side constraints are also clearly in evidence in metropolitan areas of New Zealand. Annex 1 of Telecom's January submission showed the extent of competitive access coverage of broadband access networks in metropolitan areas of New Zealand.
250. Telecom considers that this is clear evidence of the way that alternative retail broadband internet access providers in metropolitan areas of New Zealand can easily switch to target customers who are not currently covered by their network(s), in the event of Telecom attempting to raise the price of its retail broadband internet access products by five to ten percent (i.e. the "SSNIP" test).
251. The market growth of retail broadband internet access services over FWA means that the possibility of a profitable "SSNIP" in metropolitan areas of New Zealand could have only lessened since the Commission considered the issue in Decision 497.
252. Further, the boundaries of the metropolitan markets are likely to have expanded due to the advent of FWA. Wireless technologies have several advantages that mean it is economic to roll out to cover a wider range of neighbouring customers in response to any small change in competitive conditions in a neighbouring area. For instance FWA has:
- (a) relatively low sunk costs, as the assets can be easily redeployed;
 - (b) no requirement to trench or to hang wires from power poles, leading to:
 - lower labour costs,
 - greater ease in obtaining resource management consents; and
 - far quicker network rollout
 - (c) greater scalability that enables targeted small scale entry; and
 - (d) the advantage over wired technology that costs are only incurred when the user is connected - unlike wired technology where capital costs of building the network are sunk before any users are connected.
253. However, Telecom does not consider that the expansion of FWA is at the level where the threat of near-entry would create a national market – i.e. constrain Telecom from implementing a SSNIP profitably in non metropolitan areas of New Zealand where it is the sole supplier of retail broadband services.
254. This is because the economics of network extensions using FWA in metropolitan areas are much more favourable than those involved in going into completely new non-neighbouring areas. Some of the hurdles that

must be overcome are listed below. As can be seen, these are quite significant constraints that would prevent easy and quick (i.e. within one year) supply side switching.

255. For example, a FWA entrant into a non metropolitan region would need to resolve how it could access backhaul out of the new region (through, for example, putting in a new switch or arranging national data circuits). In regions where the FWA competitor is already present, it would be able to self-provision its own backhaul by linking its cell site towers together using its own wireless data transmission technology, or some other technology such as Digital Microwave Radio (DMR).
256. It would also need to obtain new Resource Management Act (RMA) approvals for the new region. In existing regions, new RMA approvals are not likely to be required for network extensions as the operator is likely to have obtained all necessary approvals when it first planned to enter that region.
257. Telecom's view of the appropriate boundary of metropolitan markets for broadband internet access is outlined in section D3.3 below.
258. To further illustrate the large range of demand side substitution options available to customers in metropolitan areas of New Zealand, below is a summary of some of the key competitive activity that Telecom is aware of in the Auckland metropolitan retail broadband market over the past few months. In contrast, Telecom is unaware of any significant retail alternatives for customers in non metropolitan areas (for example, Greymouth):

Auckland Metropolitan Area	Competitive Activity
December 2004	<ul style="list-style-type: none"> • ISPs promoting new broadband pricing and converting customer to UBS offers • Woosh promo (TVCs, press) – cutting prices of both its modem and data rates for the first 6 months of a 12 month contract (\$99 for modem, \$19.95 p.m.) • Woosh launched 4 new sites, claiming it now has 70% coverage of the Auckland region
January 2005	<ul style="list-style-type: none"> • Woosh claimed to have 10,000 subscribers with an uplift from its December \$19.95 price initiative • Woosh introduced \$29.95 plan (256k/200 Mb traffic) • TCL continues targeting existing customers • ISPs promoting new BB pricing and converting customers to UBS offers
April 2005	<ul style="list-style-type: none"> • Vector launches a business broadband service, Infinite Broadband, for the Auckland CBD, to be sold by its ISP channel partners • Wired Country now plans to sell broadband direct to business and residential end-users in the greater Auckland and Hamilton city regions • Woosh's "dollar down modem" deal is extended (subscribers put a dollar down and then spread payment on the modem over 10 months). Plus, new

	<p>signups get the first month free</p> <ul style="list-style-type: none"> • Slingshot emailed customers (& sent a mail drop to non customers) offering a free ADSL modem and a free connection (worth \$198)
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259. The completely different market constraints are also clearly illustrated by the different market shares Telecom (and other broadband retailers selling ADSL products) has in metropolitan and non metropolitan areas.
260. In non metropolitan areas, the market share of ADSL-based broadband suppliers is, of course, 100 per cent as only Telecom's retail products (and Telecom's wholesale products sold by other retailer competitors) are available.
261. However, ADSL-broadband products possess a significantly lower market share in metropolitan areas. For example, Telecom estimates retail broadband products sold over TelstraClear's fibre network in Wellington represent approximately [] **TCNZRI** of the retail broadband market in Wellington.
262. This figure illustrates the market reality of demand side substitution: customers are choosing alternative broadband products in metropolitan areas in preference to those sold over the Telecom network. This demonstrates how different the competitive conditions are in metropolitan areas when compared to non metropolitan areas with no alternative networks.
263. The Commission quoted several factors in Telecom's cross submission that it believes indicates a national market: Telecom's commitment to achieving 250,000 residential broadband subscribers by December 2005; the mass-market nature of Jetstream services, which are marketed through national advertising campaigns; and the possible adverse public perception of Telecom, were it to geographically de-average its prices.
264. None of these factors give the slightest indication of the key question the Commission must consider when defining markets in this case: whether demand and supply-side competitive constraints would prevent Telecom from de-averaging its retail broadband product prices profitably in non metropolitan areas, if it chose to do so.
265. The Commission appears to have placed weight on a regulatory factor when referring to Telecom's government broadband uptake targets as evidence of a national market. However, Ofcom noted at page 39 of its *Review of the Broadband Access Markets* that:
- "as set out in Ofcom's approach to market definition, the relevant economic markets are defined absent regulation."
266. Telecom's commitment to broadband uptake is a significant factor driving its national pricing policy for broadband products. Accordingly, conditions in the market should be analysed without this regulatory distortion.
267. Ofcom dismissed BT's argument of regulatory distortion driving a national market but this was because Ofcom found that the regulatory obligations put forward by BT were not convincing as the obligations related to other markets.

268. Telecom notes that the situation is different in New Zealand, The regulatory distortion in this case is directly in the market at issue. As explained in its cross-submission, a substantial part of its national retail broadband pricing policy is driven through its direct commitment to the Government to achieve targets for mass broadband uptake in a relatively short time period.
269. Further, the Commission has not appropriately analysed the extent of advertising by retail broadband suppliers in New Zealand. The Commission noted that Telecom advertises its Jetstream products on a national basis but failed to analyse the extent of national advertising in the market as a whole. Ofcom noted in its review of the UK broadband markets that:
- "all operators advertise on a national basis, providing further support to the conclusion that the market is national."¹⁴³
270. However, this is not the case in New Zealand. There are many examples of local advertising in metropolitan areas of New Zealand. A few are detailed below:
- (a) GASP (FWA broadband) advertised in the Petone Herald and billboards along the Hutt Motorway in Wellington in December 2004;
 - (b) Woosh set up a stand at Victoria University on 11 April 2005, publicising what appear to be new student prices;
 - (c) ThePacific.net advertised in the Marlborough Express paper, "No phone required, \$49.95 a month +gst" in April 2005; and
 - (d) Woosh promoted its "\$29.95" deal with a back-of-the-bus campaign in Wellington in April and May.
271. Telecom also wishes to clarify that it does not consider that adverse public perception would prevent it from profitably increasing its retail broadband prices by a small amount in non metropolitan areas of New Zealand.
272. Telecom has, and continues, to geographically differentiate the prices of a range of its services. For example, as the Commission is aware, in Wellington and Christchurch Telecom home line rental prices are cheaper than in the rest of the country. While customers outside these areas do not tend to like differentiated prices, they do accept that there are different conditions in different areas and that different prices can be justified.
273. Therefore, Telecom would be able to apply differential pricing with its Jetstream products, if it was operating in a market environment that was free of regulatory distortion. However, this is not the case. Telecom instead has strong regulatory incentives to meet its broadband target commitments to the Government.

¹⁴³ Paragraph 2.113, Ofcom Review of the Wholesale Broadband Access Markets, 13 May 2004.

D3.3 Proposal for determining metropolitan boundaries of retail broadband internet access markets

274. As set out at paragraph 239 to 243 above, Telecom considers that market conditions have changed to the extent that it is now appropriate to revise Commission's Decision 497 methodology for determining the boundaries of metropolitan retail markets.
275. In Decision 497, the Commission defined the metropolitan retail broadband internet access markets for business customers and for residential customers to lie within 200 and 100 metres respectively of competing access networks (mainly TelstraClear's).¹⁴⁴
276. The Commission based its methodology in Decision 497 primarily on the ability of other fixed networks operators to supply broadband services. However, it did note that the resulting boundaries may need to be refined in the future due to the emergence of wireless technologies (paragraph 223), given that the economics of extending wireless networks are likely to be quite different from those of a fixed operator.
277. Telecom agrees, and has set out how the economics of FWA network extensions differ at paragraph 239 to 243 above.
278. Given the extent of competition from FWA-based broadband suppliers, it is now appropriate to redefine any metropolitan geographic markets defined in the Final Determination so that the boundaries recognise the competitive constraints imposed by FWA broadband competitors.
279. Telecom therefore proposes that the boundaries of any metropolitan broadband internet access markets should be defined as follows:
- (a) where an FWA broadband competitor is present in a geographic area, the entire area should be designated as a metropolitan market; and
 - (b) where only fixed network broadband competitors are present in a region, the 200 metre (business) and 100 metre (residential) rule should be retained.

¹⁴⁴ See paragraphs 224-225 of Decision 497.

D3.4 Customer Dimension

280. Telecom continues to consider that separate business and residential markets do operate in respect to the provision of retail broadband internet access services in New Zealand.

281. The Commission did not express a clear view on this point in the draft determination at paragraph 76. Telecom requests that the Commission clarifies its view in the final determination, with a full analysis of the retail markets for broadband internet access in New Zealand and provides an opportunity to respond.

D4 Wholesale Market Definition

282. Telecom does not agree with the Commission's draft finding that there is a national wholesale market for the provision of broadband access.

283. The boundaries of the wholesale market are generally prescribed by the boundaries of the relevant downstream retail markets for broadband internet access.

284. This approach is supported by Ofcom in its consideration of the UK broadband access market. At paragraph 2.17 of its report, Ofcom noted that:

“although the focus of this market review is the wholesale level, the analysis of retail market definition is logically prior to the definition of the wholesale markets. This is because the demand for the wholesale service is a derived demand, i.e. the level of demand for the wholesale input depends on the demand for the retail service. The definition of a retail market is likely to affect the assessment of whether Significant Market Power (SMP) in a related wholesale market exists, since the relevant wholesale market will generally, although not necessarily, be as broad as the demand-side substitutes in the relevant retail market”.

285. Telecom notes, in further support of this, that the demand for wholesale broadband access products is derived from the demand for retail products because wholesale broadband internet access products form a large part of the cost of producing the final downstream retail products. Therefore, any increase in upstream prices or cost of broadband access infrastructure build will be reflected in higher retail prices for broadband internet access products.¹⁴⁵

286. Applying the approach described above and thus referencing the wholesale market dimensions to the retail markets described earlier in this submission, Telecom is of the view that the markets for the provision of wholesale broadband access in New Zealand are appropriately defined as follows:

Product Dimension	Customer Dimension	Geographic Dimension	
Broadband Access over ADSL, Fibre, Coaxial Cable, Fixed Wireless Access and Satellite	Residential, Business	Metropolitan,	Non-metropolitan

¹⁴⁵ The Commission appears to agree with this proposition in some parts of its draft determination. For example, the Commission noted at paragraph 60 of the Draft, any bitstream price increase could be expected to result in a significant proportion of that increase being passed through to retail ADSL broadband prices.

D5 Competition Assessment

287. Telecom does not support the Commission's preliminary finding of limited competition in the wholesale broadband access market.
288. This is primarily because Telecom considers that it is clearly constrained from exercising market power in the metropolitan wholesale broadband access markets operating in New Zealand.
289. However, Telecom does accept that it faces limited competition in retail and wholesale broadband internet access markets in non metropolitan areas of New Zealand.
290. The Commission's theory of limited competition in respect to metropolitan wholesale broadband access markets in New Zealand has not been adequately explained. This is discussed below.

Retail Market Competition

291. The draft determination noted the following in respect to the competition assessment:
- (a) Market share growth of Telecom's competitors (particularly Woosh);
 - (b) Falling retail broadband prices;
 - (c) New entry and rapidly expanding deployment of existing networks; and
 - (d) Reduced entry barriers through the advent of FWA technology.
292. These are all robust indicators of an effectively competitive market, in metropolitan areas of New Zealand, as set out below.

Market Shares

293. The Commission appears to interpret Telecom's high market share as evidence of market power. However, the market evidence does not support this interpretation.
294. High market shares is only evidence of market power where it appears the market shares has not been acquired through pro-competitive activity. For example, in the classic monopoly case where customers have only one choice of supplier and no demand side alternatives exist for the product that is being supplied.
295. However, in this case, in metropolitan areas, alternative broadband access competitors are competing effectively and aggressively to acquire customers at the retail level both through vertically integrated operations (such as Woosh) or through wholesaling access to their networks (for example Wired Country).
296. Telecom's maintenance of market share in metropolitan areas is evidence of Telecom competing effectively for broadband customers. Telecom has competed by dropping its retail broadband prices and stepping up its marketing efforts.

297. The Commission's interpretation of high market share equating to market power would only be credible if Telecom had maintained its market share in the face of new entry without responding to competition by decreasing price or improving its non-price terms of its offers. However, this is clearly not the case.

Future Market Shares and Market Entry and Expansion

298. The Commission noted that there are an increasing number of competitors supplying broadband services in New Zealand.
299. This is correct and the popularity of broadband services over alternative platforms – such as FWA – is growing as customers become more accustomed to the technology and benefits of wireless connectivity.
300. Taking a forward looking market view, the market shares of firms with alternative broadband access technologies can only be expected to grow in the next two years. This is already evidenced by the recent plans announced by Woosh to expand into the Dunedin and Hamilton metropolitan markets.
301. Another example of market expansion at the wholesale level is Vector's recent announcement that it will sell business broadband services into the Auckland CBD across its fibre optic network in conjunction with its ISP channel partners, OrCon and Maxnet. The retail broadband offering will be very competitively priced at \$329 per month + GST, with an unlimited national and international data allowance.¹⁴⁶
302. The Commission commented (paragraph 112) that it is giving only limited weight to the potential of FWA to act as a constraint on fixed suppliers over the next two years. It considered that capacity constraints of FWA relative to fixed broadband infrastructure would limit the ability of FWA to effectively compete.
303. However, FWA firms are making risky decisions and investing significantly in entering and expanding coverage in New Zealand broadband markets. This implies FWA-based firms have conducted sound business cases to evaluate their ability to earn a reasonable return on these investments in the short to medium term, at the very least.
304. This would imply that there is a sound case and reasonable expectations that FWA competitors will remain competitive with their broadband offerings in, at least, the short term.
305. Telecom suggests that this solid evidence of financial commitment to the market in the expectation of future profitable returns should be given weight in preference to the Commission's speculation at paragraph 111 of the draft determination that FWA will act as an ineffective competitive constraint in the next two years.

Falling retail prices

306. As noted by the Commission (paragraph 146), Telecom's retail broadband prices have been declining in recent years. The real price falls are even

¹⁴⁶ "The Line", Friday 22 April, 2005.

greater when the improvements in speeds and datacap allowances are taken into account.

307. Other competitors in the market are also dropping prices. For examples of the aggressive price competition in metropolitan areas, see paragraph 246 above.
308. The Commission appears to dismiss falling retail prices in the retail market as evidence of effective competition because it considered that the threat of regulation may have influenced Telecom's pricing (paragraph 146).
309. This is only correct in relation to non metropolitan areas of New Zealand. As Telecom explained previously, a substantial part of its national pricing policy is driven by its commitment to Government to achieve substantial uptake of broadband in New Zealand.
310. However, this regulatory factor only explains why Telecom has passed low prices through to non metropolitan regions of New Zealand where it faces limited competition.
311. In metropolitan areas, Telecom's pricing responses have been driven by the significant number of new broadband entrants and aggressive competition on price by these entrants.¹⁴⁷
312. Further, the Commission has failed to note the falling prices of other firms in the retail broadband markets. The threat of regulation certainly does not explain why other broadband competitors are dropping their prices. Telecom submits that the level of effective competition in the retail market can be the only plausible explanation for falling prices across all firms competing in metropolitan markets.

New Entry and rapidly deploying networks

313. As the Commission noted, a number of new localised entrants have entered the wholesale market recently (paragraph 108), and these are predominantly based on wireless technologies. Further, broadband growth in New Zealand is relatively immature.
314. These factors point towards incentives for aggressive competition between existing firms in the markets in the next two years.
315. Entry barriers are now also significantly lower with the advent of FWA competition. This increases the competitive constraint exerted by the threat of new entry of FWA providers. Sunk costs are much lower for FWA competitors than for fixed broadband competitors, as explained in detail above.
316. The Commission appears to agree that there is clear evidence of new entry and expansion of existing broadband networks, but states at paragraph 148 that this isn't sufficient to conclude that there is "no longer" limited competition in this market.

¹⁴⁷ The Commission appears to treat the threat of regulation inconsistently in its draft determination. At paragraphs 95-96, the Commission appears not to view the threat of regulation as a plausible explanation for national pricing behaviour on Telecom's part, yet at paragraph 146 the Commission found that the same threat is driving Telecom's pricing.

317. However, Telecom notes that the Commission has previously found effective competition in the metropolitan wholesale broadband access markets in Decision 497.
318. Since that Decision, the new entry and expansion of existing networks in metropolitan wholesale broadband access markets has only increased.
319. The Commission's view of effective competition in metropolitan areas in 2003 and limited competition in 2005 cannot be reconciled with the market evidence.
320. Telecom submits that the market evidence clearly supports a finding of effective competition in metropolitan wholesale broadband access markets in New Zealand.

E APPLICATION OF THE INITIAL PRICING PRINCIPLE

E1 Imputation of the Retail Price

E1.1 Introduction

321. The draft determination provides that:
- (a) TelstraClear should obtain a bitstream access service to the maximum downstream speed of which the DSLAM is capable. It is necessary to impute a retail price for this service as there is no direct retail equivalent of a bitstream access service and the basis for that imputation should be the retail prices of Telecom's Jetstream ADSL services.
 - (b) There should not be different imputed retail prices for different speed variants as such an approach is likely to hinder the ability of a wholesale customer to differentiate its broadband services from Telecom.
 - (c) Rather there should be a single price for residential customers and a single price for business customers regardless of speed and these prices should be imputed having regard to all Jetstream ADSL services including those with downstream and upstream speeds different from the bitstream access service designated.
 - (d) The imputation methodology devised by the Commission in relation to residential customers results in an imputed retail price of \$26.19. The revised imputation methodology in relation to business customers in the 27 April 2005 correction to the draft determination results in an imputed retail price of \$28.88.
322. Telecom has expressed concerns in relation to a number of other aspects of the draft determination. It is not really possible to seek to prioritise those concerns – they are all serious and they often inter-relate with other aspects. However, from many perspectives, the application of the initial pricing principle is the single most critical aspect of any regulated outcome. This is so not only from Telecom's perspective as a supplier but from the perspective of the industry and the long term interests of end users.
323. For this reason Telecom suggests that pricing principles require far greater consideration than is evidenced by the draft determination. Telecom is of the firm view that the approach adopted in the draft determination is not only contrary to the best long term interests of end users but also potentially inconsistent with the intentions and requirements of the regulatory regime.
324. The initial and final pricing principles are based on a retail minus formulation. The statutory context is clear: this is not a cost plus regime. The retail minus formulation in the initial pricing principle requires the Commission to identify a comparable retail service and impute the retail price.
325. The Commission has described a non speed restricted service but has used *all* Jetstream ADSL services as comparable services in imputing a retail price for this service regardless of their speed (on the basis that

additional speed has no material additional cost). This approach is inappropriate because:

- (a) it involves the Commission moving away from a retail minus based approach to a cost based (or at least an inappropriately cost-influenced) approach;
 - (b) the initial pricing principle requires regard to a comparable service rather than a service with a comparable cost;
 - (c) given that the market invariably differentiates end prices on the basis of speed, it is unreasonable to discount speed as a factor upon which comparability is assessed;
 - (d) there is no retail service comparable to that intended to be designated by the Commission and most of the retail offerings factored in by the Commission are in no relevant sense comparable.
326. Furthermore, the assumption upon which this reasoning is based (that additional speed has no material additional cost) is erroneous.
327. Even if the service which the Commission intends to designate is a service which the Commission can or should designate and even if the Jetstream ADSL services (or some of them) are comparable services (both of which are strongly disputed), the Commission's imputation process contains serious errors:
- (a) it imputes a single price for residential users and a single price for business users regardless of speed and in doing so is acting inconsistently with sections 18 and 19 of the Act, the initial pricing principle and overseas experience; and
 - (b) the regression model used by the Commission is seriously flawed.
328. Telecom proposes what it believes to be a fair and workable imputation methodology for access service.
329. Telecom's specific legal concerns with the Commission's application of the initial pricing principle are set out in detail in Section B.

E1.2 Comparable Service

330. The initial pricing principle requires a retail price to be imputed having regard to any comparable service. The fact that a service has a comparable cost does not necessarily make it a comparable service. (To take an extreme example, there may be services well removed from the provision of bitstream access which have comparable costs to those associated with the provision of bitstream access but quite clearly the Commission cannot base the imputation on such services.) In order for a service to be taken into account in the imputation process it must be a comparable service.
331. Telecom does not believe that any of the services within the Jetstream suite of services are in any relevant sense comparable to the non speed restricted service sought to be designated by the Commission.

332. Any suggestion that these services are comparable to the service sought to be designated merely because they all provide high speed internet connectivity cannot be supported by the language of the initial pricing principle. If it was intended that the Commission should have regard to any retail ADSL service offered by Telecom the initial pricing principle could easily have been expressed in this manner.
333. Rather, there must be comparability across key service specifications in order for a service to be considered comparable to the bitstream access service sought to be designated. In New Zealand and overseas, speed is the fundamental factor upon which high speed internet offerings are differentiated. In Annexes B and G Telecom has provided a summary of broadband retail offerings in almost all potentially relevant territories (including New Zealand). Speed is one of the key aspects on which Telecom's broadband services are differentiated from each other and customers clearly place a material value on speed. By way of example, the Jetstream Discover service is the same in all respects as the Jetstream Go service except that the Discover service operates at a downstream speed of 1 Mbps whereas the Go service operates at a downstream speed of 256kbps. Customers are prepared to pay an extra \$5 per month for the Discover service solely to access a higher download speed. It has been Telecom's experience that business customers are prepared to pay a much higher premium for speed than residential customers and thus there is a much greater premium for high speed plans for business customers.
334. If speed were not a material factor in assessing comparability this would tend to put under the spotlight why the Commission places such a great importance on the ability of TelstraClear to differentiate its retail offerings from Jetstream in terms of speed.
335. Telecom recognises that in the past, and in particular in relation to the LLU investigation, speed has not been used as an explanatory factor in regression models used to model Telecom's pricing. However this needs to be put into context. At the time Covec performed its original analysis, most of Telecom's Jetstream plans were distinguished according to their Data Allowances, that is, the amount of data which was included in the monthly charge before the end user needed to start paying "overage" for further megabytes of data. Those plans all operated at the maximum available upstream and downstream speed of the ADSL connection.
336. However, consistently with overseas practices, Telecom is moving away from this structure. This has already happened in relation to Residential plans which have as a primary distinguishing factor the speed at which the service operates. This is discussed in more detail in Annex F. Telecom has already indicated that it intends to launch at about mid-year a new set of Business plans which will have prices distinguished by speed, and it is on track to deliver to this timetable. These plans are expected to have a High Speed Allowance as per the Residential plans, although some may also offer a Data Allowance option. This new suite of plans will bring Telecom's broadband offerings more into line with the standard international approach for pricing internet-grade broadband services by the speed they offer. It will also have a flow-on effect of making the Commission's regression approach to modelling Telecom's retail plans for the purposes of deriving a bitstream access price more workable and robust. This is also discussed further below.

337. For these reasons, Telecom believes that the Commission has erred in its assessment that all services within the current Jetstream suite of services are comparable services which can be used for the purposes of the imputation process. Indeed, Telecom does not believe that there is any service within the Jetstream suite of services which could reasonably be said to be comparable at a retail level to the wholesale service sought to be designated by the Commission as all of those services have speed restrictions whereas the service sought to be designated by the Commission is a non speed restricted service.
338. If the Commission does proceed to determine a non speed restricted service then the logical conclusion of this approach is that the most comparable Jetstream ADSL service currently in existence is the Jetstream Full Speed 30,000 service. This is priced at \$2400 per month excluding GST. The Commission would need to start with that as a comparable service being the Jetstream service which has the most similar specifications to the non speed restricted service sought to be designated.⁸⁶ The Commission would then need to add an amount to reflect that the service it had defined was effectively Jetstream Full Speed Infinite Service and then subtract amounts to reflect the lower upstream speed and some of the avoided bandwidth costs. Telecom does not suggest that this is a sensible outcome. Telecom's workable proposal would ensure that reference prices for a menu of speeds would be available such that the methodology can be sensibly applied to comparable services.

Cost

339. In any event, the Commission is proceeding on the erroneous assumption that there are no material additional costs associated with providing additional speed. Telecom notes that there are differences in the cost of supplying different downstream and upstream speeds within the Jetstream suite of services and there would be a difference in cost again in supplying a non speed restricted bitstream access service. As such, even if all Jetstream offerings might be able to be described as "comparable" the "same-cost" basis upon which the Commission considers that it is entitled to have regard to all services within the Jetstream suite of services when imputing a retail price for the bitstream access service sought to be restricted is flawed.⁸⁷
340. These cost differences have been recognised by regulators in other jurisdictions. For example, as referred to in Section C1.2 above⁸⁸ Ofcom allows BT's ATM Interconnection prices to have a capacity-related component because higher speed end user services consume larger amounts of bandwidth between the DSLAM and the ATM network. Other international examples where bitstream access prices have been differentiated by speed are noted in Annexes B and E.

⁸⁶ If the Commission had taken the view that the bitstream access service should be referenced to Jetstream services in terms of speed then those Jetstream services could be taken as comparable services against which the imputation process could have been carried out.

⁸⁷ Refer paragraphs 102 – 107.

⁸⁸ See "Comparison with BT in the UK" section.

E1.3 Value Based Pricing/Price Discrimination

341. The Commission has accepted that separate prices should be imputed for residential customers and business customers and Telecom agrees with the Commission's assessment that:⁸⁹

"Separate bitstream access prices for ultimate supply to residential and business end users who purchase broadband services from access seekers using the bitstream access as a wholesale input is unlikely to hinder materially service innovation or prevent further price discrimination of end-user services."

342. However, following on from its view that it is entitled to take into account all Jetstream ADSL services in imputing a retail price for the designated bitstream access service, the Commission states that:⁹⁰

"The Commission disagrees that, for the purposes of calculating the bitstream access imputed retail price, there should be an imputed retail price for each variant of Telecom's own Jetstream service."

343. For this reason, the Commission imputes a single price for residential users and a single price for business users regardless of speed. The decision not to make an allowance for speed in pricing access to a designated bitstream access service is absolutely critical to the imputation methodology. Telecom believes the Commission has made a serious error in making this decision and that, if the Commission reaffirms this decision it would be acting inconsistently with the regulatory regime.

The economics of price discrimination in the broadband market

344. Telecom does not consider that the imputation of a single price regardless of speed will be in the long term benefits of end users. On the contrary, Telecom believes that price discrimination on the basis of speed will make customers better off whereas a pricing structure which does not allow for such price discrimination will make customers worse off.
345. As discussed in full detail by Professor Hausman in Annex C, price discrimination on the basis of speed and the type of customer, in this situation will lead to customers being better off. Not permitting price discrimination on the basis of speed will lead to a loss of welfare.
346. This is because of the fundamental differentiating characteristic of telecommunications – the industry operates in the presence of significant fixed costs. This leads to imperfect competition, where firms cannot solely charge prices equal to marginal costs. Instead, Telecom has the option of either setting prices equal to "average cost", or exercising price discrimination where different prices are charged depending on customer segment price elasticities.
347. Price discrimination on the basis of speed is clearly the preferred option, from a welfare perspective. Firms earn a greater contribution towards fixed and common costs if they can price discriminate and customers are better off if they can choose from a menu of low to high speed broadband plans in the market. Customers who place a higher valuation on higher speed broadband plans will pay for those higher speeds, whilst those who value high speed less will prefer a lower priced lower speed product.

⁸⁹ At paragraph 164.

⁹⁰ At paragraph 162.

348. Yet, in the Commission's regulated model, the market reality will be much changed from today - instead, it is likely that there will only be a single bitstream offering to residential customers and a single bitstream offering to businesses.
349. This is because access seekers such as TelstraClear will have a strong incentive to offer solely high speed broadband services. Their cost structure for servicing residential customers will be lower than Telecom's retail prices for high speed broadband. This is because Telecom will be forced to sell its regulated residential bitstream product at a weighted average price of both its high speed and low speed products. TelstraClear will thus be able to significantly undercut Telecom's retail high speed broadband products, with the outcome that many customers will choose TelstraClear over Telecom for their high speed services.⁹¹
350. Professor Hausman points out that two outcomes are possible. Either Telecom will be forced to offer only a single low speed broadband service, or a high speed broadband service will be the only one remaining in the market. If only a high speed broadband service is available, customers who would have preferred to pay less for low speed broadband are made worse off.
351. In the absence of differentiated pricing, both possible outcomes would make customers worse off. This would be contrary to the requirements of section 18 of the Act, i.e. that regulation be to the long term benefit of end users.

Telecom's view of what will happen in the market place

352. Telecom supports Professor Hausman's analysis of the likely market outcomes.
353. Access seekers who are able to obtain bitstream access at a price set regardless of speed will have no incentive to differentiate based on speed but would, on the contrary, have a strong incentive to offer a single package based on as high a speed as possible. The cost structure they would face under such a regime would mean that they will have a strong financial incentive to target high end customers and ignore low end customers.
354. If the Commission determines a single bitstream access price, access seekers will not be able to match Telecom pricing in relation to plans having the lowest specifications in terms of speed and data allowance as they face a higher marginal cost than Telecom. However, they would find it very easy to undercut Telecom in relation to plans with higher specifications as they do not need to make the same contribution to fixed cost as Telecom does.
355. Hence, contrary to the Commission's prediction that a single price will bring an increased level of product differentiation to the market, the result of a regime which does not allow different prices for different speed variants is that the access seeker will seek to target the high end of the market with a small number of high speed plans (possibly only one) and will place very little if any emphasis on low speed plans. The

⁹¹ For a full discussion of these dynamics, see Professor Hausman's paper attached as Annex C.

differentiation which the Commission anticipates and predicts will not eventuate.

356. Telecom does not believe this state of affairs would be in the long term interests of end users. In saying this, Telecom recognises that the pricing for the access seeker retail plans which would result from the Commission's suggested single price would be expected to represent very good value compared to prices of Jetstream services with equivalent speeds and would thereby exert some downward pressure on prices of such plans. The limited pool of potential customers for high speed plans could therefore be expected to be better off from a consumer welfare perspective.
357. However, the larger pool of customers and potential customers for plans with lower speed specifications would not be expected to be better off as access seekers would need to act irrationally by pricing their plans below their marginal cost in order to provide any meaningful competition for these customers and potential customers. Indeed, these customers can expect to be significantly *worse* off in the sense that not only will a single access price not introduce any downward pressure through increased competition but it can in fact be expected to exert considerable *upward* pressure.
358. Telecom must lower its prices for high speed Jetstream plans in order to compete effectively against the high speed plans offered by its competitors and as such the level of contribution to fixed cost from customers of these plans will decrease significantly. This places pressure on Telecom to restore profitability by seeking a commensurately higher contribution to fixed cost from customers of lower speed plans although even this could not fully restore profitability.
359. Telecom believes not only that having different prices for different speed variants is significantly more likely to promote competition for high speed internet access to the long term benefit of end users but also that it is the only way to do so. This is because it would deliver increased competition at all levels of the market whereas, as discussed above, the imputation methodology suggested in the draft determination would limit such increased competition to either solely the high end or low end of the market. Such increased competition would also be at the expense of end users who would simply be priced out of the market or not serviced at all and result in a reduction in the network effects from broadband which will be to the detriment of all end users.
360. Furthermore, the imputation methodology suggested by the Commission would have the effect of completely undermining the international practice of value based pricing (other than at the most basic Residential/Business level) which Telecom believes is in the best interests of end users and is the best way of achieving the agreed broadband penetration targets because it allows Telecom to bring affordable broadband access to a wider pool of customers. Telecom made extensive submissions on the scope for wholesaler differentiation, in its cross submissions at paragraphs 51 to 55. The Commission must demonstrate that the intended single price approach (for Residential and for Business) would achieve what it intends, be the least invasive means of doing so and be consistent with the regulatory regime. The onus is on the Commission to justify why elimination of price discrimination will in this case result in a better outcome than allowing it.

361. For these reasons, Telecom does not believe that the imputation methodology suggested by the Commission is the methodology which is likely to best give effect to the purpose set out in section 18. Indeed, it has no realistic prospect of doing so. The Commission would also be acting inconsistently with section 19(c) in using its suggested methodology given that an imputation methodology which allows different prices for different speeds is likely to better promote competition for the benefit of end users and maximise demand.
362. As discussed above, Telecom further believes that the imputation of a single price regardless of speed would be contrary to the initial pricing principle in the sense that it would represent a move away from the retail minus approach mandated by the initial pricing principle towards a cost based approach. (It is also relevant to note that the final pricing principle is also a retail minus principle. If the Commission perseveres with its approach to the initial price there is a substantial prospect that the final price will be set at a completely different level. The consequences of this for Telecom's customers could be dramatic. However, the focus of these submissions is on the initial pricing principle rather than the final pricing principle.)

E1.4 Overseas Experience

363. As noted above, it is international practice to offer different prices for different speeds at both the retail and wholesale level (See Annex B and Annex E respectively). For example, Telstra Corporation Limited charges wholesale customers differently for different speeds.

E1.5 Regression Analysis

364. Annex F contains Telecom's detailed assessment of the Commission's regression analysis and sets out a revised workable approach. In short, the Commission's regression analysis is deficient in the following aspects:

Business Jetstream

- (a) The Commission has incorrectly omitted the Venture Flat Rate.
- (b) The Commission has incorrectly excluded Venture Plans from consideration.
- (c) The Commission has incorrectly subtracted a "speed premium" from the derived price.

Residential Jetstream

- (d) The Commission's approach to the removal of the ISP fee is incorrect.
- (e) The Commission has incorrectly failed to include Homeline in its imputation calculation.

Data Cap and Speed Issues

- (f) The Commission has misunderstood the nature of data caps in the context of its regression analysis.

365. In Annex F, Telecom provides an alternative suggested imputation methodology which does not suffer the above short-comings.

E2 Benchmarking

366. The Commission proposes to rely on the 2002 benchmarking study which it also relied upon for Decisions 497 and 525. Telecom reiterates its previous submissions, particularly paragraph 154 of its January 2005 cross submissions which have not been recorded accurately in the Commission's draft determination.

E3 Revision

367. The initial pricing principle mandates a retail minus approach by reference to a comparable retail service. Accordingly, as the Commission recognises, there must be flexibility for the regulated price to change with comparable retail prices. Telecom therefore agrees that there should be a revision process with a DSPL type approach.
368. As noted in Annex F, the Commission, if it decides to regulate bitstream access prices, should specify the methodology by which those prices should be calculated rather than the specific numbers produced when the methodology is applied at some point in time. Assuming the Commission uses some form of regression methodology, the specification would be in the form of specifying which independent variables should be included in the analysis and what functional form the regression equation should take.
369. For example in relation to Residential, if the Commission were to adopt Telecom's suggestion, it would specify the way in which ISP charges and calling discounts should be allowed for to produce a vector of "net prices" as the dependent variable. It would then specify that any of Telecom's retail plans which are priced according to their speed and number of included Gigabytes of data should be included in the analysis. It would then direct that the functional form

$$\text{Price} = a + b.\ln(\text{Speed}) + c.\ln(\text{Data})$$

be used and that a price by speed for an imputed value of Data=0 be calculated. It might consider it useful to provide a worked example using Telecom's retail services and prices at the time for the sake of greater clarity going forward.

370. Telecom would then take the responsibility to re-run the regression each time it changed its retail prices such that the regulated prices changed at the same time as Telecom's retail prices changed.
371. Telecom does not expect that any audit process will be required as the inputs are self-evident. If any such audits were required then access seekers will need to contribute to the relevant costs.

F SUNDRY CHARGES RELATING TO SUPPLY OF BITSTREAM ACCESS

F1 Reassignment

372. Telecom has proactively reviewed and reset the churn fee to TSLRIC. This has been announced to the industry. For the purposes of its commercial arrangements Telecom accepts the TSLRIC charge it has announced. Telecom does not however accept that a TSLRIC charge is permitted by the Act. The pricing principle mandated by the Act is retail minus.

373. The Commission argues at paragraph 211 of the draft determination that Telecom should not recover common costs in its price for reassigning a customer because Telecom incurs these costs as part of its wider wholesaling activities and because these costs are not variable.

374. The Commission then states at paragraph 212 of the draft determination that:

"the reassignment charge should be set at an efficient level and notes that this will **not**, in any event, be **greater than [the incremental cost]** per transaction."

and at paragraph 213 requires the parties to negotiate an appropriate reassignment charge with this guidance in mind.

375. Despite the fact that the initial pricing principle is based on a retail minus approach the Commission appears to be suggesting not only that the parties negotiate a reassignment charge based on a cost based approach but also that the Commission expects such a charge to be below incremental cost. Apart from being inconsistent with the regulatory regime and, more particularly, the initial pricing principle, it is to Telecom's knowledge unprecedented for a regulator to suggest pricing below incremental cost.

376. The incremental cost per transaction should only set a lower bound for the efficient price level rather than an upper bound. Further, even though the common costs relating to reassignment will not vary with output over the term of the determination, they will vary with output in the long-run. As a result, the Commission should allow for the recovery of a reasonable allocation of such costs.

377. Ever since the publication of the paper *A Contribution to the Theory of Taxation*⁹² in 1927, economists have been aware that, for a multi-product firm with decreasing average cost to break even, a product's optimal price will equal its incremental cost plus a contribution to its common costs. The contribution to common cost for a product is proportional to the inverse of its price elasticity. Failure to allow for this contribution will result in the failure of the firm to meet its obligations to fund its common costs in the long run, or in further distortions to the prices for other goods or services. Both of these outcomes are less efficient than Ramsey pricing, and imply that the efficient price, if the firm is to break even, is greater than the incremental cost. As a result, the Commission's view that an efficient level for the reassignment charge should not be greater than the incremental cost cannot be correct.

378. The Commission is clearly correct to say that common costs are not variable. If they were variable they would be part of the incremental cost.

⁹² Ramsey *A Contribution to the Theory of Taxation* (1927) 37 Economic Journal 47.

However just because these costs are not variable does not mean that Telecom should not be allowed to recover them. This is discussed further below. Telecom does not agree that the mark-up covers costs incurred as part of the wider wholesaling activities. Telecom should have made clear that the mark-up is to recover this activity's share of Telecom's general overhead costs. It is legitimate on the grounds of both theory and regulatory precedent that such a recovery should be allowed. To provide otherwise involves penalising Telecom and distorting market signals.

379. It is well accepted that if regulators set prices at marginal or incremental cost in any firm subject to scale economies this would drive firms into bankruptcy.⁹³ Baumol and Sidak extend this to fixed common costs as well.⁹⁴ These common costs need to be recovered somehow from products sold. A regulated price that does not allow any recovery of common costs cannot be said to be either compensatory or in line with what a contestable competitive market would produce.
380. In every regulatory jurisdiction of which Telecom is aware, this principle of recovery of common costs is accepted. In New Zealand, the Act defines a TSLRIC as including a reasonable contribution to common costs. The mark-up Telecom used was taken directly from the Ofcom allowance for common costs for a very similar activity which BT undertakes. The principle that there should be a reasonable recovery of common costs is universally accepted and the Commission is at risk of going against many years of practical and theoretical regulatory precedent should it decide not to allow it here. TSLRIC is used over a similar time period to the duration of this determination in the context of interconnection, so the two year time period is not a reason to exclude an allowance for common costs as is the normal approach with TSLRIC calculations.
381. There is no disagreement that these costs are not variable in relation to the transition service. But the fact that they are fixed makes them no less eligible to be recovered somehow. Telecom has no choice but to recover both fixed and variable costs. To allow Telecom only to recover variable costs in this instance means that other parts of the business must now be required to absorb more of these fixed and common costs. That in turn will cause pricing distortions elsewhere. A better approach is that the Commission allows some reasonable level of recovery from regulated as well as unregulated activities - better mimicking the outcomes of a competitive market.

F2 New Connections

382. Telecom agrees with the Commission's acceptance of a new connection charge being calculated on a retail minus approach as set out in paragraph 216 of the draft determination. Telecom suggests that a DSPL type approach is appropriate in order to ensure consistency between wholesale and retail. The parties could agree the mechanism for this.

F3 Moves Adds and Changes

383. Telecom agrees with the Commission's view (paragraph 219 of the draft determination) that charges for MACs should also follow the retail minus approach mandated by the Act. Telecom has previously submitted that it

⁹³ See for example Baumol and Sidak *Toward Competition in Local Telephony* (1994).

⁹⁴ *Ibid* at 69 – 70.

only intends to charge Telstraclear in a way that it does at retail such that there is consistency. This is because it is the responsibility of wholesale customer to perform or arrange MAC operations that Telecom does not perform at retail.⁹⁵ As the MAC charge does not vary a DSPL type approach appears unnecessary. If the MAC charge changes at retail it will similarly change at wholesale.

⁹⁵ Paragraph 173 of Telecom's submission dated 28 January 2005

G NON PRICE TERMS

G1 Retail/wholesale concurrency

384. At paragraph 270 of the draft determination the Commission dismisses this issue as no longer relevant because it proposed an unconstrained service. Telstraclear made a request in paragraph 16.2(c) of its original submission that Telecom should provide comparable wholesale services which are rate shaped to match any new retail Jetstream services. We understand that what is referred to here by "rate shaping" is copper rate limiting. Telecom agrees with this comparable approach so long as the comparable retail service is within the service designation and the other requirements of the Act. This request is in line with Telecom's fair and workable proposal.

G2 Operational support

385. Telecom is committed to providing the appropriate processes and OSS, whether electronic or manual, to provide TelstraClear with access to regulated wholesale bitstream services. Through Telecom's implementation programme of Information Systems, including OSS and electronic interfaces, Telecom is committed to electronic OSS and automation where this is technically and operationally practicable and cost effective. Telecom has previously set out its position in some detail in its December 2004 and January 2005 submissions. In short:

- (a) Industry wide solutions are preferable to solutions for individual customers;
- (b) The short term implementation of provision has been completed;⁹⁶
- (c) A Telecom wholesale fault management centre was established in mid 2004;
- (d) A web based mapping system for wholesale customers was launched jointly with Terralink; and
- (e) Telecom's eOR (electronic ordering systems) has been rolled out to several customers on a trial basis. The results of the trials are now under analysis, and further roll-out is expected shortly. The Commission should note that eOR and further developments of it have been designed and implemented as wholesale specific solutions so, in this sense, is leading retail.

G2.1 Provisioning processes

386. Telecom's provisioning and delivery processes are "colourblind" as between retail and wholesale orders. Most of the substantive steps are identical and orders are treated in the order in which they are received by both the wholesale provisioning team and service companies. Service companies work to principles to ensure that when dealing with the end user of wholesale customer they recognise that the wholesale customer is their customer (not Telecom) and that there must be consistency regardless of who the end-user's service provider is.

⁹⁶ Paragraph 194 of January 2005 submissions.

387. The only differences that exist are objectively justified as they are only to the extent necessary because of the different entry and exit points – eg: notification to a wholesale customer which is not required at retail.
388. The term “equivalence” has been adopted in the draft determination along with references to “no material difference” in the draft determination to denote SAP 3. It is important to note that SAP 3 requires consistency. It does not require an identical level of services, reporting or provisioning. As “consistency” is not defined, its ordinary meaning must prevail. The legislator has specifically chosen not to use the word “identical” because it is recognised that limitations may mean that this is not always possible. For example, a notification to a wholesale customer that is not required by retail.
389. Telecom is committed to the principle of consistency. As outlined later in these submissions, Telecom’s approach to engineering design and network management promotes first order consistency, provisioning and operational requirements are colourblind between wholesale and retail (with only unavoidable differences being present) and Telecom is offering up a level of reporting in its fair and workable proposal to demonstrate this commitment.
390. The uptake of broadband has vastly exceeded expectations and this has placed pressure on provisioning resources and unfortunately resulted in delays to lead times. The difficulties have been equally shared across retail and wholesale.
391. An example of where service is naturally different for a wholesale customer is the minimum lead time. The wholesale customer needs a period of time after entering its order to confirm the acceptability of the Ready For Service date with its customer. Recently, Telecom has reduced the minimum lead time to 3 days, however noting that this will have no impact on the overall time to delivery from confirmation of order, which remains consistent between retail and wholesale.
392. Telecom acknowledges the concerns which have been expressed as to perceived differences between retail and wholesale. However, as noted above, the processes are identical for the most part and only differ to the extent that is unavoidable. Telecom is continually working to further improve and streamline processes in order to minimise that fact that some differences cannot be avoided.

G2.2 eOR for broadband

393. As an update to Telecom's previous submissions and in furtherance of Telecom’s commitment in this area, eOR for broadband is intended to be launched in May/June this year. eOR for broadband is a variation of Telecom's order and entry tracking system that will automate confirmations along the entire broadband provisioning process. It is intended that eOR for broadband will greatly improve the wholesale ordering experience for these products by enabling the wholesale customer to enter their order electronically, and have an automatic response, effectively bypassing the wholesale provisioning team. It will also allow the wholesale customer to view the progress of their order on line, which Telecom's consumer retail customers cannot do. This will be available to wholesale customers for UBS initially followed by Jetstream.

394. In the interim eOR for jetstream and UBS is as consistent with retail as is possible. It is an online ordering tool enabling easy and accurate ordering of wholesale products, updates of service level milestones in the provisioning process and measures SLA requirements. Telecom has provided tailored information to wholesale customers in accordance with their requirements. The nature of Telecom's organisation and its current systems require and justify different entry and exit points for provisioning requests from retail or wholesale. However, the treatment of requests once entered is consistent, and the wholesale specific processes are being constantly reviewed in order to be as efficient as possible.
395. For the reasons previously set out, Telecom agrees with the Commission that it should not attempt to set detailed implementation matters in relation to OSS in this determination. TelstraClear's requests to date have not been operationally or technically feasible nor have realistic timeframes been presented. Based on the guidance of the Commission any further detailed implementation matters should be agreed between the parties and any matters relating to churn should be dealt with by the TCF churn code.

G2.3 Fault repair

396. Telecom has set up a dedicated Telecom wholesale fault management centre for wholesale customers. Telecom has a separate fault management centre for retail customers. Aside from the contact points, the handling of faults (whether retail or wholesale) are handled consistently. There is no prioritisation of retail over wholesale or vice versa.

G3 Static IP addresses

397. The Commission proposes that Telecom should provide a service that does not prevent TelstraClear from providing a static or dynamic IP address. Telecom notes that its commercial UBS service does not prevent ISPs from providing static IPs and accepts that a similar approach is appropriate for bitstream access.

G4 Future bitstream availability in the new areas

398. Telecom will treat requests from TelstraClear for an ADSL upgrade in a manner consistent with requests from Telecom retail. Telecom suggests that the detail should be agreed between Telecom and TelstraClear.
399. Telecom is unable to provide a fixed notice period for upgrades. This is because the length of time varies depending on location, equipment and demand. If service is not currently available at a customer site, both the Telecom Retail Line Check tool (<http://www.telecom.co.nz/jslinecheck>), and the Wholesale JetStream & UBS Line Check Toolkit (<https://www.telecom.co.nz/jslinecheckxml>), will provide advice as to the future availability of service at that site. If the exchange in question is programmed for a DSLAM rollout within the next three months this is advised in the return string from the tool. As each quarterly work programme for DSLAM deployment is confirmed, it is entered into the availability database used by both tools. This should be sufficient notification to the public and the industry (including TelstraClear) of upgrades without additional reporting obligations as proposed in the draft determination.

G5 Pro ration billing

400. The Commission proposes (at paragraph 296 draft determination) that Telecom must:
- (a) refund a jetstream customer for any unused portion of the relevant billing period; and
 - (b) ensure that TelstraClear is charged the bitstream access charge only in respect of a period commencing on the date the bitstream service transfer is implemented.
401. In relation to (a) Telecom notes that the Commission is proposing to regulate Telecom's retail relationship with its customer. This is not permitted by the Act which regulates the supply of telecommunications services between service providers.
402. Telecom uses every endeavour to ensure that the Commission's second proposition in (b) occurs. Telecom aims to work with wholesale customers to ensure that implementation dates occur on the anniversary of the customer signing up. Therefore, wholesale customers are only charged from the date of implementation. Telecom will continue with this practice with TelstraClear's co-operation until the pro-ration capability is in place.
403. Telecom's current Jetstream billing system (IAF) does not permit the pro rata billing which the Commission's proposals are aimed at. This is why change plan activities can only occur on the end-user's billing anniversary date. The issue is shared at retail and wholesale. Telecom is currently working towards replacement of IAF with a new system that will permit pro rata billing ("Singleview"). Current timing indicates that testing will commence shortly and rollout is likely to occur in the last quarter of this year. In the interim any resolution of the current system limitation is not viable. Significant development work and significant cost would be required in order to change the current IAF lack of pro-ration capability. This would clearly be a wasteful exercise given that the development of "Singleview" is underway.
404. In furtherance of Telecom's commitment to consistency, when Singleview is launched, it is intended that pro-ration will be permitted in relation to change plans and relinquishments both at wholesale and retail. Migration of customers at retail and wholesale is expected to occur within a similar timeframe.

G6 Rebates

405. Telecom agrees with the Commission's view at paragraph 299 of the draft determination that the requested rebate is not an appropriate non price term and would be beyond the requirements of the standard access principles.

G7 Other non price terms

406. TelstraClear has requested that other non price terms of Decision 497 apply to the supply of the wholesale bitstream service and backhaul service. What TelstraClear means by other non price terms of Decision 497 remains unclarified. Telecom therefore remains unable to comment.

The backhaul service has been withdrawn so this request is no longer relevant.

407. Telecom considers that this lack of clarification means that further non price terms cannot now be added to TelstraClear's application. The Commission does not need to determine this request. Given that the parties have not negotiated further non price terms, and in line with the Commission's approach elsewhere in the draft determination, this matter should be returned to the parties for commercial negotiation.

G8 Term of the determination

G8.1 Commencement date

408. Telecom requests that the determination either sets a forward looking commencement date or that the final determination provides a period of time for delivery of its final specification. While Telecom will commit to a timely rollout in accordance with SAP 1, it will be limited by technical and operational considerations which are necessary in order to enable delivery to occur. There will be similar issues in relation to reporting in that a period of time will be required to deal with the proposed baseline report, set up the actual reporting process and auditing arrangements and a reasonable time must be allowed for this to occur.
409. Under Telecom's existing UBS regime a new product is able to be rolled out in approximately eight weeks assuming new and substantive network issues do not arise. Accordingly, it is currently anticipated that roll out of a further variant (eg: a 3Mbps UBS variant) would fall within this implementation timeframe. Implementation and testing of new products takes approximately three to six months.
410. Telecom has estimated that it will take approximately 90 days to prepare a baseline report, as referred to in Section C3, for consideration as to a reporting approach. An auditable report should be able to be produced 30 days after that baseline report is finalised. These current estimates also need to be taken into account.

G8.2 Expiry Date

411. Telecom and TelstraClear are agreed that the determination should run for 24 months from the date that the final determination is made. Telecom does not agree with TelstraClear's previous assertions that the Commission should fix a flexible or indeterminate expiry date.

H A WORKABLE WAY FORWARD

412. Telecom has addressed what it considers to be substantial workability difficulties with the proposal in the Commission's draft determination. Telecom also proposes a workable way forward for the Commission and the industry to overcome these difficulties.
413. Telecom's commercial UBS services were proactively developed taking into account overseas practice and the service designation in the Act. Telecom had not anticipated that the Commission would potentially seek to substantially depart from overseas practice. Furthermore, as outlined in these submissions, Telecom has substantial concerns as to technical and operational ability to implement the draft determination and considers that the proposals are not in the long term benefit of end-users.
414. Taking into account the Commission's views in the draft determination and extracting those parts that are not workable or not in the long term benefit of end-users, Telecom puts forward a fair and workable proposal with the following characteristics:
- (a) A selection of speed options with a different price set for each within the residential and business areas. This is consistent with overseas practice (see Annexes B and E);
 - (b) The speed options would be 256kbps, 1Mbps, 2Mbps and a "full speed" option for both residential and business;
 - (c) The "full speed" option would be to the maximum downstream speed that complies with the standard access principles and the purpose of the Act, and which can be supplied in a stable and sustainable way (See Section C). The practical maximum is likely to be around 3Mbps for the reasons detailed in this submission and would be a speed that is in line with high-end plans overseas;
 - (d) The options are L2TP (as confirmed by TelstraClear and the Commission);
 - (e) The uplink will be 128kbps as in the designation;
 - (f) The retail minus approach mandated by the Act is approached as intended for each of the speed variants (Telecom would ensure that reference retail prices were available);
 - (g) A measurement and reporting regime will be implemented in order to report on consistency in line with the objectives set out in the draft report (but will, in the case of this proposal) be meaningful in terms of consistency;
 - (h) Telecom's industry proposal to set the churn fee at TSLRIC rather than incremental cost. (The churn fee was under review prior to the launch of the draft determination and has now been reduced to TSLRIC effective 30 May 2005); and
 - (i) A realistic timeframe is set to enable Telecom to deliver this proposal to TelstraClear and the industry in a similar timeframe.

415. This proposal is aimed at striking a reasonable balance between what is technically, operationally and economically achievable and the objectives of the Commission and the Act. It pushes the asymmetry boundary between the upstream and downstream speeds to the practical maximum that is workable. A menu of speeds as outlined is workable in terms of profiles, would enable retail and wholesale comparability and thus permit workable reporting on consistency. It will also resolve many of the difficulties with the proposal in the draft determination for which those difficulties largely outweigh any perceived benefits.
416. Telecom has provided preliminary views as to how a reporting mechanism might work should the Commission wish to mandate this. It is currently estimated that a baseline report could be prepared within 90 days after the final determination and a first audit report 30 days after that baseline report is finalised. Telecom would suggest a bi-annual reporting approach.
417. A revised methodology following the Commission's regression analysis (but correcting for errors) is submitted.
418. eOR for broadband ordering and tracking is to be available shortly to enhance the ordering experience of wholesale customers. Singleview implementation is also under way for later this year to resolve the pro-rata limitation. Other provisioning processes as outlined are consistent between wholesale and retail.

ANNEX A

RESPONSES TO COMMISSION QUESTIONS

Question 1: To what extent should the relevant wholesale product market be more broadly defined than bitstream only? In particular, please comment on the preliminary view that ADSL, cable, fibre and FWA-based broadband access services should be included in the same market

1. Telecom's views on the wholesale market definition are set out in section D4. For the reasons expressed in section D2 Telecom considers that the Commission must first define the retail market. A discussion on the retail market appears at section D3.

Question 2: Bearing in mind the pricing referred to above, to what extent are symmetric and asymmetric broadband services substitutable?

2. Telecom agrees with the Commission that the market evidence support the conclusion that symmetric and asymmetric broadband services are in the same product market. Similar price points indicate that customers do treat the two types of services as substitutes.

Question 3: To what extent is Telecom's commercial UBS pricing geographically differentiated?

3. See footnote 137 in Section D.

Question 4: Comment is sought on the preliminary assessment of competition in the defined market, in particular in relation to the competition criteria listed above

4. Telecom's view on the competition assessment is set out in section D5.

Question 5 asks what are the potential instability risks that might arise from the provision of a bitstream access service with unlimited downstream speed to the maximum technical capacity of the DSLAM, and a 128kbps upstream speed?

5. Telecom's submissions in relation to the potential adverse effects of an interleaving option are set out in section C1.2. Telecom has also previously noted that the level of asymmetry inherent in an upstream/downstream speed profile of 8Mbps/128kbps is likely to mean that the service is unstable and unable to provide a satisfactory end user experience.⁹⁷
6. This is because TCP/IP (the protocol suite used for web browsing) will not function correctly with downstream/upstream speed asymmetry greater than about 10:1, as TCP acknowledgement packets will begin to saturate the 128kbps upstream channel. This will mean that end users will not see the full benefit of a bitstream access service with an unlimited downstream speed if they are using TCP based applications.

⁹⁷ paragraph 11, Appendix A of Telecom's submission.

7. As acknowledged in Section C Telecom recognises that if you are not using TCP/UDP then you will have a stable outcome. This point is confirmed by TelstraClear's consultants, AAS, who note that:

"it is likely that such a high degree of asymmetry will degrade the performance of TCP over the service. If the upstream link is heavily loaded, it can delay the transmission of TCP control packets, thus affecting the apparent downstream performance."

8. This does not obviate the noise and reach issues associated with an unconstrained downstream service.

Question 6: Would the nature of that service described above effect the provision of data streams on the network at OSI layer 2?

9. Telecom can provision L2TP⁹⁸ data streams on the network. However, there are a number of issues associated with a non rate limited service. These limitations are discussed in section C1.2.

Question 7: Do the suggested criteria appropriately measure the key service parameters necessary to assess whether the network performance of the bitstream service is consistent with the characteristics of the bitstream used by Telecom to supply its Jetstream services?

10. There are a number of difficulties with the measurement and reporting regime suggested by the Commission in the draft determination.
11. The problems associated with measuring the performance of a non rate limited service or a service with interleaving turned off are discussed in sections C1.3 and C2.3 above. Telecom has discussed the implementation and cost of reporting in section C3.3. As noted there the measurement criteria will need to be assessed in light of the final determination and the proposed baseline report. Telecom refers back to the workshop slides which advised that the measurement parameters can not be considered to be independent of each other or of the proposed unconstrained service.

Contention ratio

12. The current definition of contention ratio does not make sense – the contention ratio should be defined by reference to the peak busy hour. In addition, it is not possible to define a contention ratio in relation to a non rate limited service, other than by reference to the maximum theoretical downstream speed of 8 Mbps.

Minimum 32 kbps

13. As Telecom has previously submitted, in order for the 32kbps to be sensible, it needs to be average over a time interval (for example, 1 hour, 15 minutes, or 1 minute). That time interval depends on the characteristics of the service desired by the customer and may have a significant cost implication. The choice of time interval is important because if, for instance, it was 1 minute this would create a real time service that would be inconsistent with the limit in paragraph (c) of the additional limits on access principles applicable to the designated bitstream service. It is important that the determination includes a time interval for the 32kbps

⁹⁸ The Commission confirmed that the draft determination relates to L2TP not layer 2.

measure of not less than 30 minutes. With a 50:1 contention ratio, only services with a downstream speed above 1.5Mbps can achieve the minimum 32kpbs consistently.

Average of not less than 256kbits

14. Telecom notes that a service with a designed maximum downstream speed of 256kbits cannot mathematically achieve an average speed of 256kbits.

Measurement Location

15. Telecom agrees with the measurement location suggested by the Commission. However, as the Commission is aware, Telecom has multiple interconnection points with TelstraClear. In order to provide cost effective measurement, Telecom will need to find a point in the network which has a common relationship with all of the interconnection points, and do the measurement at this point.

Question 8: Do the parties agree that the ITU definitions for the parameters are the appropriate definitions to use as the basis for measurement of key parameters?

16. Subject to the comments made in relation to question 7 above, Telecom supports the use of ITU definitions for the parameters.

Question 9: Does Telecom seek to recover the additional costs necessary to turn interleaving off for individual ports?

17. Telecom does not currently offer any ADSL services with interleaving turned off. The price for Telecom's retail Jetstream services do not include any provision for interleaving to be turned off on a per port basis, nor does the imputed price for the regulated service determined by the Commission. Accordingly, Telecom will need to recover the cost associated with turning interleaving off on a per port basis, on top of the imputed price. Refer Section C2.4.

Question 10: Does the 'Wholesale Jetstream & UBS Line check Toolkit' currently collect this information?

18. This tool provides advice as to the future availability of service at a site. See Section G4.

Question 11: TelstraClear request that the other non-price terms of Decision 497 should apply to the supply of the wholesale bitstream service and backhaul service. What additional non-price terms do the parties consider should be included?

19. See Section G7.

ANNEX B

Evidence of Retail Value Based Data/Speed Differentiated Pricing amongst International Broadband Providers

Below are examples that highlight the extent of data/speed price based discrimination amongst broadband providers globally.

Provider	Plan Name	Downstream Speed	Upstream Speed	Usage Allowance	Monthly Price	Res/Bus
New Zealand						
TelstraClear	Paradise High Speed 1GB	2mbps	512kbps	1GB	\$39.95	Res
	Paradise High Speed 5GB	2mbps	512kbps	5GB	\$59.95	Res
	Paradise Light Speed 10GB	10mbps	1024kbps	10GB	\$139.95	Res
Woosh	Elevate	250kbps	120kbps	200MB	\$29.95	n/a
	Express 1	250kbps	120kbps	1GB	\$39.95	n/a
	Express 3	250kbps	120kbps	3GB	\$49.95	n/a
	Express 10	250kbps	120kbps	10GB	\$69.95	n/a
Australia						
Telstra	200MB Plan	256kbps	64kbps	200MB	A\$29.95	n/a
	400MB Plan	512kbps	128kbps	400MB	A\$39.95	n/a
	500MB Plan	1500kbps	256kbps	500MB	A\$69.95	n/a
	Unlimited Plan	256kbps	64kbps	10GB	A\$59.95	n/a
	Unlimited Plan	512kbps	128kbps	10GB	A\$69.95	n/a
	Unlimited Plan	1500kbps	256kbps	10GB	A\$99.95	n/a
	20GB Plan	1500kbps	256kbps	20GB	A\$129.95	n/a

Optus	DSL Basic	256kbps	64kbps	200MB	A\$29.95	n/a
	DSL Starter Plus	512kbps	128kbps	400MB	A\$39.95	n/a
	DSL Value 1GB	512kbps	128kbps	1GB	A\$49.95	n/a
	DSL Unlimited	512kbps	128kbps	10GB	A\$69.95	n/a
Singapore						
Singtel	512kbps Unlimited	512kbps		unlimited	S\$47.25	n/a
	1500kbps Unlimited	1500kbps		unlimited	S\$58.00	n/a
	3500kbps Unlimited	3500kbps		unlimited	S\$83.90	n/a
	United Kingdom					
BT	BT Basic	1mbps	<256kbps	1GB	£15.99	Res
	BT Broadband	2mbps	<256kbps	15GB	£22.99	Res
NTL	Broadband 2MB	2mbps		30GB	£24.99	Res
	Broadband 3MB	3mbps		30GB	£37.99	Res
	ADSL Business Broadband	512kbps		unlimited	£59.99	Bus
	ADSL Business Broadband	1mbps		unlimited	£89.99	Bus
Telewest (Blueyonder)	Broadband	512kbps		unlimited	£14.99	Res
	Broadband Complete	1mbps	128kbps	unlimited	£19.99	Res

	Express	384kbps 1.5mbps	-	128- 384kbps	US\$26.95	Bus
	Pro	1.5 - 3mbps		384- 512kbps	US\$36.99	Bus
Cox	Premier	5mbps		768kbps	US\$64.95	Res
	Preferred	4mbps		512kbps	US\$49.95	Res
Adelphia		4mbps		384kbps	US\$42.95	Res
		6mbps		768kbps	US\$59.95	Res
AT&T	Standard	1.5mbps		128kbps	US\$29.95	Res
	Preferred	3.0mbps		384kbps	US\$39.95	Res
Covad	Telesoho Office ADSL	<1.5mbps <3.0mbps		<384kbps <768kbps	from US\$64.95 from US\$99.95	Bus Bus
	Dedicated Office (dedicated loop)	1.5mbps 3.0mbps		384kbps 768kbps	from US\$74.95 from US\$119.95	Bus Bus
	Professional (symmetrical)	144kbps 192kbps		144kbps 192kbps	from US\$129.95 from US\$129.95	Bus Bus
		384kbps		384kbps	from US\$149.95	Bus
		768kbps		768kbps	from US\$179.95	Bus
		1.1mbps		1.1mbps	from US\$239.95	Bus

	Lite							
	Business DSL Plus	1.5mbps	256kbps			US\$79.95	Bus	
	Business DSL Plus	3.0mbps	384kbps			US\$89.95	Bus	
	Business Speed 384	384kbps	384kbps			US\$199.95	Bus	
	Business Speed 768	768kbps	768kbps			US\$219.95	Bus	

ANNEX C

ECONOMIC PAPER FROM JERRY HAUSMAN

Economic Analysis of Price Discrimination for Broadband

Jerry Hausman, MIT

May 17, 2005

I. Analysis of Price Discrimination for Broadband Service and the LTBE

1. Telecommunications networks have the characteristic of significant fixed costs. The outcome is one of imperfect competition. If a firm charged only its marginal (or variable) cost, it would be uneconomic since it would not recover its fixed costs. Thus, “first best” pricing of using price equal to marginal cost is not a feasible outcome. Two possible solutions remain:⁹⁹ (1) set price equal to “average cost” (2) exercise price discrimination where different prices are charged depending on customer segment price elasticities.¹⁰⁰ Price discrimination has always been used in telecommunications, at least for the over 30 years that I have studied the subject. In the days of regulated monopoly provision in the US AT&T price discriminated on long distance calls at prices set by regulators (the FCC). The local Bell Operating Companies also charged prices for local services that arose from prices set by state regulators in each of the 50 states and the prices were based on price discrimination.¹⁰¹
2. Price discrimination is also commonly present in competitive industries where large fixed costs exist.¹⁰² Some economists incorrectly claim that price discrimination only exists where firms have market power. To the extent that the term “market power” demonstrates charging above the competitive price this claim is incorrect.¹⁰³ The mistake in this claim is to use “perfect competition” as a standard where price equals marginal cost. However, with significant fixed costs imperfect competition must be the outcome where price exceeds marginal cost or

⁹⁹ I abstract from non-linear pricing, although non-linear pricing is actually a form of price discrimination.

¹⁰⁰ In actuality, no “average cost” measure exists in most telecommunications situations because of the presence of common costs. Common costs are another reason that price discrimination is widely used in telecommunications.

¹⁰¹ Here I am using price discrimination in the way that economists use the term: different margins arise from different prices on the same or similar services. See e.g. J. Tirole, *The Theory of Industrial Organization*, (MIT, 1988), “We will say that there is no price discrimination if differences in prices between consumers exactly reflect differences in the costs of serving consumers.” (p. 134)

¹⁰² The term “price discrimination” sometimes has negative connotations among non-economists so the terms “price differentiation” or “customer segmentation” are used. Here I use the economic term of price discrimination.

¹⁰³ However, if the claim means that the firm faces a downward sloping demand elasticity and sets price above marginal cost, the claim would be correct. However, in the vast majority of modern competitive industries with significant fixed costs and imperfect competition, firms face a downward sloping demand curve and must price above marginal cost to earn their cost of capital.

the firm would go out of business. Antitrust authorities have recognized that with imperfect competition that arises with fixed costs price discrimination often increases competition.¹⁰⁴

3. For example, in the US no airline currently has market power. Since no airline is earning its weighted average cost of capital, no airline is charging above the competitive price. Yet price discrimination is common. For example, on April 21, 2005 I purchased a roundtrip Boston-London ticket. When I purchased it on the American Airlines (AA) website, the ticket was approximately \$75 less expensive, or about 15% cheaper, than if I bought it from an AA telephone ticket agent. From my experience in the airline industry the cost to AA is not near \$75 per ticket sold by their internal agents. Further, competition between Boston and London is quite high with BA (British Airways), Virgin, and Continental all offering nonstop flights and many other European airlines offering one-stop flights. I infer the \$75 cheaper fare arises because customers who purchases airline tickets from the web are well-recognized to be more price sensitive than customers who use airline ticket agents or general purpose travel agents. Thus, in the extremely competitive US airline industry, price discrimination exists.¹⁰⁵
4. Similar differences exist in telecommunications. Cable modem broadband service and telephone broadband (DSL) compete in most areas of the US. Competition is high with cable having about a 60% market share and DSL with about a 40% market share. In many areas of the US Cox Communications (CC) is the cable company and Bell South (BS) is the local exchange carrier (ILEC). CC has been the most aggressive cable company in offering telephone and broadband internet services to its customers. CC (and most cable companies in the US) price discriminate on the basis of speed for their broadband services. Cox offers three residential broadband cable modem services: (1) Cox's "Value Package" of 256 kbps downstream and the same speed upstream is \$24.95 per month.¹⁰⁶ (2) Cox's "Preferred Package" of 4 Mbps downstream and 512 kbps upstream is \$39.95 per month. (3) Cox's "Premier Package" of 5 Mbps downstream and 768 kbps

¹⁰⁴ For a recent explanation by the chief economist of the US Federal Trade Commission, see L. Froeb and D. O'Brien, "Price Discrimination and Competition: Implications for Antitrust." Presentation given November 18, 2003. The authors conclude, "Price discrimination intensifies competition among oligopolists (in "typical" cases)." (p. 7)

¹⁰⁵ Numerous other examples exist in airlines where the price difference of a business class ticket and an economy class ticket is much greater than the cost difference on almost all routes. For example AA on Boston-London is \$1562 for an unrestricted economy class ticket while a business class ticket for the same days (May 9 and return May 13) is \$8704. This difference of over \$7000 exceeds any conceivable difference in cost.

¹⁰⁶ See <http://www.cox.com>. Site visited on May 16, 2005. This price is for households that already subscribe to cable TV so that the incremental cost of broadband is lower than for business customers. Business customers who subscribe to cable are not eligible for the lower price residential broadband service.

upstream is \$54.95.¹⁰⁷ The difference of \$180 per year is well beyond any difference in costs between the two service offerings.

5. For small business customers CC offers 5 services: (1) 768 kbps/256 kbps at \$79 per month¹⁰⁸ (2) 1.5 Mbps/384 kbps at \$109 per month (3) 3.0 Mbps/512 kbps at \$139 per month¹⁰⁹ (4) 4.0 Mbps/768 kbps at \$179 per month and (5) 6.0 Mbps/768 kbps at \$229 per month. These large differences in monthly prices do not reflect differences in cost among the services. Thus, CC practices price discrimination both among its residential and small business customers as well as between residential and small business customers.
6. Bell South, which competes with Cox in many areas of the southern US, similarly price discriminates for residential customers. BS offers 3 residential broadband services: (1) “DSL Lite” with 256 kbps/128 kbps at \$34.95 per month (2) “DSL Ultra” with 1.5 Mbps/256 kbps at \$42.95 per month and (3) “DSL Extreme” with 3.0 Mbps/384 kbps at \$54.95 per month.¹¹⁰ BS offers 3 business DSL broadband services with the same speeds: (1) 256 kbps/128 kbps at \$49.95 per month (2) 1.5 Mbps/256 kbps at \$79.95 per month and (3) 3.0 Mbps/384 kbps at \$89.95 per month. Note that BS charges significantly more for business customers than for residential customers for the same speed DSL packages. Again I note significant amounts of price discrimination.
7. A similar situation exists in Canada with significant competition between the cable provider, Rogers, and the local exchange carrier, Bell Canada. Multiple broadband services are offered with significant price discrimination. For residential customers Rogers offer 4 broadband services to residential customers over its HFC cable network: (1) “Ultra-lite” with 128 kbps/64 kbps at \$C19.95 per month (2) “Lite” with 256 kbps/64 kbps at \$C29.95 per month (3) “Express” with 3 Mbps/384 kbps at \$44.95 per month and (4) “Extreme” with 5 Mbps/800 kbps at \$46.95 per month.¹¹¹ The local exchange carrier Bell Canada also offers 4 packages to residential customers: (1) “Basic lite” with 128 kbps downstream at \$C19.95 per month (2) “Basic” with 256 kbps at \$C27 per month (3) “High speed” with 3 Mbps at \$39 per month and (4) “High speed ultra” with 4 Mbps

¹⁰⁷ Cable companies in the US typically offer higher speed cable modem service over their HFC networks than the telephone companies offer with DSL over their copper based networks. No charge for usage is made in the US for residential broadband.

¹⁰⁸ Since most small businesses do not subscribe to cable TV, the price for broadband is significantly higher than for residential customers.

¹⁰⁹ Note that this service is priced at \$1200 per year higher than the “Preferred Package” for residential customers, which has a higher download speed and the same upload speed.

¹¹⁰ <http://www.bellsouth.com>. Site visited on May 16, 2005.

¹¹¹ <http://www.shoprogers.com>. Site visited May 4, 2005.

kbps at \$50 per month.¹¹² For small businesses Rogers offers 4 services with download speeds ranging from 128 kbps to 8.0 Mbps with prices between \$C19.95 to \$C99.95 per month. Bell Canada also offers multiple broadband service packages for small businesses.

8. Cost differences do typically exist among the various broadband services. Higher speed services often have a higher investment cost than lower speed services.¹¹³ Nevertheless, the price differences are greater than the (marginal) cost differences so that higher margins exist for the higher speed services. Thus, in the competitive outcomes in the US and Canada, all the competing companies practice price discrimination.
9. Why do we observe these patterns of price discrimination with competition? The firms earn higher profits, which is their motivation. The slower speed customers have a higher (in magnitude) price elasticity. However, the high speed customers have a lower (in magnitude) own price elasticity since they typically require the ability to do large file transfers at high speed. Using the markup pricing rule from imperfect competition (Nash-Bertrand), the lower own price elasticity leads to a higher markup and therefore a higher price.
10. Using only a consumer welfare approach, the question is whether consumers are better off being offered only one variety of broadband or are they better off being offered two or three varieties of broadband.¹¹⁴ In the Appendix I demonstrate that if regulation causes no price discrimination to occur for broadband, consumer welfare is lower than if price discrimination is permitted. The economic reasoning is straightforward.
11. Consider the initial situation where only low speed broadband is offered in the market. I compare this situation where another high speed service is now added to the low speed service. Consumers can choose between the two services. The price of the low speed service decreases because the lower-elasticity customers tend to migrate to the high speed service as demonstrated in the appendix. Consumers who buy the new higher speed service are better off by the weak axiom of revealed preference (WARP) since they can buy the low speed service at

¹¹² <http://www.bell.ca>. Site visited on May 4, 2005.

¹¹³ Customer service costs can also be higher.

¹¹⁴ Note this analysis is different from the classical economic analysis where the same product is offered to different customer segments at different prices. Here differentiated products are offered to customers at different prices. However, since the margins differ price discrimination is in effect. See e.g. Tirole, op. cit., p. 114 for a discussion.

a lower price than before.¹¹⁵ However, they buy the higher speed service, which demonstrates by WARP that their utility increases. Thus, the change increases the long term benefits of end users (LTBE). Indeed, the change is a Pareto improvement since no consumer is made worse off.¹¹⁶ A Pareto improvement is a much more demanding policy goal than LTBE. Few public policy changes satisfy the Pareto improvement criterion and, instead, only satisfy the potential Pareto improvement policy criterion.¹¹⁷ Also, overall demand for broadband increases which I understand to be a policy goal of the NZ government.¹¹⁸

12. Economic efficiency also increases since the firm(s) earns higher profits when the constraint of no price discrimination is removed.¹¹⁹ It also has increased economic incentives to invest in improved broadband products for the future.
13. Thus, in this situation where elimination of price discrimination allows for introduction of a higher speed and higher price product, all broadband purchasers are made better off. The price of the low speed product decreases and consumers of the higher speed product are made better off by the introduction of the new product.
14. This type of outcome is consistent with previous actions by regulators, e.g. the Federal Communications Commission (FCC), which practiced price discrimination even when AT&T was a regulated monopoly. After competition began in long distance in the 1980s significant price discrimination occurred and continues to occur today in long distance. Indeed, I published a paper in 2004 that demonstrated the significant amount of price discrimination that occurs in the

¹¹⁵ Revealed preference is the fundamental building block of consumer choice theory. Prof. P.A. Samuelson introduced its use in economics in his Nobel Prize winning Ph.D. thesis, Foundations of Economic Analysis, (Harvard U.P., 1947).

¹¹⁶ A Pareto improvement is the most favorable type of policy change. Some consumers are made better off and no consumers are made worse off. Here all consumers who buy broadband service are made better off. Tirole op. cit. p. 139 discusses a Pareto improvement when a second market or market segment (here high speed broadband) is not served when price discrimination is not allowed. He states, "The elimination of price discrimination may be particularly dangerous if it leads to the closure of markets." (p. 139)

¹¹⁷ A potential Pareto improvements means that there are both winners and losers from a given policy change, but, in principles, the winner gain more than the losers so overall society is better off. For a further discussion, see Samuelson op. cit. An actual Pareto improvement means there are no losers.

¹¹⁸ TelstraClear (TC) disagrees with the Commission's suggestion to calculate separate business and residential average prices. Indeed, TC opposes any link between retail price and the regulated price for a given service. (TC, "Cross Submission", January 28, 2005, ¶ 132-133, ¶ 138.) However, TC nowhere does an economic analysis of its proposal with respect to LTBE. In its first submission (December 16, 2004), TC mentions LTBE in four places. (¶ 3, 25, 26, 38) However, in none of these instances does TC ever do an analysis of retail minus pricing of individual services versus average pricing across all services. Instead, TC asserts, without analysis, that access under Telecom's UBS Offer will not promote competition for the LTBE without any supporting analysis. Similarly in its Cross Submission, TC mentions LTBE in 3 places (¶ 21, 22, 33). TC again claims that the Telecom proposal of a "tight link" is not in the LTBE, but TC provides no economic analysis to demonstrate that its claim holds true. From my experience in telecommunications regulation in NZ, I understand that the LTBE is the policy goal, not the best interest of competitors such as TC. Thus, an economic analysis of how end-users would be affected by specific regulation is required to choose among different regulatory approaches.

¹¹⁹ This outcome follows from the LeChatelier principle. See Samuelson, op. cit.

residential long distance market in the US.¹²⁰ Similarly, state regulatory Commissions have always allowed for price discrimination in setting regulated prices at the state level. Recovery of the very significant fixed costs of a telecommunications network is done in a more efficient economic manner when price discrimination is allowed. Also, when a new product or service is introduced without increasing the price of the existing products, a Pareto improvement typically occurs so consumer welfare increases.

II. Outcome of NZ CC Policy of a Regulated Average Price for Bitstream

15. I understand from the draft determination (¶ 160-164) that the CC intends to regulate bitstream by requiring Telecom to charge a single wholesale price for all regulated business wholesale bitstream and a single wholesale price for all residential regulated bitstream services. No allowance for downstream or upstream speed differences will be present and no consideration of data caps will exist. For reasons I discussed above and the discussion below I think this policy will decrease the LTBE. I note that neither in the CC draft determination nor in TC's cross submission is any analysis done to demonstrate that use of a single wholesale price is in the LTBE.
16. Economic analysis in terms of the LTBE demonstrates that the correct regulatory approach is to set the regulated price on the basis of retail minus for each bitstream service Telecom offers. A single average price will likely lead to the outcome that only a single (low-speed or high-speed) bitstream service will survive in the market as I explain below. This, likely outcome should signal to the CC that its regulatory policy is incorrect since in the presence of an extremely high level of facilities-based competition in the US, Canada and other countries, the competitive process leads to multiple broadband offerings in the market where price discrimination exists as I discussed above. Thus, the CC's proposed regulation will likely distort the primary forms of speed and price based competition for broadband access that is the market outcome when significant fixed costs and imperfect competition exist.
17. I now explain why the likely outcome of the proposed CC regulation is only a single bitstream offering to residential customers and to businesses. Suppose

¹²⁰ See J. Hausman, "Why do the Poor and the Less-Educated Pay More for Long-Distance Calls?," Topics in Economics Analysis and Policy 2004.

Telecom attempts to offer both a high speed (HS) and low speed (LS) bitstream service at prices p_1 and p_2 with weighted average price \hat{p} . The regulated price to access seekers such as TCL will be $\tilde{p} = \hat{p} - c$. Because access seekers will have little or no fixed or sunk costs in terms of offering bitstream service, only the variable cost \tilde{p} will affect their pricing decision. If they offer the LS service, their marginal cost will be at least as high as $\tilde{p} > p_1$ so they will not be competitive with the Telecom LS service which will have the same attributes. Thus, the basic economics will cause them to offer the HS service at a price determined by their marginal cost $\tilde{p} = \hat{p} - c < p_2$. Given that the majority of residential subscribers likely would subscribe to the LS service the gap between \tilde{p} and p_2 is likely to be significant. Thus, many customers will choose to buy the HS service from TCL rather than from Telecom.

18. The end result will be that Telecom will be forced to offer only a single broadband service. The outcome is likely to be an example of an outcome of “Gresham’s Law” where Telecom offers only LS service.¹²¹ As I discussed above, the result decreases the LTBE. Alternatively, HS service could be the remaining service, but customers who would otherwise have purchased the LS service are made worse off by WARP.¹²² Indeed, broadband penetration will be less than it would be under correct regulation that recognizes the diversity of Telecom’s current offerings. Either outcome has only a single broadband service, which decreases consumers surplus and decreases the LTBE. “Regulatory arbitrage” by TCL and other access seekers is the cause of this decreased welfare. Regulatory arbitrage need not be an outcome of CC regulation, but instead arises from the provision of a regulatory arbitrage opportunity by the CC policy.
19. Economists and competition authorities have long recognized the price discrimination is determined by the impossibility of arbitrage.¹²³ It would be a remarkable outcome if the CC negated the outcome of competitive markets such as the U.S. and Canada where welfare-improving price discrimination occurs for broadband service by introducing regulatory arbitrage in NZ. The LTBE of NZ

¹²¹ Sir Thomas Gresham’s “law” is that “bad money drives out good.” See <http://www.tdctrade.com/econforum/hkma/hkma021001.htm> for a discussion.

¹²² TC views this outcome as likely, See TC “Cross Submission,” ¶ 136.

¹²³ See e.g. Tirole, op. cit, p. 134. The Department of Justice and Federal Trade Commission Horizontal Merger Guidelines (1992, ¶ 1.12) notes that resale must not be possible for price discrimination to occur.

consumers would be decreased by regulatory interference in competitive market outcomes.

20. If instead the CC adopts a retail minus strategy for each of Telecom's bitstream services, the opportunity for regulatory arbitrage diminishes. Telecom will have the correct economic incentives to offer the optimum amount of product variety consistent with the existence of imperfect competition.¹²⁴ Further, Telecom will have the correct economic incentives for investment in new generations of even higher speed bitstream services. The current CC-proposed regulatory policy will incorrectly distort these incentives since Telecom will not be able to recover its investment in higher speed services since the weighted average price calculated by the Commission will be below the cost to Telecom of providing these services.

¹²⁴ Since Telecom is producing the service "profit stealing" will not be a problem and it is likely that the market outcome will lead to the optimum amount of variety because of the working of the "invisible hand of perfect competition" as discussed in J. Hausman, "Sources of Bias and Solutions to Bias in the CPI", Journal of Economic Perspectives, 2003.

Appendix: Economic Analysis of Price Discrimination for Broadband

Jerry Hausman

Professor of Economics, MIT

Let $F(p)$ be a cumulative distribution for consumers reservation price for DSL. For price p_1 we have demand $x(1-F(p_1))$ where x is the potential population for broadband who would purchase at $p = 0$.¹²⁵ I first consider the situation with no price discrimination and the firm offers “basic” DSL. The firm’s problem is to maximize profit choosing price p_1 given marginal cost c :

$$\max_{p_1} \Pi = (1 - F(p_1))(p_1 - c) \quad (A1)$$

The solution to the problem is:

$$p_1 = c + \frac{1 - F(p_1)}{f(p_1)} \quad (A2)$$

I now consider the comparative statics of equation (A2) when a second higher speed DSL product is offered at a higher price p_2 . I assume consumers who had a higher reservation price for DSL than p_2 will choose the higher speed DSL product. The solution to the profit maximization problem for setting the price for the original product is:

$$\tilde{p}_1 = c + \frac{F(p_2) - F(\tilde{p}_1)}{f(\tilde{p}_1)} \quad (A3)$$

Since $F(p_2) < 1$, the numerator of equation (A3) decreases for the initial position of $\tilde{p}_1 = p_1$. Under the assumption that consumers with lower reservation prices are more price sensitive I find that the new price $\tilde{p}_1 < p_1$. Thus, the price of the basic DSL service decreases.¹²⁶

Consumers who buy the new higher speed service are better off by the weak axiom of revealed preference (WARP) since they can buy the low speed service at a lower price

¹²⁵ Without loss of generality I set $x = 1$ in what follows.

than before. However, they buy the higher speed service, which demonstrates by WARP that their utility increases. Thus, the change is in the long term benefits of end users (LTBE). Indeed, the change is a Pareto improvement since no consumer is made worse off. Also, overall demand for broadband increases which I understand to be a policy goal of the NZ government.

Economic efficiency increases since the firm earns higher profits when the constraint of no price discrimination is removed. It also has increased economic incentives to invest in improved broadband products for the future.

Thus, in this situation where elimination of price discrimination allows for introduction of a higher speed and higher price product, all broadband purchasers are made better off. The price of the low speed product decreases and consumers of the higher speed product are made better off by the introduction of the new product. Overall, consumer welfare and social welfare both increase.

¹²⁶ The condition on price sensitivity is sufficient but not necessary for a price decrease since the numerator of equation (A3) will be less than equation (A2) at the initial price p_1 .

ANNEX D

Extract from Alcatel Report

Overview

Telecom's Jetstream ADSL has been configured to train at the fastest speed possible. Therefore, the actual line speed is the achievable line speed (given the specified noise margins).

This contrasts with the configuration of Telecom business services, which are configured to a specified line rate, based on the subscription fee. Business lines may be capable of running at a faster rate than the actual line rate.

It is expected that the achievable line speed will degrade over time as more services are activated, increasing the noise in the cable, and reducing the Signal to Noise Ratio (SNR).

This was examined for []TCNZRI, where records of the initial synchronisation (sync) rates for 115 ADSL lines were located, and the current line rate could be obtained from the DSLAM. The original records were created around 2001.

The original and current sync rates were compared, and the average egress speed change for this group of subscribers was [].]TCNZRI In this period of 3-years at []TCNZRI, cable fill rate for DSL has reached [] (depending on the cable).

[

]TCNZRI

Continued on next page

Continued

Overview
Continued

It seems that there is no limit to how much worse a line can get, when faced with sufficiently severe interference.

[

]TCNZRI

Looking at the same data another way, we can compare the original line speed with the current line speed.

[

]TCNZRI

[**]TCNZRI** of the original lines started up at the maximum line rate [**]TCNZRI**. These lines will not change speed despite significant changes in crosstalk levels. Of the remaining [**]TCNZRI** lines, the average line rate [**]TCNZRI** in 3 years. The standard deviation [**]TCNZRI** in 3 years, indicating that the network performance is [**]TCNZRI**

ANNEX E

Evidence of Wholesale Value Based Data/Speed Differentiated Pricing amongst International Broadband Providers

Examples of international wholesale broadband offers

	Downstream Speed	Upstream Speed	Usage Allowance	Monthly Price	Notes
Australia					
Telstra	256kbps	64kbps	n/a	A\$22.00	DSL Layer 2 Internet Grade
	512kbps	128kbps	n/a	A\$27.70	
	1.5mbps	256kbps	n/a	A\$50.25	
	512kbps	512kbps	n/a	A\$50.25	
United Kingdom					
BT				Home	
	250kbps	64 to 250		£12.25	IPStream Prices ATM Interconnection prices
	500kbps	64 to 250		£13.00	
	1000kbps	250 kbps		£23.00	
	2000kbps	250 kbps		£38.00	
				Office	
	500kbps	64 to 250		£20.41	
	1000kbps	250 kbps		£32.64	
	2000kbps	250 kbps		£57.00	
	Tiscali*	128kbps			
256kbps					
1mbps					
2mbps					
Ireland					
Eircom	1024kbps	128kbps		€39.99	
	2048kbps	128kbps		€54.45	

* http://www.tiscali.co.uk/mediacentre/press_release_b2b/13_01_03_b2b.html

ANNEX F

Telecom's comments on the regression analysis

Analysis of the Commission's regression model

1. If the Commission persists with a single price regardless of speed, the imputation methodology the Commission uses at best contains a number of serious errors and at worst is fundamentally flawed. Telecom comments below on errors specific to the Business Jetstream regression analysis and the Residential Jetstream analysis, as well as on some general issues around the use of speed and data caps in the regression analysis.

Business Jetstream

2. The Commission has corrected a number of errors in relation to pricing for business customers in its 27 April 2005 correction. However, a number of outstanding issues remain:
 - (a) The Commission has omitted the Venture Flat Rate without any rationale. The plan provides for a throttle on cap after 10Gb of data in a month. While this is different to the other two Venture plans which have an overage charge, in the Residential case there are four plans with throttle on cap and one with overage and the Commission has been prepared to consider these collectively. There is no apparent reason why this difference is averaged over for residential customers, but is considered a reason for exclusion in relation to business customers. Including this plan in the Commission's regression, along with the other two Venture plans gives an intercept of negative \$47.31. While this result is ridiculous, it highlights a problem with the Commission's regression model, rather than a reason to exclude this retail plan from consideration. Instead of rejecting a retail plan because it does not conveniently fit the Commission's model, Telecom proposes a more general model that explains the pricing of the retail plans as a function of the data cap and data speed. Statistical tests can then be carried out to determine the validity of the Commission's assumptions.
 - (b) Another concern is the more general one of excluding the Venture plans from consideration, other than the comparison of the price of Venture 3G with Jetstream 3000 to derive an arbitrary 'Speed premium' 'adjustment'. Telecom can see no reason to exclude actual retail observations from consideration. Indeed these Venture plans have represented almost all of the sales of new Broadband plans to business customers since their launch in October last year. The Venture plans are genuine commercial offers from Telecom and should be taken into account in assessing Telecom's retail prices.
 - (c) A third error relates to the subtraction of a 'speed premium' from the derived price based on the modelling of Full Speed Jetstream plans. The Commission considers (rightly) that customers pay a premium for higher speed service (paragraph 7). (The inconsistency between this observation of reality and the proposed single price is noted above.) It then seeks to remove this premium on the grounds that the bitstream access price should not include a speed-related component. This rationale is inconsistent however. The price of \$44.32 which the Commission derives before this adjustment already excludes a speed component as it is a single figure independent of speed. Any further adjustment beyond this

point would be to make a second speed-related adjustment. The other problem is the direction of the adjustment. The Commission subtracts a factor for the calculated difference in value between a Full Speed service and one which runs at 256kbps. This implies the Commission is seeking to derive a price for a 256kbps wholesale bitstream access service. Yet the Commission has recommended that only a full speed wholesale service be supplied. The Commission's approach is to then set a price for a 256kbps service and then require Telecom to sell a much more valuable product than this at the 256kbps price.

Residential Jetstream

3. Similarly, Telecom notes errors in the regression analysis for pricing to residential customers. Firstly, the Commission's approach to removal of the ISP fee is not consistent with the clear wording of the Act. Telecom agrees that there should be a deduction from the base retail price to account for the exclusion of ISP services from the bitstream access designated service. However the Commission's approach in Step 2 of paragraph 177 of simply subtracting the ISP retail charge is not consistent with the requirement to subtract the avoided costs Telecom saves when a retail activity is desisted from in a wholesale context. The Initial pricing principle requires that the Commission conduct a benchmarking exercise in relation to what ISP costs will be avoided by Telecom when it supplies a bitstream access service to an access seeker rather than an Xtra Broadband service to a retail customer.
4. Telecom suggests however that there would be delays involved in conducting a proper benchmarking exercise and that a more workable solution for all parties would be to adopt the approach from the final pricing principle directly. That is, to calculate the costs Telecom avoids when no longer conducting the ISP activity and subtract these from the Xtra Broadband price after the Commission's Step 3.
5. Telecom has calculated the costs of the various Xtra activities which will be avoided in a wholesale context. These are:

[

] TCNZRI

Using this total cost of [] **TCNZRI** excl GST per month results in an increase in the Residential bitstream access price of \$3.25 per month (excluding the effect of any other changes).

6. Another error is that the Commission has ignored the inclusion of Homeline in the imputation calculation. It should have calculated the result over the entire bundle, not the bundle without Homeline. It is not sufficient for an end user simply to have a Homeline, it must be a Homeline with Telecom at retail (as well as the requirement for the tolls with Telecom). In particular the following combination of services would **not** qualify for the \$10 tolls discount:

(a) resold Homeline through TelstraClear (or other access seeker);

(b) tolls with Telecom; and

(c) Xtra Broadband.

7. The \$10 tolls discount is only available when all of the services listed above are purchased directly from Telecom at retail. Therefore the calculation of the implied price of the Jetstream component of the bundle needs to allow for the \$10 discount being spread over Homeline rental as well as over ISP charges, tolls, and the Jetstream. The Commission notes the inclusion of the Homeline requirement in its paragraph 177, but its calculations do not reflect this.
8. The \$10 discount also needs to be spread over the ISP component as the Commission has chosen to use the full retail bundle as the starting point rather than the bundle excluding an ISP charge (the resold service). The Commission's explanation in paragraph 178 that the ISP charge is independent of where the end user purchases Calling is not correct. Telecom implicitly offers a different price for the ISP service when Calling (and Homeline and Jetstream) is purchased with it as the \$10 bundle discount relates to all the retail services within the bundle. This approach is consistent with the pricing principle the Commission quotes in its paragraph 174.
9. The approach the Commission should take here is to be consistent with the approach it has taken in relation to the allowance for inclusion of tolls in the bundle. The Commission used the average value of toll calls when calculating what proportion of the \$10 discount applied to the Jetstream component. Analogously it should examine the average amount of ISP spend in the bundle. This involves looking at what proportion of bundle discounts have \$0 of ISP spend (a non-Xtra ISP being used), and what proportion have \$10 of ISP spend. Telecom has calculated this figure to be \$9.17 as 91.7% of bundle customers have their ISP as Xtra.
10. The Commission can correct its formula by adding the term "+39.85 / 1.125 + 9.17 / 1.125" into the denominator of the "Jets. Share" column of its spreadsheet. The 39.85 is the retail price of Homeline and the 9.17 is the average ISP revenue that Telecom earns. Making this correction results in an increase in the residential bitstream access price of \$1.30 per month (excluding the effect of any other changes).

Data Cap and Speed Issues

11. The Commission proceeded with its regression analysis on the basis of a misunderstanding of the nature of data caps. Data caps have a clear relevance and purpose in relation to price differentiation, but there is also a cost element which the Commission is not allowing for.
12. Telecom's commercial UBS does not have a specific data allowance because it distinguishes by speed. A higher speed will typically move more data so Telecom's commercial UBS obtains a recovery for Telecom's extra costs of speed and data through the speed-related charge alone. The Commission's approach doesn't allow for either speed or data in its proposed prices.
13. The speed-related and data volume-related costs between the DSLAM and the first ATM switch arise because of the use of shared capacity. If there was a dedicated link from each DSLAM port through to a port on the host

ATM switch then this would not arise – costs would be entirely dependent on the volume of connections. However such a configuration, while technically feasible, would be very expensive. Telecom utilises shared capacity between the DSLAM and the ATM to reduce costs as do all other service providers providing similar internet grade services. This configuration has its costs determined by the amount of capacity that needs to be provided. This is determined by the speed of the connections into the DSLAM and the expected amount of data to be moved over the links. Thus there is both a speed and data volume component in Telecom's ADSL cost structure.

14. It is possible then to have bitstream prices at retail and wholesale set in relation to either speed or data, or both. Telecom has decided in accordance with the most common approaches internationally to charge according to speed. A benefit of this is that the speed-related costs occur primarily between the DSLAM and the ATM switch which means that a speed-related charge is closer to the structure of Telecom's costs.

SUGGESTED METHODOLOGY

15. Taking into account the flaws in the Commission's imputation methodology, and reserving its position in relation to whether there should be a non-speed constrained service and a single price for that service distinguished only by residential and business offerings, Telecom suggests the following imputation methodology.

Revised Residential Regression

16. Telecom considers that a better specified form of regression model for Residential Jetstream prices would be:

$$\text{Price} = a + b.\ln(\text{Speed}) + c.\ln(\text{Data})$$

17. This is because of the way Telecom has chosen to price its internet services, which also reflects more generally observed market prices. The principle is that each doubling of inputs results in only a linear increase in price. For example there is the same increment in price to go from 1 to 2 units as to go for 2 to 4 units, 4 to 8 units and so on. To back out this exponential increase in service quantity for a linear increase in price it is necessary to take the logs of the service parameters before applying a linear regression model.
18. The result for the five Residential Jetstream plans is:
$$\text{Price} = \$17.827 + \$3.366.\ln(\text{Speed}) + \$8.172.\ln(\text{Data})$$
19. This model has an adjusted R squared of 0.999 showing that it is an almost perfect fit for the data being modelled. All of the coefficients are highly statistically significant.
20. This equation is derived after making the correction for the inclusion of Homeline and ISP charges in the bundle required to receive the \$10 (including GST) tolls discount. Values exclude GST.
21. This equation can then be substituted with the desired speed of the bitstream access product and solved for Data = 0. As noted above in the Data Caps and Speed Issues section above, it is not strictly correct to say

that the bitstream access service has no data-related value, but the results produced from this model are reasonable in terms of allowing access seekers to compete and using Data=0 avoids the need to perform an analysis of the avoided costs of removing the data from a specification with maximum possible data.¹²⁷

22. As the model uses logs of independent variables it is not possible to evaluate the result for Data = 0 directly (log(0) is undefined). This can be resolved by substituting values at each end of the modelled data range, that is for Data = 1Gb and Data = 10Gb. This shows that there is a price premium of \$18.82 for the extra 9Gb, which implies a price per Gb of \$2.09. This value can then be subtracted from the value for Data = 1Gb to derive an implied price for Data = 0.

23. The results produced are:

Speed	Imputed Retail Price	Resulting Bitstream Access Price
256	\$34.40	\$28.90
1024	\$39.07	\$32.82
2048	\$41.40	\$34.78

24. If the Commission wishes to maintain that only one speed of bitstream access should be supplied (as fast as possible) then the price for a higher speed service can be used as the only available wholesale price as this is the one which most closely reflects what service will be being provided to access seekers. As Telecom explains in section C1.2, it is not possible to define a stable service at the maximum possible download speed of the line. A service can be defined though at some speed higher than the currently-offered maximum of 2048kbps. Telecom is currently examining what the realistic stable limit would be, but for example if the limit was 2.9Mbps, the bitstream price would be \$35.76.

Speed	Imputed Retail Price	Resulting Bitstream Access Price
2900	\$42.57	\$35.776

25. While these results are materially higher than the corresponding prices in Telecom’s commercial UBS offering, this is a result the Commission should expect because of Telecom’s pricing strategy in relation to its commercial UBS product. The Commission might note that Ofcom expects that in five year’s time access seekers will have 25%¹²⁸ of the UK Broadband market. This access seeker share is with a longer history of industry-specific regulation and the availability of LLU. Therefore the New Zealand target of 33% of growth was never going to be realistic under normal market pricing. Therefore Telecom had to price its commercial UBS offering at an artificially low level if it was to have any chance of meeting this extraordinarily ambitious target. The consequence of this then is that when the provisions of the Act are applied to Telecom’s retail prices, it shows that commercial UBS is priced at rates well below retail minus. This is another consequence of the regulatory distortion referred to in paragraph 266.

¹²⁷ Alternatively this could be thought of as Data being priced at cost.

¹²⁸ Office of Communications *Direction Setting the Margin between IPStream and ATM interconnection Prices* at paragraph 5.23.

BUSINESS

Comparing Full Speed and Venture

26. We can compare the features of Telecom's two kinds of business ADSL offering by looking at the respective features of two types of plan – the Jetstream Full Speed 600 plan and the average of the Venture 1G and Venture 3G plans. These examples have been chosen as they are at the bottom end of the two respective ranges (and are therefore closest to the intercept of any regression using the Commission's method) and because the two examples have the same price.

Feature	Full Speed 600	Average Venture 1G and 3G
Price	\$61.33	\$61.06
Included Gb	0.6	2.0
Download speed	Typically 4-6Mbps	256kbps
Upload speed	Typically 600kbps	128kbps
What happens after cap reached?	Same speed, price of 18 c/Mb	Same speed, price of 4.44 c/Mb
Time to use quota	13 minutes (= 0.22 hours)	1042 minutes (= 17.4 hours)

27. This table shows that there are significant differences in the speeds of the two plans. This might indicate that there should be a big difference in the respective prices, but this is counteracted by the differences in the volume of included data. The most telling figure perhaps is the last one where one plan has eighty times as much opportunity to run at the desired speed before the user is required to start paying additional charges in the form of overage. This severe restriction which is placed on the Full Speed 600 plan is the key feature which indicates why the Full Speed plans (in particular the low end ones) cannot be used as comparable services in relation to setting prices for the designated access service.

Implications of regulating based on Full Speed service

28. If a regulated product is based on the Full Speed service the access seeker will not have the severe time restriction imposed by the low end Full Speed plans (the 13 minutes in the case of Full Speed 600). The access seeker will need to incur additional costs in relation to national and international bandwidth, although the approximate cost of this is only \$1 to \$2 per Gb depending on the desired quality. Telecom's Full Speed plans escalate in price at approximately \$80 per Gb as the user migrates from one plan to the next which indicates that it is more than just the data volume cost being recovered in this price structure. Telecom would face substantial costs in its network if Full Speed Jetstream customers were able to run their connections at full speed for most of the time. These costs don't particularly relate to data volumes as noted above – they relate to network capacity to cope with the bandwidth in the core network to support these speeds as noted in section C1.2.
29. This relationship manifests itself in a contention ratio in that those Full Speed customers on the 600 plan are able to share a lot less bandwidth per customer than those on the 30,000 plan. This is because Telecom knows there is a defined limit on the amount of time during a month that each service can run at full speed. This certainty disappears however if the designated service is as implied by the Commission's approach of imputing

bitstream access prices from Full Speed prices as it does in its draft determination. Telecom would need to provide full bandwidth on the assumption of an unlimited potential amount of usage at this speed. Even with Telecom's many noted concerns with the service the Commission has designated, the Commission has not gone to this extreme (and nor can it within the Act).

30. This implies then that the Full Speed Jetstream price observations cannot be used directly as they relate to quite a different kind of service to the one the Commission is designating. It is not sufficient even to say that the price of the designated service must be below the lowest price (for Full Speed 600) as this ignores the limited capacity at retail/unlimited capacity at wholesale dichotomy discussed above. In reality the appropriate designated price is likely to be within the range of Full Speed prices, but those prices don't provide any guidance directly on where within that range the appropriate price might be.
31. Telecom recognises that its current business Jetstream plan price structure, while we considered it appropriate at the time, is now out of alignment with international approaches and neither maximises benefits to end users or to Telecom. Telecom is taking the opportunity with the launch of the new 1Mbps and 2Mbps plans to re-structure its business broadband pricing. These new plans are intended to be priced more in line with conventional approaches overseas in relation to business broadband pricing, and thus designated bitstream access service priced in relation to them will also correspondingly be more in line with best international practice. Telecom considers that any set of regulated bitstream access prices derived from these new plan prices will result in a price structure more beneficial to both access seekers and end users.
32. While this observation does not provide the opportunity for Telecom to outline the business regression model in detail today, this information will be available prior to the Conference, and so the Commission and TelstraClear will still have an opportunity to provide comments or suggest any refinements they consider appropriate to Telecom's recommended approach.
33. The important point to note in the meantime is that the Commission in its final determination needs to specify a methodology by which designated prices can be calculated, rather than seeking to regulate specific numbers. This has the advantage of making the process robust in the face of changes in Telecom's structure of retail prices, as will inevitably happen in the current fast-changing and competitive broadband market. It also means that access seekers are protected from any potential price squeezes which could result if Telecom reduced its retail prices while the regulated bitstream price stayed constant.

ANNEX G

Broadband retail offers in New Zealand - consumer

	Downstream Speed 128k upstream)	(all Usage Allowance	Monthly Price (incl GST)	Telecom (where applicable)	Comparison
Xtra Broadband (prices assume access & calling with Telecom)	256kbps	1GB	\$39.95		
	256kbps	3GB	\$49.95		
	1mbps	1GB	\$44.95		
	2mbps	10GB	\$69.95		
Orcon	256kbps	1GB	\$39.95	Same	
	256kbps	Flat Rate	\$49.95		
	2mbps	10GB	\$59.95	\$10 less	
Ihug (with Ihug calling)	256kbps	4GB	\$39.95		3GB more usage for same price
	256kbps	20GB	\$49.95		
	1mbps	1GB	\$39.95	\$5 less	
	2mbps	10GB	\$59.95	\$10 less	
World Xchange	256kbps	1GB	\$37.95	\$2 less	
	256kbps	3GB	\$47.95	\$2 less	
	1mbps	1GB	\$42.95	\$2 less	
	2mbps	10GB	\$67.95	\$2 less	
Slingshot	256kbps	2GB	\$39.95		1GB more usage for same price
	256kbps	5GB	\$44.95		2GB more usage for \$5 less
	256kbps	Flat Rate	\$49.95		
	1mbps	3GB	\$44.95		2GB more usage for same price
	2mbps	3GB	\$49.95		
Iconz	256kbps	2GB	\$39.95		1GB more usage - same price
	256kbps	10GB	\$44.95		7GB more usage & \$5 less
	1mbps	10GB	\$54.95		
	2mbps	10GB	\$64.95	\$5 less	
MaxNet	256kbps	Flat Rate	\$49.95 (direct debit)		
Quicksilver (with Quicksilver calling)	256kbps	1GB	\$29.95	\$10 less	
	256kbps	4GB	\$39.95		1GB more usage, \$10 less
	256kbps	10GB	\$49.95		
	1mbps	1GB	\$34.95	\$10 less	
	1mbps	4GB	\$44.95		same price, 3GB more usage
	1mbps	10GB	\$54.95		
	2mbps	1GB	\$39.95		
	2mbps	4GB	\$49.95		
2mbps	10GB	\$59.95	\$10 less		

WorldNet	256kbps	3GB	\$39.95	2GB more usage, same price
	256kbps	Flat Rate	\$49.95	
	1mbps	2GB	\$44.95	same price, 1GB more usage
	1mbps	Flat Rate	\$64.95	
	2mbps	12GB	\$69.95	
	2mbps (with tolls)	1GB	\$39.95	
	2mbps (with tolls)	12GB	\$59.95	\$10 less, 2GB more usage