



Telecom New Zealand Limited

**Submission in respect of the Commission's proposed technical
specification of the Bitstream Access Service**

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Public Version

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A EXECUTIVE SUMMARY

1. Telecom remains of the view that the fair and workable proposals in front of the Commission best give effect to the purpose of promoting competition for the long-term benefit of end users. Without prejudice to that view and our previous submissions, Telecom comments on the Commission's Proposed Technical Specification of the Bitstream Access Service dated 30 August 2005 ("Proposed Technical Specification").

Service components

2. The Commission's Proposed Technical Specification appears to comprise three service components as follows:
 - (a) a baseline service with a constrained PIR of 3.5Mbps (paragraph 7(a) of the Proposed Technical Specification) ("baseline service");
 - (b) enhancements to the baseline service based on Telecom's launch of new internet grade best efforts services with PIRs greater than 3.5Mbps (paragraph 7(b) of the Proposed Technical Specification); and
 - (c) enhancements to the baseline service based on line route qualification analysis (paragraph 7(c) of the Proposed Technical Specification).

Baseline service and consistency with retail is workable

3. The first two of these three service components appear to be feasible, assuming that Telecom has correctly interpreted the Proposed Technical Specification and that some outstanding issues can be resolved satisfactorily. The proposed maximum PIR of 3.5Mbps for the baseline service is consistent with Telecom's submissions that this is the appropriate trade off in relation to reach.
4. The Proposed Technical Specification does not explain what will happen when a given access line will not synchronise at a rate which will support the default PIR of 3.5Mbps. This technical limitation can be resolved by delivering the service with an actual PIR determined by the line synchronisation rate. While the SIR and PIR would be configured in accordance with the Proposed Technical Specification, the actual PIR delivered would be less than 3.5Mbps. It is imperative that this is taken into account, that TelstraClear understands this and that TelstraClear manages its own and its customers' expectations.
5. The baseline service could be offered on all Alcatel, Nokia and Conklin DSLAMs.¹ However, the actual PIR obtained on Conklin DSLAMs with transport of less than 4Mbps (approximately 75% of Telecom's Conklin DSLAMs) would be less than 3.5Mbps. For those Conklins, TelstraClear will need to rate shape the service to the actual PIR. This is in line with the exception proposed in paragraph 7(i) of the Proposed Technical Specification which Telecom believes is aimed at the Conklins which are accepted between the parties and the Commission as having limitations. The exception needs to be drafted in a more concise manner and

¹ For the purposes of these submissions Telecom has used the term "Conklin DSLAM" to refer generically to all cabinet based or "mini DSLAMs" with limited transport.

incorporate the situation where lines on any DSLAM synchronise below 4Mbps.

6. The baseline service can be implemented on the basis that the SIR allocated per end user is calculated as the weighted average SIR allocated per end user by Telecom for internet grade best efforts services provided by Telecom. However, it must be recognised that this calculated parameter is a nominal value, set in the context of the terms "internet grade best efforts" and must not be considered to be a service level commitment that applies universally for 100% of the time. The use of the UBR ATM characteristic can never assure such an outcome. The actual SIR value experienced by a particular connection will vary over a distribution of values about the nominal value over time. However, Telecom will design the regulated service in such a manner as to ensure that the nominal SIR values are normally achieved, in line with that achieved for its own retail and wholesale comparable services. This means that the available resources under congestion conditions will be fairly allocated across the services within any virtual path based on their relative nominal SIR values and for most of the time, any given connection (retail, wholesale or regulated) will experience much better throughput than the nominal SIR allocated to the relevant end user.
7. Our estimated implementation time for the baseline service (with interleaving on) is 16 weeks. However, because no changes can be made to the network during the brown-out period for approximately four weeks over the Christmas period, the earliest that the service could be implemented is 20 weeks from the date of the final determination (assuming this date is prior to 15 December 2005). Telecom repeats its previous submissions that it is imperative that the Commission takes account of a sensible implementation timeframe in its final determination.

Higher speed service based on new line qualification check is operationally and technically complex

8. Telecom understands from the Proposed Technical Specification that the Commission has accepted the reach issues and is considering identification of short pairs in short cables which may be able to sustain a higher PIR. However, the third service component (paragraph 7(c) of the Proposed Technical Specification) is highly problematic for the following reasons:
 - (a) It is loosely defined and contradictory, leaving room for a wide range of different interpretations.
 - (b) Rather than providing clarification the Commission has asked the parties to propose solutions.
 - (c) The proposal is new and has not previously been commented on by the parties.
 - (d) Telecom does not currently have a line qualification tool and does not currently carry out such a process. Dr Milner made this clear at the July workshop² and the Commission has itself noted this in

² Pages 64 and 64 July conference transcript.

the Proposed Technical Specification.³ Telecom has received no enquiry from the Commission on this prior to the release of the Proposed Technical Specification.

- (e) Accordingly, the Commission must appreciate that its loosely defined proposal in paragraph 7(c) means that Telecom is effectively starting from scratch to try to offer up some solution.
 - (f) The parties have been provided with 8 working days to comment on this proposal with little clarification. The proposal is a fundamental departure from the draft determination and discussions and submissions that have followed.
 - (g) Telecom does not provide such a service to itself. The proposal therefore goes well beyond standard access principle 3 in clause 5 of Schedule 1 to the Act.
9. Without prejudice to Telecom's views that the high level proposal in paragraph 7(c) is flawed, Telecom offers its preliminary views on the relevant parts of the proposal as best it can in the short timeframe available.
10. The Commission must carefully consider the limit in clause 6(a) of Schedule 1 of the Act. The Commission is proposing to drive substantial operational and technical complexities under paragraph 7(c). This should also take into account the *maximum* availability of its proposal – namely that only around 10-15% of lines are estimated to be able to synchronise at 7.6Mbps and not impact on other users of the cable network (assuming that they could be identified in a practicable and economic way). Telecom explains the substantial complexities involved in its initial assessment of the high level line qualification proposal. We also comment on the definition of the PIR and how this must be managed assuming (but not accepting) that a line qualification could occur.
- (a) *The maximum feasible PIR*
11. The Commission has clarified that it is proposing a constrained service with a single high PIR or a small number of higher PIRs, but not an infinite number of PIRs. The PIR has not however been defined. The only workable solution is to define the PIR by reference to the theoretical maximum rate at which an access line can synchronise with current technology, which is 7.6Mbps providing a "maximum feasible PIR" of 6.016Mbps. Any other value would be arbitrary as would the suggestion for several PIRs.
12. Furthermore, the greater the number of PIRs, the more complex the implementation and the OSS arrangements become. This is particularly the case with an interleaving off option requiring the creation of more profiles. For this reason, an interleaving off option will not be possible on Conklin DSLAMs.

³ Paragraph 10.

(b) Line route qualification check

13. Telecom has a current copper network mapping system called "AM/FM" and a process is set out in these submissions as to how a line qualification check might occur. There are significant challenges with the use of this process, principally that the process will be highly manual requiring a competent person to use and interpret results at each step. The process from service request to a successful qualification check would take approximately 4 to 6 hours.
14. As the Commission acknowledges at paragraph 12 of the Proposed Technical Specification, the cost of a line check, which would be in the region of [..... **TCNZRI**] per line check, would be borne by TelstraClear as it is a direct cost incurred solely by its request. Having TelstraClear bear the costs it creates should also act to manage the number of requests made. There will also be timing issues – Telecom is unlikely to be able to process much more than 1 line qualification check per day.
15. Initial consideration has been given to modifications or automation of such a process. However, in light of the timeframe available and the lack of information available as to how many requests might be made, Telecom is unable to consider further at this time the cost of moving to automation, whether that would be economic and how that might occur. Telecom has very real concerns around the practicability and economics given that only 10 – 15% of lines are estimated to be able to synchronise at 7.6Mbps.
16. The Commission must also take into account that a line qualification check occurs at a single point in time. It does not therefore capture continuing changes in structure and characteristics at another point in time. As a result, the actual performance will also change over time and this must be made clear to TelstraClear and that it will be TelstraClear's responsibility to manage this with its customer. It is not inconceivable that a line qualification check is passed one day but, on another day, it does not.
17. The Commission has confirmed that TelstraClear cannot require Telecom to invest in new capability or technology to meet requests that are proposed under paragraph 7(c). Telecom would be required to provide "the maximum feasible PIR based on technology utilised on that route as at the date of TelstraClear's request." For the technical reasons outlined above (and subject to the technical, economic and legal difficulties with the line qualification proposal) Telecom considers that the only workable solution is to define the PIR by reference to the theoretical maximum rate at which an access line can synchronise which is 7.6Mbps providing a "maximum feasible PIR" of 6.016Mbps.

(c) Investment incentives and section 18

18. Furthermore, if the Commission does not take this approach then it is inevitable that there will be dynamic efficiency effects in terms of incentives for investment in new technologies which the Commission must consider in line with the section 18 purpose. Telecom regards any obligation to provide any speed higher than it provides itself as poor telecommunications policy and inconsistent with standard access principle 3 in clause 5. Telecom has marketed a 2 Mbps service as its

primary higher speed service in order to appropriately manage the many complexities involved with its network⁴. Telecom has considered carefully how that speed could be increased and managed and has put forward to the Commission that this could potentially be lifted to 3.5 Mbps.

19. The Commission's open-ended approach in paragraph 7(c) to maximum downstream speed implies that any investment Telecom makes in the future that increases the speed capability of its network should be immediately made available to competitors. The Commission needs to seriously consider the incentives this creates on Telecom to invest. The Commission is aware of the very complex and significant NGN investment programme the company has underway. In order to increase speeds in its network, Telecom needs to do at least both of the following.
 - (a) invest in newer versions of ADSL such as ADSL2 and VDSL; and
 - (b) shorten the lengths of copper.
20. Both these investment drivers are part of our NGN strategic intent. In order to make these investments economic, Telecom needs to see a return from this investment. If by virtue of investing in ADSL2 or investing fibre to shorten copper lengths the result is the potential to offer higher bandwidth services but this is automatically handed over to competitors, then this cannot possibly create any sensible set of economic incentives.
21. Investment in more fibre in the local network to shorten copper lengths and newer forms of DSL are clearly key parts of Telecom's NGN investment programme. It is our understanding that the Commission with its unbundling investigation recommendations to Government was looking to protect incentives for Telecom to invest.
22. It is not at all clear how, under an open-ended approach to PIR, Telecom is going to receive any additional or substantive revenue or return on such NGN investments.

Conclusion

23. While Telecom maintains its view that the fair and workable proposals put forward strike a sensible balance and best give effect to the long term interests of end users, Telecom's response to the technical specification in paragraph 7 is that:
 - (a) paragraphs 7(a) and 7(b) with an appropriate exception for technology limitations are workable subject to the Commission correctly defining it and resolving the issues discussed in these submissions. Telecom is willing to work with a determination that requires Telecom to deliver higher speeds than 3.5Mbps (this being the appropriate balance based on the limits of the current generation technology) if Telecom launches a best-efforts internet service with downstream speeds above this level. This approach is consistent with the UBS designation regulating best-efforts

⁴ Telecom has full speed plans available but has explained throughout these proceedings that, because of the technical issues in the network that have been at issue in these proceedings, Telecom is moving away from these plans.

internet capability, TelstraClear's requests for equivalence on numerous occasions during this application, the standard access principles in clause 5 of schedule 1 of the Act and Telecom's commitment to retail and wholesale comparability; and

- (b) paragraph 7(c) is not workable. It is not only technically and operationally complex, but uneconomic and goes beyond standard access principle 3. The proposal also appears to strike at the very investment incentives that the Commission was seeking to protect in its LLU decision. The Commission needs to be aware of the risk and complexity that paragraph 7(c) would introduce. This is at a time when executional challenges with a transition to NGN and broadband growth are occurring.

- 24. This general policy perspective reinforces the importance of the Commission setting a maximum PIR of 3.5Mbps being the maximum capability of existing generation technologies.

Structure of this submission

- 25. Telecom provides a revised description of the Proposed Technical Specification at Annex A.
- 26. The rest of Telecom's submissions are set out as follows:
 - Part B Technical Service Specification
 - Part C Interleaving
 - Part D Implementation
 - Part E OSS
 - Part F The Commercial Effect of a New Service Specification

B TECHNICAL SERVICE SPECIFICATION

Introduction

27. The Commission's Proposed Technical Specification of the Bitstream Access Service dated 30 August 2005 ("Proposed Technical Specification") appears to comprise three service components as follows:
 - (a) a baseline service with a constrained PIR of 3.5Mbps (paragraph 7(a) of the Proposed Technical Specification) ("baseline service");
 - (b) enhancements to the baseline service based on Telecom's launch of new internet grade best efforts services with PIRs greater than 3.5Mbps (paragraph 7(b) of the Proposed Technical Specification); and
 - (c) enhancements to the baseline service based on line route qualification analysis (paragraph 7(c) of the Proposed Technical Specification).
28. The first two of these three service components appear to be feasible, assuming that Telecom has correctly interpreted the Proposed Technical Specification and that some outstanding issues can be resolved satisfactorily. The third service component is problematic. At present, this component is loosely defined and contradictory, leaving room for a wide range of different interpretations.
29. Telecom's understanding of the three service components and any outstanding issues associated with them are expanded below.
30. In short, Telecom considers that service components set out in paragraphs 7(a) and (b) of the Proposed Technical Specification are workable subject to modifications as set out in these submissions. Telecom sought clarification on the third service component set out at paragraph 7(c) of the Proposed Technical Specification. The Commission set out some clarifications on 5 September 2005 but in the audio with the parties principally sought solutions rather than providing detailed clarification. Telecom sets out the issues with paragraph 7(c) as it appears in the Proposed Technical Specification and offers up the solutions to the Commission's new proposals that it has been able to consider in the short timeframe available.

B1 Downstream Peak Information Rate (PIR)

31. The Commission needs to be aware of the risk and complexity that it is proposing to drive into Telecom's business at a time when the business is facing immense executional challenges with a transition to NGN and broadband. Telecom looks to arrange its network in a prudent manner. The consequences of the Commission pushing Telecom into areas of network management which are frankly unexplored cannot be reliably predicted. Neither can the implications for increasing the executional risks of NGN developments.
32. It remains strongly Telecom's view that the maximum PIR should be set at 3.5Mbps. Telecom considers that this is an appropriate compromise from a network utilisation and customer experience perspective. It compares favourably with regulated services in other jurisdictions and is

well above the 1.5Mbps maximum speed Telstra offers in Australia on their DSL services. If Telecom launches a higher retail best efforts internet grade service, Telecom will comply with paragraph 7(b) of the Proposed Technical Specification. Such a speed offers very good speeds in comparison with other UBS type services in respect of a nationally available service. The incremental risks of the Commission's approach do not justify the incremental benefits to customers.

33. Telecom responds to paragraphs 7(a), (b) and (c) of the Proposed Technical Specification below.

B1.1 Baseline 3.5Mbps Service

Service characteristics

34. Paragraph 7(a) of the Proposed Technical Specification requires Telecom to provide a bitstream access service with a constrained downstream peak information rate of 3.5Mbps. Telecom's understanding from the regulatory proceedings to date is that this baseline service has the following service characteristics:

- (a) downstream peak information rate ("PIR") of 3.520Mbps;
- (b) upstream PIR of 128kbps;
- (c) downstream copper rate limiting at 4.048Mbps;
- (d) upstream copper rate limiting at 160kbps;
- (e) maximum downstream power setting of -40dBm/Hz;
- (f) per virtual circuit shaping on both the upstream and downstream at their defined PIRs (i.e. 3.5Mbps downstream and 128kbps upstream);
- (g) nominal sustained information rate ("SIR") equal to the weighted average SIR allocated per end user by Telecom for internet grade best efforts services provided by Telecom (to be reviewed and adjusted periodically);
- (h) downstream hierarchical shaper weighting defined as the integer value which delivers an SIR closest to that defined by the above calculation;
- (i) shares a single virtual path between the DSLAM and the first ATM switch with all other retail and wholesale best efforts internet grade services;
- (j) ATM shaping on the upstream and downstream traffic streams set to UBR (Unspecified Bit Rate); and
- (k) optional interleaving (assuming that the testing referred to in section C below demonstrates that optional interleaving can be implemented without causing adverse impacts to Telecom's network or other end users).

35. The baseline service would be offered on all Alcatel, Nokia and Conklin DSLAMs. However, the actual PIR obtained on Conklin DSLAMs with transport of less than 4Mbps (approximately 75% of Conklin DSLAMs currently have transport less than 4Mbps, representing about 50% of lines connected to Conklin DSLAMs) would be less than 3.5Mbps as described in paragraph 90 below.

Issues for resolution and Telecom's proposed solutions

36. Telecom considers that the baseline service represents a pragmatic response to many of the key technical and operational issues discussed during the course of these proceedings. In particular, the baseline service:
- (a) has a constrained downstream line rate;
 - (b) has a maximum upstream throughput rate of 128kbps;
 - (c) has a nominal defined SIR approximately equal to the weighted average of the current retail service SIRs;
 - (d) shares a single virtual path between the DSLAM and the first ATM switch with all other retail and wholesale best efforts internet grade services;
 - (e) uses ATM UBR traffic shaping;
 - (f) has per VC rate shaping at the defined upstream and downstream PIRs;
 - (g) will minimise power spectral density in the cable sheath and therefore maximise the reach attainable by other services within the cable sheath;
 - (h) will ensure the fair allocation of shared resources during periods of congestion; and
 - (i) will ensure that the regulated service has service characteristics that are consistent with those offered by Telecom at retail.
37. However, there are a number of issues requiring further clarification to ensure smooth implementation of the baseline service. These issues and Telecom's proposals for addressing them are discussed below. In summary, the outstanding issues are:
- (a) What happens when a line will not synchronise to 4.048Mbps and will therefore not support the 3.5Mbps PIR service?
 - (b) How is the weighted average SIR to be calculated and what does this mean in terms of the implemented SIR?
 - (c) What happens when it is agreed that the weighted average SIR should change to a new value?
 - (d) When can the baseline service be implemented?

38. Telecom considers that the resolution of all of these issues is achievable by way of further clarification of the Proposed Technical Specification.

Line synchronisation below 4.048Mbps

39. It is not clear from the Proposed Technical Specification what happens when a given access line does not synchronise at a rate which will support the default PIR of 3.5Mbps.
40. For a given access line to support a PIR of 3.5Mbps, the line will need to synchronise at a rate of a little over 4Mbps. This is expected to occur for about 75% of Telecom's access lines. The remaining 25% of access lines will not synchronise to this rate because either:
- (a) they are connected to Conklin DSLAMs with transport of less than 4Mbps; or
 - (b) they are simply too long.
41. The scenario in paragraph 40(a) above appears to be contemplated by the exception in paragraph 7(i) of the Proposed Technical Specification. By contrast, as discussed in section B1.4 below, the scenario in paragraph 40(b) above is not currently addressed in the Proposed Technical Specification. Approximately 50% of access lines that fail to synchronise to 4.048Mbps, will do so because of line length.
42. Telecom considers that the best way to deal with either of the scenarios referred to in paragraphs 40(a) and (b) above is for the service to be delivered with an actual PIR determined by the line synchronisation rate. For example, if a given line synchronised at 3Mbps, the PIR of the service would be 2.5Mbps. In other words, although the PIR and the SIR of the service would be configured by Telecom in accordance with the designation, the actual PIR delivered would be less than 3.5Mbps. TelstraClear would therefore be responsible for managing its customers' expectations appropriately.
43. An alternative approach would be for Telecom to provide a series of lower PIR services (for example a 1Mbps PIR service and 2Mbps PIR service). However, the Commission appears to have rejected Telecom's previous proposal to provide a menu of services with different downstream speeds. In addition, when combined with optional interleaving, this approach would require a large number of additional service profiles, which would rapidly become unmanageable.

Calculated and implemented SIR

44. Refer to section B2 for a discussion on this topic.

Changing the weighted average SIR

45. Refer to section B2 for a discussion on this topic.

Baseline service implementation

46. Telecom expects that the baseline service with interleaving on would take 16 weeks to implement following a final determination by the Commission. This is the minimum amount of time that would be required to design, build and test the new service profile(s) and to implement the necessary information system changes. Unfortunately, given current timing, the implementation could not be achieved prior to the network brown-out period of approximately four weeks over the Christmas period. During this period, no new work can be undertaken on the network. This means that the best timing which could be achieved in practice is 20 weeks from date of final determination (assuming this date is prior to 15 December 2005). Telecom would expect to apply provisioning rules for access customers taking regulated UBS or retail Jetstream in a consistent manner.

B1.2 Baseline Service with Higher PIR Consistent with Retail

Service characteristics

47. Paragraph 7(b) of the Proposed Technical Specification requires Telecom to provide a bitstream access service with a constrained downstream PIR above 3.5Mbps where Telecom introduces a new internet-grade best efforts service in its retail portfolio with a PIR greater than 3.5Mbps on a common cable route.
48. Telecom understands from the Commission's clarification of the Proposed Technical Specification that any service provided under paragraph 7(b) would have all the same characteristics as the baseline service, except for the PIR. It is therefore assumed that such a service would have the following service characteristics:
 - (a) downstream peak information rate (PIR) of XMbps, where $X > 3.5$ Mbps upstream PIR of 128kbps;
 - (b) downstream copper rate limiting at approximately $1.2 \times X$ Mbps;
 - (c) upstream copper rate limiting at 160kbps;
 - (d) maximum downstream power setting of -40dBm/Hz and if the Telecom service is defined with lower downstream power settings then this would also apply to the associated regulated service;
 - (e) per virtual circuit shaping on both the upstream and downstream at their defined PIRs (i.e. XMbps downstream and 128kbps upstream);
 - (f) nominal sustained information rate (SIR) equal to the weighted average SIR allocated per end user by Telecom for internet grade, best efforts services provided by Telecom (to be reviewed and adjusted periodically);
 - (g) downstream hierarchical shaper weighting defined as the integer value which delivers an SIR closest to that defined by the above calculation;
 - (h) shares a single virtual path between the DSLAM and the first ATM switch with all other retail and wholesale best efforts internet grade services;
 - (i) ATM shaping on the upstream and downstream traffic streams set to UBR (Unspecified Bit Rate); and
 - (j) optional interleaving (assuming that the testing referred to in section C below demonstrates that optional interleaving can be implemented without causing adverse impacts to Telecom's network or other end users).

Issues for resolution and Telecom's proposed solutions

49. There are a number of issues requiring further clarification to ensure that this service can be implemented. These issues and Telecom's proposals for addressing them are discussed below. In summary, the outstanding issues are:
- (a) What is meant by the term "common cable route"?
 - (b) What will be defined as a "trigger service"?
 - (c) What provisioning rules will apply to the service?

Common cable route

50. The terms "common route" and "common cable route" are not clearly defined in the Proposed Technical Specification and these are not terms which are in common use within the industry.
51. TelstraClear sought clarification from the Commission as to the definition of "common route" or "common cable route". The Commission's response was that it was seeking submissions from the parties on this issue.
52. For the reasons outlined below, Telecom has assumed that the terms "common route" and "common cable route" refer to the cable binder which is common to both the Telecom retail service and the high PIR regulated service.
53. In order for Telecom to offer higher PIR services to its customers, there will need to be some form of selection of cable pairs to ensure that:
- (a) the reach of the chosen pair will support the higher bit rate; and
 - (b) the implementation of the higher bit rate service on one pair will not detrimentally impact the reach performance of adjacent pairs.
54. This means that Telecom must either:
- (a) manage the power spectral density of the service used on the chosen cable pair; or
 - (b) only choose cable pairs within cable binders where all cable pairs have a short reach.
55. Telecom understands that the terms "common route" and "common cable route" refer to the second of these cases. TelstraClear can therefore only expect to receive similar PIR performance to that of the "trigger" Telecom retail service, if the regulated service also lies in the same cable binder – i.e. the "common cable route". TelstraClear cannot request a higher PIR service in cable binders where Telecom cannot offer its higher PIR services.

Trigger service definition

56. As alluded to above, it is important to distinguish between:
- (a) the "trigger service" - the relevant retail service introduced by Telecom which triggers the application of paragraph 7(b); and
 - (b) the "resulting service" - the regulated service which is subsequently made available to TelstraClear.
57. Paragraph 7(b) of the Proposed Technical Specification defines the trigger service as an "internet grade best efforts service with a downstream PIR in excess of 3.5Mbps on a common route". Telecom understands the reference to "internet grade best efforts" implies UBR ATM shaping and the reference to "common route" refers to the cable binder which is common to both the Telecom retail service and the high PIR regulated service as defined above.
58. For the avoidance of doubt, Telecom also suggests that definition of the trigger service should be amended to specifically exclude the "full speed" services currently offered by Telecom. As Telecom has previously submitted, it is moving away from offering "full speed" services because they are not constrained and therefore not properly defined. To argue that the "full speed" services have already triggered paragraph 7(b) (which TelstraClear may argue) will raise the reach issues once again.

Provisioning rules

59. The service component specified in paragraph (b) of the Proposed Technical Specification will require relatively complex provisioning rules because even where a given access line is able to support a higher speed service, care will need to be taken to ensure that the service does not increase power spectral density within the cable binder and therefore adversely affect other services within that binder.
60. As a result, the cost of delivering such a service will be higher than that of a service operating at or below 3.5Mbps.
61. Telecom proposes that the provisioning rules applicable to the relevant trigger service should, as far as possible, be applied to the regulated service. This would mean that the regulated service, could be implemented within roughly the same timeframe as the equivalent retail service.

B1.3 Maximum Feasible PIR via Line Route Qualification Check

62. Paragraph 7(c) of the Proposed Technical Specification proposes that Telecom provide a bitstream access service with the maximum feasible PIR where a line route qualification check confirms availability of a downstream PIR exceeding 3.5Mbps on a common cable route.
63. This is a completely new service component which has not previously been suggested by the Commission or considered by the parties during the course of these proceedings. It seeks to go beyond retail and wholesale comparability and TelstraClear's numerous requests for equivalence. Telecom does not currently provide itself with a line route qualification check of this type so the Commission's proposal not only ignores Telecom's advice that it does not have the tools to carry out such a check, but it also seeks to go beyond standard access principle 3.⁵
64. The service component outlined in paragraph 7(c) of the Proposed Technical Specification is not as readily defined as the service components specified in paragraphs 7(a) and (b). It is true that some cable routes could support higher speed services, without having a detrimental impact on other users of the cable sheath. However, the identification of these cables routes and the subsequent operational processes that would be required to exploit these opportunities are significant issues.
65. In addition, as currently drafted, paragraph 7(c) of the Proposed Technical Specification is vague containing a number of contradictions and ambiguities, which would require substantial attention.
66. Telecom does not accept that the proposal in paragraph 7(c) is workable. Without prejudice to this view, Telecom responds on various parts of the proposal as requested. In doing so, Telecom offers solutions to some parts of the loose proposal but even so, this does not solve the fundamental technical, legal and economic issues which make this proposal unworkable.
67. These issues and the proposals for addressing them which Telecom has been able to consider in the short timeframe available are discussed below. In summary, the key issues which Telecom has identified to date are:
 - (a) How is the "maximum feasible PIR" defined?
 - (b) What are the parameters to be used in defining the line route qualification check?
 - (c) How do we deal with reconfiguration of the cable network over time?

⁵ Telecom's current line checker tool is used to qualify a single access line in isolation of all other access lines. By contrast, the line route qualification check required under paragraph 7(c) of the Proposed Technical Specification would be used to qualify a line in relation to all other lines within the common cable binder.

Defining the maximum feasible PIR

68. Paragraph 7(c) currently refers to the service as having "the maximum feasible PIR". This type of requirement would normally be interpreted as relating to an unconstrained service. However, paragraph 8 of the Proposed Technical Specification states that "the Commission considers that it is necessary to specify a constrained PIR".
69. The Commission has subsequently indicated that it is proposing that the maximum feasible PIR be set according to a constrained service and that it would either be (i) a single high PIR or (ii) a small number of higher PIRs. However, the Commission has not defined the value(s) of this parameter.
70. Telecom is strongly of the view that the maximum PIR should be set at 3.5Mbps. This is the appropriate compromise from a network utilisation and customer experience perspective. Without prejudice to that view Telecom comments on the Commission's proposal for an undefined "maximum feasible PIR". The only practical approach to such a proposal, is to define "the maximum feasible PIR" by reference to the theoretical maximum rate at which an access line can synchronise using currently available technology. This rate is 7.6Mbps in Telecom's network. Accordingly, Telecom proposes that the corresponding "maximum feasible PIR" should be defined as a constrained rate of 6.016Mbps (in terms of IP packets).
71. The choice of any other value for "the maximum feasible PIR" would be entirely arbitrary and could certainly not be regarded as a "maximum". The choice of several values for "the maximum feasible PIR" would also be arbitrary and would require Telecom to support an additional set of service profiles (potentially with interleaving on and off creating even more profiles and more complexity).
72. The Commission has clarified that TelstraClear cannot ask for a higher speed service (eg a 20Mbps service) and require Telecom to invest in new technology in order to satisfy this request. However, the Commission has suggested that the "maximum feasible PIR" should be based on technology utilised on the relevant cable route as at the date of TelstraClear's request. Telecom disagrees with this suggestion. The actual value of "the maximum feasible PIR" would have to be specified in the final determination and set by reference to the technology utilised by Telecom at the date of that determination. Any attempt to regulate Telecom's NGN investment (eg: ADSL2+ or shortening of copper loops) is inconsistent with section 18 of the Telecommunications Act 2001 and the Commission's previous protection of these investment incentives.⁶ In any event, it is unlikely that ADSL2+ will be fully implemented within the term of this determination.
73. The Commission has also confirmed that apart from PIR, the service component described in paragraph 7(c) would otherwise have the same service characteristics as the baseline service. This means that the service would have the following service characteristics:
- (a) downstream peak information rate (PIR) of 6.016Mbps;

⁶ Paragraph 15 of Telecom's 16 December 2005 submission. See also paragraphs 18 and 19 of this submission.

- (b) upstream PIR of 128kbps;
- (c) downstream copper rate limiting at approximately 7.6Mbps;
- (d) upstream copper rate limiting at 160kbps;
- (e) maximum downstream power setting of -40dBm/Hz (see also comment below);
- (f) per virtual circuit shaping on both the up and downstream at their defined PIRs (i.e. 6Mbps downstream and 128kbps upstream);
- (g) nominal sustained information rate (SIR) equal to the weighted average SIR allocated per end user by Telecom for internet grade, best efforts services provided by Telecom (to be reviewed and adjusted periodically);
- (h) downstream hierarchical shaper weighting defined as the integer value which delivers an SIR closest to that defined by the above calculation;
- (i) shares a single virtual path between the DSLAM and the first ATM switch with all other retail and wholesale best efforts internet grade services;
- (j) ATM shaping on the upstream and downstream traffic streams set to UBR (Unspecified Bit Rate); and
- (k) optional interleaving (assuming that the testing referred to in section C below demonstrates that optional interleaving can be implemented without causing adverse impacts to Telecom's network or other end users).

74. Only around 20% of Telecom's access lines will synchronise at the 7.6Mbps line rate. A further 40-50% of lines will synchronise between 4.048Mbps and 7.6Mbps. However, only a small percentage of these lines will be contained within short binders, within which the higher bit rate can be exploited without impacting on long reach lines. This means that in reality:

- (a) around 10-15% of access lines that synchronise at 7.6Mbps could actually be used to support a service with a PIR configured to 6.016Mbps; and
- (b) around 10-15% of access lines that synchronise between 4.048Mbps and 7.6Mbps could actually be used to support a service PIR configured to 6.016Mbps (although the actual PIR would be less),

assuming that the relevant access lines could be identified.

75. For the access lines in the 7.6 to 4.048 Mbps synchronisation range, Telecom proposes that either:

- (a) the PIR is set at 6Mbps and allowed to degrade down to 3.5Mbps without changing the service characteristic; or
- (b) TelstraClear chooses to only offer the 3.5Mbps baseline service (Telecom's preferred approach).

Defining the parameters to be used in the line route qualification check

- 76. The higher the PIR of a given service, the more likely it is that the service will cause interference to other services in the common cable binder. For any service operating with a PIR above 3.5Mbps it is necessary to undertake a line qualification check to ensure that the relevant access line is in a relatively short cable binder so that the higher speed service will not impact on the broadband reach of longer lines.⁷
- 77. Paragraph 12 of the Proposed Technical Specification refers to TelstraClear requesting a line route qualification check for the purposes of paragraph 7(c). Telecom sought clarification from the Commission as to the parameters it had in mind for a line qualification check. The Commission's response was that it sought solutions from the parties.
- 78. The parameters to be used for the line route qualification check, must be aligned to those defined for "the maximum feasible PIR" service as described above.
- 79. The only approach that Telecom can propose at this time to implement the line route qualification tool would utilise Telecom's current copper network mapping system called "AM/FM". The qualification process would be broadly as follows:
 - (a) TelstraClear proposes a customer address with a Telecom PSTN access line that is connected to a DSL enabled exchange at which it proposes to deliver a 6Mbps PIR service.
 - (b) A line trace function is implemented on the copper pair connected to the nominated premise.
 - (c) The line trace function traces the copper plant in segments back through the cable network to the source DSLAM and calculates the end to end line attenuation at 1024KHz in the process.
 - (d) If the line is capable of supporting a synchronisation rate greater than 4.048Mbps (in practical terms the synchronisation rate would need to be greater than say 4.5Mbps to be worth continuing the process), then the first test is passed and the process can continue – otherwise the qualification check would be aborted.
 - (e) The next step is to determine whether the nominated cable pair has any multiples attached to it (i.e where one cable is tapped into another cable). If a multiple is encountered, then a further route trace is required on the associated multiple.

⁷ As discussed in footnote 2 above, the line route qualification check required in these circumstances is fundamentally different from the line checker tool that Telecom currently uses.

- (f) If the associated multiple will not support a synchronisation rate above 4.5Mbps then again the qualification check will be aborted.
- (g) If the cable pair and any associated multiple will support a synchronisation rate above 4.5Mbps, then the next step is to identify all other pairs in the same distribution binder (the common cable route) – this will normally consist of 25 pairs.
- (h) The next step is to perform a route trace on each of these 25 pairs (and any associated multiples) to ensure that they will also support synchronisation rates greater than 4.5Mbps.
- (i) Only when all the pairs in the common binder and the associated multiples associated with these cable pairs are all shown to be capable of operating at synchronisation rates above 4.5Mbps will the line qualification check provide a positive result and service can be offered to TelstraClear requesting the nominated high PIR service.

80. Unfortunately, the above process has a number of challenges:

- (a) the cable data contained in the AM/FM database is only about 90% accurate at best (over time, and with the best quality processes in place the data does contain errors), so a positive qualification check still leaves a 10% probability that any particular line (with a positive qualification check) will not synchronise above 4Mbps in reality;
- (b) some of the cable types within the database are very old and as a result, the actual cable characteristics are not well recorded. These imperfections will impact on the accuracy of the trace results, particularly when used to predict high synchronisation rate performance; and
- (c) the process is highly manual and requires a competent person to execute the process and interpret the results at each step, especially where multiples and other cable plant anomalies are encountered.

81. An individual line trace will take an experienced operator about 10 to 15 minutes on average to execute – the higher value applying when a multiple is encountered. For a 25 pair distribution cable binder, this implies the entire process from service request to successful qualification check will take about 4 to 6 hours. This would cost around [..... **TCNZRI**], which would make a qualification check totally uneconomic.

82. A modification of the above process would be to undertake a pre-qualification of the entire network, to create a first pass qualification, enabling unlikely candidates to be ruled out much more quickly. Once this pre-qualification has been undertaken, it might be possible to automate some of the final qualification process. The problems with this approach are:

- (a) the automation development effort would be likely to cost in excess of [..... **TCNZRI**], take several months to implement and the accuracy would still be less than perfect; and

- (b) the value of automation is highly dependent on the volume of requests expected from TelstraClear. For example, if there are only one or two requests per day, then it would be more economic to use the manual process. Alternatively if there are around 10-20 requests per day, then automation would be essential.
83. Telecom would need to understand the likely volumes of paragraph 7(c) type requests in order to develop a more robust and economic line qualification check process.

Changes to the Telecom cable network

84. The line qualification check process outlined above assumes that Telecom's copper cable network remains static in terms of its structure and characteristics over time. Unfortunately, this is not the case. A line which passes the line qualification check one day may well not pass the same check a few months later. Furthermore, the actual performance experienced by TelstraClear's customer will experience changes over time.
85. These changes can occur through a variety of mechanisms:
- (a) cable plant is frequently reconfigured to enable the connection of new customers, in both infill and new sub-division scenarios;
 - (b) new subdivisions can required reconfiguration of feeder and distribution cables to insert new cabinets;
 - (c) copper feeder cables can be replaced by fibre cables; and
 - (d) as previously submitted, as the penetration of broadband services within the cable network increases, all customers will experience degradation in synchronisation rate, even in short cable binders.
86. TelstraClear would have to be prepared to accept such changes in Telecom's network when they occur.

B1.4 Exception

87. In paragraph 7(i) of the Proposed Technical Specification, the Commission proposes the following exception to all three PIR scenarios:

"where Telecom has limited capacity between the ATM switch and the DSLAM, the PIR is set to the maximum capacity available for dimensioning between the ATM switch and the DSLAM."

88. Telecom understands that this exception is intended to apply in situations where a given access line fails to synchronise at a rate high enough to support the relevant service because the access line is connected to a Conklin DSLAM with transport of less than 4Mbps (approximate 25% of Telecom's DSLAMs). The exception is however unclear and does not address all of the circumstances in which a given line may fail to synchronise to a high enough rate.
89. The transport limitation applicable to Conklin DSLAMs is typically on the link from the cabinet mounted Conklin DSLAM to the hub DSLAM from which it is parented (the Conklin DSLAMs are always subtended off a nearby hub DSLAM parent). On this transport link, the bandwidth constraint is physical, in that there are only 1 or 2Mbps links terminating on the Conklin DSLAM. From the subtending hub DSLAM through to the first ATM switch, there is a separate virtual path for each Conklin. This virtual path is dimensioned to the same rate as the physical transport to the Conklin because the PIR is always the dominant parameter.
90. Given the above, Telecom proposes that the regulated service when offered on Conklin DSLAMs should always be configured as the 3.5Mbps baseline service (as per specification 7(a)). This means that there would be four possible outcomes as follows:
- (a) the Conklin has 4Mbps transport and the line synchronises at 4.048Mbps - the line will support the baseline service, and the service will perform in a similar manner to the baseline service on a Alcatel or Nokia DSLAM;
 - (b) the Conklin has 4Mbps transport and the line synchronises below 4.048Mbps - the service PIR will degrade commensurate with the actual synchronisation rate, service performance will be degraded and TelstraClear will need to inform their customers accordingly;
 - (c) the Conklin has 2Mbps transport and the line synchronises at 4.048Mbps - the service will perform more like a 1.5Mbps PIR service, but with the same SIR as the 3.5Mbps service. TelstraClear will need to rate shape the service to the available PIR (i.e. 1.5Mbps) to minimise the potential for buffer overload and inform their customers accordingly; and
 - (d) the Conklin has 2Mbps transport and the line synchronises below 4.048Mbps - the customer will experience a service with a nominal PIR of 1.5Mbps until the synchronisation rate drops below 2Mbps. When this happens, the actual service PIR will drop below 1.5Mbps and TelstraClear will need to inform their customers accordingly.

91. As noted in section B1.1 above, a given line may also fail to synchronise at a sufficient rate to support the relevant service because of its length. This can happen for a line connected to any DSLAM. When this situation is encountered, Telecom proposes that:
- (a) the Baseline 3.5Mbps service profile continue to be applied, as the Commission appears to have rejected Telecom's previous options to deal with this situation;
 - (b) the service PIR degrades commensurate with the actual synchronisation rate achieved on the line, and the SIR remains the same as that for the baseline 3.5Mbps service; and
 - (c) TelstraClear will need to inform their customers of the change in service characteristics.
92. Again, when the line synchronisation rate is well below the 4Mbps as a result of the length of the access line, TelstraClear will be requested to shape the downstream service at their LNS (L2TP terminator) to the nominal degraded service PIR to avoid buffer overload.
93. The exception in paragraph 7(i) of the Proposed Technical Specification should be amended so that it applies to all of these situations. Telecom considers that this could be achieved by redrafting it to provide a blanket exception where Telecom is unable to provide the relevant regulated service because of constraints due to attenuation, noise and technical limitations.

B2 Sustained Information Rate (SIR)

94. The Commission proposes that:

“The SIR allocated per end-user is calculated as the weighted average SIR allocated per end-user by Telecom for internet grade best efforts services provided by Telecom.”

95. Telecom understands this to mean that for any active connection using the regulated service, the end user would expect to have a throughput at least equal to the weighted average SIR for most of the time, even at peak busy periods. However, this expectation must be set in the context of the terms “internet grade best efforts” and so must not be considered to be a service level commitment that applies 100% of the time.⁸ The use of the UBR ATM characteristic can never assure this outcome. However, Telecom will design the service in such a manner to ensure that this outcome is normally achieved, in line with that achieved for its own retail and wholesale comparable services.

96. Under the proposal discussed at the technical workshop and reflected into the Proposed Technical Specification, Telecom and TelstraClear traffic would share the same virtual path between the DSLAM and the LAC/BRAS. All services within the virtual path (whether retail, wholesale or regulated services) will experience similar statistical distributions of latency, packet delay variation and packet loss, and will behave consistently under congested conditions (albeit not identically).⁹ The available resources under congestion will be allocated fairly across the services based on their relative SIRs – i.e. those with higher SIR will receive more resource while those with lower SIRs will receive less resource and the distribution of resource allocation at peak times will be in proportion to the relative nominal SIR values.

97. In order to ensure that there is no confusion about the applicable definition of SIR, Telecom comments below on some of the points made in TelstraClear’s letter of 16 August 2005. These comments relate to:

- (a) service parameter measurement;
- (b) Telstra measurement of SIR averages;
- (c) implementation of a change in average SIR; and
- (d) LT2P service characteristics.

Service parameter measurement

98. In paragraph 10 of TelstraClear’s letter of 16 August 2005, TelstraClear provides some proposals for monitoring the consistency of treatment between the various services within a given virtual path and across the population of virtual paths. TelstraClear propose:

⁸ Ms Dodd from TelstraClear confirmed at the workshop that TelstraClear was not seeking service levels as would appear in a contract – see July workshop transcript.

⁹ Again this was noted at the July workshop – see transcript – eg: p 161. See also p 7 of TelstraClear’s Document dated 22 July 2005 produced at the workshop where TelstraClear acknowledged that it was not necessary to measure parameters.

“that this would include setting and monitoring a consistent maximum utilisation level on the shared virtual path (for instance, 80% of maximum for Alcatel (and similar) DSLAMs and 50% for Conklins). The service parameter measurement should report the 99th percentile of the busy hour load, measured using 5 minute samples.”

99. Unfortunately, this approach is not useful for the measurement of a highly contended set of services within a UBR configured virtual path. By definition, during the peak busy hour, the virtual path will saturate, otherwise there would be no contention. It would effectively mean that SIR = PIR for all connections at all times. The virtual path must show 100% utilisation during these peak periods or it is not dimensioned correctly. Defining an 80% utilisation target is nonsense for this environment. The critical issue is that when the virtual path saturates, the bandwidth available is still capable of supporting the sum of the sustained information rates of the services active within the virtual path at that time. This implies the need for a quite different measurement process to that described by TelstraClear.
100. It is acknowledged that TelstraClear proposes the use of a sample based on a 5 minute average. Such a sample will tend to smooth out the traffic peaks and hence make the utilisation appear less than the absolute peak. However, even with a 5 minute average sample, the 80% utilisation target is unreasonable for such a highly contended internet grade best efforts service set.

Telstra measurement of SIR averages

101. Paragraph 11 of TelstraClear's letter of 16 August 2005 describes Telstra's approach to the measurement of SIR. The procedure outlined would provide an average peak busy hour SIR for all allocated users of the virtual path. In comparison, the true measure of the actual SIR experienced by any user at peak periods is the data throughput at the peak period divided by the number of actual users at that time – not the number of allocated users as used by Telstra. In the Telstra context this may well be sufficient as all users of the virtual path apparently have the same assigned nominal SIR and Telstra seems happy to allocate bandwidth at a rate which is related to allocated users as compared to active users.
102. In Telecom's situation, this measurement provides an assessment of the average SIR for all allocated users of the virtual path at the peak busy period, but provides no information about any individual Access Seekers real SIR performance. To determine the performance for active users by Access Seeker, the analysis is much more complicated as each Access Seeker (and Telecom itself) may have a variety of services, each with different nominal SIR, and for each of these different services, different numbers of users may be active at the peak busy hour. Telecom can readily determine the number of allocated users to a given virtual path and the service characteristics associated with each of these allocated users. However, determining the number of active users within a given virtual path at a specified point in time is more difficult. This number also changes quite rapidly over time. Hence even if such an analysis is undertaken, it will only be valid for short periods of time. A further complication is that this form of measurement is also influenced by the traffic offered by users of the services. Some users will offer highly peaky traffic, while others will offer more sustained traffic loads. Mixes of all types of users typically exist on most DSLAMs, but for some DSLAMs

there are concentrations of certain types of users. This can add distortion to the analysis.

103. In summary, Telecom does monitor the traffic throughput characteristics of its virtual paths on a regular basis, to ensure that the aggregated SIRs for all the active services within all virtual paths is maintained to a high standard, even during periods of time when the utilisation of the virtual path is at 100%. However, at any particular time for any particular connection on a given DSLAM, the actual SIR performance can vary from that defined for the service. On the other hand, for most of the time the same connection will experience much better throughput than the SIR and even at peak busy times, all services within the virtual path (retail, wholesale and regulated) will experience degraded performance in proportion to their relative SIRs.

Implementation of a change in average SIR

104. TelstraClear at paragraphs 12 to 14 of its letter of 16 August 2005 proposes a method for the change of SIR which involves a profile change on the LAC only. It is true that this approach can be implemented and will change the profile for each service affected on any LAC. However, TelstraClear overlook the fact that simply providing a new profile does not mean that it will be applied. The profile will only be applied the next time any individual user re-authenticates onto the broadband access server. For customers who frequently turn off their DSL modem this will happen reasonably quickly. However, many users today leave their DSL modems logged on continuously for months before they go through a re-authentication process. These users would experience the old profile for several months before the new profile came into effect. If TelstraClear want to change the SIR profile of their service every quarter, then there could well be a number of profiles in operation for TelstraClear services at any point in time. This will further complicate the measurement procedures discussed above and introduces increased operational complexity.
105. Telecom on its own cannot address this problem as it does not have the relationship with the end customer. The only correct way to deal with this issue is for TelstraClear to request all their customers to reset their modems when a change in SIR is made.
106. Changing the SIR values of the regulated service on a regular basis also needs to reflect the commercial realities. In the case of Telecom's retail services, if more customers begin using the higher speed services thereby triggering an upward movement in the weighted average SIR, then Telecom would commensurately receive an increase in revenue as the higher speed products have higher prices. Hence if the regulated service is adjusted in terms of increased SIR to reflect this shift in the retail products, then there would be an expectation of a corresponding adjustment in the imputed price for the regulated service with higher SIR. How this change is then communicated to the Access Seeker customers and what choices they have in accepting or rejecting the price adjustment appears to create some interesting issues. The price increase and the SIR increase must flow through together to maintain the imputation from comparable services required in the Act by the service description.

107. The procedure for defining the weighted average downstream SIR needs to reflect the practicalities of the equipment used to implement the fairness under congestion. Today, an infinite range of SIR values cannot be implemented. The SIR value implemented will always be the closest value to that determined by the weighted average calculation and will always be an integer multiple of the SIR applied to Telecom's 64kbps "throttle on cap" service. This provides reasonable discrimination but will always mean that the actual SIR is equal to the calculated SIR, plus or minus a kbps or so.
108. Telecom proposes that the SIR be defined in terms of relativity to the SIR of the 64 kbps Throttle on Cap service. The relativity is measured as a Relative Weighting Index (RWI) in the hierarchical scheduler. The current RWIs are:

256 kbps	4
1024 kbps	16
2048 kbps	32

The numbers of observations at each of these RWIs could be used to calculate the weighted average RWI. This average RWI would be defined for the regulated bitstream access service and entered as a parameter in that service's profile. This would mean there was no need to measure actual SIR performance at retail or wholesale. As noted, actual SIRs will inevitably vary from planned SIRs, but by defining the regulated service in terms of the RWI parameter, any such variation will always be equal between retail and wholesale. If actual retail SIR is above planned retail SIR, then the actual wholesale SIR will also be above, and by the same amount. Similarly if retail is below then wholesale will be and by the same amount.

109. Associated with the implementation of the new profile, the network must be re-dimensioned to take into account the new SIR characteristics. This involves defining the new dimension for each DSLAM virtual path and then reconfiguration of the 1000s of virtual paths across the network to reflect the new dimensions. This is a relatively mature process, as it is also implemented to enable growth in the network, but still involves operational time to complete. The typical operational cycle for re-dimensioning all virtual paths on all DSLAMs is 4 weeks. This means that a change in SIR would take 4 weeks to correctly replicate across all DSLAMs.

L2TP service characteristics

110. Paragraph 15 of TelstraClear's letter of 16 August 2005 discusses the characteristics of the commercial UBS backhaul service. This has no relevance to this determination.
111. Paragraph 16 of that letter discusses L2TP service characteristics as delivered from the first ATM switch. Telecom agrees with TelstraClear that the virtual path containing the L2TP tunnels needs to be dimensioned to appropriately accommodate the following factors:
- (a) the sum of the weighted average SIRs for all of the services contained within the virtual path;

- (b) the application of an overhead to each SIR to allow for the encapsulation of the L2TP tunnels; and
 - (c) the virtual path must be sized to be at least equal to the highest PIR service contained within the virtual path, including an allowance for the overhead of the L2TP tunnel.
112. On the other hand, Telecom does not support TelstraClear's assumption that the entire STM-1 be dedicated to the access seeker. This is totally inappropriate as the access seeker is only paying for the contents of the virtual path associated with the STM-1 interface. It is accepted that at a physical level, the STM-1 interface is dedicated to the access seeker, but at the logical level the only switch and transport capacity dedicated to a given access seeker is that defined by the virtual path as described above. The switch and transport capacity is shared across many users and many services and so must be allocated based on actual usage only.

C INTERLEAVING

Need to test

113. The Proposed Technical Specification is silent as to the application of interleaving. However, the Commission has indicated that it intends to proceed with the interleaving proposal outlined in its draft determination. This proposal would require Telecom to turn interleaving off for an individual port when requested to do so by TelstraClear.
114. Telecom has provided detailed submissions throughout this process about the potential adverse affects that turning interleaving off on a per port basis may have on its network and other end users.
115. Although in theory turning interleaving off on a particular line should not affect the performance of other lines, international experience suggests that turning interleaving off may cause a range of practical problems that could impact other users of the cable sheath.
116. In these circumstances, Telecom considers that 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. Telecom outlined the nature of the testing required and its likely cost in section C2 of its 20 May submission on the draft determination. Telecom estimates that it would take around 3 months to plan and configure the necessary tests, and a further three months to actually conduct those tests. The cost of this testing should be borne by TelstraClear.

Operational cost implications

117. 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. Telecom has previously indicated that there will be an initial setup cost associated with creating the additional profiles required to support the interleaving off option, as well as transaction costs equivalent to a MAC for each request to turn interleaving on or off. A retail minus approach should apply as proposed by the Commission in relation to MAC charges in the draft determination.

Implementation issues

118. The introduction of optional interleaving would effectively require the same implementation process as would be used for any other new service. A second ("interleaving off") profile would need to be created for each variant of the regulated service. Telecom expects that it would take 16 weeks to develop and implement these profiles from the date of any decision requiring Telecom to implement optional interleaving.
119. As previously submitted, profiles are a finite resource in the DSLAMs. Conklin DSLAMs do not have enough profiles available to support a second profile for each variant of the regulated service. Accordingly, an interleaving off option will not be provided on access lines connected to Conklin DSLAMs.
120. In the event that optional interleaving is pursued in the final determination then the Commission must:

- (a) make it clear that Telecom does not agree with the Commission's proposal and is not responsible for any adverse effects that might occur as a result of the Commission's ruling;
- (b) provide Telecom with the ability to deal with any adverse effects;
and
- (c) take into account the additional technical and operational complexities that will result.

D IMPLEMENTATION

121. This section summarises the implementation issues discussed elsewhere in this submission. Telecom provides its best estimate of implementation timeframes at this time.

Implementing paragraph 7(a) of the Proposed Technical Specification

122. The baseline service (with interleaving off) is relatively well defined and the implementation of this service would be relatively straight forward. As outline in section B1 above, Telecom expects that this service would take 16 weeks to implement following a final determination by the Commission. This is the minimum amount of time that would be required to design, build and test the new service profile(s) and to implement the necessary information system changes. However, because of the network brown-out period for approximately four weeks over the Christmas period, during which no new work can be undertaken on the network, the earliest this service could be implemented is 20 weeks from date of final determination.

Implementing paragraph 7(b) of the Proposed Technical Specification

123. Again, the implementation of this service would be relatively straight forward. Telecom expects that this service could be implemented within roughly the same timeframe as the equivalent retail trigger service.

Implementing paragraph 7(c) of the Proposed Technical Specification

124. The implementation of the service outlined in paragraph 7(c) of the Proposed Technical Specification is more problematic. As with the services outline in paragraphs 7(a) and (b) a new service profile would be required to support this service component. However, in addition, each time TelstraClear raised a request for this service, a line route check qualification would need to be undertaken to ensure the higher PIR service could be delivered without increasing the power spectral density in the cable sheath and therefore affecting the reach of other services in the cable bundle. Telecom does not currently provide itself with a line route qualification check of this type. At first, the line route qualification check would involve a manual process, that would take about 4 to 6 hours and cost around [..... **TCNZRI**] per request. Over time, if the volume of requests from TelstraClear was sufficient, Telecom could look to automate this process. The automation development effort is estimated to cost in excess of [..... **TCNZRI**] dollars, take several months to implement and the accuracy would still be less than perfect.

Implementing optional interleaving

125. The introduction of optional interleaving would effectively require the same implementation process as would be used for any other new service. A second ("interleaving off") profile would need to be created for each variant of the regulated service. Telecom expects that it would take 16 weeks to design, build and test the new service profile(s) and to implement the necessary information system changes from the date of any decision requiring Telecom to implement optional interleaving.¹⁰

¹⁰ This does not include not including additional wholesale order management.

Final determination must take account of implementation

126. In the draft determination the Commission simply stated that the commencement date would be the date that the determination is made. Telecom has previously submitted its concerns¹¹ that the final determination must be reasonable in relation to implementation requirements.
127. Telecom will commit to a timely rollout in accordance with standard access principle 1 but may be limited by technical and operational practicability issues¹². Telecom suggests that the Commission sets implementation requirements in the final determination by reference to standard access principle 1.

¹¹ See section G8.1 of Telecom's May submissions on the draft determination.

¹² Clause 6(a) of Schedule 1 of the Act recognises these issues and limits standard access principle 1 in this respect.

E OSS

128. In the draft determination (paragraph 276) the Commission proposed that:

Telecom is accordingly required to provide a level of operational support to TelstraClear, whether manual or automated, such that there is no material difference in provisioning or fault repair in regard to the experience of retail customers whether retail services reliant on bitstream access are supplied to TelstraClear or Telecom.

129. Telecom agrees with the approach in the draft determination. Telecom reiterates the views expressed in its May and June submissions.
130. Since the draft determination, submissions and the conference there have been additional submissions in the area of OSS both orally and in writing. TelstraClear now agrees to Telecom's eOR for broadband solution for commercial UBS subject to three modifications. TelstraClear also accepts Telecom's industry Roadmap for B2B for commercial UBS. Telecom has responded to these points in its letter to the Commission dated 31 August 2005. Telecom's ability to deliver OSS in this form has been conditional on a need to assess how the regulated service differs from the commercial service.
131. Commission staff indicated in an audio with the parties that the Commission was minded to consider adding a role for an independent facilitator. No detail as to that proposal has been provided. Telecom has responded on this at a high level in its letter dated 31 August 2005.
132. If the Commission is still minded to consider a role for an independent facilitator we request that it gives due regard to the issues Telecom has raised. Telecom would be very happy to elaborate its response if the Commission wishes to advise exactly what is under consideration. Given the potentially adverse effects of the issues Telecom has raised, if the Commission is minded to proceed, it should set out its proposal for a short consultation period. Telecom has received no response to its request in its 31 August letter.
133. Commission staff stated in an audio whereby it provided clarification to the parties on the technical specification that it was only consulting further on issues that departed from the draft determination. In the case of OSS, Telecom understands that the only departures from the draft determination in contemplation are those issues raised above.
134. TelstraClear has however sought the establishment of KPIs and measurement on regulated OSS matters. No indication has been provided from the Commission that it is minded to consider this request and no proposals have been set out by TelstraClear or the Commission as to how this would work. Telecom reiterates the request made in its 31 August letter that, if the Commission is minded to depart from the draft determination and move to some form of OSS KPI regime, it needs to consult in order that an adequate opportunity to respond is provided. Failure to do so risks a determination being made with which Telecom cannot comply.
135. Telecom has not had an opportunity to respond on any other departures from the draft determination and is not aware that it needs to.

136. Telecom has indicated throughout the proceedings that the OSS in place and planned for commercial UBS and Jetstream may or may not be appropriate for the regulated bitstream access service, depending on how it is ultimately defined.
137. Telecom now comments on the appropriateness of eOR for broadband and B2B as set out in the Industry Roadmap for the services set out in the Proposed Technical Specification.

OSS for Baseline service and higher speed service consistent with retail

138. Telecom considers that it will be able to implement eOR for broadband and B2B as detailed in the Industry Roadmap for both commercial UBS and Jetstream services and for the regulated services set out in paragraphs 7(a) and 7(b) of the Proposed Technical Specification. Assuming the issues discussed in section B are adequately dealt with, the regulated UBS requirements (excluding the line checker) are currently expected to be able to be managed through minor enhancements. Bearing in mind Telecom's initial assessment as to implementation timeframes for the baseline service Telecom considers that OSS will be ready at the same time as the regulated service will be ready.

Higher PIR service based on line qualification

139. OSS issues with paragraph 7(c) of the Proposed Technical Specification are substantially more problematic. As the proposal in paragraph 7(c) is loosely defined and we have been requested to provide potential solutions to this, Telecom is not in a position to confirm OSS arrangements in the absence of greater clarity.

F THE COMMERCIAL EFFECT OF A NEW SERVICE SPECIFICATION

140. The Proposed Technical Specification sets out a service (with three components described above) that vastly differs from the service proposed in the draft determination and discussed at the conference with Commissioners.
141. Submissions by the parties to the draft determination and at the conference on pricing have therefore been in relation to a materially different service proposition. The parties were specifically requested not to make submissions on pricing at the July workshop that followed the conference where new proposals outside the draft determination were discussed and have now led to this revised technical specification. This section sets out Telecom's concerns around the lack of consultation on a pricing methodology for the new proposed services and responds to paragraph 17 of the Proposed Technical Specification.
142. The Commission has stated that it will not be consulting on a pricing methodology for this materially different service. However, this means that previous submissions on pricing made by the parties will not enable the Commission to take on board the parties views for pricing the service that is now proposed. Any pricing determination for a service such as that in the Proposed Technical Specification will therefore be made without consultation and without the benefit of the parties' views.
143. As the Commission is aware, pricing is fundamental to both parties yet the Commission finds itself largely without submissions on an appropriate methodology. The new weighted average service definition naturally lends itself to a weighted average price methodology. However, no proposal has been put forward by the Commission and no submissions have therefore been made. Given the substantial change in the service specification from the draft determination the pricing methodology in the draft determination cannot be applied.
144. While Telecom has no desire to extend what has already been a lengthy process for all involved, the Commission is now proposing something quite new in terms of a service specification and is not consulting on a pricing methodology. Telecom considers this is not only a reviewable error but runs a high risk of regulatory error that fundamentally impacts on the parties.
145. In order to expand on Telecom's concerns, the following paragraphs explain which parts of Telecom's previous pricing submissions are or are not relevant to a pricing methodology for a new service.

Relevance or not of previous pricing submissions

146. In relation to the previous service definition which the Commission proposed in the draft determination a method was required to evaluate what the appropriate price was in relation to that particular service definition. The Commission proposed that a regression method be used to evaluate this price. Telecom accepted a regression analysis but suggested some modifications. Network Strategies, in TelstraClear's submission, proposed a further variation which was an "arithmetic" approach being a simpler version of the regression approach. With the change in service definition, all of the submissions made by the parties and the discussion at the conference are now redundant.

147. The previously suggested method of evaluating the y intercept of a regression line based on observed prices will no longer relate the price of any regulated service with the definition of that service (if indeed it ever did). When the service definition is based on the relative amounts of sales Telecom has made at retail of various plans and speeds, the pricing methodology also needs to take account of the same weightings when imputing price. Using the services selected to calculate the weighted average SIR and their respective proportions will give the weighted average Telecom retail price for business customers and weighted average Telecom retail price for residential customers on a directly comparable basis.
148. Adjustments will still need to be made to this price, however these will be along the lines of the adjustments already discussed in earlier submissions. For example an allowance needs to be made for imputing the tolls discount and ISP charge out of residential bundles and the weighted average amount of included high speed allowance needs to be adjusted for when deriving an imputed wholesale price.
149. Telecom's submissions in relation to value based pricing and price discrimination remain highly relevant. Telecom remains of the view that its fair and workable proposals providing for a range of speeds for business and residential customers best meets the long term interests of end-users. The Commission is not proposing a range of speeds. The Commission has also not stated whether it intends to pursue a residential baseline service and a business baseline service.
150. As noted in Telecom's previous submissions, competition is imperfect when fixed sunk costs are a significant share of total costs. In a situation of imperfect competition with significant fixed costs Telecom and TelstraClear, including their economic experts Professor Hausman and Professor Ordover, acknowledged that price discrimination among groups of customers is a typical outcome in competitive markets.
151. With respect to retail services for which the Commission's proposed bitstream service is an input, this involves charging residential and business customers different prices even if for essentially the same service in proportion to their willingness to pay. Professor Hausman presented evidence of this outcome in the highly competitive broadband markets in the US and Canada.
152. The Commission's proposal in the draft determination to differentiate the wholesale price between business and residential customers based on the observed retail prices is consistent with competitive outcomes observed in the US and Canada. To summarise previous submissions, if wholesale prices are not differentiated then there will be a reduction in the range of broadband services, and prices to residential customers are also likely to increase. To the extent that price discrimination does not occur, prices will increase to residential customers, because they have higher (in magnitude) price elasticities than business so with price discrimination they get a lower price as observed in both the US and Canada.

Relating a weighted average price to previous submissions

153. Changing the service description away from that contemplated in the draft determination and towards a weighted average approach leads inevitably to a change in pricing methodology. As Telecom has submitted above a weighted average price, subject to necessary adjustments, is required to match the service description the Commission is now proposing. Telecom reviews here, at a high level, the relevance of various parts of Telecom's previous submissions relating to pricing in the light of this new proposed service description.
154. In Telecom's 20 May submission at paragraph 364 it noted six concerns with the pricing methodology proposed by the Commission in its Draft Determination (as clarified). These six concerns and the current relevance are:
- (a) Failure to include Venture Flat Rate. This would be included in a weighted average price approach to the extent that customers were purchasing this service at retail.
 - (b) Failure to include Venture plans. Again, these would be included to the extent that they are being purchased at retail.
 - (c) Inappropriate Speed Premium adjustment. To the extent that customers buy higher speed plans and pay a premium for these plans the effect in terms of both increasing the weighted average SIR and the weighted average price will be consistent between retail and wholesale.
 - (d) Treatment of the ISP fee. This adjustment should be made in the manner Telecom advised in its submission. That is a retail minus avoided cost approach should be used where the costs of the ISP function are one of the costs avoided when the service is provided on a wholesale basis.
 - (e) No allowance made for Homeline in the bundle imputation calculation. The same adjustment should be made now as was advocated for by Telecom in its previous submission.
 - (f) Inappropriate adjustment made for the effect of data caps. The same concerns would exist here in that the Commission needs to convert from a set of retail plans which have limited amounts of either included speed or included data and use these prices to infer the price of a wholesale service with unlimited amounts of the determined SIR and PIR. The adoption of a weighted average approach allows this issue to be resolved completely as the next section explains.

Resolving the data caps issue under a weighted average methodology

155. Telecom considers that the Commission should define the allocated SIR (or RWI) over all user observations including those users who are throttled for some part of the month. So for example if an end user had an RWI of 16 and was throttled for the last 5 days out of 30 in a month, that user would contribute:

$$((16 \times 25) + (1 \times 5)) / 30 = 13.5$$

into the overall weighted average RWI calculation.

156. This scaling back of the RWI to allow for throttling then translates exactly to the access seeker. The regulated bitstream service's RWI will never be throttled to 1 (it has no limit to its high speed allocation), so it needs to start each month with a lower overall RWI than the average starting RWI for Telecom retail customers because those retail customers will be throttled in some cases. If every single Telecom user was like the one in the example above, then the Telecom users would run at 16 for 25 days, then run at 1; while the bitstream access users would run at 13.5 for the whole month to give the same overall average.
157. In the case of Telecom users who are on an overage plan rather than ToC, they contribute their RWI for the whole month, but the retail average price is adjusted upwards by allowing for the fact that the overage fees are counted towards the overall weighted average retail revenue. This then makes a corresponding contribution to the weighted average wholesale price
158. If both of these adjustments are made (to the allocated SIR and to the average price calculation) then there is an exact match between the service definition at retail and wholesale. Issues around the dichotomy between no data at retail/unlimited data at wholesale are avoided.
159. A weighted average methodology then has a considerable advantage over either the regression methods of the Commission or Telecom or the "arithmetic" method of Network Strategies on which previous submissions have been made by all parties.

Average SIR – no material cost different

160. Telecom largely agrees with the Commission's statement in paragraph 17 of the Proposed Technical Specification that, in respect of the SIR, there will be no difference in the delivery cost between the proposed regulated service and Telecom's corresponding average retail service.
161. This however is only true under certain circumstances so that statement needs to be qualified. There are two particular situations that need to be considered where this would not be true:
 - (a) *Higher PIR:SIR ratio:* When there are different contention ratios between services then the virtual path capacity costs will not be proportional to the SIR. As Telecom has explained to the industry,¹³ the dimensioning of the virtual path is based on the sum of the PIRs of the services using that virtual path divided by the 50:1 contention ratio. Where there is a constant PIR:SIR ratio the SIR relativities will match the cost relativities. However if a service is defined with a higher PIR:SIR ratio than the average, the virtual path capacity cost will be proportionately larger relative to the SIR even though it is the same relative to the PIR.
 - (b) *PIR above 3.5Mbps:* When the PIR of the service is above 3.5 Mbps the cost is driven, at least in part, by spectrum consumption

¹³ See 24 August 2005 Wholesale Bulletin at page 12.

in the cable sheath. Below this limit there is no practical difference with the PIR, and the SIR can be used to infer the relativities of costs between services. This then means that a service with lower than 3.5Mbps downstream and with an average SIR will have a cost equal to the average costs of Telecom's services.

162. If the proposed regulated service had a weighted average PIR as well as a weighted average SIR then it *would* be the case that there was no material difference in cost between retail and wholesale. However, the definition of PIR independent from Telecom's retail PIRs creates these extra two cost factors referred to above. The Commission will need to take account of these material cost differences when it sets the price for its proposed regulated service. The Commission's statement at paragraph 17 of the Proposed Technical Specification currently fails to take this into account. Telecom describes below in paragraphs 166 to 172 how these adjustments can be made.
163. This is not to say however that the pricing of the service should be based on cost. The designation requires that the price be imputed from Telecom's retail prices. A discount is then applied. The pricing methodology is a retail minus one and is not one based on Telecom's costs.

Pricing issues discussed at the Conference

164. For the most part issues around price and its implementation for bitstream access which were submitted on or discussed at the Conference are made easier by the weighted average approach but have not been discussed. In particular:
- (a) There will be no need for Telecom to re-run a regression model as prices change and there will be no need to allow for a potentially changed functional form as new prices or services are introduced. If Telecom introduces a new service, on the day of introduction there will be no customers for it, so it will have no effect on the weighted average SIR or price. Over time weighted average SIR and price will move according to how popular the new plan is and its relativity to the existing averages.
 - (b) Such an approach avoids Mr Small's enquiry as to a potential gaming issue¹⁴. If Telecom were to introduce an artificially priced plan with an objective of moving the regulated service or price in some artificial way it would have no effect. Customers would not want to buy the plan so it would have no effect on the weighted averages – the weighting would always be zero.
 - (c) A notice period would not be required in relation to the introduction of new plans. On the day of introduction at retail there is no effect on the weighted averages. By the time any material effect was seen on the wholesale service or price, the service would be known about by access seekers. The only potential issue would be in relation to price changes in circumstances where existing customers were automatically transferred to the new price points rather than making a choice to move to them over time. Such a step change in the weighted average price would need to be reflected through and

¹⁴ page 58 of the conference transcript.

Telecom would propose to provide one month's notice if such an event were planned to occur and make the appropriate adjustment to the weighted average wholesale price simultaneously with the retail change.

165. Telecom's initial views are that calculating a weighted average Telecom retail price should be a relatively simple process. The difficult part will come in relation to how adjustments should be made for the two ways in which the costs of the proposed regulated service will not correspond to Telecom's weighted average cost. Telecom examines here methods to deal with the two exceptions we have noted to the Commission's statement in paragraph 17 of the Proposed Technical Specification.

Higher PIR: SIR ratio

166. Suppose, for the sake of illustration, that the weighted average Telecom retail service calculation gave a result that the average service was somewhere in between Telecom's 256k and 1M services, for example that it was a 800k PIR/16k SIR service. Further suppose that the weighted average residential price, after all appropriate adjustments, was \$30 per month. The issue for the Commission in such circumstances is how to adjust for the fact that the proposed regulated service would have an implied PIR: SIR of 3500:16. Clearly a 3500:16 service is more valuable than an 800:16 service as at any time outside of peak congestion it operates at a higher speed. There is also a cost of such a service imposed on other users at any time outside of peak. The 3500:16 service uses more off-peak virtual path capacity than the 800:16 service, meaning that all other users sharing that virtual path have a proportionately lower share¹⁵. Conversely, a 3500:16 service is less valuable and imposes relatively lower costs on other users than a 3500:70 service (i.e. one which has the current average PIR: SIR ratio) in that the 3500:16 service slows down more as congestion increases.
167. The \$30 figure is the correct price for an 800:16 service for this example. It may be possible to infer the price of a 3500:70 service using regression analysis or similar, although the Commission will recall that the best method to do this was a controversial issue. There is no way however to infer the imputed retail price for a 3500:16 service. It is not possible to impute from Telecom's retail prices because Telecom's services increase in PIR at the same time as they increase in SIR – that is, there is perfect colinearity and it is not possible to statistically separate the value/cost/price increase associated with more PIR from the value/cost/price increase associated with more SIR.
168. If, for example, Telecom were to launch a 3500:16 retail product it would be possible to use the price from this directly, whether by applying the retail-minus calculation to this value or by using the price point to separate the different value effects of PIR vs. SIR. While this exists as a possibility, if the Commission designated a service as described, the Commission would not be able to rely on this.
169. There will also be differences in where within the range from the 800:16 price to the 3500:70 price the 3500:16 price will fall according to customer

¹⁵ This doesn't impose a cost on Telecom as Telecom will provision the virtual path in relation to the SIR. The cost is imposed on other end users sharing the virtual path during shoulder periods. The Commission will need to consider the interests of these other end users when it makes its decision, and in particular should set a price which provides appropriate price signals in relation to this effect.

type. Residential customers are more likely to be concerned with the peak speed and so the 3500:16 price will be closer to the 3500:70 residential price. Business customers are more likely to be concerned with throughput so the 3500:16 price will be closer to the 800:16 business price.

170. The Commission will need to explore with Telecom's retail marketing group what pricing policy it would apply to such a service. As an indication, if the 800:16 residential price after adjustments was \$30, the 3500:16 price would be about \$34.

PIR above 3.5 Mbps

171. As a further extension of the issue that customers will value PIR and SIR at least somewhat independently, when the PIR is increased above 3.5 Mbps as suggested in the Commission's paragraphs 11 and 12 a further price adjustment is required. In this case the SIR is the same as the 3.5 Mbps service but there is a value/cost/price increase resulting from the ability to download data more quickly outside of peak times. Again, this will result in a larger percentage increase in price for residential, although the dollar change for business may be greater.
172. Using the same example numbers as above, a service specified as 6000:16 PIR: SIR would have a residential price of around \$38 per month.

ANNEX A
REVISION OF PROPOSED SERVICE SPECIFICATIONS

Proposed Service	Proposed Service Specifications
<p>PIR set to 3.5Mbps</p> <p>(Baseline Service in paragraph 7(a) of the Proposed Technical Specification)</p>	<ul style="list-style-type: none"> • downstream PIR of 3.520Mbps; • upstream PIR of 128kbps; • downstream copper rate limiting at 4.048Mbps; • upstream copper rate limiting at 160kbps; • maximum downstream power setting of -40dBm/Hz; • per virtual circuit shaping on both the upstream and downstream at their defined PIRs (i.e. 3.5Mbps downstream and 128kbps upstream); • nominal sustained information rate ("SIR") equal to the weighted average SIR allocated per end user by Telecom for internet grade best efforts services provided by Telecom (to be reviewed and adjusted periodically); • downstream hierarchical shaper weighting defined as the integer value which delivers an SIR closest to that defined by the above calculation; • shares a single virtual path between the DSLAM and the first ATM switch with all other retail and wholesale best efforts internet grade services; • ATM shaping on the upstream and downstream traffic streams set to UBR (Unspecified Bit Rate); and • optional interleaving (assuming that the testing referred to in section C demonstrates that optional interleaving can be implemented without causing adverse impacts to Telecom's network or other end users).
<p>PIR set to any speed above 3.5 Mbps where Telecom introduces an internet-grade best efforts service with a downstream PIR in excess of 3.5 Mbps on a common route; or</p> <p>(Paragraph 7(b) of the Proposed Technical Specification)</p>	<ul style="list-style-type: none"> • downstream peak information rate (PIR) of XMbps, where $X > 3.5\text{Mbps}$ • upstream PIR of 128kbps; • downstream copper rate limiting at approximately $1.2 \times X\text{Mbps}$ • upstream copper rate limiting at 160kbps; • maximum downstream power setting of -40dBm/Hz and if the Telecom; service is defined with lower downstream power settings then this would also apply to the associated regulated service; • per virtual circuit shaping on both the upstream and downstream at their defined PIRs (i.e. XMbps downstream and 128kbps upstream); • nominal sustained information rate (SIR) equal to the weighted average SIR allocated per end user by Telecom for internet grade, best efforts services provided by Telecom (to be reviewed and adjusted periodically); • downstream hierarchical shaper weighting defined as the integer value which delivers an SIR closest to that defined by the above calculation; • shares a single virtual path between the DSLAM and the first ATM switch with all other retail and wholesale best efforts internet grade services; • ATM shaping on the upstream and downstream traffic streams set to UBR (Unspecified Bit Rate); and • optional interleaving (assuming that the testing referred

	to in section C demonstrates that optional interleaving can be implemented without causing adverse impacts to Telecom's network or other end users).
Exception	<p>Telecom may provision a lesser PIR where Telecom is unable to provide the relevant regulated service because of constraints due to attenuation, noise and technical limitations.</p> <p><u>For example:</u></p> <ul style="list-style-type: none"> - An actual PIR of 3.5Mbps can not be delivered on Conklins with transport of less than 4Mbps. For those Conklins, TelstraClear will need to rate shape the service to the actual PIR - when the line synchronisation rate is well below the 4Mbps as a result of the length of the access line, TelstraClear will be requested to shape the downstream service at their LNS (L2TP terminator) to the nominal degraded service PIR to avoid buffer overload.
Downstream Sustained Information Rate	<p>The SIR allocated per end-user is calculated as the weighted average SIR allocated per end-user by Telecom for internet-grade best efforts services provided by Telecom.</p> <p>(The relevant dimensioning parameters to be used in conjunction with this definition are discussed in section B2)</p>
Upstream Speed	Maximum upstream throughput rate of 128kbps for data traffic sent from the end-user
Sharing of best efforts internet grade Virtual Path	Telecom and TelstraClear to share a single Virtual Path from the L2TP Access Concentrator (LAC) to the DSLAM currently used by Telecom's best efforts traffic – Unspecified Bit Rate (UBR) services.