



The Section 9A Backhaul Study

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Executive Summary

We support the Commission's study to update its understanding of backhaul markets, which play an increasingly important role in New Zealand's telecommunications markets.

The study paper usefully surveys the technologies, functional levels and geographic aspects of backhaul services. The paper also highlights that the backhaul function – linking of access networks serving end users and core nodes from which services are provided – is a key part of providing telecommunications and, as it seeks to capture dispersed traffic from sparsely populated regions, can be prone to ineffective competition.

With a widespread regional network to 649 locations¹, Chorus remains central to connecting many communities. RSPs have little choice but to acquire backhaul from Chorus to provide a range of services, to complete network coverage for business data customers, or as a tail extension service.

Spark has deployed its own backhaul solutions to approximately 255 of these 649 locations, but are reliant on Chorus for the remainder. We have seen quite significant price declines from Chorus on some of these routes, in response to competition. On other routes which are not subject to competitive forces though, prices have remained at the regulated price levels and are substantially above the prices on competitive routes.

For example:

- a. The price for a 1Gbps link between Auckland and Palmerston North, which previously would have been priced at around \$31,000 under regulated pricing, has been reduced by Chorus to \$3,000 under competitive Chorus Regional Transport (**CRT**) pricing but Greymouth the Karamea route remains at around \$19,000 per month; and
- b. The price for a 1Gbps link between Rotorua and Taupo, which previously would have been priced at \$12,000 under regulated pricing, has been reduced by Chorus to \$700 under CRT pricing but Invercargill to Te Anau is around \$13,000 per month.

It is the quantum of these price differences between competitive and regulated pricing, rather than the fact of a price difference, that suggests a structural issue with the current regulated pricing framework.

Unsurprisingly, it is typically in the smaller cities and towns in rural regions that there is limited or no competition that we have seen no material price reductions, and where Chorus continues to charge the regulated prices. If the current regulated backhaul framework is producing erroneous results that do not accurately reflect competitive outcomes, these are the areas that are most vulnerable to that error.

The Commission's study paper rightly raises a number of important questions: Are current regulatory prices efficient? Are the current services delivering the expected competition and investment outcomes? Can the RBI process provide competitive provision of backhaul? Does the bundling of less competitive routes with competitive routes distort competition?

The current study should aim to set the context within which Commission and policy makers can consider these questions - ultimately considering the adjustments that should be made to current regulatory settings.

¹ For example, the Commission noted in its 2012 competition assessment that Chorus could potentially provide regulated backhaul from 649 locations. It found that 171 of the 215 primary routes reviewed were competitive.

Without wanting to pre-suppose the answers to these questions, we observe that the current service descriptions:

- Do not reflect how operators purchase and use backhaul capacity, because they are expressed to be service-specific transmission capacity products rather than generic transmission capacity products;
- Do not reflect the markets in which they are purchased. The Commission itself considered these products within a wider “transmission market” when applying its competition test to them;
- Do not reflect international best practice. Service agnostic approaches are common overseas, and Ofcom and the ACCC have regulated generic transmission services². Further, regulated prices for those generic transmission services in these same markets have been falling, as the Commission has noted.

² See Ofcom at [4.605] <http://stakeholders.ofcom.org.uk/binaries/consultations/bcmr-2015/statement/bcmr-final-statement-volume-one.pdf>.

Introduction

1. Thank you for the opportunity to comment on the study paper (**the paper**). Spark NZ welcomes and supports the Commission's work in preparing this paper – backhaul markets are increasingly important as the link between rapidly changing technology and services that RSPs can deliver and consumers. We are both a significant purchaser and provider of backhaul services.
2. It is timely to consider the backhaul market further. Regulated backhaul services were last considered in detail in 2008 at the time the Commission issued the UCLL and UBA backhaul STDs respectively. Since then, there has been significant technological and market change:
 - a. Technologies have become available that offer lower costs and operational flexibility;
 - b. There are now at least 4 infrastructure based operators offering wholesale capacity between centres on main routes, and a number of regional operators;
 - c. Significant ongoing investment in backhaul networks will be necessary as customers are demanding ever more data and access networks are upgraded;
 - d. The Government is investing in UFB fibre and RBI networks, and has ambitious targets that by 2025 99 per cent of New Zealanders are able to access broadband at peak speeds of at least 50 Mbps. This will require a significant increase in backhaul capacity.
3. Access to Chorus' intra-regional backhaul service at efficient prices will be increasingly important for competing providers, including mobile network operators, who will want to improve the quality of their regional networks. The Government has also proposed that backhaul continue to be regulated - post 2020 - outside the utility-oriented model which will be focused on the access network. In other words, the Government is relying on evolving the current regulatory approach to ensure it remains fit for purpose and delivers the outcomes that are consistent with the purpose and expectations of stakeholders.

Focus issues for further study

4. We support the general technical descriptions and functions set out in the paper. As the paper notes, backhaul relates to the collection of traffic (sitting between the access network and core service nodes) and will vary by operator depending on the operators' network.
5. The paper rightly focusses on the functional aspect of backhaul in the first instance. The approach taken by the paper highlights the functional and economic characteristics of backhaul – i.e. capturing disperse traffic from potentially sparsely populated regions - and how these characteristics suggest it is an area where market power is potentially an issue. For example, backhaul is key to aggregating voice and data traffic and transmitting it from an aggregation point controlled by one party (such as an access provider) to the aggregation point of another party (such as a RSP) or between aggregation points controlled by the same party.
6. Accordingly, the backhaul network design is typically hub and spoke in nature since it is developed to bring traffic back to a hub from multiple remote locations. These remote locations can be subject to different levels of traffic demand, sometimes sparse across one service type and greater across another service type. It is this topology that makes it different from other parts of the network. For example, the core network is dominated by any to any connectivity and high traffic densities.
7. Focusing on these functional and economic characteristics best exposes any potential competition and regulatory issues:

- a. Backhaul is a key input to an end to end service, and accordingly service providers must access backhaul to provide connectivity services to end users;
 - b. Backhaul service performance will have a direct impact on customer experience. There needs to be appropriate service quality because the end user experience is ultimately determined by all components - access and backhaul. Accordingly, access provider backhaul investment needs to keep up with the significant investment network operators and RSPs are making in access and core networks, which are being upgraded to meet growing customers demand for more and more data; and
 - c. A geographically dispersed service will enable traffic aggregation from high cost remote areas across links which are more likely to be prone to limited competition. While we expect that costs will be higher on these routes, the incumbency and scale advantage of the access provider means that new operators are unlikely to enter or provide a meaningful competitive constraint.
8. The paper notes that the study may lead the Commission to consider whether there are reasonable grounds to investigate amending or replacing the service description in the Act. We think this is a good objective to have given the multi-product environment and the role of backhaul across the range of products. The Commission should focus on areas where competition concerns may arise – issues relating to capacity, timeliness of supply, rigidity of rules without reasonable technical justifications - and ensure that remedies are fit for purpose.
9. Accordingly, in addition to possible changes to the Act, we believe the study could also be used to refresh the Commission’s understanding of how and where competition is likely to be limited, the nature of regulated pricing and backhaul service specification.

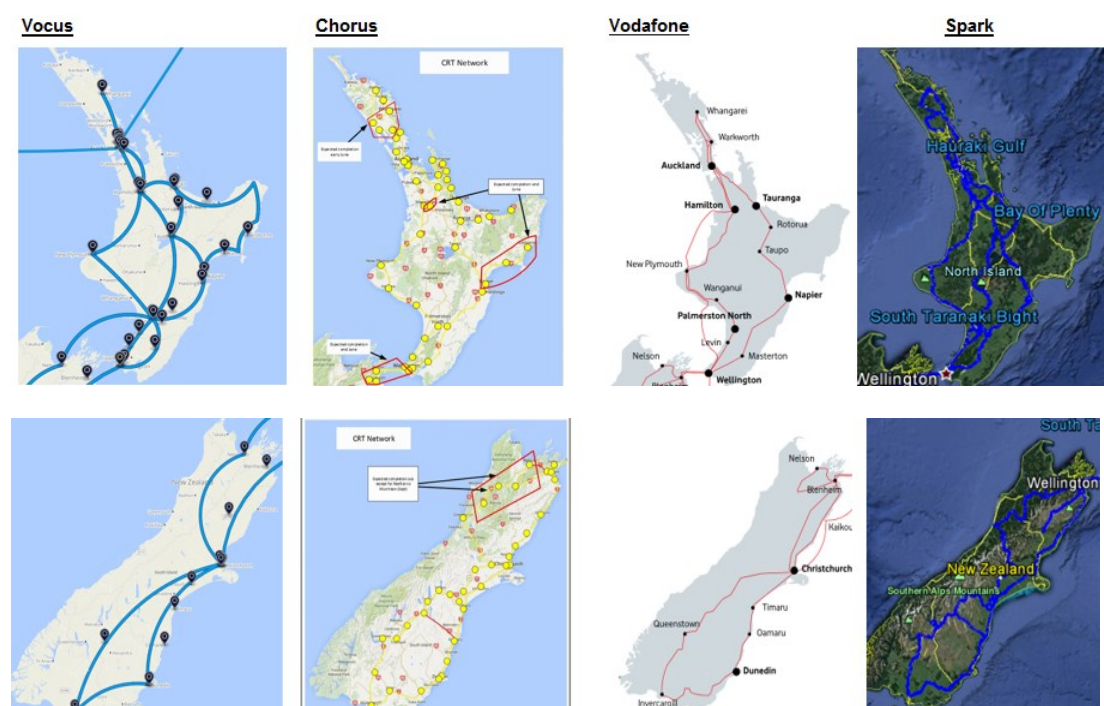
Whether competition is likely to remain limited in intra-regional markets

10. We support the Commission considering the markets on a geographic basis – this reflects how the market is developing and Chorus service differentiation. Closer examination of the market shows a clear distinction between core routes - where there are multiple infrastructure based providers and competitive pricing - and intra-regional markets with limited choices and high prices
11. Chorus participates in both these markets through different backhaul options - including regulated and “commercial” backhaul, tail extension services, dark fibre within UFB regions and a competitive Chorus Regional Transport service between main centres – that target different segments and geographic markets.

Core transmission routes

12. A number of facilities based operators are offering transmission services on routes between the main centres, and this has resulted in innovation and competitive prices on those routes. For example, as Figure 1 illustrates, there are at least four infrastructure based transport providers providing services on routes between main centres and a number of service providers offer national networks based on resold wholesale capacity.

Figure 1: infrastructure based core network providers



13. We have seen significant price reductions on these routes. For example, in July 2015 Chorus reduced the price of its Chorus Regional Transport (**CRT**) service by over 75% for some variants as [...] feedback showed our pricing was not competitive in the marketplace.³ CRT is available from 75 core fibre route locations. This provides a strong indication that regulated pricing levels too have failed to provide an effective indication of efficient and competitive price levels for these sorts of backhaul products.
14. Further, dark fibre backhaul options are also available from locations within the UFB footprint (UFB arrangements provide for the Dark Fibre Access Service (**DFAS**) and inter-exchange ICABS services). There are a number of regional providers – i.e. Citilink, Enable, UFF, Northpower and Vector – and switchless wholesale network providers.

Intra-region routes

15. However, there are fewer options on intra-regional routes outside competitively fibred areas and main core routes. These routes are used to provide transport to urban exchanges and secondary regional centres. Chorus has backhaul links to over 650 exchange sites⁴. As we provide voice, data and wireless services widely we are in almost all, if not all, potential sites, in the structurally separated world Spark requires backhaul to all these locations. We currently self-provide to only 255 of them.

³ See Informer 266: 13 July 2015. <https://customer.chorus.co.nz/increased-coverage-and-revised-pricing-for-chorus-inter-candidate-area-transport-service>. See Chorus comparison of prices on specific routes at <https://customer.chorus.co.nz/chorus-regional-transport/pricing-2/pricing-11>. For example, 10Gb pricing between Nelson and Invercargill has reduced from \$30,350 to \$4,200, and between Whangarei and Auckland from \$8,300 to \$2,101. A Chorus is also offering discounts for 2-5 year term commitments.

⁴ The Commission identified 649 in its 2012 competition assessment, we have identified 689 (we suspect the difference is notional exchanges).

16. A minority of these intra-regional routes are subject to competitive transmission. For example, the Commission concluded in its 2012 competition review that - of the 215 potential UCLL/UCLF Backhaul Primary Links reviewed - only 171 routes were determined to be competitive⁵.
17. We believe that competition remains limited in intra-regional markets, and this is likely to continue to be the case. This means that the regulated backhaul services will remain an important complement to the fixed access utility regulatory model and competitive core nodes and services.

Whether regulated prices are efficient and delivering expected investment outcomes

18. Further, we support the study having a close look at regulated prices.
19. The current prices were set in 2008 using a benchmark process, and as noted in the paper such rates have fallen internationally. For example, UK and Australian regulated prices for transmission services have fallen by between 13% and 78%⁶. Further, the relationship between regulated bandwidth services and tail extension services (priced on a per end user basis) remains unclear. The tail extension service, in part, will use the same transmission links as the regulated bandwidth based service.
20. We have seen prices fall significantly on competitive routes. Chorus currently offers the regulated UCLL/UCLFS backhaul service, an unregulated “Commercial Backhaul” service at the same price as the regulated service, and a competitive CRT service. Figure 2 sets out the UCLL/UCLFS backhaul and unregulated commercial service prices for different distance bands and bandwidth. We purchase the unregulated commercial variant, but this does not suggest that this is a competitive service or priced on that basis.

Figure 2: Chorus regulated UCLL and unregulated “Commercial Backhaul” prices

Backhaul						
UCLL Backhaul						
Rental						
Product ID	Price ID	Description	Speed	Step	Price (excl GST)	Price of comparable “commercial” variant
22124	700BN-15	Monthly rental 100Mbps Group 1	100 Mbps	0-5km	\$600.00	\$600.00
22125	700BN-15	Monthly rental 100Mbps Group 2	100 Mbps	6-10km	\$1,100.00	\$1,100.00
22126	700BN-15	Monthly rental 100Mbps Group 3	100 Mbps	11-15km	\$2,181.00	\$2,181.00
22127	700BN-15	Monthly rental 100Mbps Group 4	100 Mbps	16-20km	\$2,586.00	\$2,586.00
22128	700BN-15	Monthly rental 100Mbps Group 5	100 Mbps	21-25km	\$2,938.00	\$2,938.00
22129	700BN-16	Monthly rental 100Mbps Group 6	100 Mbps	>25km	POA	POA
22130	700BN-16	Monthly rental 1 Gbps Group 1	1 Gbps	0-5km	\$1,600.00	\$1,600.00
22131	700BN-16	Monthly rental 1 Gbps Group 2	1 Gbps	6-10km	\$2,100.00	\$2,100.00
22132	700BN-16	Monthly rental 1 Gbps Group 3	1 Gbps	11-15km	\$5,301.00	\$5,301.00
22133	700BN-16	Monthly rental 1 Gbps Group 4	1 Gbps	16-20km	\$6,287.00	\$6,287.00
22134	700BN-16	Monthly rental 1 Gbps Group 5	1 Gbps	21-25km	\$7,142.00	\$7,142.00
22135	700BN-16	Monthly rental 1 Gbps Group 6	1 Gbps	>25km	POA	POA

21. Chorus’ CRT service is available on fibre routes between main centres, i.e. to just over 10% of the number of sites of the higher priced commercial service. While we have not yet surveyed all routes, there are significant differences between regulated and competitive CRT bandwidth availability and prices on the same route. For example,

⁵ The Commission assessed 215 primary routes to unbundled exchanges. As unbundling generally occurred in high density urban areas, we believe it is unlikely that there are a material number of competitive routes in the residual 434 sites not considered by the Commission.

⁶ The ACCC recently cut regulated prices for domestic backhaul services in comparison to the regulated prices it set in 2012. Compared to those prices, the ACCC estimated that average prices for short distance, low capacity services (2Mbps) would decline by 13 percent in metro areas and 22 percent in regional areas, and average prices for long distance, high capacity services (100Mbps) would decline by 76 percent in metro areas and 78 percent in regional areas.

- a. The price for a 1Gbps link between Auckland and Palmerston North, which previously would have been priced at around \$31,000 under regulated pricing, has been reduced by Chorus to \$3000 under competitive CRT pricing but Greymouth the Karamea route remains at around \$19,000 per month; and
 - b. The price for a 1Gbps link between Rotorua and Taupo, which previously would have been priced at \$12,000 under regulated pricing, has been reduced by Chorus to \$700 under CRT pricing but Invercargill to Te Anau is around \$13,000 per month.
22. We expect competitive prices to be cheaper, and Chorus should be encouraged to compete and offer lower prices. However, discrepancies of this nature suggest that regulated prices – based on TSLRIC prices which is intended to signal the efficient prices seen in a competitive market – do not reflect competitive prices we are seeing in practice. The Commission should consider further whether regulated prices should be updated.

How the STD and designated service description in the Act might be updated to ensure it is fit for purpose

23. The paper also sets out that the Commission may consider whether there are reasonable grounds to investigate amending the existing designated services. We support the Commission considering this issue further.
24. The industry does not provide or purchase transmission services on the basis set out in the current designated service and, therefore, the service definition is unlikely capture and remedy competitive and policy issues or support s18 outcomes. For example, the Commission has adopted a transmission market for assessing backhaul competition. The current application specific limitation in the current service description makes no sense, nor is it likely to support efficient innovation and investment in a transmission services market.
25. Ofcom and ACCC have both taken service agnostic approaches when considering transmission services. In its April 2016 statement, Ofcom put mobile backhaul and LLU backhaul in the same leased line market. This was on the basis that they were technically equivalent and faced the same competitive conditions⁷.
26. As noted in the study paper, the Commission should consider amending the service definitions so that they are not tied to a specific technology or assumptions relating to how competition will occur. The service definition, in addition to removing service limitations, should also recognise that backhaul/transmission:
- a. Is acquired in practice as a dark fibre and active service, depending on the circumstances. We prefer to acquire dark fibre for capacity and operational flexibility reasons, but accept this is not always possible;
 - b. Is bundled into different packages and/or made variable, and the regulated service needs to recognise the potential and impact of this bundling. For example, Chorus currently offers tail extension backhaul services as an alternative to the regulated service, i.e. on a per customer rather than capacity basis.
27. The Commission could consider further how the service should be updated. We accept that the Commission would need to look at changes via a Schedule 3 process. However, we don't think this is new regulation as Chorus suggest, this is just redefining the current so that it remains fit for

⁷ For example, see Business Connectivity Market review at 4.610 <http://stakeholders.ofcom.org.uk/binaries/consultations/bcmr-2015/statement/bcmr-final-statement-volume-one.pdf>

purpose. The Schedule 1 review is intended to ensure that regulated services remain necessary and relevant, and an implication of this is that the Commission may recommend service descriptions are updated so that this is the case.

28. We support the Commission investigating amendments to the designated service description as part of the study. However, in parallel, we believe that the Commission should also consider whether current service definitions and non-price terms remain fit for purpose and are promoting s18 outcomes. Update its understanding of backhaul service performance and quality through the study would inform whether a s30R investigation was warranted to consider service performance of the existing regulated service.
29. In the competitive markets we operate in, service performance and SLAs are key attributes of wholesale service offerings. The regulated backhaul services require the same focus as UBA is currently subject to in the ongoing s30R review. In other words, the study should consider appropriate approaches to:
 - a. More capacity options, i.e. so that there are 100Mbps, 1Gbps and 10Gbps options. A 100Gbps service would prove a degree of future-proofing. Further, the RSP choice of dark fibre or bandwidth constrained service options should be based on relative economics rather than artificially limited;
 - b. Commitments - rather than best endeavours - relating to the cost and time to install additional links. Further, repeated activities should be on a fixed rate card where possible;
 - c. The non-price terms should promote efficient operations, i.e. by creating SLAs for restore and provisioning (there are no SLAs in the current arrangements); and
 - d. Reduce RSP cost and uncertainty relating to third party fibre access to exchanges for interconnect purposes, i.e. to promote competitive provision of backhaul services.

Questions

Technical features of backhaul/transmission services

- 1. In your view, have we adequately defined the scope of our domestic backhaul services study? Please explain your view.**

Generally, we agree with the approach taken by the study. The technical elements discussed highlight the importance of lifting the analysis to a level that it exposes the economic and regulatory implications of backhaul service. For example, as set out above, backhaul is a critical key input to providing telecommunications networks and the nature of traffic suggests that competition issues can arise.

- 2. Do you agree with the geographic classification for domestic backhaul services? Please explain any proposed changes.**

The general categories within the paper make sense for the purposes of the study.

In terms of taking the study forward, we believe the focus should be on intra-regional routes as this appears to be where regulatory and competition issues are likely to arise. The main routes between centres are highly competitive, delivering expected investment and innovation outcomes.

- 3. Please comment on backhaul technologies. In particular, in your view:**

- (i) have we overlooked any current or emerging backhaul transmission technologies at any layer?**
- (ii) are there any material technological or geographical constraints on where the technologies could not be used to provide backhaul services?**
- (iii) is Ethernet becoming the default technology of choice for backhaul services from main trunk to metropolitan? If so, why?**

While different technologies and interfaces are offered as set out in the paper, generally backhaul is purchased as capacity or as dark fibre. Operators generally prefer to acquire dark fibre for capacity and technical reasons, but recognise that this will not always be economic. It's an economic choice. Generally, modern technologies support a range of interfaces and this means that, in practice, operators will purchase capacity and then fit the interface to what is available.

In terms of the degree to which the specific technologies listed in the paper are used in practice:

Layer 1 technologies

- a) Digital Microwave Radio (DMR) technology is usually currently used to deliver an ethernet connection. We have deployed DMR (and other operators are likely to as well) as a platform for an ethernet backhaul service;
- b) Dark Fibre is commonly used for backhaul and ethernet equipment installed;
- c) DWDM is possible but would technically be difficult to operate. Technical difficulties include the need to precisely shape wavelength to fit the allocated channel band and not to interfere with adjacent bands, and the power level has to be controlled precisely to avoid impacting shared amplifiers. We do not support this capability in our network;

Layer 2 technologies

- d) SDH/SONET is a legacy technology primarily used for PSTN trunk purpose, and looking forward operators are unlikely to want to use it for backhaul. It has limited capacity (up to 10Gbps). Chorus backhaul product is specified independently of the delivery technology – there is no specific SDH offering;
- e) MPLS is unlikely to make sense in this context. It is a protocol layer used for network virtualisation to provide separation between virtual network and services. It can be used to deliver ethernet services. As far as we know, no operator offers an MPLS service or interface; and
- f) Ethernet is used as an interface or service and is the dominant form of backhaul service (but not as a transport technology).

Additional technology options include:

OTN, digital and DWDM transport can be used to deliver a range of services, including:

- a) Switched ethernet - same as any other switched ethernet service with packet switching and multiplexing (part of the packet over transport trend) just a different tech/platform to do it;
- b) Transport Ethernet - point to point transport of ethernet on dedicated capacity. This is different from switched ethernet services in that it is carried perfectly transparently. It is transport of ethernet bits not ethernet frames. We sell these and use them all the time.
- c) OTU transport is the digital equivalent of a DWDM wavelength. The customer presents a base band digital signal and the provider handles the optical encoding, channel management and all the associated gnarly analogue functions.

4. We invite comments on the regulated backhaul services. We are particularly interested in your view on whether the choice of backhaul transmission service depends in any way on the type of traffic that is to be conveyed ie,

(i) whether transmission requirements for UCLL differ from those for UBA, whether transmission requirements for UCLL differ from those required for mobile backhaul; and any other relevant potential application for domestic backhaul services;

(ii) what bandwidth options are required to meet future demand?

As noted above, we purchase commercial tail extension, dark fibre and bandwidth constrained services for backhaul purposes (in addition to providing our own capability).

Overall, we don't differentiate between applications (we are acquiring fibre or bandwidth) although the interface or service might differ. Our preference is always to purchase dark fibre as it offers bandwidth options and is more flexible.

Generally, in terms of a bandwidth service, we believe operators are best served by a generic Ethernet backhaul product available in 100Mbps, 1Gbps and 10Gbps options. A 100Gbps service would prove a degree of future-proofing.

The regulated service distinctions in our regulatory framework do not appear to be commonly applied for regulatory or competition purposes, if at all. For example, the Commission applies the regulated backhaul competition test in the context of a transmission market (reflecting how the capability is typically sold or purchased), and Ofcom and the ACCC do not make application specific distinctions in its competition and regulatory analysis.

5. We are also interested in your view on whether there are backhaul services which are not subject to competition that should be regulated? Please explain how your view is consistent with the section 18 purpose statement.

We think the current regulated service should be updated so that its service and technology agnostic, and the best way to do this could be to consider it as dark fibre and transmission service variants (reflecting the competition test and overseas regulatory approaches).

Regulation should only apply where competition is limited. Section 18 directs the Commission to promote efficient outcomes, and those that we'd see in a competitive market.

We haven't completed the study and do not have a firm view, but the section 18 promoting considerations would likely include:

- a) Efficient wholesale and end user prices that promote the end user uptake of telecommunications services;
- b) Promoting investment and innovation by access providers through reduced uncertainty relating to the provision and price of backhaul services;
- c) Efficiency gains through a technically up to date regulated service, and better aligning price and service performance;
- d) Foster innovation of backhaul service by, for example, permitting wholesale providers to construct and offer competing tail extension services; and
- e) Promoting technical efficiencies by clarifying that bandwidth can be shared by multiple services. The Commission's competition test assumes RSP can aggregate multiple traffic streams, however clarifying would reduce uncertainty.

6. Have we adequately captured and described the local access nodes which are of interest to access seekers and network operators? If not, what additions, or alterations would you recommend?

The access node options set out at paragraph 30 appear to cover the options. Increasingly, the starting point is likely to be wireless access sites.

Understanding supply of backhaul services

7. We invite any comments on the existing suppliers of domestic backhaul services. We are particularly interested in the following:

- (i) the extent to which existing suppliers self-supply backhaul services; and
- (ii) any major changes that recently occurred, or are expected to occur in the foreseeable future, in the provision of domestic backhaul services?

We self-supply when it is economic to do so and expect to continue doing so, deploying our own fibre when economic. At this stage, we have built out to around 255 sites and acquire backhaul to to residual 689 Chorus sites⁸.

⁸ We have yet to clarify reasons for the difference to the [649] nodes referred to in the Commission's 2012 competition assessment. This is different to our estimate – we believe this is likely to be because our estimate includes notional exchanges.

The wholesale market is starting to offer 100Gbps options on core routes. For example, Chorus has indicated that will offer a 100Gbps variant on its CRT network.

8. We also invite comments on expansion conditions in the provision of domestic backhaul services. We are particularly interested in:

- (i) any factors that could impede expansion in the provision of domestic backhaul services;**
- (ii) whether excess capacity is available, and where;**
- (iii) whether there is a lack in capacity for backhaul services such as mobile backhaul services**
- (iv) and how long expansion to add capacity incrementally takes.**

There are significant costs to add new coverage – the key conditions being aggregating sufficient demand, securing access to Chorus sites, and upgrading of supporting core network infrastructure. In regional areas where there are fewer end customers and, accordingly, less aggregate bandwidth required from which to recover costs. The key issue is whether competition is limited, and whether pricing is efficient for the site.

Operators are investing to meet demand and, in terms of the core network between main centres, we're not aware of capacity limitations. We invest to add capacity as required. In terms of the time to add capacity, this can take somewhere between minutes (to turn up a port on a transponder) and a year to plan and lay new fibre.

Finally, it's unclear whether the possible WAN service offering set out at paragraph 39.2 is intended to be a technical or pricing construct. We are not sure the configuration is technically feasible where collection and backhaul functions are in the same domain, but is likely to be a feasible pricing construct.

Understanding how backhaul services are supplied

9. Please explain

- (i) to what extent are transmission services currently supplied on a link-by-link basis, and to what extent is transmission services supplied as a national service?**
- (ii) what are the drivers to supply backhaul services as a national service rather than the traditional link-by-link basis?; and**
- (iii) whether there is a developing trend towards supplying domestic backhaul on the basis of a national service rather than on a link-by-link basis**

Backhaul services are generally provided on a link by link basis, and Chorus also offers tail extension services on a per customer basis.

It's difficult to see the whole market trending towards a national domestic backhaul service, and Chorus is the only provider that could provide such a service. Where we provide a national service this is based on a combination of our own network, and inputs from other providers such as Chorus. The degree to which Chorus can bundle regional route prices in to national pricing is a competition risk and issue.

10. In the instance when a RSP requires a national deal from a non-Chorus provider, would that non-Chorus provider have to deal with Chorus to provide transmission capacity on a national level?

In practice, other wholesale providers would need to obtain regional backhaul from Chorus to offer a national service. A number of providers can offer a national service – i.e. Vocus, Vodafone and Spark – but in practice this would need to be augmented by a Chorus backhaul service (whether this was regional links or tail extension service).

11. In your view, what is the likely impact of RBI and UFB on backhaul services eg, demand, supply, capacity, coverage and price?

The Government has ambitious targets that by 2025 99 per cent of New Zealanders are able to access broadband at peak speeds of at least 50 Mbps. This will require significant increase in backhaul capacity.

It's unclear what the final RBI and UFB impact will be. For example, we expect that increased demand will provide an incentive to build supporting backhaul coverage and capacity, and that that this will occur within existing coverage and to extend the network. Whether it is viable for other operators to do this will, in part, depend on the terms and conditions for access to existing Chorus backhaul.

Understanding demand for domestic backhaul services

12. In your view, what non-price service attributes are important to demand for domestic backhaul services? Please explain your reasons.

This will be operator specific. Our preference is to acquire dedicated capacity that can be utilised efficiently across all services.

The key attributes that operators would likely focus on are:

- a) Service characteristics relating to network robustness, guaranteed bandwidth, contended/uncontended service, speed and latency (all of which impact the price);
- b) Options to provide path diversity. This could be for own network resilient or, for example, for wholesale customers seeking diversity between data centres;
- c) Service performance - agreements around provisioning, restoration processes and response times. For example, we seek to meet provisioning targets demanded by our international customers. Currently, we are not meeting a 40 day provisioning SLA from a significant international carrier approximately 80% of the time when relying on a Chorus link. For domestic customers, we now forecast 10 to 12 weeks provisioning times when we rely on a Chorus link to provide the end to end service (up from 6 to 8 weeks); and
- d) A logical pricing structure, i.e. relationship between install costs for 1Gbps and 10Gbps handovers.

13. In your view, what are the major recent changes and expected changes in the foreseeable future in the demand for domestic backhaul services?

Increasing bandwidth requirements to support data growth. The upgrading of access networks – i.e. RBI, additional 4G capacity and roll out of 5G networks – will all add to demand for domestic backhaul.

Further, operators are offering higher capacity transport options on main routes. For example, Chorus has announced that it will offer a 100Gbps option on its CRT network. We expect that larger customers will migrate to 100Gbps speeds as demand for data grows.

14. For each of the options described, we invite comments, and evidence to support your comments, on:

- (i) whether you agree with our description of the options available to purchase domestic backhaul;**
- (ii) in your view, what drives the choice of each option;**
- (iii) the differences (if any) in the customers buying each of the options;**
- (iv) In your view what relative share of the backhaul market is purchased under each of the above options?**

Like most operators we will deploy the lowest lifetime cost backhaul capacity, and this is a combination of build versus lease.

Spark wholesale offers include⁹:

- a) **Data Transport Service.** We have invested significantly in our core networks and built our new Optical Transport Network (**OTN**). DTS is a carrier grade, point-to-point data transfer solution productised from the underlying OTN capabilities and used for connecting customer sites (e.g. Offices, Data Centres, Exchanges) at agreed speeds and performance standards;
- b) **Carrier Ethernet Service.** A Layer 2 Carrier Ethernet Service using OTN. Carrier Ethernet is a suite of carrier grade, switched Layer 2 managed data services that can deliver connectivity between customer sites as point-to-point, point-to-multipoint, or meshed/multipoint-to-multipoint solutions;
- c) **Wholesale National Transport Service.** A robust and reliable high speed transport service that provides dedicated bandwidth; and
- d) **National P2P Backhaul and Handovers.** P2P Backhaul is for service providers who require a robust and reliable high speed Ethernet backhaul service that provides dedicated bandwidth

These services are delivered over the Spark network or, where purchased as a national service, we purchase transmission from other operators such as Chorus.

For operators, domestic backhaul options are largely driven by price, network reach and customer demand.

Understanding how domestic backhaul services are priced

15. Explain whether pricing structures are moving away from the traditional pricing model. If so, please explain the new alternative pricing structure(s) and the rationale for adopting new pricing structures.

Pricing structures are currently based on a combination of install price, bandwidth, access type and distance combined with the term of contract.

⁹ See our wholesale website for detailed service descriptions.

The primary pricing structures relate to pricing on a location to location basis, and tail extension per end user options. Pricing may also be influenced on a total solution basis rather than component pricing basis as wholesale service providers start to see more competitive pressure from service aggregators and others competing in the traditional wholesale market.

16. In your view, what are the drivers of the significant drop in commercial backhaul prices in New Zealand?

The significant drop in commercial backhaul prices is likely a combination of:

- a) The intensification of competition on a greater number of existing routes. These are the primary transport routes and metropolitan fibre areas. We are not aware of material price reductions outside these competitive areas (particularly intra-regional routes); and
- b) The introduction of new technologies and the investment in fibre backhaul by all market participants. An example of new technology is the implementation of the OTN which represents the current state of the art for providing domestic backhaul services.

Chorus has responded to competition from other providers, reducing prices on the competitive main routes. For example, Figure 3 compares price options on a sample of routes. The unregulated service is priced at the same as regulated UCLL/UCLFS backhaul. These prices are significantly higher, on a same route basis, than the competitive CRT service.

Figure 3: Sample of CRT prices compared to the “Commercial” service¹⁰

Site 1	Site 2	Speed	CRT	Commercial
Auckland	Palmerston North	100Mb/s	N/A	\$12 594.48
		1G	\$2 940.00	\$30 618.24
		10G	\$4 200.00	N/A
		100G	\$31 500.00	N/A
Gisborne	Napier	100Mb/s	N/A	\$7 233.00
		1G	\$2 417.69	\$17 584.00
		10G	\$3 453.84	N/A
		100G	\$25 903.80	N/A
Rotorua	Taupo	100Mb/s	N/A	\$4 955.00
		1G	\$705.16	\$12 047.00
		10G	\$1 007.37	N/A
		100G	\$7 555.28	N/A
Whangarei	Mangawhai	100Mb/s	N/A	\$4 407.00
		1G	\$671.33	\$10 713.00
		10G	\$959.04	N/A
		100G	\$7 192.80	N/A

Further, in July 2015 Chorus announced reduced prices for its ICAT service (rebranded as CRT) in response to competition from other operators (Figure 4).

¹⁰ Commercial refers to Chorus’ unregulated transmission service.

Figure 4: Chorus sample comparison of ICATs and CRT prices¹¹

Comparison - ICATs 10Gb existing pricing

Site	Whangarei	Auckland	Hamilton	Rotorua	Tauranga	Palmerston North	Wellington	Nelson	Queenstown	Christchurch	Dunedin	Invercargill
Whangarei	-	8,300	13,550	15,650	16,700	24,050	27,200	-	-	-	-	-
Distance Kilometres		131	244	318	274	526	618					
Auckland	-	-	7,250	12,500	10,400	17,750	21,950	-	-	-	-	-
Distance Kilometres			113	394	155	395	491					
Hamilton	-	-	-	10,400	8,300	20,900	27,200	-	-	-	-	-
Distance Kilometres				94	78	286	390					
Rotorua	-	-	-	-	4,100	19,850	25,100	-	-	-	-	-
Distance Kilometres					49	252	371					
Tauranga	-	-	-	-	-	21,950	27,200	-	-	-	-	-
Distance Kilometres						299	415					
Palmerston North	-	-	-	-	-	-	7,250	-	-	-	-	-
Distance Kilometres							152					
Wellington	-	-	-	-	-	-	-	-	-	-	-	-
Nelson	-	-	-	-	-	-	-	25,100	24,050	25,100	30,350	-
Distance Kilometres								562	257	559	695	
Queenstown	-	-	-	-	-	-	-	-	23,000	17,750	9,350	-
Distance Kilometres									358	172	155	
Christchurch	-	-	-	-	-	-	-	-	-	16,700	25,100	-
Distance Kilometres										311	466	
Dunedin	-	-	-	-	-	-	-	-	-	-	10,400	-
Distance Kilometres											177	
Invercargill	-	-	-	-	-	-	-	-	-	-	-	-

10 Gb new pricing

Site	Whangarei	Auckland	Hamilton	Rotorua	Tauranga	Palmerston North	Wellington	Nelson	Queenstown	Christchurch	Dunedin	Invercargill
Whangarei	-	2,101	3,908	4,200	4,200	4,200	4,200	-	-	-	-	-
Auckland	-	-	1,811	3,096	2,480	4,200	4,200	-	-	-	-	-
Hamilton	-	-	-	1,495	1,246	4,200	4,200	-	-	-	-	-
Rotorua	-	-	-	-	788	4,033	4,200	-	-	-	-	-
Tauranga	-	-	-	-	-	4,200	4,200	-	-	-	-	-
Palmerston North	-	-	-	-	-	-	1,991	-	-	-	-	-
Wellington	-	-	-	-	-	-	-	-	-	-	-	-
Nelson	-	-	-	-	-	-	-	4,200	4,105	4,200	4,200	-
Queenstown	-	-	-	-	-	-	-	-	4,200	2,746	2,485	-
Christchurch	-	-	-	-	-	-	-	-	-	4,200	4,200	-
Dunedin	-	-	-	-	-	-	-	-	-	-	2,827	-
Invercargill	-	-	-	-	-	-	-	-	-	-	-	-

However, we haven't seen similar price reduction on intra-regional routes. A key study issue is how competitive benefits can be replicated on routes where competition appears to be limited.

The OECD has commented on the distinct competitive conditions between main transport and regional routes. The Initial Pricing Principle for the regulated backhaul services is benchmarking of comparable countries that use a forward-looking cost based pricing methodology. In this regard, we note that the OECD stated in its 2014 report *International Cables, Gateways, Backhaul and International Exchange Points*, that

"It is very challenging to compare the regulated wholesale prices across countries. This is because regulators use different methodologies in setting prices and ISPs may buy core network connectivity between major cities from a different network than the connectivity into smaller towns, which they need to buy from an incumbent operator."

This means, as the OECD commented in its 2014 report, that it can cost more to reach locations outside major cities in OECD countries, and in many instances, as in New Zealand, only the incumbent network provider can provide access to those locations. Despite the difficulties in comparison and comparability, the OECD concluded that there were available indications for regulators of the costs of backhaul.

The OECD concluded that overall, the inter-city backhaul market in most OECD countries meets the market requirements. On the face of it, competition is unlikely to be limited on the main routes.

¹¹ See Chorus product description <https://customer.chorus.co.nz/chorus-regional-transport/pricing-2/pricing-11>

It is in the smaller cities and towns, and in rural regions that there is limited or no competition. This is consistent with the finding by the OECD in 2014 that across the OECD area, regulators have found that there is a position of dominance with incumbent operators supplying regional backhaul. It is on these intra-regional routes, where there is no or only limited competition that we have seen no material price reductions, and where Chorus continues to charge the regulated prices.

Observable trends in regulated and commercial backhaul

The discussion paper also surveys recent overseas regulatory pricing decisions. We agree, these would indicate that New Zealand regulated prices may no longer be efficient.

Regulated prices for domestic backhaul services in New Zealand were set in 2008 (Decisions 626 and 627 for UCLL and UBA respectively), and for sub-loop backhaul in 2009 in Decision 672. There is some evidence to suggest that regulated prices are out of date. The Commission has noted from paragraphs 51 onward in the discussion document that since 2008 the domestic backhaul prices for the benchmark countries used at that time have shown a declining trend.

The Commission refers to evidence from BT Openreach to illustrate the level of decline in that jurisdiction. In 2014, the OECD¹² noted that over the preceding decade, the backhaul market had undergone consolidation and rationalisation across the OECD area with a resulting increase in capacity and decline in prices of backhaul connectivity. The OECD report specifically identifies Australia and many countries in the European Union area as examples of this. The Commission's data is consistent with the observations made in the OECD's 2014 report.

The Commission also notes at paragraph 52 that the ACCC recently cut regulated prices for domestic backhaul services in comparison to the regulated prices it set in 2012. Compared to those prices, the ACCC estimated that average prices for short distance, low capacity services (2Mbps) would decline by 13 percent in metro areas and 22 percent in regional areas, and average prices for long distance, high capacity services (100Mbps) would decline by 76 per cent in metro areas and 78 percent in regional areas.

Australian price reviews

In the following paragraphs, we examine the use of benchmarking, supported by regression analysis in Australia in the 2012 and the 2016 Final Access Determinations taking into account, the OECD comment that *"[i]t is very challenging to compare the regulated wholesale prices across countries, because regulators use different methodologies in setting prices"*.

An independent report in 2012 provides some comparison of Australian and New Zealand domestic backhaul pricing at that time and provides some qualitative comparison behind the likely cost differences in the two jurisdictions. Similarly, there is evidence from the Australian Productivity Commission that the cumulative distribution of sub-national population density in Australia is comparable to that in New Zealand.¹³ This suggests that the distance and capacity requirements for domestic backhaul required to serve the populations in both countries are likely to be broadly similar in relative scale (but not in actual comparison).

We agree with the ACCC finding in the 2016 FAD that the primary price determinants for domestic backhaul are capacity and distance, with a non-linear relationship to price, but notes

¹² "International Cables, Gateways, Backhaul and International Exchange Points", at page 17, OECD Digital Economy Papers, No. 232, OECD (2014), OECD Publishing. <http://dx.doi.org/10.1787/5jz8m9jf3wkl-en>

¹³ Cribbett, P. 2000, *Population Distribution and Telecommunication Costs*, Productivity Commission Staff Research Paper, AusInfo, Canberra, August. Figure 3.4 at page 20 and 3.5 on page 21.

that the Australian regression parameters and non-linear price relationship in the regression equation(s) underpinning the ACCC decision would likely differ from the corresponding New Zealand parameters and relationships.

We conclude below, that the ACCC process, while confirming the Commission's view that New Zealand backhaul prices will likely have declined since 2008, does not of itself provide a complete indication of the scale of that change.

Australia's use of regression analysis to support benchmarking in 2012

In Australia, the 2012 decision on the DTCS pricing used a domestic benchmarking approach which assumed that prices in competitive areas and on competitive routes were reflective of the costs of supplying efficient services in the Australian market. The 2012 FAD set prices for a one year period for a standalone DTCS service based on a regression model to support and inform the benchmarking approach used in that decision. In a report dated 30 May 2012, Market Clarity reviewed ISP costs in Australia and New Zealand¹⁴.

Independent backhaul cost comparisons between Australia and New Zealand in 2012

Market Clarity noted that Australia had "a more contested market for domestic backhaul, at least in capital cities" but this was offset by greater distances. Despite some concerns with the data available they noted that the significant difference in backhaul pricing might represent lower raw costs for domestic backhaul, (due to the smaller land mass of New Zealand as compared to Australia), and/or to lower domestic capacity purchased to support customers. They also noted that ISPs might spend less on domestic backhaul from a lower average revenue per user due to the non-price terms and conditions of the incumbent offering those services. At paragraph 5.2.1 of their 2012 report, Market Clarity noted that New Zealand respondents to their study identified domestic backhaul costs as a constraint on traffic growth¹⁵.

ACCC's 2016 Final Report

As the ACCC noted in its April 2016 Final Report on the DTCS, the primary price determinants are capacity and distance, with a non-linear relationship to price. The econometric analysis on which the ACCC decisions were based built a regression model, including participation by and engagement with stakeholders and industry experts, that provided the best explanation of observed commercial prices on competitive routes, (and hence assumed cost reflective prices).

We agree with the Commission, however that there is sufficient qualitative and quantitative evidence available to confirm that there is a declining price trend in competitive domestic backhaul prices. Spark is clear that the evidence of decreased prices since the 2008 benchmarking process means that the regulated prices set at that time should now be reviewed in line with international trends. In addition, noting the comments made by Market Clarity referred to above, we believe that non-price terms should be considered in any such review to ensure that the overall backhaul service package pricing is cost reflective.

17. Are you concerned about any pricing behaviour in the provision of backhaul that may raise potential competition concerns?

¹⁴ *Understanding the Trans-Tasman Broadband Value Gap: ISP Costs in Australia and New Zealand*, Market Clarity, 30 May 2012 at section 4.5

¹⁵ Market Clarity noted the caveat that while it held considerable benchmark data for raw purchase prices for backhaul in Australia, it did not hold similar data for New Zealand, and that New Zealand study respondents were reluctant to divulge price data on this and other wholesale telecommunications services.

As noted above, the evidence shows that Chorus is competing strongly on specific backhaul routes as competitive entry takes place. Chorus should be permitted to compete.

Competitive entry tends to take place on those routes where the actual or expected level of backhaul traffic makes it commercially viable to build sufficient capacity. In general, it will always be difficult accurately to identify pricing behaviour which is inconsistent with the economic efficiency objectives of the Act, and under the relevant determinations, and to differentiate it from appropriate competitive or strategic pricing behaviour.

It does of course cost more to reach more dispersed locations outside New Zealand's major cities and larger towns from a regional interconnection point of presence. The build out to a regional point of presence from these locations is more expensive and the roll-out of competing backhaul networks is less commercially viable, even with lower technology costs. In addition, the investment risk is greater for a competitor even if the backhaul investment required would open access to RSPs and potentially also mobile networks.

The RBI investment has of course gone some way to addressing this need, but even where higher capacity backhaul links have been provided, it is still these locations which are predominantly served by Chorus or RBI investment leaves funded fibre as an island within the wider Chorus network (and less suitable for competing build).

Given the evolving nature of the market, it is always going to be difficult to determine competitive behaviour from strategic pricing behaviour intended to deter investment. Accordingly, without seeking to limit the Commission's other options, we believe the best approach at this stage is for the Commission to ensure that regulated prices reflect efficient TSLRIC costs, minimising Chorus' incentive for strategic pricing behaviour and potential for inefficient entry. The ACCC approach is one way to ensure that prices on routes lacking competition reflect competitive conditions.

18. Please provide evidence on any price differentials between routes that you would deem to be competitive and uncompetitive.

See above. There are significant differences between the regulated price and Chorus' competitive CRT price on competitive routes. However, we expect wholesale customers would migrate to the cheaper service on competitive routes. In other words, in practice, Chorus is unlikely to sell both services on the same route. Further, the regulated price is unlikely to be an efficient price.

Therefore, it's difficult to compare on the basis of unadjusted pricing data alone what the impact of with and without competition on a specific route is. This requires a fuller review of the critical cost factors currently prevailing in the efficient provision of backhaul services using current technologies, together with the appropriate associated non-price terms, to identify uncompetitive routes with any confidence. In general, however, we would imagine that any routes which are not subject to competition, and for which Chorus continues to charge the regulated price are likely to exhibit a upward price differential from a current cost based price for the same service.

Assessment of competition for the supply of domestic backhaul services

19. We invite views on the criteria for assessment of competition for domestic backhaul services. We are particularly interested in your view on

- (i) the most appropriate criteria that should be used in future competition test assessments, and also what criteria should remain intact;**
- (ii) how far is close enough to a Chorus exchange to be a competitive constraint on Chorus and why?**

The purpose of the competition test is to identify routes where competition is not limited. We support the Commission continuing to take a geographic or route by route basis as, on the face of it, this best exposes the supply and demand side dynamics of the market. The Commission's current approach applies practical "rules of thumb" in order to identify where competition might be limited. We support the approach as a reasonable means of simplifying ongoing competition tests.

In the past, the Commission's approach to the competition assessment has relied on evidence satisfying four criteria, and within that a near entrant test. A backhaul link should be deregulated where the following criteria confirm that the link is competitive:

- a. The absence of any other market conditions which might prevent effective competition.
- b. Whether a nearby fibre-based network should be considered a competitive constraint, and whether the operator has publically stated that it does not intend to offer services to or from the relevant local exchange.
- c. Chorus is not likely to face lessened competition.
- d. The presence of any additional market conditions present that may prevent effective competition from developing. The Commission's example suggests that one such condition might be the absence of an appropriately specified and priced service that allows alternate backhaul providers to aggregate backhaul traffic from multiple access seekers from inside the exchange.

Additional considerations within these criteria could include:

- a. The viability of new entrants investing in transmission facilities. For instance, if reasonable access to facilities, such as (but not limited to), ducts controlled by another market participant is not available, there might well be an additional entry barrier for a near entrant; and
- b. As applied by the ACCC in its competition assessment, consideration of:
 - i. Whether there is sufficient current and expected future demand to attract new investment and entry, and secondly, an assessment of the level of price competition. We see these two matters as crucially linked to the issues of contestability which sit around the near entrant test; and
 - ii. The level of price competition on the particular route; and
- c. The expected level of demand on that link. The Commission should make explicit provision for current and expected future demand for backhaul services on the link or links under consideration, i.e. the probability that a near entrant can both make and sustain successful entry.

END
