

Bitstream access: comments on the draft determination

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1 Introduction

In response to the Commerce Commission's *Draft determination on the application for determination for access to and interconnection with Telecom's fixed PDN service 'Bitstream access'* (21 April 2005), TelstraClear has requested that Network Strategies provide comments on various aspects of the Commission's analysis.

After this introduction, this report discusses:

- whether there should be differential pricing between residential and business services (section 2)
- imputation of access prices from retail prices (section 3)
- removing transmission-related charges from retail prices (section 4)
- a summary of our findings (section 5).

Please note that the views contained in this report are entirely those of Network Strategies.

2 Differential business and residential pricing

The Commission has imputed separate residential and business wholesale prices. The validity of this approach rests upon the assumption that we are dealing with prices differentiated by market. Network Strategies has examined the wholesale bitstream ATM access markets in a number of jurisdictions¹ and has not found any operator which charges different prices for the same product depending on whether end users are business or residential customers. At the same time it is apparent that certain product offerings are designed for different end-user segments (typically the contention ratio – for example BT's Home and Office offerings with contention ratios of 50:1 and 20:1 respectively).

A summary of the pricing of bitstream ATM access products is provided in Exhibit 1 below. The pricing of bitstream ATM access products in all jurisdictions in our sample is

¹ Australia (Telstra), Belgium (Belgacom), France (France Telecom), Ireland (eircom), Italy (Telecom Italia), Netherlands (KPN), Norway (Telenor), Spain (Telefónica), United Kingdom (BT).

based on parameters (contention ratio, bandwidth, etc) which are defined either by the incumbent or by the new entrant.

If we take Telstra as an example there are two Broadband DSL Layer 2 products:

- Internet Grade (with Protected and Growth pricing options)
- Business Grade.

The Internet Grade Protected pricing option is based on retail-minus pricing. The Growth option was introduced to encourage the take-up of higher bandwidth services, is not based on retail-minus pricing, and is used as the basis for most OLO offerings. We understand that the only difference between Internet Grade and the Business Grade products is that the latter allows for provision of quality of service (QoS) guarantees and higher bandwidth (up to 6Mbit/s downstream and 640kbit/s upstream). However, detailed specifications and pricing information are not published on the Telstra Wholesale website.

Operator	Pricing principle	Pricing structure							
		Differentiated pricing	Contention ratio	POTS dependent	Bandwidth	Distance	Usage	End user volume discount	Other OLO-defined
<i>Telstra</i>									
Internet Grade Protected	Retail-minus	x	x ¹	x	✓	✓	✓	x	✓
Internet Grade Growth	n.a.	x	x ¹	x	✓	✓	✓	x	✓
<i>Belgacom</i>									
xDSL Wholesale	Retail-minus	x	x	x	✓	x	x ²	✓	x
Bitstream	Cost-oriented	x	x ¹	x	✓	✓	x	x	✓
<i>France Telecom</i>									
ADSL Connect ATM	Cost-oriented	x	x ¹	x	✓	x	x	x	✓
Turbo DSL	Cost-oriented	x	✓	x	✓	✓	x	x	✓
<i>eircom</i>									
Bitstream	Cost-oriented	x	x	x	✓	✓ ³	x	x	x
<i>Telecom Italia</i>									
Wholesale ADSL lite pay-per-use	Retail-minus	x	x	x	x	x	✓	x & ✓ ⁴	✓
Single access flat-rate ADSL wholesale	Retail-minus	x	x ¹	x	✓	x	x	x	✓
ADSL wholesale	Retail-minus	x	✓	x	✓	x	x	✓	✓
<i>KPN</i>									
Bitstream Access	Partly regulated ⁵	x	✓	✓	✓	✓	x	✓	✓
<i>Telenor</i>									
Jara ADSL	Regulated	x	x ¹	✓	✓	✓	x	x	✓

1 The contention ratio is a function of the number of end users and the bandwidth chosen from the DSLAM to the ATM PoP.

2 These products have usage limits beyond which the bandwidth will be reduced to 64kbit/s.

3 Some of the products have bundled ATM transport.

4 Per-line and batch pricing options.

5 KPN is under the obligation to provide non-discriminatory access for bitstream services which are used to support high quality IP-services for the (corporate) business market.

Exhibit 1: Summary of bitstream ATM access pricing for selected operators [Source: Network Strategies]

Operator	Pricing principle	Pricing structure							
		Differentiated pricing	Contention ratio	POTS dependent	Bandwidth	Distance	Usage	End user volume discount	Other OLO-defined
<i>Telefónica</i>									
gigADSL	Regulated	x	x ¹	x	✓	x	x	x	✓
<i>BT</i>									
Datastream	Retail-minus ⁶	x	x ¹	x	✓	✓	x	✓	✓

6 Based on the price difference between Datastream and the upstream IP connectivity product (IPStream).

Exhibit 1 (cont.): Summary of bitstream ATM access pricing for selected operators [Source: Network Strategies]

3 Imputing retail access prices

The Commission's analysis of Telecom's retail prices assumes that those prices consist of an access price, which is constant across all service offerings, plus a traffic-related price, corresponding to the data cap. We note that pricing strategies – especially for unregulated services – may be far more complex than being purely cost-based. While covering costs is the usual objective (at least in the medium to long term), other aims that may influence pricing include:

- increasing market share, either for the total market or for particular market segments – this generally sees prices for the product (or one particular service offering within the product range) being priced at low margins, or as a loss leader
- positioning the services relative to other products and services offered by the operator or its competitors
- creating some perceived additional value for consumers, and pricing at a premium that reflects this perceived value
- maximising profit (pricing what the market will bear).

If the pricing principle being used for wholesale products is pure ‘retail-minus’ then the above retail pricing strategies will be embedded within the resultant wholesale prices. While there are certainly many advantages with the retail-minus approach, there are also a number of well-known criticisms. Retail-minus does not result in efficient prices if retail prices are not competitively set or regulated at near competitive levels². The key question is whether certain prices should be excluded when imputing the access price, for example loss leaders or exorbitantly priced services. Price selection needs to be based on whether the inclusion or exclusion of a particular price would be viewed as anti-competitive.

Exclusion of loss leaders from the retail-minus approach could be seen as facilitating potential for a retail price squeeze or predatory pricing and must be discouraged. Furthermore, as outlined below, international benchmarking indicates that Telecom’s retail broadband pricing is unlikely to be below cost.

While we believe that potential loss leaders should remain within the analysis, the inclusion of exorbitantly priced plans may lead to an anti-competitive result. Thus, we should consider whether any of Telecom’s plans fall into this category.

Benchmarking is often used to assess whether prices may be considered excessive. The Ministry of Economic Development (MED) found that the price of residential broadband ‘compares well with the OECD average’³. However, this analysis was for the lowest price residential plans for 3Gbytes data volume in each country and does not adjust for the different characteristics of the various plans. The optimal residential plan, which we assume to be Telecom’s Xtra Broadband Explorer, provides only 256kbit/s downstream, yet the price is stated as being comparable with services of higher bandwidth, no data caps, and no speed constraints. For business plans, the MED found that Telecom’s prices are well above OECD averages:

The price of business quality broadband service is significantly above those in the other OECD countries. For low data usage (~3GB per month) Telecom New Zealand’s price was

² Case Associates (2003) *Remedies under the new EU regulation of the communications sector*, report for the European Telecommunications Network Operators’ Association, 20 June 2003.

³ Ministry of Economic Development (2004) *Benchmarking the comparative performance of New Zealand’s telecommunications regime*, 30 June 2004.

~80% above the 17 OECD country average, for medium data usage (~5 GB per month) it was ~160% above the 17 country OECD average. [paragraph 24].

In our own recent comparison of prices for retail ADSL services we found that amongst a sample of incumbent operators, Telecom has the fourth most expensive low end plan, yet the higher priced services are clearly superior to that offered by Telecom, either in terms of bandwidth or a more generous data allowance (Exhibit 2). In addition, most of the lower priced services appear more feature-rich than Telecom's low end plan.

	<i>Downstream speed (kbit/s)</i>	<i>Upstream speed (kbit/s)</i>	<i>Price (NZD-PPP)</i>	<i>Monthly usage limit (Mbytes)</i>	<i>Excess usage charge (NZD per Mbyte)</i>
TDC	256	128	18.61	0	0.07
KPN	416	160	30.04	1500	n.a.
Telstra	256	64	30.56	200	0.15
TeleSonera	250	64	33.90	unlimited	n.a.
BT	512	256	34.63	1000	<0.01
France Telecom	512	128	35.32	unlimited	n.a.
Belgacom	512	128	42.04	400	0.01
Telecom New Zealand	256	128	44.40	1000	n.a.
Telenor	704	128	46.92	unlimited	n.a.
eircom	512	128	56.40	4000 (down) 1000 (up)	0.05
Telefónica	256	128	74.69	unlimited	n.a.

Exhibit 2: *Comparison of low end residential plans for selected incumbent operators*
[Source: Network Strategies]

We therefore find that based on international benchmarking, Telecom's retail plans do appear to be expensive. The relatively high prices could well be due to the lack of competition within the market, in comparison with other jurisdictions. We note that the Telecommunications Act 2001 states that with respect to wholesale pricing:

...the applicable access provider is not entitled to recover ...:

- (a) inefficiencies in the provision of the service giving rise to higher costs

- (b) profits in excess of what would represent a reasonable return (including reasonable profit) on capital invested. [Schedule 1, clause 3]

Clearly the Commission should seek to impute a retail price as a starting point for the 'retail-minus' calculation that does not carry through high retail pricing (and excess profits), caused by a lack of competition, into the wholesale price. One approach would be to exclude from the imputation calculations those prices which are shown to be excessive via international benchmarking. Another approach is to adopt a methodology for the imputation exercise that minimises the risk of results skewed by excessive rents. In the next section we outline a methodology that, without excluding plans, takes account of 'premium' pricing.

4 Removing transmission from the retail prices

The Commission assumes that DSL prices are purely cost plus some margin. In order to find a price for access, the Commission sought to remove the traffic-related charges from the retail prices. This was attempted by fitting a straight line (using regression analysis) to the retail price excluding GST and ISP charges. The data cap allowance was used as the predictor variable.

Use of a straight line is appropriate if there is a constant charge per unit of data volume, regardless of the amount in the data cap, and if the profit margin is constant across all services. However, this assumption is flawed, as we find that as the data cap increases, the charge per Mbyte decreases (a common pricing strategy used by operators). This may easily be demonstrated in the following example.

Analysis of business services: Xtra Jetstream

To obtain an indication of how charges per unit of data volume of the data cap behave, we subtracted the retail price (less GST and the ISP charge) of the base Xtra Jetstream 600 plan from the equivalent prices of the higher data cap plans⁴. Thus we have extracted what

⁴ The data used in our analysis was sourced from the Commerce Commission's *TelstraClear Bitstream Draft Determination: correction of business bitstream calculation*, 27 April 2005.

the Commission assumes to be a fixed fee for access plus a traffic-related charge for 600Mbytes (the data cap of the base plan). The resulting price should then be purely the charge for additional data volume. The charge per Mbyte is then calculated by dividing this charge by the data cap less the initial 600Mbytes. We find that as the data cap increases, the price per Mbyte decreases substantially, with the discount (from the Xtra Jetstream 1200 plan) for the highest data cap services increasing to almost 20% (Exhibit 3).

<i>Business plan</i>	<i>Data cap (Mbytes)</i>	<i>Retail price less GST and ISP charge (\$)</i>	<i>Price per Mbyte above 600 Mbytes (\$)</i>	<i>% variation from Jetstream 1200 per- Mbyte charge</i>
Xtra Jetstream 600	600	61.33	n.a.	n.a.
Xtra Jetstream 1200	1 200	120.00	0.10	0.0%
Xtra Jetstream 1800	1 800	176.00	0.10	-2.3%
Xtra Jetstream 3000	3 000	292.00	0.10	-1.7%
Xtra Jetstream 5000	5 000	458.00	0.09	-7.8%
Xtra Jetstream 10000	10 000	888.00	0.09	-10.1%
Xtra Jetstream 20000	20 000	1 600.00	0.08	-18.9%
Xtra Jetstream 30000	30 000	2 400.00	0.08	-18.7%

Exhibit 3: *Estimation of unit price for data volume for business plans [Source: Commerce Commission, Network Strategies]*

Naturally, the Xtra Jetstream 600 service should be used as the base service for comparison, however using the next higher service illustrates the discounting without requiring assumptions regarding the level of the access price.

Given that we find that the per-Mbyte price varies according to the size of the data cap, clearly it is inappropriate for the Commission to fit a straight line to the adjusted prices – this is equivalent to assuming a constant price per Mbyte.

If we assume that price per-Mbyte for the Xtra Jetstream 1200 plan is undiscounted, then by simple arithmetic we calculate that the business access price is the price for the Xtra Jetstream 600 plan less (600 × price per Mbyte for Xtra Jetstream 1200), or \$2.66. If there is a discount applied to the Xtra Jetstream 1200 plan, then the business access price should be lower again.

However, an alternative view is that instead of the higher data cap plans being discounted, the lower data cap plans are actually priced at a premium, and that the profit margin is higher for these plans. If we assume that the price for the highest data cap plan has no discount, then by a similar calculation as that described above, but using the minimum price per Mbyte (from Exhibit 3, for Xtra Jetstream 20000), we obtain a business access price of \$13.74.

In fact the pricing may include a combination of discounts for higher data cap plans and premiums on lower data cap plans – in which case the business access price would lie within the range \$2.66–13.74.

Data caps and actual traffic volumes

The Commission's analysis, together with our own analysis above, assumes that the pricing is set for a traffic level equal to the data cap. This is a prudent approach and may be appropriate if customers regularly generate traffic at levels comparable to the data cap. However it may be that if customers rarely achieve the data cap, a more aggressive pricing strategy would set prices at a level corresponding to an actual data volume somewhat below the data cap, corresponding to observed traffic levels.

As an example, for a high data cap service, 99% of customers may use no more than 80% of the data cap, so the operator may choose to discount the price to reflect this type of behaviour.

If the prices were set according to traffic levels somewhat below the data cap, the above analysis of the Xtra Jetstream service could be repeated using actual traffic, if such information was made available by Telecom. Note that if these lower traffic levels were used, the imputed price per Mbyte would increase, and thus the imputed access price would decrease.

It should also be noted that data volumes that exceed the data cap for the Xtra Jetstream plans will incur excess usage charges, which vary from 18 cents per Mbyte for Xtra Jetstream 600 to 9 cents per Mbyte for Xtra Jetstream 20000 and 30000.

An alternative model

Given that there is clear evidence of the Xtra Jetstream traffic charges varying with the volume of traffic, if the Commission wished to pursue a statistical analysis some type of curve should be fitted to the data instead of a straight line, such as:

$$price = a + b^{c \times cap} \times cap \quad c < 0$$

where a , b and c are parameters to be estimated, cap represents the data cap, and $price$ is the price of the plan. The value of the parameter a would represent the imputed access price.

We emphasise that this form of model may be appropriate for the Xtra Jetstream business plans, but if Xtra Venture plans or Xtra residential plans were to be included within a single model, the functional form of the model would need to be able to encompass the different characteristics of these plans. As we demonstrate below, the pricing strategies of these services differ from that of Xtra Jetstream – these differences would need to be quantified with additional parameters. Increasing the number of parameters would require more data points in order to produce robust estimates of the parameters. A very rough rule-of-thumb used by statisticians⁵ suggests that the number of parameters should be no more than one quarter of the number of data points. So with our three parameters above, ideally there should be at least 12 data points for reliable estimates (we have only eight).

This type of analysis is called nonlinear estimation, and requires specialised statistical software in order to determine values for the parameters. When we examined the above functional form using appropriate software, we found that the data is insufficient to develop estimates of the parameters.

⁵ Chatfield, C. (1988) *Problem solving: a statistician's guide*, Chapman & Hall, London.

Exclusion of Venture services

The Commission has excluded Xtra Venture plans from its analysis of business services as these ‘do not provide a meaningful outcome’⁶.

This lack of a result indicates that the underlying pricing principles for the Xtra Venture service are quite different to those of the Xtra Jetstream service, and/or the two offerings have differing features or characteristics which the Commission did not capture in its model.

Xtra Venture business plans have a downstream speed of 256kbit/s, and an upstream speed of 128kbit/s, whereas the Xtra Jetstream business plans are listed as ‘full speed’, or 2000kbit/s downstream and 600kbit/s upstream. Both services have excess usage charges, however the excess charge of the Xtra Venture 3GB plan is only 31% of the excess charge of the Xtra Jetstream 3000 plan (which has the same data cap). This suggests that retail prices are indeed influenced by the speed of the service – even if the underlying costs are not. There may be other points of difference, such as contention ratios. Another possibility is that the Xtra Venture plans could be offered as loss leaders.

A similar analysis to that performed on the Xtra Jetstream business service estimates the per-Mbyte charge as \$0.01 per Mbyte, and the price excluding traffic for Xtra Venture service as \$41.06, however this assumes that the base price per Mbyte is calculated from the Xtra Venture 3GB plan. With only two plans, we are unable to determine if this price is discounted or not. We therefore conclude that our estimate of \$41.06 is likely to be an upper bound for the imputed access price.

The excess usage charges for Xtra Venture plans is 4.44 cents per Mbyte: using this price instead of our estimated per-Mbyte charge we obtain an access price of \$7.06, which would be the lower bound for the access price.

The huge difference between our estimated per-Mbyte charge and the excess usage charge would seem to indicate that a significant premium is applied to the latter. We also note that

⁶ Commerce Commission (2005) *TelstraClear Bitstream Draft Determination: correction of business bitstream calculation*, 27 April 2005.

the excess usage charge of the Xtra Venture plans is significantly less than that of the Xtra Jetstream plans.

Analysis of residential services

The Commission used a similar approach for analysing residential services. Retail prices were adjusted to exclude GST and ISP charges plus an adjustment for the calling discount offered with bundled services, and a straight line was fitted to the resultant prices using a regression analysis.

Unlike the business Xtra Jetstream plans, which varied only in the level of the data cap, the residential services differ in both the data cap and in the downstream speed (Exhibit 4). Furthermore, only the Xtra Broadband Navigate plan has an excess usage charge – all other plans decrease speed if data caps are exceeded.

<i>Plan</i>	<i>Data cap (Mbytes)</i>	<i>Downstream speed (kbit/s)</i>	<i>Upstream speed (kbit/s)</i>	<i>Adjusted price (\$)</i>
Xtra Broadband Go	1 000	256	128	[] TCNZRI
Xtra Broadband Discover	1 000	1 000	128	[] TCNZRI
Xtra Broadband Explorer	3 000	256	128	[] TCNZRI
Xtra Broadband Adventure	10 000	2 000	128	[] TCNZRI
Xtra Broadband Navigate	10 000	2 000	128	[] TCNZRI

Exhibit 4: *Characteristics of Telecom's residential DSL plans [Source: Commerce Commission]*

Comparing the Xtra Broadband Discover and Xtra Broadband Go plan (which have the same data cap) we see that the downstream speed differs, so presumably the differential in price reflects this characteristic. The Commission has previously noted that speed does not

significantly affect the cost of bitstream access⁷, however the retail prices on which the Commission is basing its analysis clearly do differentiate according to speed – even if not reflected in the underlying costs. Thus any analysis should adjust for this factor.

There are insufficient data points (that is, residential plans) to support a regression model, given that there is likely to be more than one predictor variable. In fact, there are insufficient data points to support a model with a single parameter. We therefore find the Commission’s analysis of the residential services to be invalid.

The only two plans with similar characteristics, other than the data cap, are Xtra Broadband Go and Xtra Broadband Explorer. If, as in our analysis above for the business services, we assume that the retail price is simply the access price plus a traffic price dependent on the level of the data cap, simple arithmetic shows that the price per Mbyte for the latter service is [] TCNZRI. Thus assuming the same rate is applicable for the Xtra Broadband Go service, gives an access price of [] TCNZRI.

It is possible that this estimate could be high, if the lower capped plans are priced at a premium. If these plans are loss leaders, this price could be an underestimate. Due to the differing characteristics of the other plans we are unable to make any further conclusions.

We do not consider it appropriate to model the prices using a regression model with the only predictor variable being the data cap. Clearly there are other influences on residential pricing, such as downstream speed, which, although the underlying costs may not differ, Telecom may choose to price at some premium. In addition, customers with the residential plans (with the exception of Xtra Broadband Navigate⁸) who exceed the data cap will have the speed reduced to that of a dial-up modem. Thus our estimate of the ‘access’ price above would also include a consideration for excess usage, and thus must be considered to be an upper bound for the true access price.

⁷ Commerce Commission (2005) *Draft determination on the application for determination for access to and interconnection with Telecom’s fixed PDN service*, 21 April 2005, paragraph 159.

⁸ Xtra Broadband Navigate has an additional two cents per-Mbyte charge for traffic exceeding the data cap.

Feasibility of regression analysis combining residential and business services

As we have seen above, the characteristics of the various residential and business plans vary, which is reflected in the price. These characteristics include downstream speed, data caps, treatment of usage in excess of the data cap, plus the underlying pricing strategy (for the access and traffic components) appears to differ markedly between the Xtra Jetstream, Venture and residential plans.

Any statistical modelling would need to incorporate parameters for each characteristic that influences retail price. There are too few data points to support such an analysis that includes all plans, both residential and business.

5 Summary

Our analysis of Telecom's retail DSL prices has found that the pricing strategies are more complex than simply assuming an access charge, constant across all service offerings, and a traffic-related charge, directly proportional to the data cap. Retail prices do vary according to speed (even if there is no significant variation in the underlying costs), and there appears to be discounts or premiums applied to certain plans.

The Commerce Commission has applied linear regression analysis to the adjusted price data. In our view, this is a more complex approach than necessary, requiring certain assumptions which we have demonstrated to be invalid, such as:

- prices per Mbyte are not constant across all plans, but decrease as the data cap increases
- price is influenced by factors other than the data cap, such as downstream speed, and whether or not excess usage charges are incurred when the data cap is exceeded
- the underlying pricing strategies for the access and traffic components differ markedly for the business services (Jetstream and Venture) and the residential plans, with the business plans having a higher traffic-related component than the residential plans.

We have applied a much simpler arithmetic approach to obtain a likely range for the imputed access price. This approach has the advantage that no complicated assumptions of

questionable validity are required. In addition it takes into account both the highest and lowest prices charged for volumes, thereby capturing the possibility of premiums and discounts.

Our analysis found that the access charge will probably lie within the following ranges:

- Xtra Jetstream business plans – \$2.66–13.74
- Xtra Venture business plans –\$7.06–41.06
- Xtra residential plans – likely upper bound [] TCNZRI

Furthermore, as we can assume that the access charge is common across all services, it is therefore likely to be within the common range \$7.06–13.74 (illustrated in Exhibit 5). It is possible that the Xtra Venture plans are loss leaders, however the omission of these from the analysis would reduce the lower bound of the range to that of the Xtra Jetstream business plans.

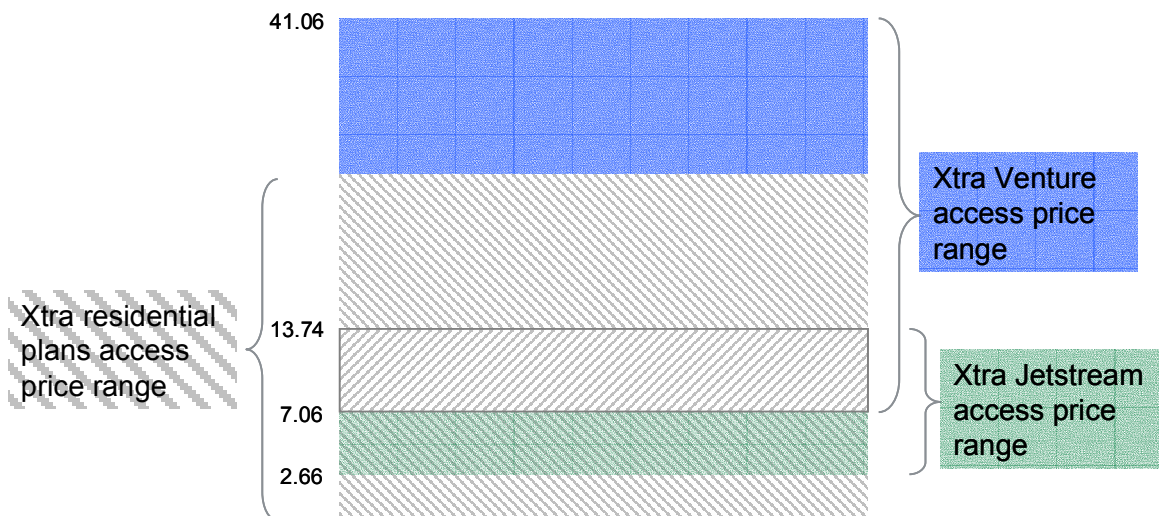


Exhibit 5: Likely range of imputed access price (not to scale) [Source: Network Strategies]

A practical solution for obtaining the imputed access charge would be to take the midpoint of our likely range, namely \$10.40.