

Satellite Broadband: A Global Comparison

A report for nbn™

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Executive summary

Ovum was engaged by **nbn**[™] (**nbn**) to examine the performance of the Australian **nbn**'s satellite broadband solution against similar satellite broadband products internationally. **nbn** will soon be commercially launching its national wholesale satellite broadband Sky Muster service, initially based on the Sky Muster satellite launched in October 2015 and later expanding to incorporate a second satellite to be launched in the second half of 2016.

The two **nbn** satellites will have a combined capacity of 135 Gbps and will deliver services to over 200,000 regional and remote homes and businesses. The Sky Muster based services will deliver either 12 Mbps down and 1 Mbps up or 25 Mbps down and 5 Mbps up. Additionally, **nbn** supports its retail service providers with Service-Level Agreements for these wholesale access products.

Ovum examined eighteen retail service providers internationally that offer satellite broadband services. Their performance was examined across peak data allowance, download speed, upload speed and affordability (price per GB of data), and were compared to Australian retail plans based on **nbn**'s Sky Muster service. Note that not all Australian retail service providers have announced their Sky Muster based plans and pricing yet.

Retail plans based on **nbn**'s satellite broadband service are world leading in terms of both performance and affordability. Retail satellite broadband services based on **nbn**'s Sky Muster service will be a major step change for internet access for regional and remote Australians over the alternatives that have been available to date.

On a performance basis, **nbn**'s satellite broadband service is equal to the world's best in terms of download speed and peak monthly data allowance. Additionally, **nbn** supports its retail service providers with Service-Level Agreements for **nbn**'s wholesale access products. This allows **nbn** satellite broadband based services to properly support a range of applications, particularly bandwidth intensive video applications. As far as Ovum is aware, these SLAs are unique for consumer level satellite broadband in an industry segment that has traditionally been plagued by congestion problems.

On an affordability basis, Australian retail plans based on **nbn**'s Sky Muster service are available at close to the best global pricing on a price per GB basis across the benchmarked operators. There are also a range of good entry level plans available.

The main findings of the comparison of retail plans based on **nbn**'s Sky Muster service and the international satellite broadband services are:

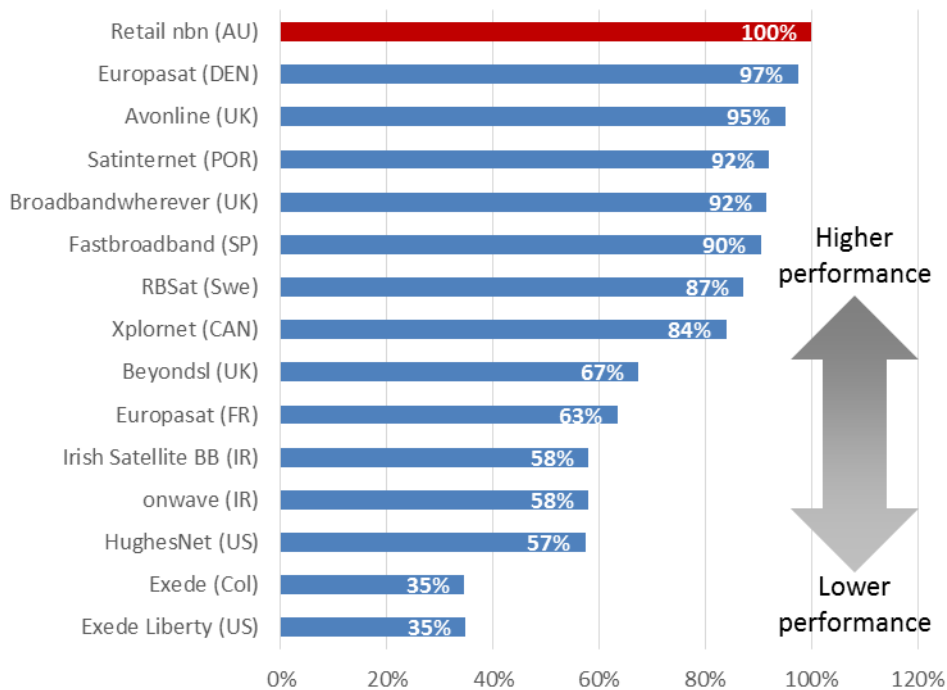
- Monthly peak data allowance is equal to the best stated peak data allowance internationally. This provides an affordable option for Australian consumers to utilise high data usage services such as video.
- Download speed is available equal to the fastest claimed download speeds across all the benchmarked service providers and are faster than the majority of the download speeds benchmarked. Additionally, **nbn** supports its retail service providers with Service-Level Agreements for **nbn**'s wholesale access products, whereas complaints about congestion and slow download speeds for satellite broadband is common internationally.
- Upload speeds are only slightly lower than the best claimed upload speed claims across all the benchmarked service providers (5 Mbps versus 6 Mbps), however, similar to download speed, congestion impacts actual speeds obtained.

- Australian Sky Muster based plans are amongst the most affordable across the benchmarked operators. Amongst the 25 Mbps download speed plans, one of the Australian retail plans is the most affordable across the benchmarked operators. Note also that Ovum deliberately focussed on collecting data from satellite broadband providers that have deployed the latest generation of high-throughput satellites, which provide the most cost effective data pricing.

This combination of excellent technical performance and strong retail affordability makes **nbn's** satellite broadband service a world leader. Ovum's ranking based on technical performance and affordability is shown below. The ranking is based on a combination of:

- Data allowance was calculated as a percentage of the maximum data allowance on retail plans based on **nbn's** Sky Muster service, that is, 100GB.
- Download speed was calculated as a percentage of **nbn's** Sky Muster services' maximum download speed of 25 Mbps.
- Price per GB was calculated as a percentage of the inverse of the average of the best price per GB of the retail plans based on **nbn's** Sky Muster service, that is, **nbn's** average price per GB of US\$1.10, so that higher prices scored lower.

Composite score for data allowance, download speed and price per GB



Report approach and methodology

The purpose of this report is to compare satellite broadband solutions around the world, and in particular to compare the retail satellite broadband plans based on **nbn**'s Sky Muster satellite service to global norms.

The report compares 18 retail satellite broadband service providers internationally plus 3 Australian retail service providers using **nbn**'s Sky Muster service. A mix of developed and developing countries was examined: the countries and service providers covered were:

- Australia (Activ8me, Harbour ISP, SkyMesh)
- Austria (skyDSL)
- Brazil (Via Sat)
- Canada (Galaxy, Xplornet)
- Columbia (Exede)
- Denmark (Europasat)
- France (Europasat)
- Germany (skyDSL)
- Ireland (Irish Satellite Broadband, onwave)
- Portugal (Satinternet)
- Spain (Fastbroadband)
- Sweden (RBSat)
- UK (Avononline, Beyondsl, Broadbandwherever)
- USA (Exede Liberty, HughesNet)

The service providers that were selected are all providing satellite broadband solutions on a commercial basis. Where they have multiple plans, we have chosen the plan that gives the best performance for each variable (that is, largest data allowance, fastest speed, or lowest cost per GB), though typically for a given service provider the same plan is the best plan across all the variables we examined.

Since **nbn** only offers a wholesale product, we have selected for Australia the retail service providers (RSPs) that have published their satellite broadband pricing based on **nbn**'s new Sky Muster satellite.

Modern satellite broadband services are mostly provided through geosynchronous high capacity satellites utilizing the Ka band to achieve faster data speeds and a lower cost per bit to end users than older data satellite services. The newer generation of high-throughput satellites utilise a high level of frequency re-use and a larger number of smaller spot beams (similar to how mobile cellular networks work) to provide significantly greater capacity and per-user transmission speeds than traditional satellites.

nbn's Sky Muster satellite was launched on 1 October 2015 and is a new generation high-throughput satellite with 101 Ka based spot beams. In combination with the second **nbn** satellite that will launch in the second half of 2016, the Sky Muster service will have a capacity of 135Gbps and will deliver services to over 200,000 regional and remote homes and businesses. Wholesale speeds are available to RSPs at 12 Mbps download with 1 Mbps upload speeds and 25 Mbps download with 5 Mbps upload speeds. Additionally, **nbn** supports its retail service providers with Service-Level Agreements (SLAs) for these wholesale access products.

Where possible in our data collection, we focussed on service providers that utilise these new generation satellites for the retail services, though there are still some locations that are only serviced

by older satellite technologies. This means that we are benchmarking the Australian **nbn** Sky Muster based services with the best satellite broadband services available globally. While Galaxy (Canada) is supposedly using a newer generation satellite, their plans are quite limited compared to the other providers, with no comparable higher tier plan¹. As such, Galaxy (Canada) has been left out of the comparison benchmarks as Xplornet in Canada provides a better alternative.

The variables chosen for comparison were:

- data allowance;
- download speed;
- upload speed; and
- price per GB.

These were chosen because they have a direct impact on the utility of the broadband service, and are reasonably likely to be reported by service providers. Other variables such as latency were generally not reported and are not included in the analysis, however, the level of latency between different geosynchronous satellite services is broadly similar.

There were some complications in comparing different service providers. In cases where a data allowance was clearly stated, those claims were included without further examination. But in cases where the product was claimed to have an “unlimited” data allowance, terms of use and fair use agreements were scrutinized to see whether there were in fact limits to data usage; where this was the case, we have assumed that these limits are effectively a data allowance and recorded them as such. Some service providers impose no explicit limits or fair use provisions at all (or have variable limits such as the top 10% of users being rate limited during periods of congestion); in such cases, we recorded no data allowance. In practice, where no explicit limits are enforced, the interaction of design capacity and customer demand will lead to reduced speeds during peak periods and a practical limit on the ability to download.

Where the service provider differentiates between peak and off-peak usage for their data allowance, we have focussed on the peak period data allowance. Off-peak periods (where they exist) for satellite broadband services are generally only a few hours in the early hours of the morning and are not practical for normal usage by the majority of customers. Some service providers offer “unlimited” off-peak data, but limit the traffic type to only email and web browsing.

Satellite technology is a shared service, with users within the same spot beam sharing the capacity of that spot beam. Quoted download and upload speeds are based on the capability of the technology, but actual performance is dependent on factors such as how well the spot beams have been planned to match the distribution of demand on the ground and how many end users have been allocated to a given spot beam. The **nbn** Sky Muster service has a design advantage in that the spot beams have been planned based on knowledge of the exact locations of the customer base that will not have access to alternative access technologies. Other global satellite broadband operators have a higher

¹ Galaxy’s plans vary by location and Ovum checked plan availability and pricing for multiple post codes and did not find any high speed plans. (e.g. <http://archive.is/XpBlj>). Galaxy also states in their FAQ that “we do not recommend streaming high throughput applications (ie. Netflix, Apple TV) that are designed for Cable and DSL connections. Using high throughput video streaming applications can cause you to exceed the Soft Download Cap.” Galaxy also applies daily limits on data usage.

level of uncertainty regarding their potential customer base and congestion is a common problem internationally.

By way of capacity design-demand comparison, the **nbn** Sky Muster service (once both satellites are operational) will have a total capacity of 135Gbps to meet the demand requirements of 200,000 regional and remote premises. ViaSat-1 (which primarily covers North America) has a total capacity of 140Gbps but is servicing 800,000 residential households².

Unlike terrestrial broadband services, it is rare for satellite broadband services to quote an “actual” or “average” speed. For this study, we have relied on the claimed speeds of service providers (which is typically a technology capability speed) and actual performance for the same stated speed could vary significantly between providers, and for the same service provider across their coverage area. For Australian RSPs, **nbn** provides SLAs for its 12/1 Mbps and 25/5 Mbps wholesale products.

All providers reported an advertised plan price. Price per GB was calculated for those providers for whom we also recorded a data allowance. The most cost effective plan (typically the largest plan) was used for each provider.

As a result of these restrictions, not every service provider reports each of the three variables. Consequently, when calculating the comparisons for the different variables, not every service provider is included in each comparison. In each comparison, we note which service providers are excluded and why.

For the majority of the service providers, it was possible to provide a comparison on data allowance, download speed and price per GB. In these cases, we were able to construct a composite index to provide a comprehensive comparison of the different satellite broadband services.

Satellite broadband benchmarks

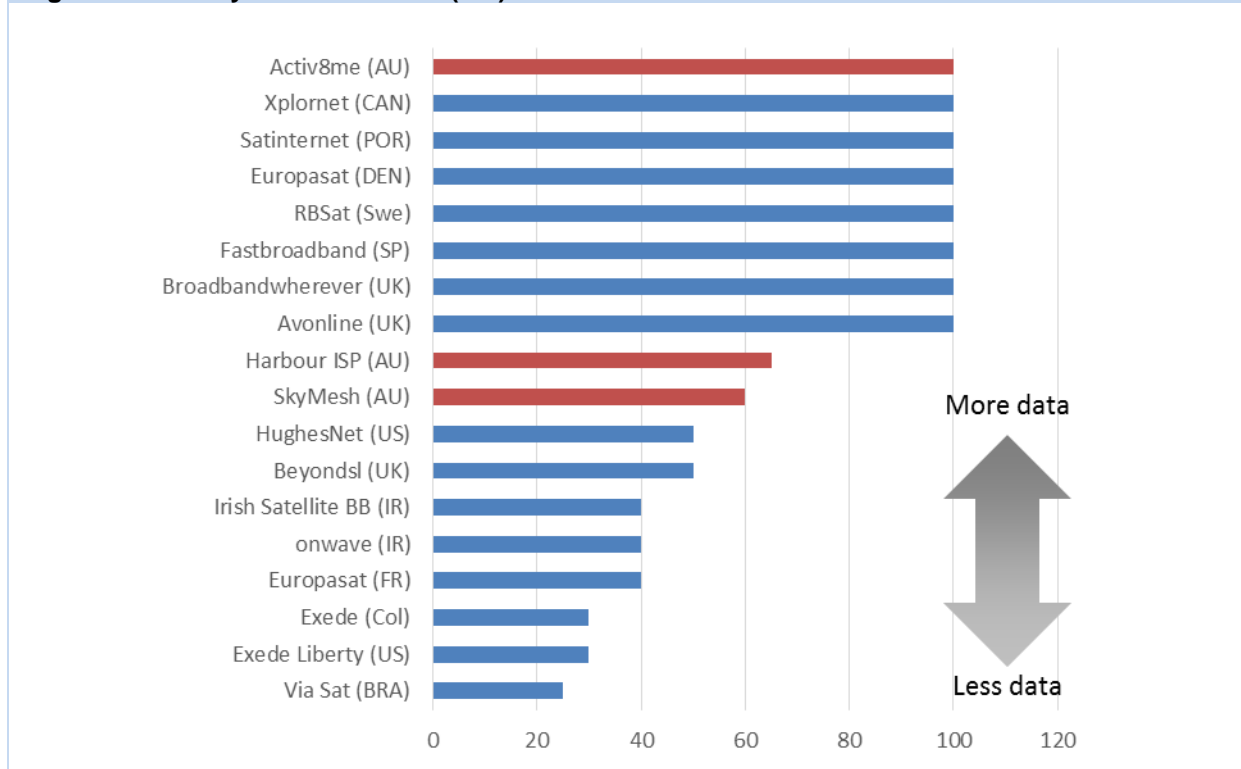
Data allowance

Of the service providers we examined, the majority published an unambiguous peak period data allowance. Only skyDSL (in both Germany and Austria) offered an “unlimited” peak period data allowance, however, unless customer numbers are low, this would likely result in periods of congestion. This situation was seen locally with the Australian interim satellite service.

The data allowances for these service providers are displayed in Figure 1. This shows that the 100GB peak data allowance by the Australian RSP Activ8me is equal to the best stated peak data allowances by service providers internationally. The Australian RSPs Harbour ISP and SkyMesh have currently chosen to offer plans with 65GB and 60GB as their maximum peak data allowances, which still places them ahead of most international satellite broadband providers.

² “Innovations and Economics in Satellite Broadband”, Steve Gardner, CTO, ViaSat, 2nd October 2015

Figure 1: Monthly data allowance (GB)



With the large peak data allowance available through Activ8me equalling the best stated peak data allowances by service providers internationally, this provides an option for Australian customers to consume a significant quantity of data enabling them good access to high data usage applications and services, particularly video services. The top plans provided by Harbour ISP and SkyMesh still provide a substantial peak data allowance by international standards, but have a different mix of peak and off-peak data allowances and monthly pricing that could be better suited to some customers.

Download and upload speed

As noted above, for satellite technology, actual download and upload speeds achieved in practice are a function of factors such as how well the spot beams have been planned to match the distribution of demand on the ground and how many end users have been allocated to a given spot beam. Demand modelling and spot beam planning is an area that **nbn** has invested considerable time and effort to ensure an optimal outcome for end customers in terms of sustainable download and upload speeds. This allows **nbn** to provide its RSPs with SLAs around the 12/1 Mbps and 25/5 Mbps wholesale products.

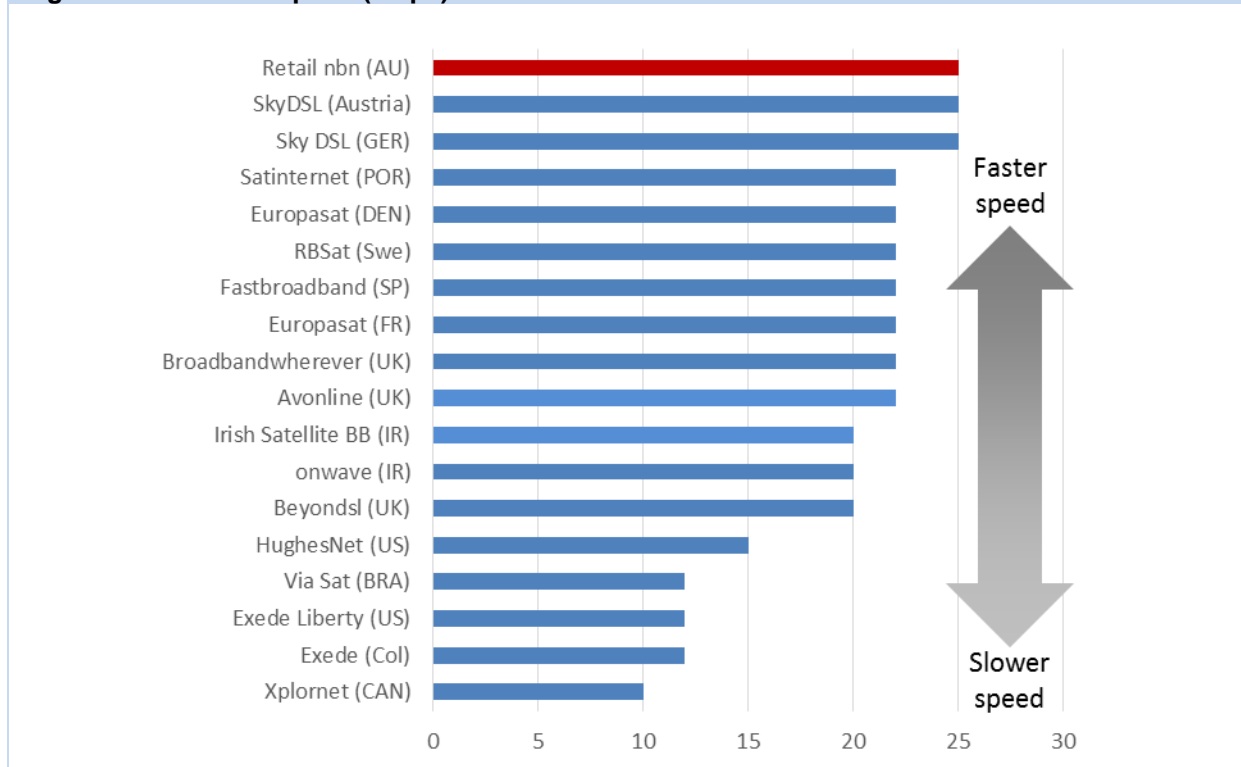
Unlike terrestrial broadband services, it is rare for satellite broadband services to quote an “actual” or “average” speed. Most telecoms regulators are not currently monitoring broadband satellite performance like they do for other terrestrial broadband services. Interestingly, in the United States where the FCC monitors broadband satellite service, the service providers claim lower download and upload speeds than the highest claimed speeds elsewhere.

For this study, we have relied on the claimed speeds of service providers (which is typically a technology capability speed) and actual performance for the same stated speed could vary significantly between providers, and for the same service provider across their coverage area.

Of the service providers we examined, all stated both a download and an upload speed.

Figure 2 shows that the satellite broadband services provided by the Australian RSPs based on **nbn**'s Sky Muster service provide a speed equal to the fastest download speed across all the benchmarked service providers and are faster than the majority of the download speeds benchmarked. The differences between service providers were strongly related to the satellite technology used, unlike data allowances that allows some variability based on different business models.

Figure 2: Download speed (Mbps)



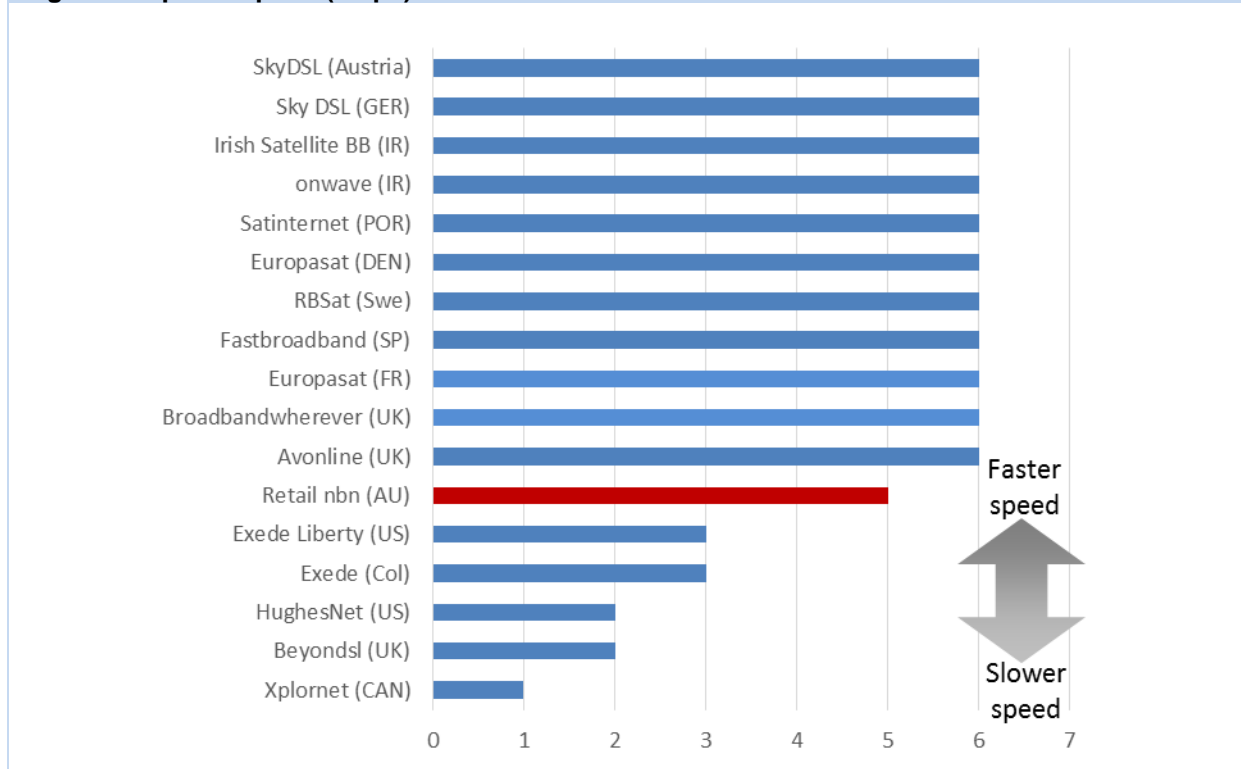
nbn's satellite broadband download speed performance is important because, in combination with a large download allowance, it supports high-bandwidth services such as video. Download speed is a key factor determining how usable a broadband service is and how capable it is in supporting multiple applications running simultaneously. The SLAs that **nbn** provides its RSPs for the 12/1 Mbps and 25/5 Mbps wholesale products is a key factor in ensuring retail customers experience performance in line with stated speeds.

We also looked at reported upload speeds. These reported speeds are subject to the same limitations as the download speeds.

The results for upload speed are displayed in Figure 3. The satellite broadband services provided by the Australian RSPs based on **nbn**'s Sky Muster service are only slightly lower than the best upload speed claims across all the benchmarked service providers (5 Mbps versus 6 Mbps). As with

download speeds, the claimed differences between service providers were strongly related to the satellite technology used.

Figure 3: Upload speed (Mbps)



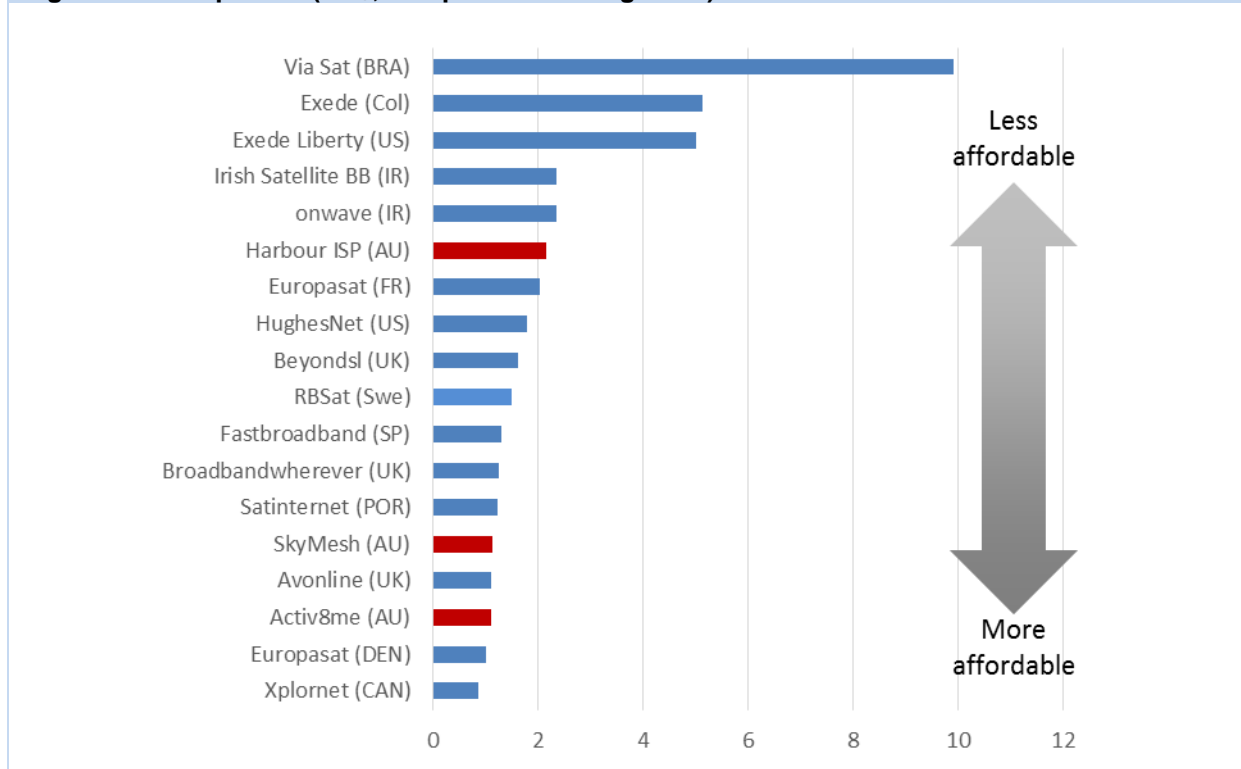
nbn's satellite broadband upload speed performance underpins the use of more symmetric applications such as voice and video conferencing and cloud services which are important to businesses.

Price per GB

As noted above, of the service providers we examined, the majority published an unambiguous peak period data allowance. Only skyDSL (in both Germany and Austria) offered an “unlimited” peak period data allowance. As stated above, unless customer numbers are low, this would likely result in periods of congestion.

All of the benchmarked service providers report retail prices. In all cases, we used the lowest price per GB plan on the fastest speed (which typically had the largest data allowance) for each service provider to make the comparison. Using a Composite Exchange Rate, we were able to compare price per GB for data, as so to benchmark the affordability of different services. The results are displayed in Figure 4.

Figure 4: Price per GB (US\$, composite exchange rate)



Australian retail plans based on **nbn**'s Sky Muster service are available at close to the best global pricing on a price per GB basis across the benchmarked operators. There was a significant variation in the prices per GB reported, ranging from US\$0.87 for Xplornet (Canada) to US\$9.91 for Via Sat (Brazil).

The two satellite broadband providers (Europasat in Denmark and Xplornet in Canada) offering a cheaper per GB price than Activ8me both only offer plans with a claimed download speed of up to 22Mbps. This makes Activ8me's plan the most affordable 25 Mbps download speed plan.

It should be noted that Ovum deliberately focussed on collecting data from satellite broadband providers using the latest generation of high-throughput satellites, which provide the most cost effective data pricing. Satellite broadband services based on older generation satellites are significantly more expensive on a per GB pricing basis.

This benchmark is important because it is a measure of the affordability of broadband services for a wide range of household and business customers. There are also a range of good entry level plans available from Australian RSPs.

Composite performance

For the majority of the service providers examined, we were able to form a composite index of their technical and affordability performance compared to retail plans based on **nbn**'s Sky Muster service.

nbn's satellite broadband technical performance was measured based on its 25/5 Mbps satellite broadband service with a 100GB download allowance. To measure the affordability of retail plans based on **nbn**'s Sky Muster service, we used the price per GB of Activ8me's 35GB 25/5 Gbps plan. Generally, the cheapest price per GB is achieved with the highest data allowance plans, and we

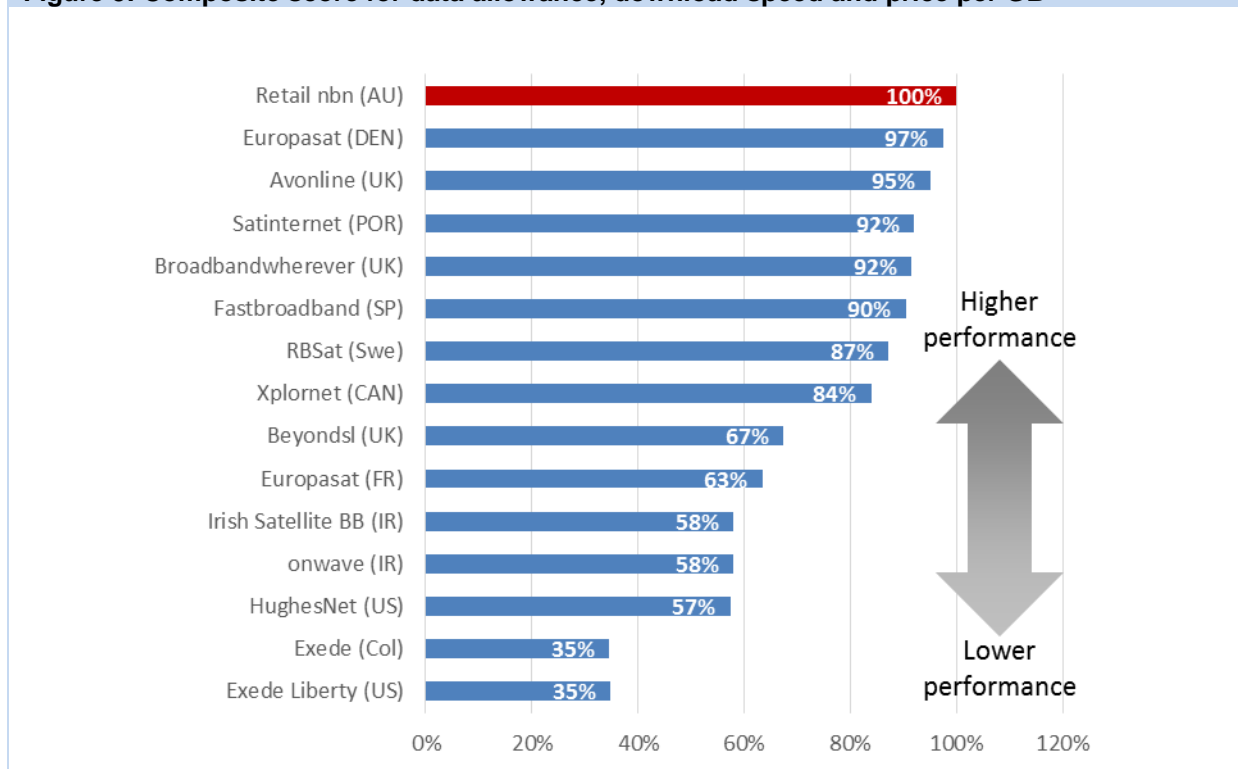
expect that competition in the Australian retail market will drive the per GB pricing for the higher allowance plans to at least a similar level. Note that not all Australian RSPs have announced their Sky Muster based plans and pricing yet.

We calculated the performance of all of the other operators as a percentage of these three benchmarks:

- Data allowance was calculated as a percentage of the maximum data allowance on retail plans based on **nbn**'s Sky Muster service, that is, 100GB.
- Download speed was calculated as a percentage of **nbn**'s Sky Muster services' maximum download speed of 25 Mbps.
- Price per GB was calculated as a percentage of the inverse of the average of the best price per GB of the retail plans based on **nbn**'s Sky Muster service, that is, **nbn**'s average price per GB of US\$1.10, so that higher prices scored lower.

These three percentages were then combined as a weighted average to give a composite score for that operator. A weighting of 40% was given to download speed and 30% to each of data allowance and price per GB. The results are displayed in Figure 5.

Figure 5: Composite score for data allowance, download speed and price per GB



This analysis demonstrates the excellent performance of **nbn**'s satellite broadband Sky Muster service, which combines high technical performance with strong levels of retail affordability.

Conclusion

In conclusion, this benchmarking and comparative performance exercise demonstrates that **nbn**'s satellite broadband Sky Muster product provides a combination of excellent technical performance with strong levels of retail affordability when compared to international peers.

The **nbn** product is generally technically as good as or superior to its peers, offering high download allowances and high speeds compared to other satellite broadband services. This allows **nbn** satellite broadband based services to support a range of applications, particularly bandwidth intensive video applications. While comparisons were made on the basis of claimed technical performance, **nbn**'s knowledge of the exact locations of the customer base during the design phase and a higher level of dimensioned capacity per household allows it to provide SLA support for the 12/1 Mbps and 25/5 Mbps wholesale products to its RSPs.

In addition, **nbn**'s satellite broadband based services are made available through the RSPs at affordable prices with both good entry level plans available, as well as plans that provide competitive pricing on a per GB basis with the best priced satellite broadband services globally. Amongst the 25 Mbps download speed plans, one of the Australian Sky Muster based plans is the most affordable across the benchmarked operators.

This will position rural Australia to gain new access to a host of applications at affordable prices, closing the gap between urban and rural Australia. For regional and remote Australians, satellite broadband services based on **nbn**'s Sky Muster service will be a major step change for internet access over the alternatives that have been available to date.

By way of local comparison, the **nbn** Interim Satellite Service (ISS) has a total system capacity of 4Gbps compared to the 135Gbps that will be provided by the combined two **nbn** Sky Muster satellites. While the theoretical limit of the ISS is 6 Mbps down and 1 Mbps up, due to the system capacity constraint, speeds in practice were often much lower. IPSTAR's satellite broadband service is up to 4 Mbps down and 2 Mbps up. Services based on **nbn**'s Sky Muster service will provide either 12 Mbps down and 1 Mbps up or 25 Mbps down and 5 Mbps up.

Prices for rural and remote satellite broadband customers will also be significantly lower compared to previous satellite broadband alternatives in Australia. IPSTAR's 10 GB per month plan is priced at AU\$114.95 per month, while Activ8me's 10 GB ISS plan is AU\$39.95 per month. Using **nbn**'s Sky Muster service, Activ8me is offering 15 GB per month (peak, with another 50 GB off-peak) at 12/1 Mbps for AU\$39.95 per month and 100 GB per month (peak, with another 50 GB off-peak) at 25/5 Mbps for AU\$230.95 per month.

Appendix

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About Ovum

Ovum is a UK headquartered analyst and consulting firm with global reach. It is part of Informa Group, the world's leading provider of business intelligence. Ovum's expertise extends across the Telecoms, ICT and Media and Entertainment markets to provide comprehensive market coverage.

Ovum research analysts maintain a continuously updated set of data analysis tools that provides detailed quantitative insights into market trends. We provide consulting advice on market, regulatory, technical and competition issues to both public and private sector organisations.

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