



AUSNOG 2018

The challenges of growing quickly

Recap from Ausnog 2017

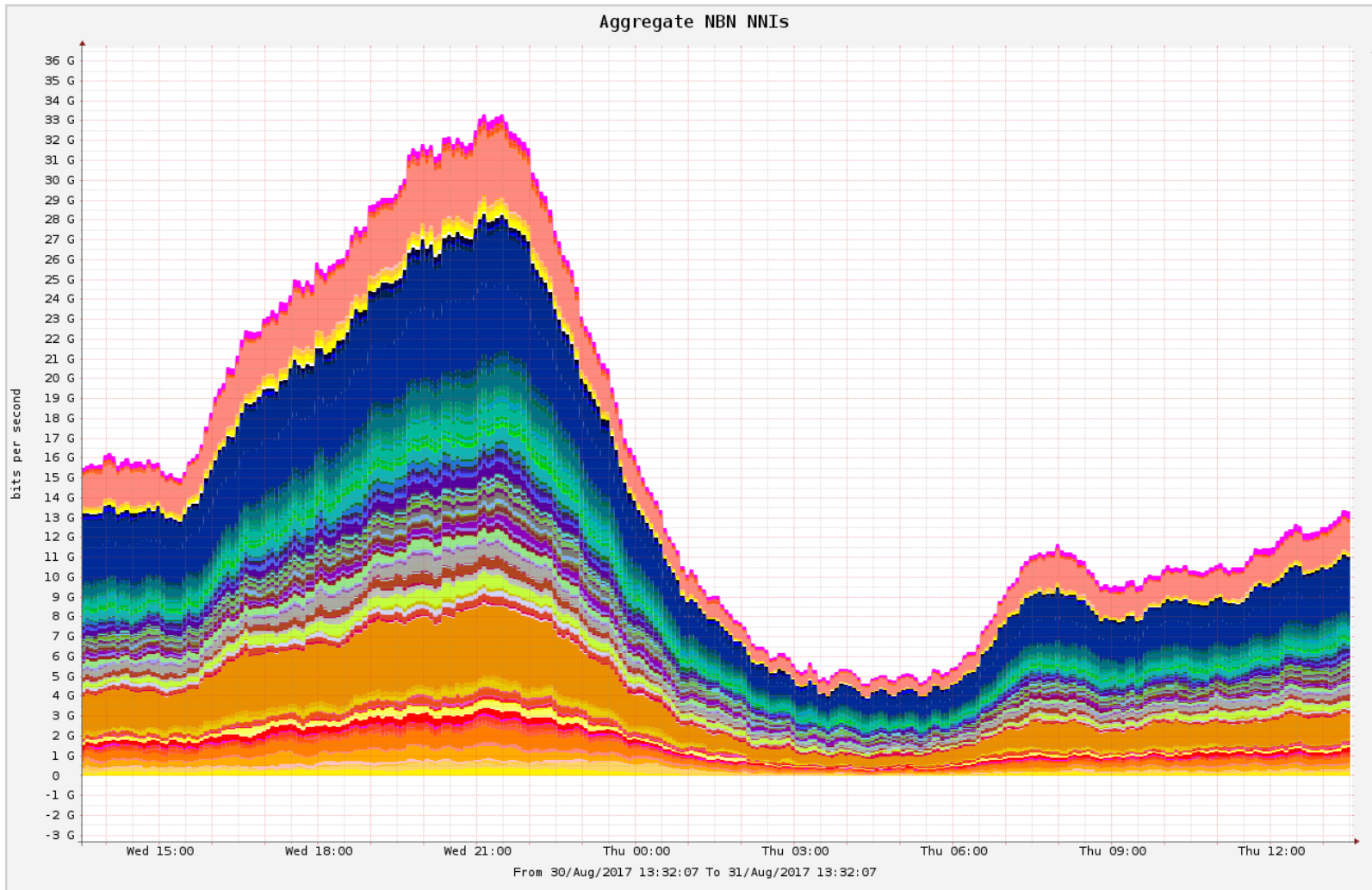


The regional ISP becoming a national telco.

In September 2016 we announced that we would build to all 121 nbn POIs; at the time, we were connected to just 12 POIs and had 10,000 nbn subscribers.

- Poor experience with an aggregator in the market led to the decision
- At the time of Ausnog 2017 we were active with at least 1G at 118 POIs and in November 2017 we completed the full 121 POI rollout
- The rollout took 6 months longer than expected, nearly sent us broke and had many, many challenges.
- 55 of the 121 links didn't work out of the box and required additional work by Telstra Wholesale to correct the issues

Recap from Ausnog 2017



35 Gbits of traffic being used over an aggregate of 118 POIs at August 2017

Serving 28,600 nbn subscribers

13.3 Gbits of CVC sitting idle costing approx. \$202,000 a month

Network at Ausnog 2017



AS4764

INT – Interactive, VDC – Vocus DCs, YDCH – Your DC Hawthorn, OTW – Over the Wire, SY1 – Equinix SY1

When 1G just isn't enough



Rapid growth and Telstra Wavelength outages triggered our next move.

The initial 121 POI network was built using 1G unprotected TW wavelength services to all POIs except 3, which were 10G protected.

- Ultimately at the time we decided to build the network we couldn't afford anything more than 1G unprotected
- From May 17 to November 17 we experienced 34 outages, 22 of which took more than 8 hours to resolve and a total downtime of 881 hours during the period. The average downtime was 25 hours.
- Outages combined with rapid bandwidth growth triggered our decision to build 10G protected to 119 POIs and upgrade the remaining 2 to 1G protected.

Focus on 50 & bundles



In November 2017 nbn rewarded the big boys for behaving badly and the landscape changed again.

In November 2017 nbn released their Focus on 50 campaign, giving providers 50% more cvc at no extra cost, and then followed that up in May 2018 with the bundles.

- Providers that had been under-provisioning suddenly had more bandwidth, and the speed complaints in the market mostly went away.
- Aussie's competitive advantage of delivering a consistent speed experience was then being challenged by the larger providers.
- This led to our doubling down on further improving the network and customer service areas of the business.

Fast forward to today

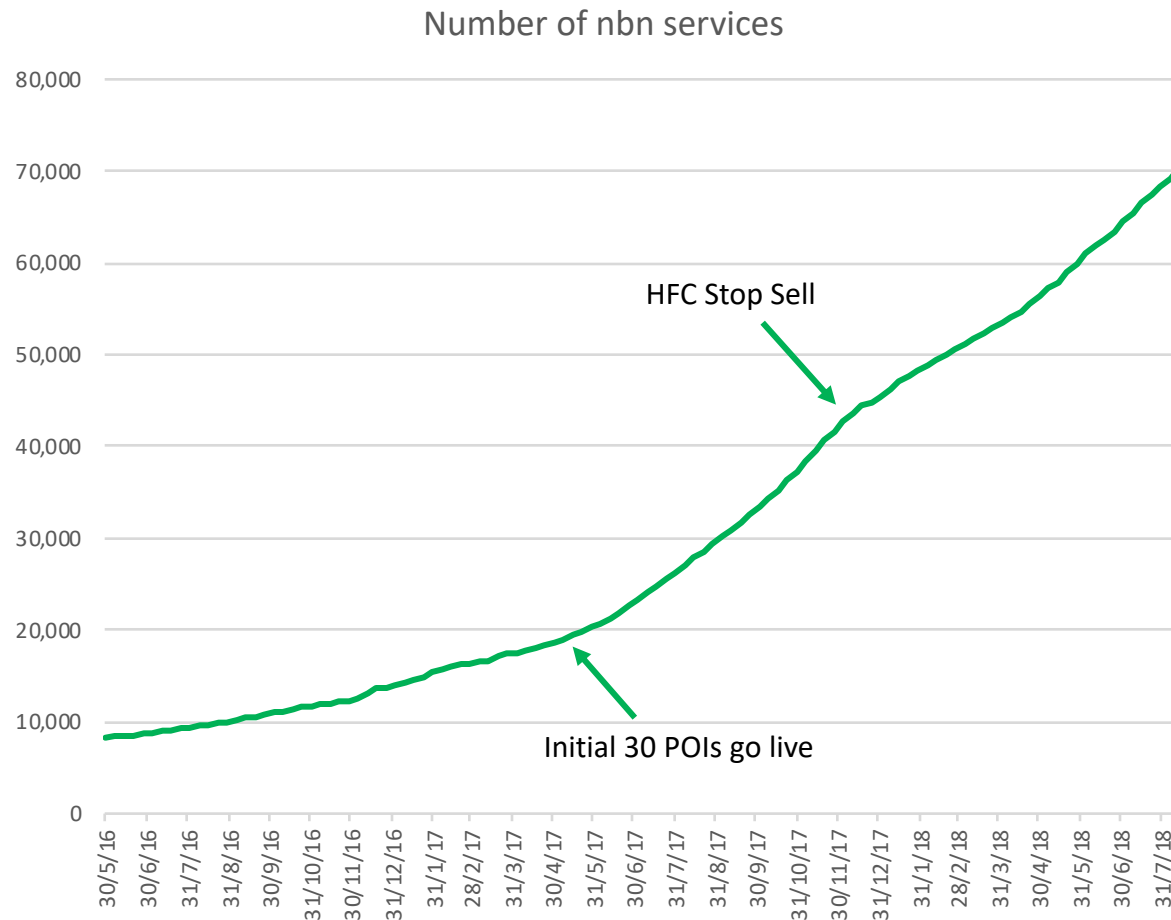


Today we are connecting more than 6000 nbn services a month.

Having control of our own network has been the key to our rapid growth. It has allowed us to deliver a consistent product that customers have come to expect.

- Now the 5th largest nbn provider in Australia with a market share of 1.63%. Take of new service orders is around 3.2%.
- Automation has played a huge part with over 90% of orders going through without any human intervention. Tightly integrated with nbn's b2b systems.
- 100% Australian based operation with 150 staff based in Morwell, Victoria.

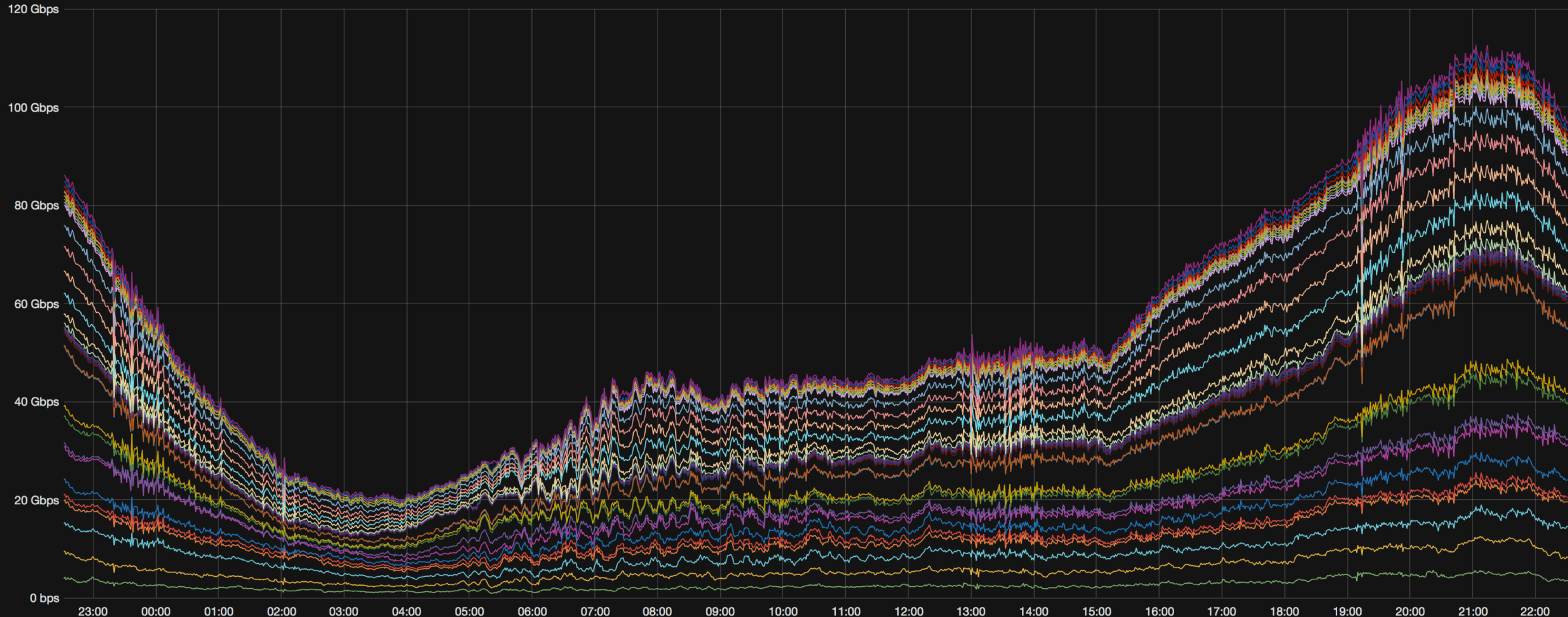
Customer take up rate



- As at today we have 72,000 nbn services connected, an increase of 43,400 since Ausnogs last year.
- Growth has been fairly consistent since launching the POI network, except for the nbn HFC stop sell and then a slower than expected FTTC release through the first half of 2018.
- Churn is at 1.2%, lower than the industry average.

Network traffic today

Inbound Traffic



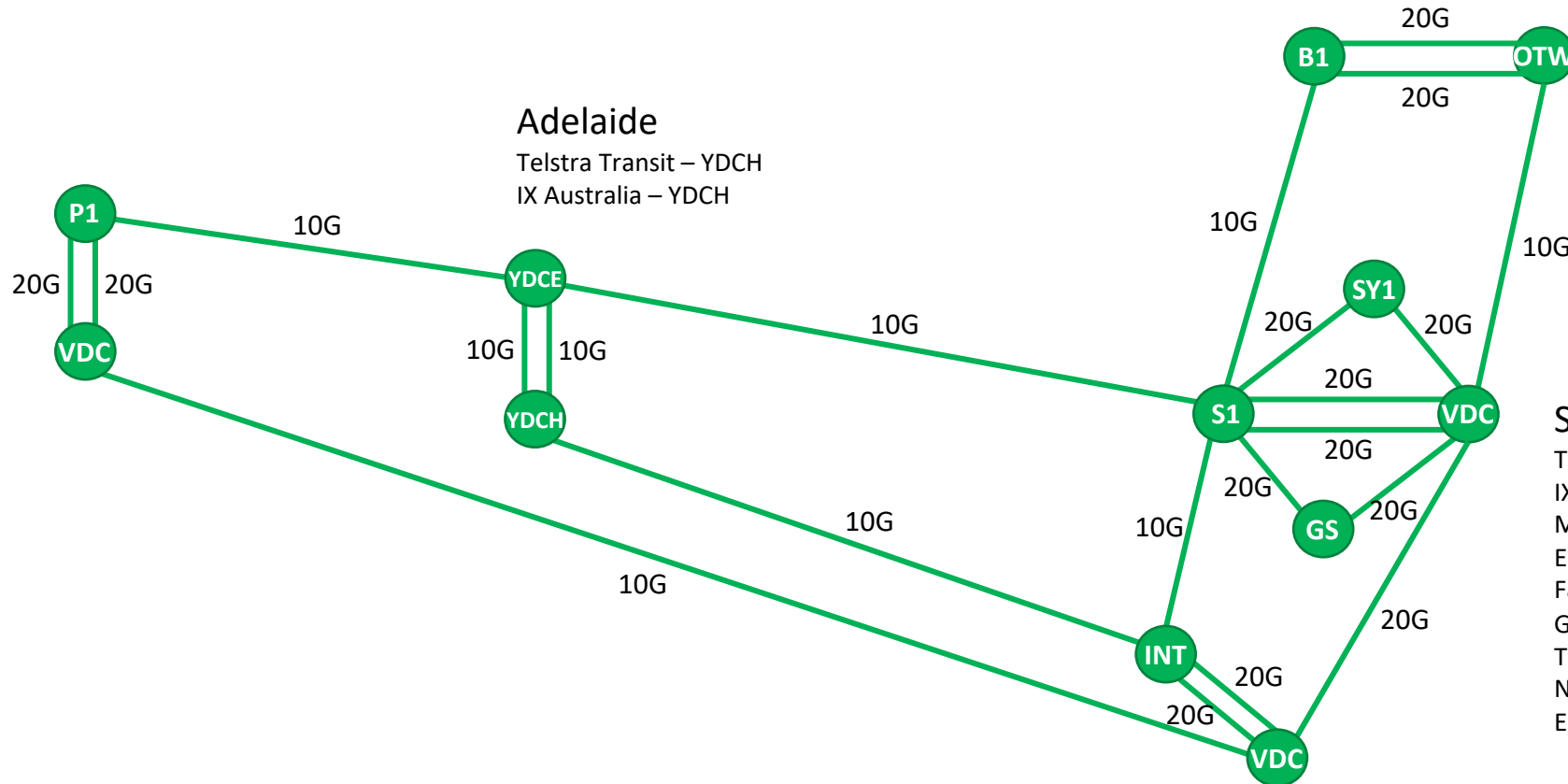
Telstra Portmel Max: 5.6 Gbps Current: 3.4 Gbps Telstra Mel Max: 7.2 Gbps Current: 4.8 Gbps Telstra Perth Max: 6.7 Gbps Current: 6.4 Gbps Telstra Sydney Max: 6.2 Gbps Current: 5.0 Gbps Telstra Ade Max: 1.7 Gbps Current: 948 Mbps
Telstra Brisbane Max: 5.0 Gbps Current: 3.5 Gbps WA-IX Max: 8.2 Gbps Current: 7.2 Gbps QLD-IX Max: 2.7 Gbps Current: 1.1 Gbps NSW-IX Max: 9.2 Gbps Current: 7.3 Gbps SA-IX Max: 2.5 Gbps Current: 2.1 Gbps Vic-IX Max: 18.2 Gbps Current: 12.9 Gbps
NSW-IX NextDC Max: 378 Mbps Current: 191 Mbps Megaport Portmel Max: 6.3 Gbps Current: 5.4 Gbps Megaport QLD Max: 946 Mbps Current: 518 Mbps Megaport NSW Max: 934 Mbps Current: 637 Mbps Megaport WA Max: 932 Mbps Current: 133 Mbps
Megaport NSW NextDC Max: 1.8 Gbps Current: 800 Mbps Equinix Sydney Max: 4.6 Gbps Current: 3.6 Gbps Akamai Max: 7.0 Gbps Current: 4.9 Gbps Google Cache Max: 6.8 Gbps Current: 5.3 Gbps Google Cache 2 Max: 7.3 Gbps Current: 5.4 Gbps
Google Max: 5.8 Gbps Current: 4.7 Gbps Google 2 Max: 5.2 Gbps Current: 4.1 Gbps Facebook Link 1 Max: 890 Mbps Current: 571 Mbps Facebook Link 2 Max: 821 Mbps Current: 586 Mbps Twitch 1 Max: 985 Mbps Current: 769 Mbps
Twitch 2 Max: 856 Mbps Current: 784 Mbps Megaport Vic VDC01 Max: 383 Mbps Current: 268 Mbps Netflix 1 Max: 1.8 Gbps Current: 1.0 Gbps Netflix 2 Max: 1.9 Gbps Current: 1.0 Gbps Edgecast Max: 2.9 Gbps Current: 1.6 Gbps

Network today



Perth

Telstra Transit – VDC
IX Australia – VDC, P1
Megaport – VDC, P1



Brisbane

Telstra Transit – OTW
IX Australia – OTW, B1
Megaport – OTW, B1

Sydney

Telstra Transit – VDC, GS
IX Australia – S1, VDC
Megaport – S1, VDC
Equinix Exchange – SY1
Facebook PNI x 2 – SY1
Google PNI x 2 – SY1, GS
Twitch PNI x 2 – SY1
Netflix PNI x 2 – SY1
EdgeCast PNI x 2 – SY1

Melbourne

Telstra Transit – INT, VDC
IX Australia x 2 – VDC
Megaport – INT, VDC
Google Cache x 2 – VDC
Akamai Cache – VDC

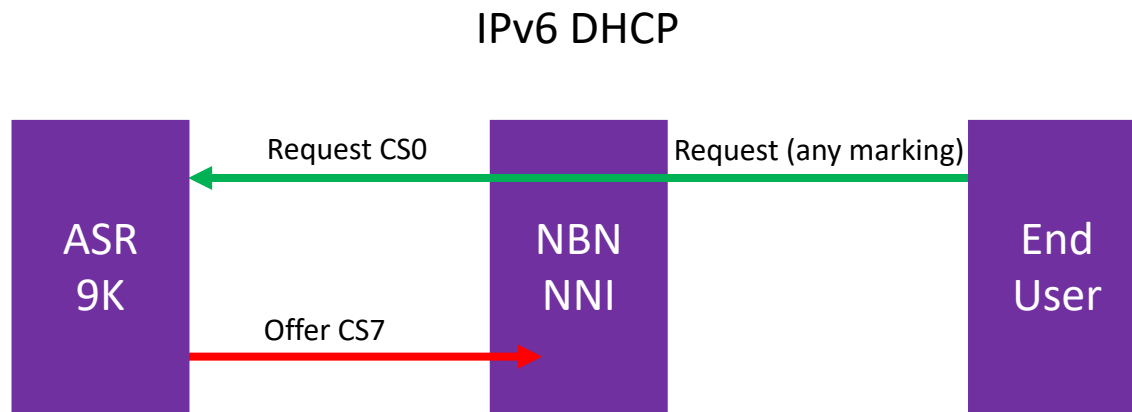
AS4764

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Current challenges



- IPv4 exhaustion hit in June 2018 and required us to purchase IPv4 addresses. We acquired a /18 (16,384 addresses) at the price of AU \$380,000.
- The June /18 will be exhausted by late October so we are now looking to acquire another /18 (expected to cost AU \$405,000 due to currency and IP price rises) which we expect will last till late November 2018.
- High cost of IPv4 space led to us speeding up our IPv6 project and we are now looking at CG-NAT vendors as a longer term solution rather than buying more IPv4 space.
- Our goals see our customer take up rate rapidly increasing over the next 9 months and we expect bandwidth per month grow to go from 12G to 32G per month with total inbound capacity demand set to increase from 110G today to 380G by June 2019.
- Finding suitable engineers to join our team is challenging, especially in regional Victoria.
- Presently we have 55 of the 10G protected links operational with a further 16 handed over in the final stages of activation. We want all 119 complete by October 2018.
- Presently we have 10 POIs on stop sell due to our 80% stop sell, congestion management policy.



- DSCP-Mapped UNI-D ports remap any ingress traffic (IPv4 or IPv6) that does match a provisioned traffic class to TC-4.
- This policy of remapping does not apply to NNI ingress traffic which must be tagged as CS0 on both the inner & outer VLAN.
- Frustratingly, feature parity between v4 & v6 did not exist on the Cisco ASR9k platform. CoS values that are configurable in v4 for traffic such as DHCP and ARP are hard coded for v6 traffic types such as DHCPv6 & ICMPv6.
- Cisco have made the DHCPv6 values configurable in newer software releases and provided a hotfix that hard codes ICMPv6 to CS0.

Traffic in 9 months



Our inbound traffic is expected to increase from 110G to 380G by June 2019 – this was our holy shit wake up call.

With "peak" nbn occurring over the next 12 months, sign-up rates will significantly increase.

- Our core of N x 10G links isn't going to cut it moving forward
- We have the POIs sorted with over 1.2 TBits committed capacity but the core is going to be a problem, and it's going to bite us quickly
- Need to move to a 100G core urgently to solve the bandwidth problems
- IPv4 purchasing is no longer viable so we will need to incorporate CG-NAT (free opt out) with native IPv6.
- Supporting infrastructure like DHCP & Radius servers are also being revisited.

Next 12 months' challenges

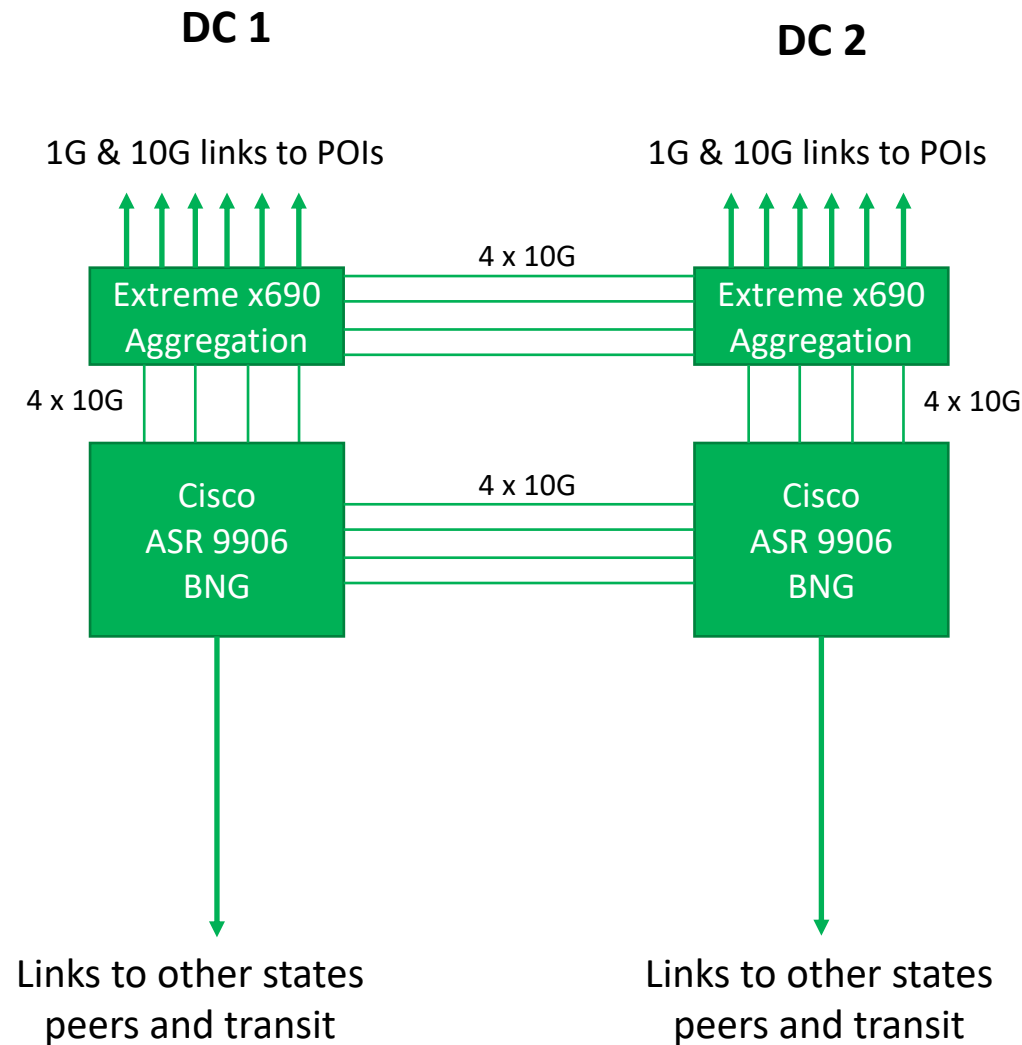


Just when we think our growing pains are over, the marketing and sales team has more in store for us!

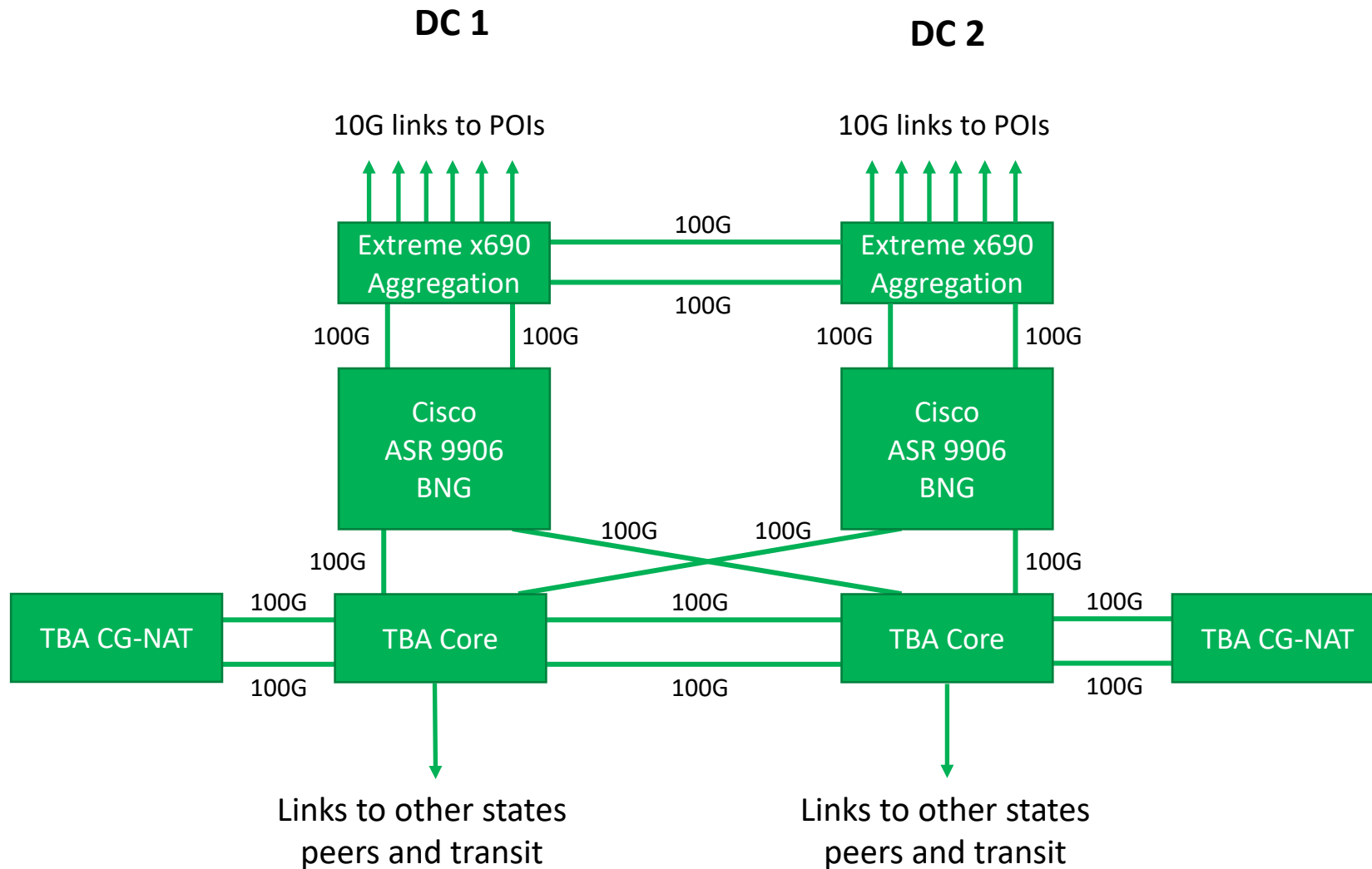
Over the next 12 months we plan to release further products and add a further 100,000 nbn services.

- In the next 3 weeks we need to select a vendor for the core and CG-NAT equipment – account reps take note, we don't have time to muck around
- By Christmas the core and CG-NAT needs to be implemented in at least Victoria and New South Wales or we'll need to buy more IP addresses
- Just having Telstra as a transit provider isn't cutting it anymore so we are going to either go international with our own network or start buying from other tier 1 carriers

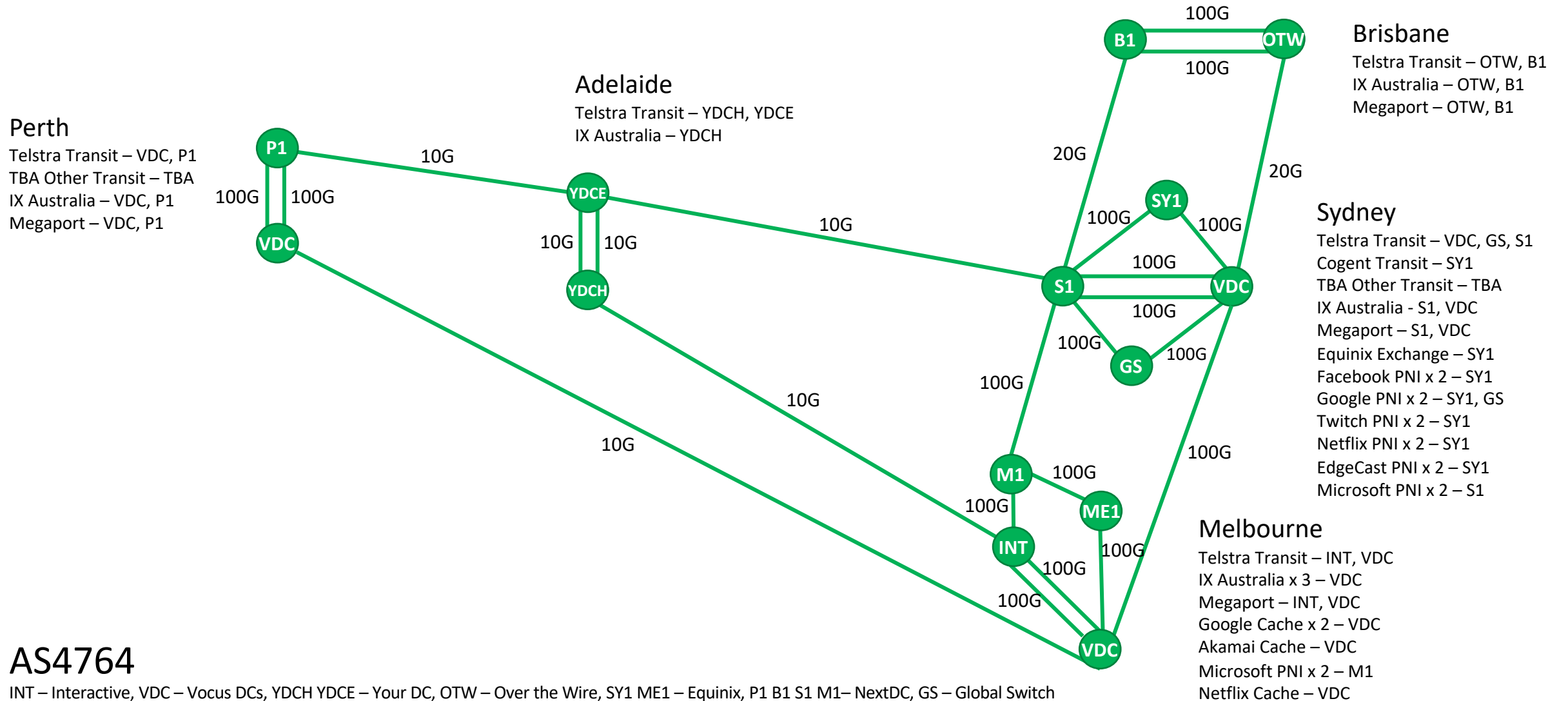
State level design - today



State level design – 3 months



The network in 3 months



CG-NAT vs purchase IPv4



	Year 1	Year 2	Year 3
Purchase IPv4 space	\$4.8m	\$6.7m	\$7.6m
CG-NAT & Network Upgrade	\$2.4m	\$2.4m	\$2.4m
Savings per year	\$2.4m	\$4.3m	\$5.2m

Hardware solution is based on core upgrade to 100G with CG-NAT equipment, financed over 3 years.

- Moving to CG-NAT has become an economic decision
- Over the 3 year period CG-NAT and upgrading the core network is \$11.9m cheaper than purchasing IPv4 space on the open market
- Savings are actually deeper if you include core network upgrade into IPv4 purchase figures
- Will provide an opt-out option for those that require a real world IPv4 address, and continue our static IPv4 purchase option
- We were not prepared to consider CG-NAT as a solution until we could provide dual stack native IPv6 to an nbn customer.

State as an island

Whilst we have a national backbone, we are designing key server infrastructure to run on a “state as an island” basis.

Key resources like DHCP, Radius and DNS need to be operational all the time or customers literally drop offline.

- Using IPoE requires radius and DHCP to be always available; if these services go offline, customers will be offline within 1 hour
- Currently DHCP and radius are based in Victoria with DNS available in all states using an anycast IP model
- Moving forward we will have DHCP and Radius in an anycast model as well, with servers in each data centre nationally replicating the relevant information from our databases in Melbourne

Staying focused



We've got so many opportunities, staying focused on the main game is hard.

Prior to being a national nbn player, Aussie was a builder of network infrastructure in regional Victoria and South Australia

- Being presented with opportunities to build next generation wireless networks for bypassing the nbn
- Opportunities to work with various state governments on alternative access networks
- Needing to stay focused on our nbn play whilst shutting down legacy infrastructure like our own fixed wireless network and removal of DSLAMs from 18 exchanges

Industry challenges



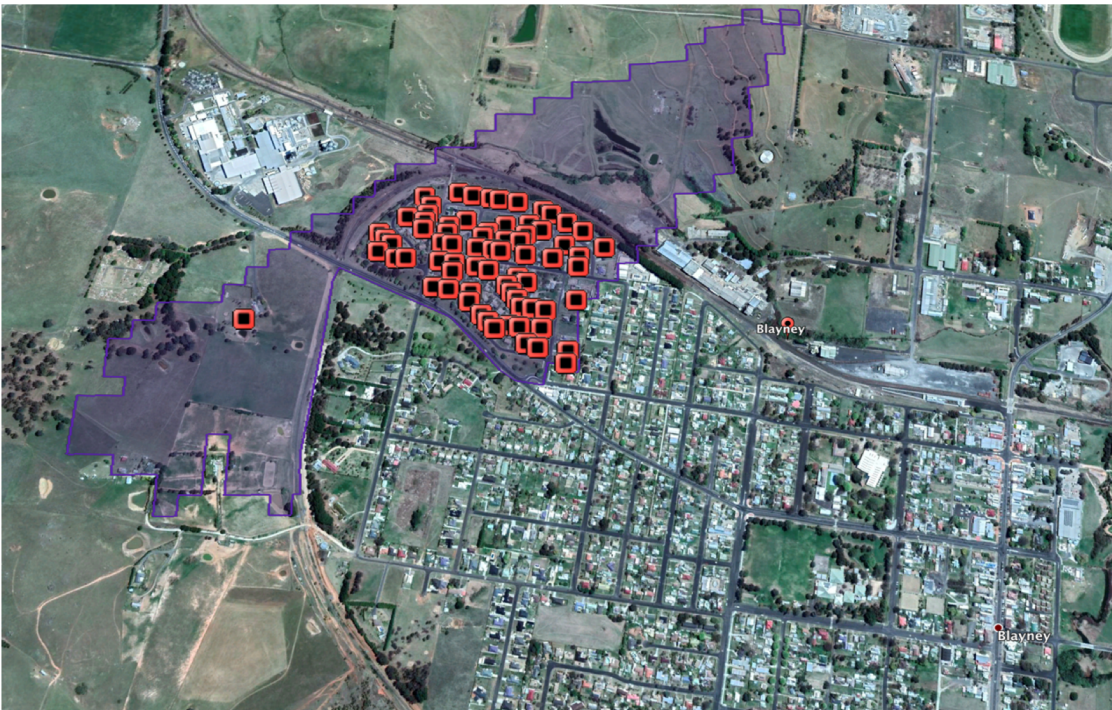
As an industry we are facing more regulation than ever.

There's so much regulation coming, we're about to hire an in-house lawyer.

- The ACMA service continuity standards due to come into effect in September place the burden on RSPs, and forget to hold nbn accountable.
- Changes are being rushed in, and supporting changes to things like the porting code are also needed to make rollback possible
- This will drive up costs for smaller RSPs who don't have the benefit of their own mobile network to provide parallel services

nbn fixed wireless

Nbn's fixed wireless network sees 18% of premises receiving less than half the plan speed in busy hours *.



The fixed wireless network has been widely used in inappropriate areas and it's time for change.

- Fixed wireless was used to get quick wins in the early nbn rollout which has resulted in normal house lots ending up on fixed wireless
- We are calling on the government to provide additional funding to convert these town blocks from fixed wireless to FTTN or FTTC.
- Doing this will free up much-needed spectrum and cell capacity for those on rural blocks on the outskirts of towns.
- nbn say 5% of cells are congested which then translates to 13% of premises.

* Based on Aussie's calculations using both public and commercial in confidence data

As reported in the media, nbn plan to release a “MAX” product to replace the current 25-50/5-20 speed tier.

Industry consultation around nbn’s fixed wireless “MAX” product is about to begin and as an industry we need to speak up:

- The concept of the max product is to remove the customers’ perception around what speeds are attainable and make it look more like a mobile broadband product, in terms of having variable speed based on what’s available at the base station. Once fully developed it proposes to deliver up to 75 Mbits down and 10 Mbits up.
- The service is still being proposed with a 6 Mbit design floor in the busy hours of the day. In off-peak times it may be possible to achieve 75 Mbits but not in the times the customers will most likely want it.

If you're not in the game now, it's already too late – NNI link is 3 years too late.

Great concept but it won't increase competition on a national basis.

- Whilst it reduces the barrier to entry for smaller players it still requires them to on board with nbn, purchase CVC or use the bundles and manage 121 CVCs for national coverage.
- Good for smaller providers that are just focused on a handful of POIs and increases control compared with an traditional aggregation model.
- Still requires them to have an aggregation agreement with someone for national coverage – results in differing service standards – the primary reason Aussie built to all POIs.



Questions?

Download this presentation at:

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aussiebroadband.com.au