

Internet Uninterrupted

Australian Households
of the Connected Future

Internet evolution: an explosion of devices and simultaneous applications

When the first Australian universities joined the Internet nearly 40 years ago, most households were yet to enter the information age. For the average Australian, it was like there was no information highway at all. For the latest news, you read a paper. To hear new music, you watched Countdown or went to a record store.

Looking back to 1996, only one per cent of Australian households regularly used a computer at home, according to the Australian Bureau of Statistics (ABS), and only 26 per cent of these had a modem capable of networking beyond the home.

Meanwhile, only one per cent of households had 'cut the cord' by 1996 – by ditching the shared home phone in favour of one or more mobile phones. And in 1996, only 300,000 Australians were using a home computer to access the Internet in any way, including email.

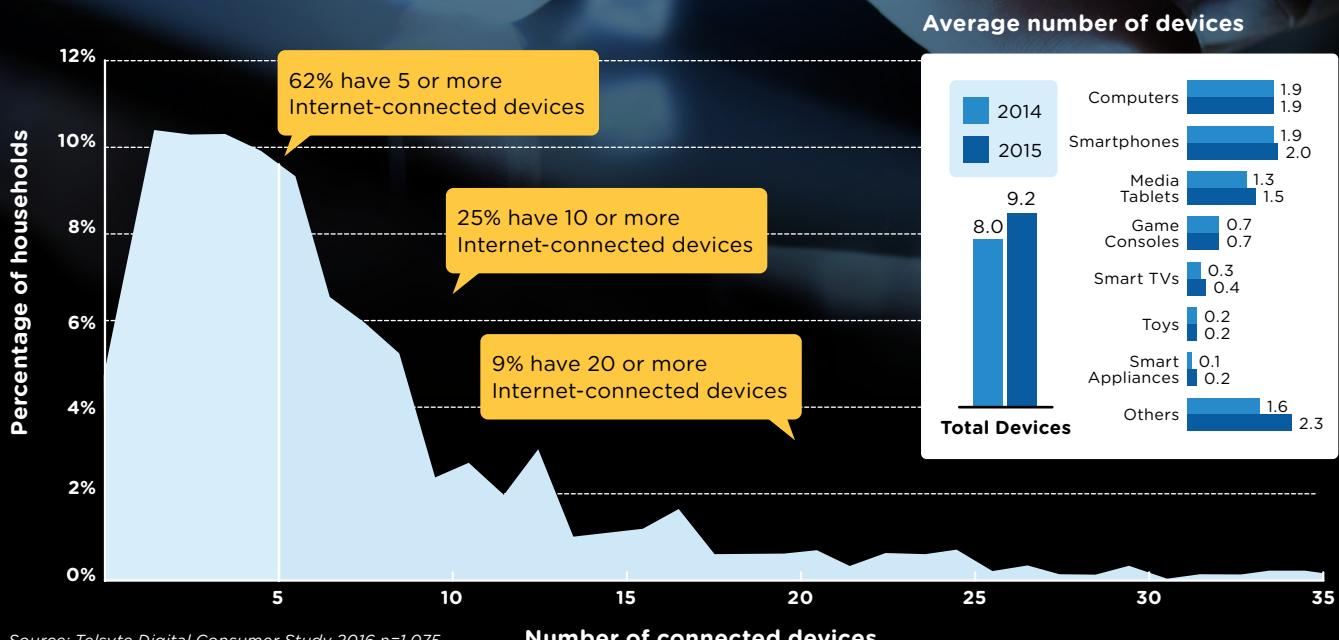
In this era, Australians were using technology very differently compared to today. To access the Internet we needed to wait until the phone line was free. To use a computer we needed to fight off others who wanted to use the one shared computing device. If we browsed the web, we did so one page at a time – a single-lane digital highway.

Australian households in 1996:

- 6.6m households in Australia
- 34% have a computer at home
- 31% regularly use a computer at home
- 5% access the Internet at home
- 3% use email at home

Source: Australian Bureau of Statistics, Household Use of Technology (8146.0), 1996

Figure 1: On average, Australian households have nine Internet-connected devices



Source: Telsyte Digital Consumer Study 2016 n=1,075

Progress – slowly but surely

Fast forward thirteen years to 2009 – the year **nbn** was incorporated – and we find that many more digital devices had entered households, but connectivity still had plenty of room to grow. For example, 45 per cent of households had gaming consoles by 2009, but 75 per cent of these were still used for offline play only, according to Telsyte's Digital Consumer Study 2010.

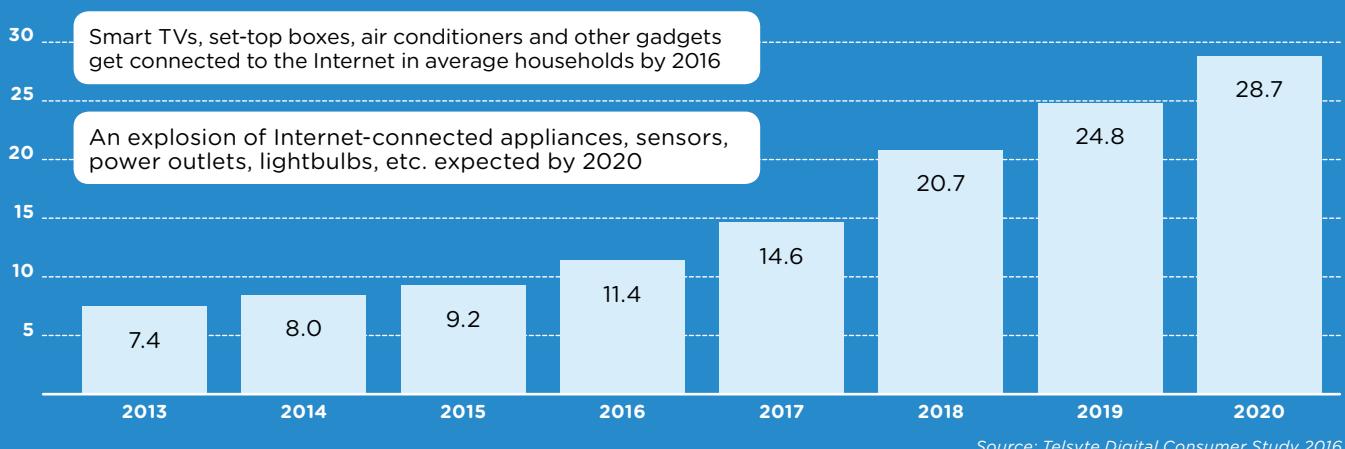
Likewise, 72 per cent of Australian households had fixed broadband by 2009, but nearly a third were still stuck on the original, slower version of ADSL.

From 2009 the pace of development continued to accelerate, but even as recently as 2011 97 per cent of all subscription TV was provided through dedicated cable or satellite services.



On average, Australian households have nine Internet-connected devices

Figure 2: Average number of Internet-connected devices in Australian households (2013–2020)



Haven't things changed since then?

As of 2015, Telsyte calculates that the average Australian household has more than nine connected devices. On top of this, the average household is using around eight Internet applications at once during periods of peak usage. For example, they may be updating their smartphone's apps while video chatting on a tablet and watching streaming video on a Smart TV – all while other members of the household are attending to their studies, online gaming or work applications in other rooms.

Telsyte forecasts that by 2020, the average Australian household will have 29 connected devices as Internet connectivity is built into everything from whitegoods to lighting. This is called “the Internet of Things” and it is coming to everything from kettles to air conditioners.

Some of these connected devices, such as printers, may be frequently idle. Others, such as PCs, may well run five Internet-connected applications at

once, as users simultaneously play games, chat with friends, download content and more. Consequently, Telsyte estimates that the average household will have 12 applications connecting to the Internet at once during peak times, up 50 per cent on today's levels. And the more online applications you use at once, the harder your broadband connection has to work – even if some of those applications do not use much bandwidth of their own.

It is a bit like a vehicle highway – every additional car directly fills some space, but it also needs plenty of room on every side to allow it to reach its destination smoothly and in good shape.



Simultaneous application usage is set to grow by 50 per cent in households by 2020

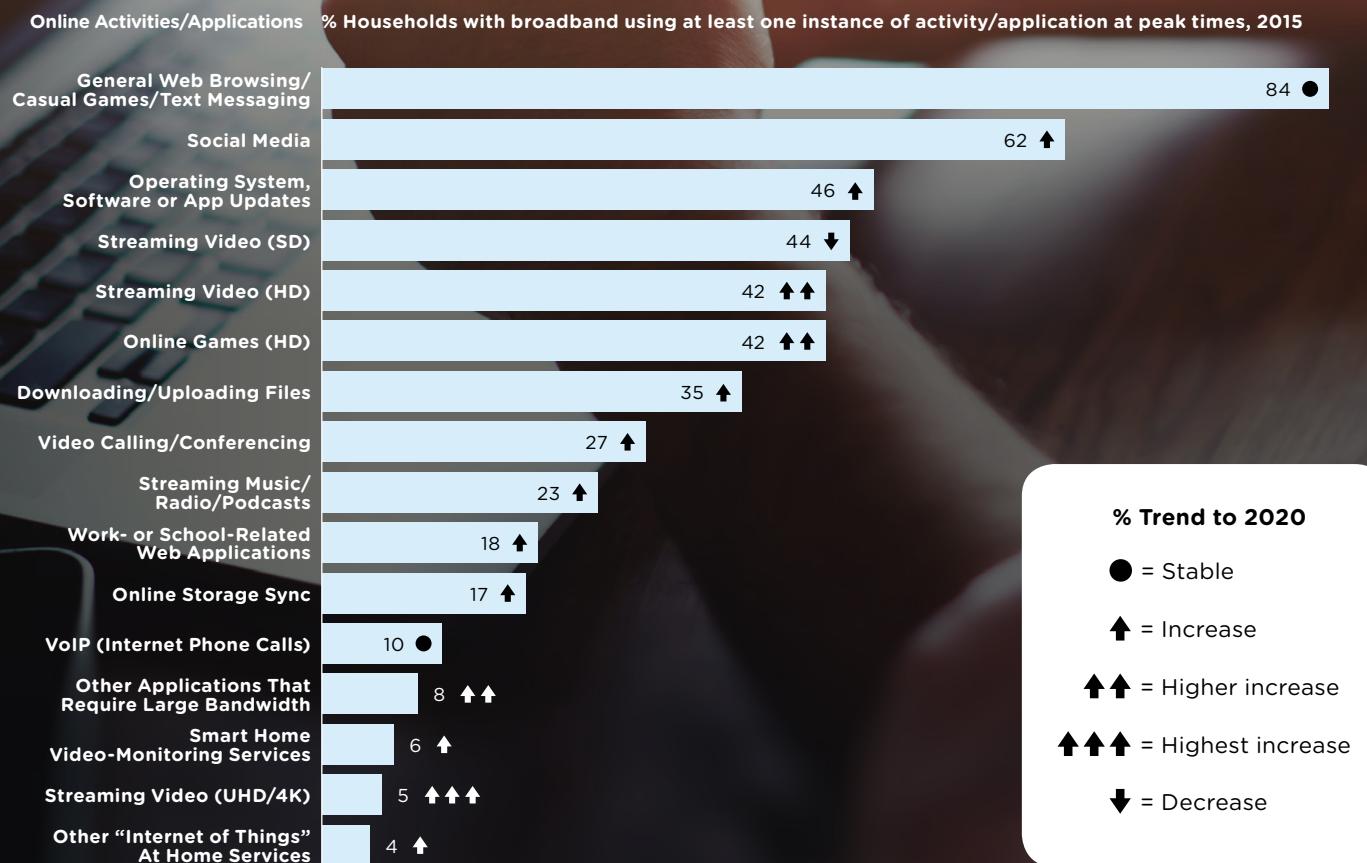
Households pile on the applications

The average Australian household has rapidly increased its use of simultaneous broadband applications. At peak times it is common for Australian households to conduct general web browsing (84%), social media (64%), operating system and app updates (46%), some SD and HD streaming as well as other applications (see Figure 3).

These applications are more likely to be added to in the future, as more households conduct streaming of Ultra High Definition (or 4K) video.

To explore this further, five modern household types were identified according to whether the adult(s) are in work, whether they regularly work from home, and whether they have children or adult offspring.

Figure 3: Simultaneous application usage at peak times



Source: Telsyte Digital Consumer Study 2016 n=1,075

The Hectic Household

Busy professional households that seek the latest loungeroom and home office technology and services



Life is busy and getting busier, especially for those who are trying to balance career and parenting demands.

Hectic Households are single- or dual-parent households with children living at home where at least one parent works and regularly has to work from home to keep up with their career demands.

With two parents in full-time employment (for most Hectic Households), there is often money left over for the latest toys. One in five Hectic Households has a household income of \$150,000pa or more, compared to just eight per cent of all households. In line with their average incomes, 55 per cent of Hectic Household members have a TV set-top box, compared to 29 per cent of all Australians. Likewise, 60 per cent have a gaming console, 39 per cent have a 3D-capable TV and 51 per cent have a Smart TV.

All these devices typically live in the loungeroom, the communal space of the home where households spend time together. So while technology can help busy professionals to further their careers, it is also a key feature of the spare time families have together or as individuals. The interesting part is when Hectic Households try to use technology in both these ways at once — they are likely to face hard limits on how much data they can push through their broadband connections.

In fact, of all the household types examined in this report, Hectic Households are the most likely to say they regularly experience a lag on their fixed broadband connection.

These lags affect both work and play. On the one hand, Hectic Household members regularly work from home, and are the most likely to list cloud storage and backup as one of the reasons they are frustrated by broadband lags (18 per cent, compared to six per cent of all Australians). On the other hand, the loungeroom technology this group uses to escape work pressures is also struggling to obtain the throughput that it needs. 28 per cent of Hectic Household members list Ultra HD/4K streaming as one of the reasons they are frustrated by broadband lags, compared to eight per cent of all Australians. Hectic Households are the neediest household type examined in this report in terms of both download and upload bandwidth requirements.



Hectic Households are the most likely to own a Smart TV



The Hectic Household: a snapshot

- Affluent: 23% earn \$150,000 pa or more, vs 8% of all households
- Demanding: the most likely to regularly experience broadband lags
- Well entertained: 51% own Smart TVs, vs 26% of all households
- Number of apps during peak usage today: 12
- Number of apps during peak usage by 2020: 19

Suburban Dreamers

Suburban households that might hit bandwidth limits before the kids go to bed



Despite all the changes that are occurring in Australian cities, the lure of the suburban dream — the big yard with a dog, plenty of time and space for the family, the job that you leave in the office when you come home at night — remains strong.

In fact, more Suburban Dreamers prefer safety and security in their lives — and spending time with their family and friends — ahead of anything else.

Suburban Dreamer households are defined as single- or dual-parent households with children living at home. They might work from home occasionally, but unlike Hectic Households, a core principle of the Suburban Dream is you leave work in the office when you clock off.

For Suburban Dreamers, the few short hours between when the parent(s) get home and when the children go to bed are the busiest. More than half (53 per cent) of Suburban Dreamers say they have experienced a lag in their broadband between 5pm and 7pm, which is when the number of people who are at home, awake and able to go online reaches its peak. This is well ahead of the Australian average of 37 per cent of people experiencing a lag at that time.

And what are they doing when these lags begin? The short answer is “all sorts of things”. After all, part of the

appeal of the Suburban Dream is that there is enough room to put larger families under the one roof. However, it is worth noting the importance of one activity in particular: computer and video gaming.

Suburban Dreamer households try to create a welcoming environment for children, including young adults who may still be attending university or just starting their careers. The children and young adults that make up these households mean that 61 per cent of Suburban Dreamers own a gaming console, compared to just 38 per cent of Australians as a whole.



61 per cent of Suburban Dreamers own a gaming console



53 per cent of Suburban Dreamers say they have experienced lag in their broadband between 5pm and 7pm



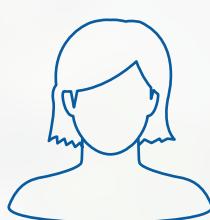
Suburban Dreamers: a snapshot

- Busy evenings: 53% experience 5-7pm lags, vs 37% of all households
- Play games: 61% own a gaming console, vs 39% of all households
- Number of apps during peak usage today: 7
- Number of apps during peak usage by 2020: 13

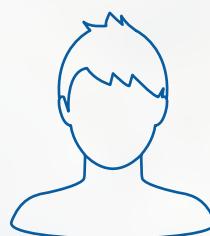
Case Study: Suburban Dream in Dapto, Wollongong, NSW



Brian Boulton, 56
Volunteer



Dianne Boulton, 50
Volunteer



Joshua Boulton, 19
University student



Naomi Boulton, 16
High school student

Before upgrading over the **nbn™** network in September 2015, the Boulton family had an ADSL connection that dropped below 8MB/s whenever it rained. Back then, tech enthusiast Joshua would often emerge from his room, and try to persuade the rest of his family to stop watching a streaming movie so he could get decent performance for an online game he was playing.

These days, it is a different story. Not only can everyone in the household do their own thing, but often they are each doing many things at once.

Joshua is online six to eight hours a day. In addition to using his desktop for gaming, it is the tool he uses to watch lectures and upload assignments. He is also always connected via Wi-Fi.

His sister Naomi is the typical multi-tasker. On any given day, she will be completing homework on her laptop, while chatting about it with friends on her tablet. Meanwhile, her smartphone continually chimes as she receives new alerts from social networks and group chats.

In the loungeroom, their mother Dianne watches 90 minutes a day of streaming video or files downloaded to the family's media server. She also uses her laptop daily for social media and for her volunteer role with her church's food bank.

With their nbn™ connection the Boultons can explore their own interests, whether for work or play, without fear of congestion when everyone is doing something at once

Their father Brian takes a similar approach to his volunteer role and streaming video, as well as using cloud storage to sync his large collection of digital photos.

The family even shares its **nbn™** network connection to the benefit of others. Brian has taken home a church computer to upgrade its operating system via the **nbn™** network, while Joshua's friend was able to use the connection to purchase and download a 65GB game in less than two hours.

With their **nbn™** network connection the Boultons can explore their own interests, whether for work or play, without fear of congestion when everyone is doing something at once.

City Living

Untethered city-dwelling singles and couples who use technology to support active lifestyles



Increasingly, the centres of Australian cities are occupied by adults in good jobs with great social lives who may not have children.

For this study, City Living households are defined as couples that have never had children and where at least one adult works full-time. The mobile lifestyle — facilitated by smartphones, tablets and increasingly wearables like smart watches — is a feature of City Living households.

Increasingly, these households are saying goodbye to the quarter-acre block. According to the ABS, the current trend is that more apartments are receiving building approval than houses. And Telsyte data shows that 46 per cent of City Living households live in an apartment or townhouse, compared to 24 per cent of Australians as a whole.

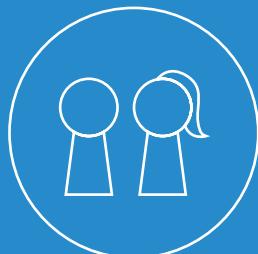
Having two incomes and no children means that many City Living household members are in a good position to invest in new technology. This group has, in fact, already adopted many of tomorrow's trends. But the most striking feature of this group is the old technology that they are leaving behind.

For a start, City Living households take a lead on the 'cord cutting' trend. Only 59 per cent of City Living household members have a fixed home phone, compared to 71 per cent of Australians as a whole.

City Living homes tend to be smaller and their computers tend to be used for work as well as play. As a result, only 33 per cent of City Living households have a desktop PC at home, compared to 52 per cent of all Australians.



The mobile lifestyle, including wearables like smart watches, is increasingly a feature of City Living households



City Living: a snapshot

- Smaller homes: 46% live in an apartment or townhouse, vs 24% of all Australians
- Cutting the cord: 59% have a fixed home phone, vs 71% of all Australians
- Always connected: 92% always keep their tablet online at home, vs 78% of all tablet owners
- Number of apps during peak usage today: 11
- Number of apps during peak usage by 2020: 15

Empty Nesters

Using technology to get things done — although not always with the latest devices



As life spans continue to lengthen, the number of retired people living in Australia continues to grow.

For this study, Empty Nester households are any couples or families with children who do not live at home.

According to all stereotypes, Empty Nester households should be the last to take up new technology, and the data generally bears this out. For example, only 51 per cent of Empty Nester mobile phone owners have a smartphone, compared to 76 per cent of Australian mobile phone owners. Just 15 per cent have a gaming console in their home, compared to 38 per cent of Australians as a whole.

But that does not mean Empty Nester households avoid technology. Far from it. While the range of technologies they use tends to be narrower than in other households, their use of certain technologies is still high.

For a start, 66 per cent of Empty Nesters have a desktop PC (compared to 52 per cent of all households). On top of this, 83 per cent of Empty Nesters have a digital camera, compared to 67 per cent of all households.

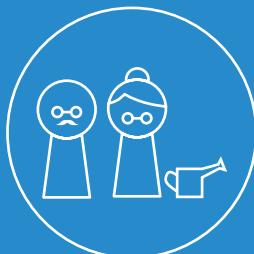
And where do these digital photos end up? A fair few must surely be uploaded from the household desktop PC to email or the web. While Empty Nester households are less likely to use social networks than any other household type, fully 65 per cent still use Facebook. What is more, 81 per cent have accessed email in the last week, versus 69 per cent of all Australians.

As they use less technology than the other household types, Telsyte modelling shows that the average Empty Nester household's bandwidth needs could grow based on increases in HD video consumption and simultaneous video conferencing.



Empty Nester households' bandwidth needs could grow based on increases in HD videos and video conferencing

Empty Nesters: a snapshot



- Lack new devices: 51% of those with mobiles have a smartphone, vs 76% of mobile owners
- Retain older devices: 83% have a digital camera, vs 67% of all households
- Old-fashioned communicators: 81% have used email in the last week, vs 69% of all Australians
- Number of apps during peak usage today: 6
- Number of apps during peak usage by 2020: 9

Shared Households

Keeping to a budget but heavy users of Internet-sourced entertainment



Shared accommodation households are growing in popularity as the rising cost of housing is forcing more young people, students and single people into finding housemates.

Cost-of-living pressures feature heavily in this segment, which now numbers around 400,000 households in Australia.

As a result of these financial pressures, Shared Household members tend to own fewer devices than other Australians — fewer media players, TV set-top boxes, tablets.

However, what they lack in terms of device ownership, they make up in terms of Internet usage. For example, 33 per cent of Shared Household members have watched catch-up TV in the last week, compared to 15 per cent of all Australians. 61 per cent have accessed YouTube in the last week, versus 42 per cent of all Australians. 34 per cent have someone in the house who uses the Internet for online education. 40 per cent have someone in the house who uses the Internet for online gaming. And 28 per cent of the Shared Household

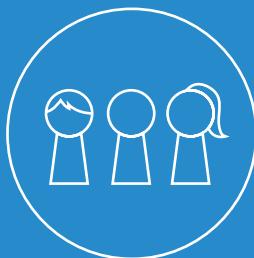
members who watch Netflix are on the Premium plans supporting four simultaneous screens — compared to just 13 per cent of all Netflix viewers in Australia.

As a result of all these high levels of usage, it is not surprising that 32 per cent of Shared Household broadband users say they regularly experience broadband lags, compared to 22 per cent of fixed broadband users as a whole. Consequently, 85 per cent say that they will upgrade their broadband speed between now and 2020 if they can, compared to 60 per cent of all Australians.



Shared Household broadband users regularly experience broadband lags

Shared Households: a snapshot



- Love catch-up TV: 33% watched it in the last week, vs 15% of all Australians
- Crave speed: 85% hope to upgrade their broadband speed before 2020, vs 60% of all Australians
- Use speed for games: 40% of those with lags said they affected gaming, vs 14% of all those with lags
- Number of apps during peak usage today: 8
- Number of apps during peak usage by 2020: 12

Case Study: Shared Living in Victoria Park, Perth, WA



Nathan Glover, 21

Full-time university student,
part-time retail administrator



Yhana Lucas, 24

Full-time university student,
part-time tax administrator



Lee Newton, 27

Housemate

Partners Nathan and Yhana and their housemate Lee share a rental property near Curtin University, where they study. They signed up for their ISP's fastest and second-largest **nbn™** network plan the moment they moved into their home three months ago.

"We're all pretty much into technology," says Nathan. "We use it all the time. We do not shy away. When we can do something with technology then we will do it with technology, and we're all tech savvy."

Nathan, Yhana and Lee's home is overflowing with connected devices. Nathan himself has a couple of desktops, three gaming laptops, a tablet, four servers, a smartphone and a smartwatch. Yhana and Lee have their own devices too, and there is a media streaming device connected to the shared TV in the loungeroom and a shared NAS file server. Nathan is even thinking about automating the household's lighting.

"We use it all the time. We do not shy away. When we can do something with technology then we will do it with technology, and we're all tech savvy"

When he's watching university lectures on his desktop with the high-resolution screen, Nathan typically takes notes on his tablet, and accesses the Curtin student network and keeps documents in sync with cloud storage from his laptop. During downtime, he will play online games for a few hours a day. Meanwhile, the others are watching streaming video while staying on top of their studies.

Peak bandwidth needs expected to grow

As every type of household from Hectic to Empty Nester increases its use of Internet applications, household behaviour will go through big changes. By 2020, with the continued spread of high-definition video into all areas of life and the dawn of the Internet of Things, households' Internet behaviour will look greatly different to today.

Ultra HD: high-definition video is just the beginning

Video communication and content has clearly revolutionised how Australians use the Internet. To date, most of this video has been of standard definition (SD) quality, and sometimes in High Definition (HD). However, even higher-resolution video has started to appear in living rooms with Ultra HD/4K.

At present, just five per cent of Australian households have an Ultra HD (UHD or 4K) smart TV — which is the highest-definition screen available to consumers. Each uncompressed frame contains more than eight million pixels.

This is but one aspect of a trend that is transforming every aspect of online life. Before long, Australians can expect to consume high-quality and immersive video whenever they use the Internet to do anything from shopping for clothes to interacting with government. HD

video is also expected to be a key part of workplace collaboration, which can boost business productivity.

The use of UHD/4K will not be limited to big screens, with smartphones available today that feature screens of this resolution. Naturally, there will be efficiency gains as video compression technology improves. Telsyte believes compression will improve 20 per cent between 2015 and 2020, helping fit more high-definition video through any connection.

HD video is also expected to be a key part of workplace collaboration, which can boost business productivity

The dawn of the Internet of Things (IoT) at home

The second key driver is the rise of the Internet of Things. Australia is on the verge of an era in which just about every electronic device — from smoke detectors to alarm clocks to hot water systems and beyond — will be connected to each other and to the Internet.

In the Telsyte Australian IoT @ Home Market Study 2015, Telsyte forecast that the market for IoT devices and services used in the home will grow by a factor of 11, reaching \$3.2b by 2019.

The main reason for this explosive growth is due to appliance manufacturers starting to add Internet connectivity to every product they sell over the next few years. It is happening quickly, as manufacturers like Samsung have indicated that all their products will be IoT capable by 2020. A good analogy might be how mobile phone manufacturers started adding cameras to phones over a decade ago. Today, not only is it rare for a mobile phone not to have a camera, but many of us will not even remember what it was like not to have this useful feature. The same is expected to be the case with IoT-enabled devices and appliances.

Many of the coming IoT devices will require minimal bandwidth on their own. For example, an IoT-enabled dishwasher may only require a few bits sent occasionally to notify a service centre that it needs maintenance. However, the sheer number of IoT devices in the home that will strive to use the same Internet connection simultaneously will add greatly to the demands on a household's broadband.

To return to the highway analogy, each IoT-enabled device needs lane space not just for its own data, but also to maintain a comfortable distance between it and the other applications that are driving on the same information highway at the same time.



The Internet of Things at home will be a natural evolution as everything from whitegoods to air conditioners gets connected

Figure 4: Future smart home apps



12 - 15 MB/s ↓
Smart TV
UHD/4K
streaming
video



4 MB/s ↓↑
Virtual Reality
Online Gaming
Immersive
games
and content



0.3 MB/s ↓
Multi-room
Streaming
Streaming
music in
any room



1 - 1.5 MB/s ↓↑
Multi-Person
HD Video
Conferencing
Keeping in touch
with people on
any device



0.1 - 0.5 MB/s+ ↓↑
Smart
Appliances
Remote
maintenance
and monitoring



0.5 - 1.5 MB/s ↓
Smart Doors
and Locks
(with video
monitoring)
Keyless entry



0.5 MB/s+ ↓↑
Smart Health
Sleep apnea
monitoring
and treatment
system, syncing
in real time with
the medical
research centre



0.1 MB/s ↓
Smart Hot
Water System
Heats when
power is
cheapest.
Low power
mode when
you're away

↓ = Download ↑ = Upload

*Includes typical application upload and download overhead as well as bitrate. Figures could vary by platform.

Australian households will embrace the ultra-connected future

By 2020, Australia's population will have reached 26.4 million, with almost 10 million households of great diversity. On average, Australians will be older and living in smaller homes that are closer to the centre of cities. A range of technologies that are confined to research labs today — from virtual reality headsets to viable home batteries — will be a fact of life for ordinary Australians.

In this not too distant future, Australians will continue to ramp up their use of the Internet for work, study and play, where multitasking blurs the lines of when one starts and another stops. They will view and generate higher-resolution video content to view on any device. They will immerse themselves in virtual reality games and vivid experiences as profound as 'being there'.

As they replace their ageing whitegoods, households will find they have many more devices connected to

the Internet naturally. They will find more 'things' in the home that need a reliable broadband connection, from security and health monitoring services, to smart meters, locks and lighting.

Many of these technologies exist today and are simply waiting to go mainstream — like smartphones, tablets and even the Internet did before them.



The average Australian household will have 29 Internet-connected devices by 2020

About this paper

This paper was commissioned by nbn co limited and produced by Telsyte.

It explores how Australian households use the Internet today and expect to in the future, with a focus on how they are using a growing number of different broadband applications at once.

It is designed to identify the current and future peak bandwidth needs of Australian households. It provides insights on the applications, devices and services that Australian households will increasingly rely on for their daily lives.

This paper was based on Telsyte primary and secondary research, including a survey conducted in October 2015 as part of the Telsyte Australian Digital Consumer Study 2016, which had a representative sample of 1075 respondents, and was weighted to ABS (Census) statistics for age, gender and location.

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