



Australia's  
broadband  
network

# gen nbn™: 2020 and beyond

**The future of a connected Australia**



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## About this guide

This report was developed by Western Sydney University and commissioned by nbn, the company building Australia's broadband network.



**WESTERN SYDNEY**  
UNIVERSITY



## About nbn

**nbn** (the company) was established on 9 April, 2009 to design, build and operate Australia's new broadband network.

**nbn** is a wholly-owned Commonwealth company - a Government Business Enterprise - and is represented by Shareholder Ministers; the Minister for Communications and the Minister of Finance.

For more information about **nbn™**, visit [www.nbn.com.au](http://www.nbn.com.au)

## About Western Sydney University, Institute for Culture and Society

The Institute for Culture and Society at Western Sydney University studies transformations in culture and society in the context of contemporary global change and is the largest dedicated research concentration of its kind in Australia.

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# gen nbn™: 2020 and beyond

The **nbn**™ network is an essential piece of national infrastructure that enhances connectivity throughout Australia's vast continental landmass.

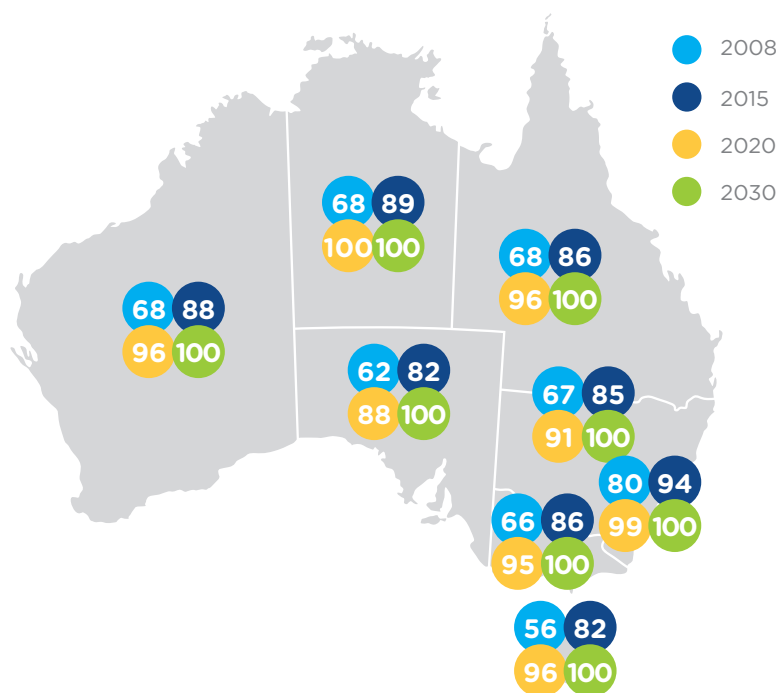
Connectivity is arguably the quintessential resource of the new century: more important than natural resources, military power or industrial manufacturing. Each order-of-magnitude increase in digital capacity changes how people, businesses and institutions think and live connectivity, translating niche or boutique digital experiences into mainstream practices.

The **nbn**™ network is one of many conditions required for sustainable and significant change. To take advantage of the unprecedented potential that the **nbn**™ network brings, Australia is expected to see advances in areas such as education, training, digital literacy, and community engagement. With careful

attention to these areas, the rollout of the **nbn**™ network raises prospects for the realisation of new economic and cultural possibilities. Just as the move from dial-up narrowband to always-on broadband has, in less than two decades, created habits, expectations, dependencies and connections, we anticipate the expansion of fast broadband will create powerful opportunities for **gen nbn**™.

Australians continue to adopt the internet at extraordinary rates. The Australian Bureau of Statistics reports six in every seven households had internet at home in 2015 – up from two-thirds in 2007/08. Conservative estimates see these figures growing to 94 per cent of households by 2020, encompassing virtually all households by 2030. These will be connected across a mix of **nbn** broadband, 4G mobile internet and other internet services. The **nbn**™ network will match much of this demand, delivering access to remote and densely populated areas across the continent.

## Households with Internet at home, 2008-2015 (projected to 2030)



Source: ABS Catalogue 81460D0001\_201415, Household Use of Information Technology

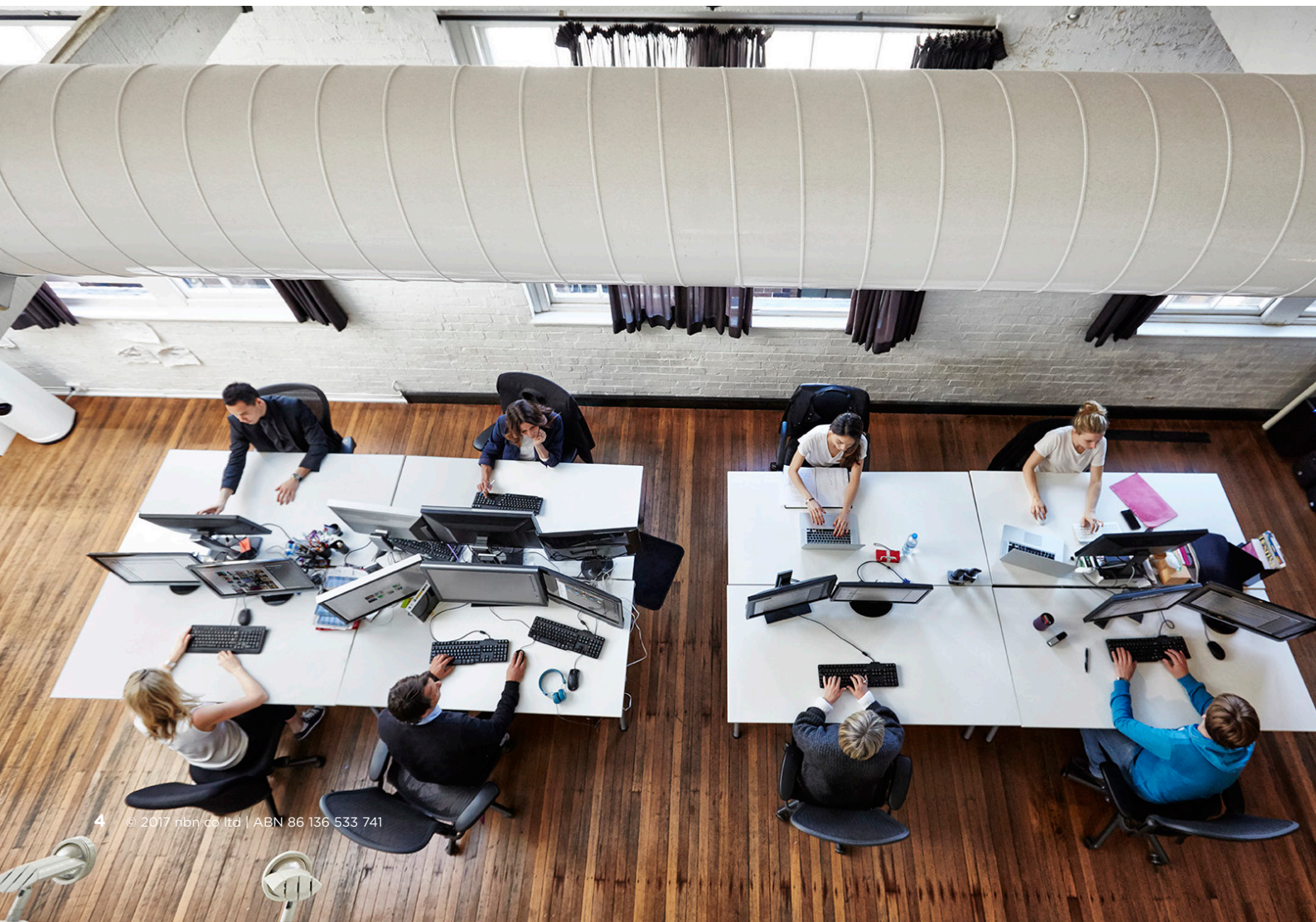


The opportunities are many, but they are mirrored by challenges that we must collectively address. Movements away from and towards major and regional urban centres, in part facilitated by connectivity, rejuvenate some communities and place strains on others. Lowered thresholds for start-ups pose competitive challenges for established firms in health, energy and media.

There is great potential to consolidate many Australians' digital habits of social and multimedia consumption and enable them to move up the 'ladder of opportunity'. But without the necessary interventions, it is possible that Australia's digital divide will deepen. Australians need to anticipate and solve the challenges that confront us so we can optimise the significant cultural, political and economic benefits that potentially accompany greater connectivity afforded by the **nbn**<sup>™</sup> network.

Acknowledging these challenges, this report also outlines the many opportunities to which fast broadband via the **nbn**<sup>™</sup> network will enable. It focuses on the likely impacts on lifestyle, consumption, work, wellbeing and learning. Australia is a technologically advanced country. Australians are early adopters of technological developments, integrating technology into work and other life-activities. With government, community and corporate investment in innovation, Australia is poised to play a leading role in the development of the technology sector globally. By mobilising individuals and communities in the project of activating the potential of the **nbn**<sup>™</sup> network delivery platform, Australia is well placed to be the most integrated, digitally connected continent on the planet.

Australia is currently at a tipping point. National high-speed connectivity opens up an array of possibilities for economic prosperity and social benefit. But if the nation is to maximise the opportunities and meet the challenges, this will require a collective effort that builds upon and strengthens existing face-to-face connections and community-based engagement. The **nbn**<sup>™</sup> network is a key digital platform. How we use it will matter.





# Key Findings

This report examines five key areas of social life: connectivity and infrastructure, consumption and lifestyle; working and living; health and wellbeing; and education and learning. We take the years 2020, 2025 and 2030 acting as reference points for our statistical data and analysis.

## Connectivity and Infrastructure

Quality connectivity is the quintessential infrastructure of the new century and the risks of poor-to-average internet connectivity for a nation are profound. Australia's digital infrastructure needs to be fast, robust and scalable. **nbn** is providing the foundations for faster connectivity today and continued investment into the future. It delivers the first co-ordinated broadband network extended at a continental scale.

The step change made by the **nbn**™ network will make Australia the world's most integrally connected continent. Its significance becomes clear only when we consider its uniqueness as a co-ordinated broadband network a continental scale. The distinctiveness of the **nbn**™ network lies in the connectivity it will deliver across Australia's large geographic mass, widely recognised as one of the earth's seven continents.

Most continents are divided by national territories, but Australia's status as a nation as well as a continent offers **nbn** the opportunity to develop a coherent national network, where barriers posed by diffuse patterns of regulation and ownership are minimised.

Measured by IP addresses per capita, Australia is already the most connected of the world's continents. More than four-fifths of those connections are mobile or ADSL-based, and the nationwide rollout of the **nbn**™ network is set to increase Australia's connectedness significantly. The completion of the **nbn**™ network can see Australia become the world's most connected continent in terms of broadband access, affordability and speed tiers.

Australia is both a vast land mass and a highly urbanised country, with nearly 90 per cent of the population living in urban areas. The **nbn**™ network offers a technological infrastructure that can bridge the gap between urban, regional and rural populations.

“Wholesale upload speeds which **nbn** provides to internet service providers are 25, 50 and 100 mbps, and by 2020, this network is forecast to ‘deliver beyond **nbn**’s minimum commitments’. In remote and rural Australia, access to these fast speeds may help to alleviate the social inequality and loss of economic productivity produced by the ‘digital divide’—an effect of differences in internet access and affordability.”

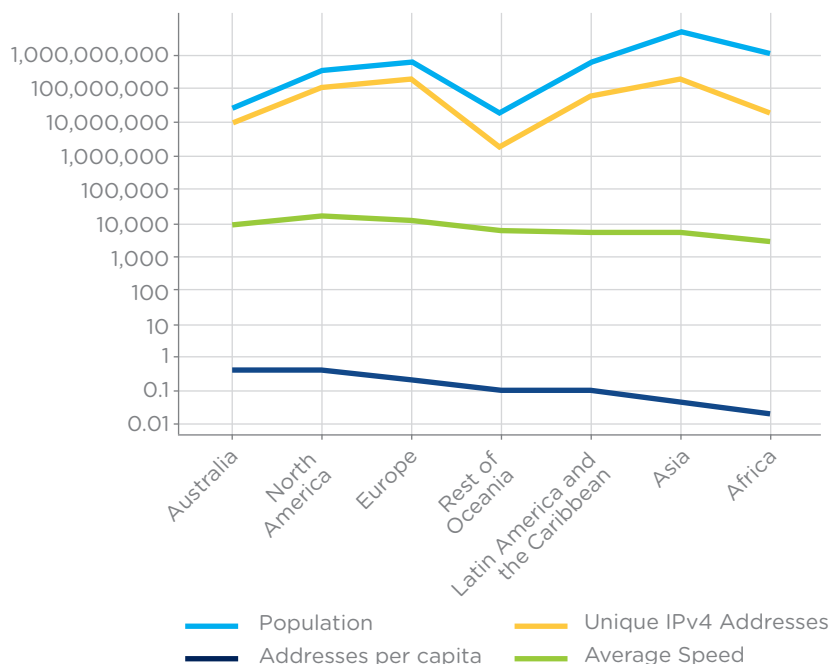


Enhanced connectivity will run alongside changes to Australia's vital physical infrastructures. These include expansion of ports, new airports like Western Sydney Airport, upgrades to major city arterials and, potentially, high-speed rail links along the eastern seaboard. Each year, this infrastructure supports 1 billion tonnes of freight passing through the nation's ports; 150 billion passenger kilometres on its roads, and another 12 billion by rail; and 150 million passengers arriving or departing its airports. Greater digital connectivity will mitigate congestion and improve efficiency in how we use these networks.

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Connectivity plays a role in helping marginalised individuals stay connected to communities, employment opportunities, education, health, and social support services.

Continent Populations, 2015, and IP Addresses, 2016



Sources: United Nations, Population Division and Akamai, State of the Internet: Unique IPv4 Addresses





## Consumption and Lifestyle

The **nbn**™ network will contribute to changing how Australians live, shop and enjoy their leisure time.

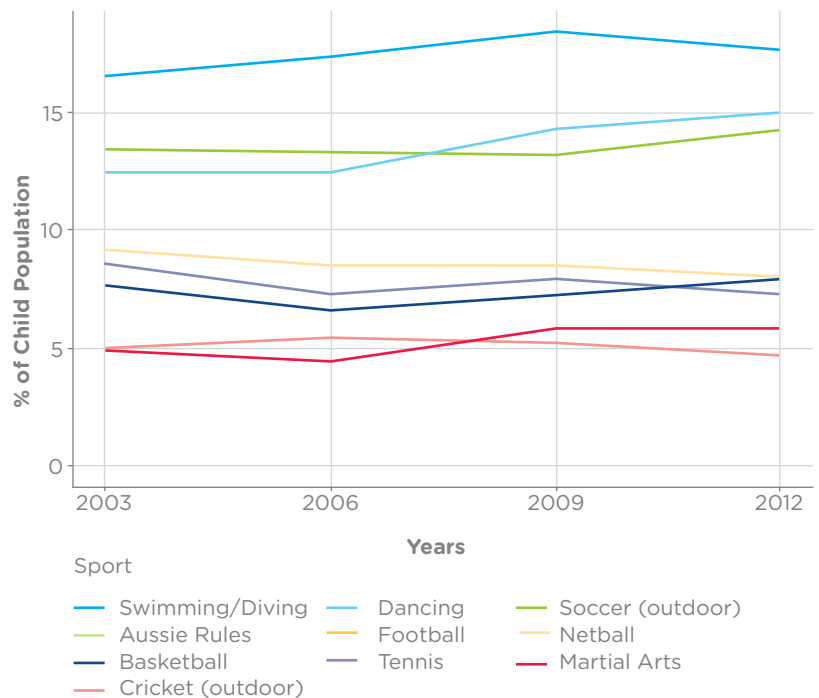
The **nbn**™ network can help facilitate increased social connectedness amongst older Australians who relocate to regional towns and centres when they retire. It also affects the young: since 2003, access to the internet for children has increased by 25 per cent. On these trends internet use in 2016 is already greater than television viewing. This does not appear to be at the expense of physical activity: according to ABS figures children continue to participate in sport.

Overall, Australians are already avid consumers of online services. In less than two years since its Australian launch, Netflix now reaches nearly six million people—a quarter of the country's population. Again, this online activity augments rather than replaces other social activities, with cinema attendance higher today than at any point since 1993.

Beyond consumption of entertainment products, the next decades may see the normalisation and mainstreaming of technologies that have been experimental until now: artificial intelligence, 3D printing, virtual and augmented reality, and increasing levels of digital financial transactions. These technologies have the potential to transform education, health, and business, and will be significant in reducing barriers for households on low incomes or living away from employment and education opportunity.

Increased digital connectivity comes with concerns about its threat to social life and physical health. Evidence of this threat is at best mixed, with much online activity assisting the wellbeing of ourselves and others around us. According to a survey administered by Western Sydney University and Google Australia, approximately 75 per cent of Australians read updates from friends and family online on a regular basis, and regularly communicate digitally in other ways. Digital connectivity and face-to-face social connectedness can be—and today, often are—mutually supporting.

## Children's Participation in Sport and Leisure Activities, 2003 to 2012



Source: ABS Catalogue 4901.0.55.001 Children's Participation in Sport and Leisure Time Activities, 2003 to 2012

"Beyond consumption of entertainment products, the next decades may see the normalisation and mainstreaming of technologies that have been experimental until now: artificial intelligence, 3D printing, virtual and augmented reality, and increasing levels of digital financial transactions."

## The next decades may see the normalisation and mainstreaming of:



**ARTIFICIAL  
INTELLIGENCE**



**3D  
PRINTING**



**VIRTUAL  
REALITY**



**AUGMENTED  
REALITY**



**DIGITAL  
TRANSACTIONS**

## Working and Living

Digital connectivity is reshaping work and living arrangements in Australia. The rollout of the **nbn™** network will help to produce positive effects on education, work, housing affordability, and employment.

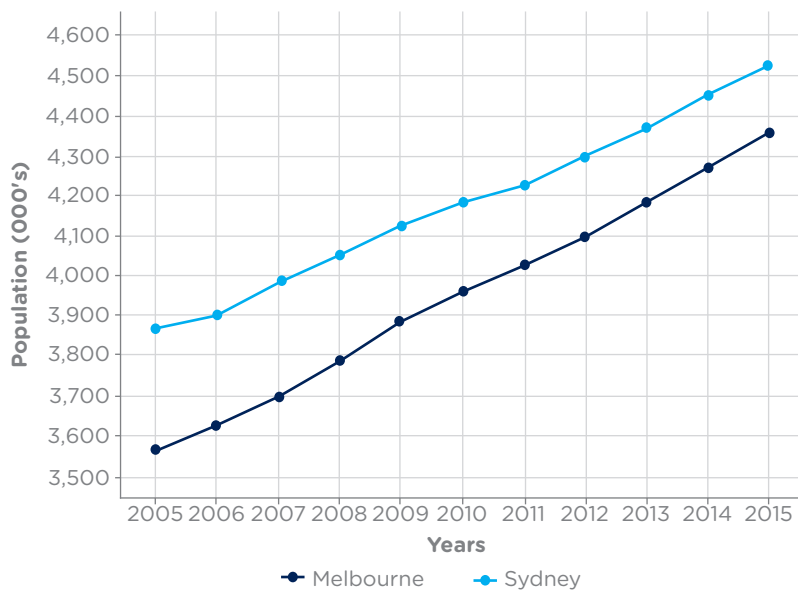
Where and how we work is undergoing change. The industries that have the largest projected growth—health care, professional services, and education—are all in the tertiary sector, while primary and secondary industries are expected to decline. Today, these three fastest growing industries employ 3.5 million Australians. By 2030, they are projected to employ an additional 800,000 workers. Digital services driven by access to the **nbn™** network is predicted to boost Australia's Gross Domestic Product (GDP) by around 2 per cent every year by 2020.

By contrast, staple employer industries such as mining, manufacturing and agriculture appear likely to employ less people over time. A fast network will help Australia's workforce and business community respond to global market trends and technological innovation.

While Sydney and Melbourne continue to grow, in the past decade internal migration figures show modest but significant movement away from both cities, as people opt for living in neighbouring small cities and country towns. Stronger digital infrastructure can support more flexible work arrangements and encourage sustainable internal migration. The long-term net effect will include less congested major cities and an economic boost to nearby regions.

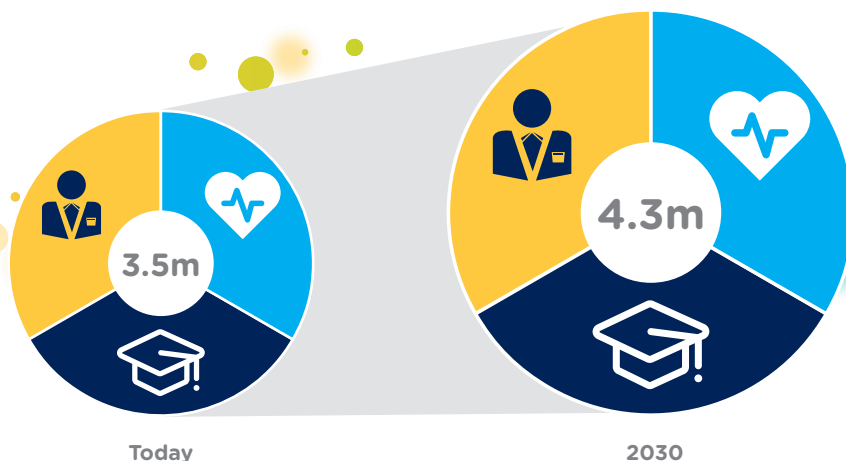
Connected technologies are transforming homes and workplaces. By 2020, existing technologies such as 3D printers, virtual and augmented reality, drones, home automation, voice recognition and artificial intelligence will become more pervasive and entrenched in domestic, commercial and public buildings and sites. The oft-cited prediction of 50 billion Internet of Things devices is unlikely to be realised by 2020, but may be realised—or even massively exceeded—by 2025 or 2030, dramatically increasing the size, scale and bandwidth requirements of the internet.

## Population, Sydney and Melbourne, 2005-2015



Source: ABS Catalogue 3218.0 Regional Population Growth, Australia

“Connected technologies are transforming homes and workplaces. By 2020, existing technologies such as 3D printers, virtual and augmented reality, drones, home automation, voice recognition and artificial intelligence will become more pervasive and entrenched in domestic, commercial and public buildings and sites.”





## Health and Wellbeing

Digital technology is already changing the nature of health care at both an individual, and sector-wide level. Telehealth, wearable technology, mobile apps, 3D printing, implantables, big data, and machine learning are emerging trends that are revolutionising the way healthcare is delivered.

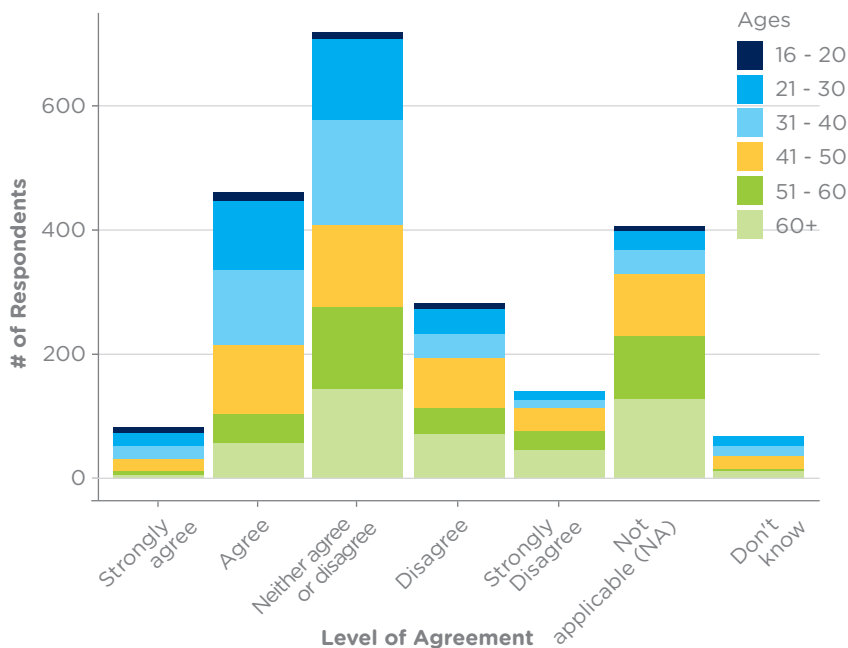
Australia's ageing population and large landmass pose challenges to quality health delivery. In regional and rural Australia, improved connectivity may generate improved health outcomes, particularly when laid across rather than replacing existing services. Improvements can be made into complex health challenges such as mental health by developing targeted online strategies, training professionals, and leveraging the communicative potential of new technologies to increase awareness of health issues.

Telehealth enabled by the **nbn**<sup>TM</sup> network will be able to connect regional, rural and remote areas to a fast and stable broadband network from 2020, saving up to \$3 billion in annual health costs. By 2025 it may be possible to use big data to predict and manage disease outbreaks. By 2030 we could see 3D printing being able to drastically enhance the ability to design and produce customised medical aids and prosthetics at the consumer level. As the **nbn**<sup>TM</sup> network rollout progresses, more communities across Australia will be able to connect health-care providers and patients through video-conferencing. Medical research will benefit from better opportunities for collaboration with other domestic and international institutes.

These trends continue our existing use of the internet to improve wellbeing. Many Australians—especially those under 40—feel healthier and make better health-related decisions because of the availability of online information, advice and apps.

The **nbn**<sup>TM</sup> network can also support positive mental health outcomes. One in four young people experience a form of mental health disorder, and 99 per cent of young people also use the internet daily. Research conducted by the Young and Well CRC demonstrates the potential for digital technologies to raise awareness, reduce stigma and improve access to care for those with mental health issues.

## Attitudes about health benefits of online activity



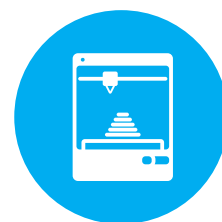
Source: Digital Capacities Index, Western Sydney University / Google Australia

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## Education and Learning

Technology is becoming central to education internationally, and Australia is no exception. The rollout of the **nbn**™ network will be a key factor to strengthen the viability of Australia's education system, and it will play a role in future recruitment, engagement, delivery and retention. It is also critical to building the skills and literacies that will enable Australians to maximise the benefits of connectivity individually, locally, nationally and internationally.

As employment markets shift towards highly skilled service industries, Australians are seeking post-secondary qualifications at an increasing rate. In 1982 less than 40 per cent of the population held non-school qualifications; in 2015, this has grown to nearly 60 per cent. Australia is now home to 40 universities, with more than 1,400,000 students.

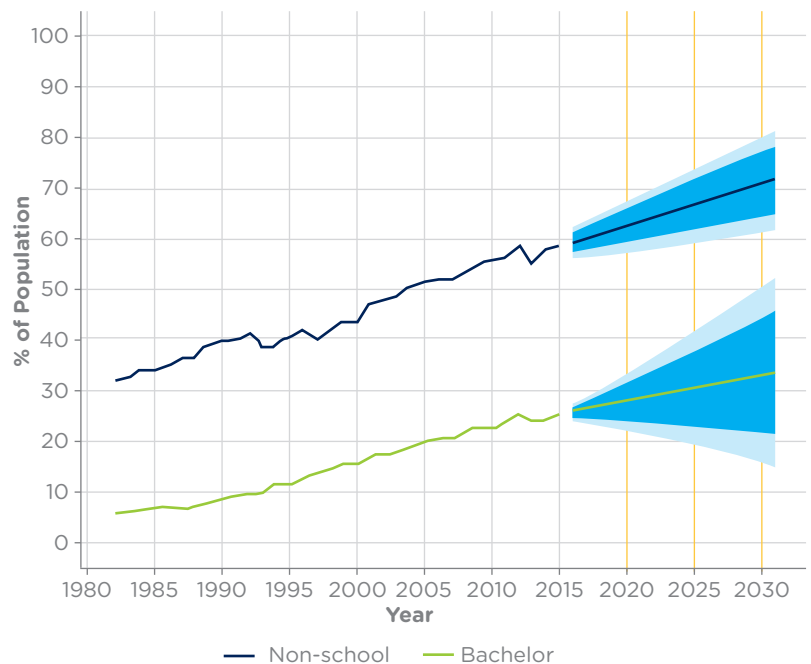
Education is also a major and growing export, with 25.8 per cent—more than one quarter—of university enrolments comprised of international students. A regionally competitive broadband network is a core capacity that will enable Australian universities to attract and retain international students in a volatile and competitive market.

Connectivity will also drive innovation in science, technology, engineering, arts and maths (STEAM) disciplines. Big data analytics, video conferencing, virtual and augmented reality, and 3D simulations and visualisations are transforming research fields, producing new methods and results in medical and natural sciences, finance, transport, urban planning and digital humanities.

Fast internet offered by the **nbn**™ network will continue the transformation of education at all levels. Some of this transformation will be in the spaces and devices where education, both formal and informal, takes place. By 2020, cross-disciplinary co-working facilities, maker-spaces and living labs will be established in all tertiary institutions and in many secondary schools. In 2025, robotics, wearables, virtual and augmented reality will become more integrated into curricula—both as aides to traditional content, and as subject areas in their own right.

Already subjects of considerable experimental and critical research, machine-learning and artificial intelligence will be significant topics in the 2020s, and by 2030, may considerably change how human learning is conceived, delivered and assessed.

## Post-Secondary Qualification, Australia, 1982-2030



Source: ABS Catalogue 62270D0013\_201505 Education and Work, Australia, may 2015

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# Conclusions

**The nbn™ network is Australia’s new landline and internet network. It is designed to provide all Australians with access to all the benefits of fast internet services, wherever they might live. It is delivered by a wholly Australian government-owned business enterprise.**

Optimising Australians’ ability to make the most of the digital age will require considered, continued, and co-ordinated investments.

This report has identified the wide range of possibilities that the **nbn™** network rollout offers to connectivity, work, lifestyles, health, and education across Australia. The **nbn™** network will be a key technology to ensure that these opportunities are taken up.

This requires that, together, we integrate a series of activities:

- Work to enhance Australians’ digital skills and literacies through education and training;
- Implement user-centred participatory approaches to developing technology-based initiatives that support users of digital technology to maximise the possibilities of increased connectivity;
- Find ways to harness online activities to bolster, support and sustain life offline;
- Develop innovative systems and educational strategies to enable Australians to minimise the risks they face online whilst maximising the opportunities that encased connectivity presents; and
- Develop the necessary incentives to stimulate our digital economy and safeguard Australian society.

As Third and Collin note, “the digital is, by now, a key component of the infrastructure ecology of the everyday”. Across continent-scale areas like Australia, fast and reliable internet connectivity brings unprecedented possibilities for building a stronger economy. This economy will be supported by technology applications and the growth of new tech-based industries. Together these will promote educational opportunities and career pathways for a broader range of Australians; increase efficiency and optimise the delivery of high-quality, globally innovative healthcare; strengthen diverse communities; and advance sustainable futures for our cities and towns.

In the twenty-first century, connectivity has become a new kind of capital. As the world economy pivots toward Asia, Australia’s future depends upon continuing to deepen economic, political and cultural ties with our regional neighbours. Digital connectivity is one of the essential means for doing so. The **nbn™** network delivers a platform that can create the world’s most connected continent, a foundation for further economic prosperity, political engagement, and cultural flourishing.

“The **nbn™** network delivers a platform that will create the world’s most connected continent, a foundation for further economic prosperity, political engagement, and cultural flourishing”.

Continent	Population (2015)	IP Addresses (2016)	Ratio	Average Speed (2016)
AUSTRALIA	23,969,000	9,267,959	0.39	8,812
NORTHERN AMERICA	357,838,000	136,497,154	0.38	15,033
EUROPE	738,442,000	175,944,163	0.24	12,464
REST OF OCEANIA	15,362,000	1,806,850	0.12	7,284
LATIN AMERICA AND THE CARIBBEAN	634,387,000	66,052,683	0.10	5,167
ASIA	4,393,296,000	199,107,664	0.05	4,910
AFRICA	1,186,178,000	19,573,565	0.02	2,781



# Case study: day in the life of **gen nbn**<sup>TM</sup>, 2030

**Alex is a 24-year-old woman living in Ballarat. She has recently started a new job as a communications officer for one of the major banks in its Melbourne head-office.**

At 6:00 AM, on a Monday in February 2030, Alex wakes up to the sound of rosellas and the sight of the sun rising. Her fitness band, strapped unobtrusively to her wrist, tells her she slept well through the night. That's great: on Mondays and Thursdays she has a long day, commuting up to Melbourne to work with her team. On these days she decides to work out from home and streams an interactive High Intensity Interval Training session from her living room.

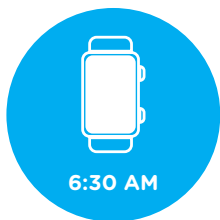
By 7:00, Alex is walking to one of the many autobus network pick-up stations. Here, a driverless car that has predicted her arrival at 7:20 will be waiting to take her to the bus depot, where an on-demand bus will drive her and other passengers up to Melbourne CBD.

On the bus she checks her life-data, using an app built by one of Ballarat's many new technology start-ups. Her recent data suggests her sleep is improving, and the app prompts her to submit this data to her national health record. She decides against it for the time being. On her last e-check-up, her doctor suggested she continue to manage her own life-data.

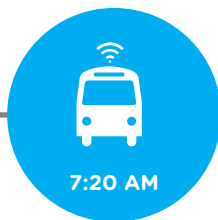
In 2030, many large employers have organised work into self-managed teams of four-to-five people. To reduce traffic congestion and office-space costs, these firms roster teams into offices for two or three days per week. On other days, the teams tele-commute through high-speed broadband, collaborating with video conferencing, group-based instant messaging and real-time editing tools.

At 8:45, Alex steps into her workspace, and after checking her mail and messages, at 9:00 she leads a ten-minute stand-up meeting with her four teammates. Originally used by 'agile' software teams, during the 2020s many organisations had taken on this practice. Though a new employee, Alex enjoys her rotating leadership role, as well as the opportunity to hear more about what her colleagues do.

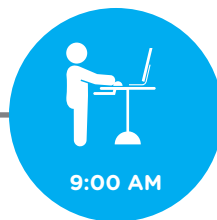
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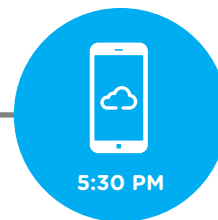
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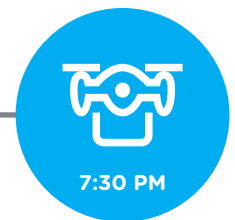
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She leads a ten-minute stand-up meeting with her four teammates.



A travel app on Alex's phone asks whether she would rather be dropped directly at her apartment to avoid the rain



A weather-proof drone hovers outside the balcony, carrying their three meal packages.

During the day, she participates in several video conference calls with a team in Brisbane and, late in the day, another team in Kolkata, India—a new city market where her employer is keen to expand. During the second call, she collaborates in real time with her Indian colleagues, revising an infographic design that will appeal to the local Bengali audience. Their manager suggests they'd like to have her visit their team later in the year, to help with their local branding and design.

On her way home, a storm breaks over Ballarat and a travel app on Alex's phone asks whether she would rather be dropped directly at her apartment to avoid the rain. She forgot her umbrella, and taps 'yes' in response. The bus automatically devises the most efficient plan to drop its passengers home. She spends the rest of the commute playing an augmented reality puzzle-game where the icons and background have been updated to reflect the local rainy conditions.

Just before arriving home, her house-mates message her to say they want dinner delivered, and send her an electronic menu. While they both opt for Vietnamese, she thinks she'll try one of the Bengali options: Maccher Jhol, a spicy fish stew. At 7:30 pm, a weather-proof drone hovers outside the balcony, carrying their three meal packages. The drone sees Alex opening the balcony door, and doesn't bother to message her.

Over dinner, Alex's housemates discuss their day—and which new series to start streaming on their OLED 4K television. They decide on a local drama that has just begun streaming. Its cinematography of Australia's far north, shot and screening in ultra-high-definition, has received rave reviews.

Later that evening, Alex spends a few minutes checking her education schedule so she can plan a conference call from home with her two colleagues in Kolkata, India. Each week she studies digital art and graphic design with an accredited online course provider, and she has just been informed she has enough credits to apply to an online Masters degree in digital humanities with an Australian university. If successful, her employer will allow her one day's study leave each week.

She decides she will consider this option over the coming weekend, and requests her AI assistant to prepare what she needs to make a decision: her current and forecast income, rent, student loan-repayments, and weekly study-time commitments.

At 11 pm, Alex goes to bed: tired from one of her long 'work-from-office' days, but excited by the prospects for travel and study in the year ahead.





Australia's  
broadband  
network

## January 2017

This report was published by nbn co limited, the company building Australia's broadband network.

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