



solutions for change



ANNUAL REPORT 2019

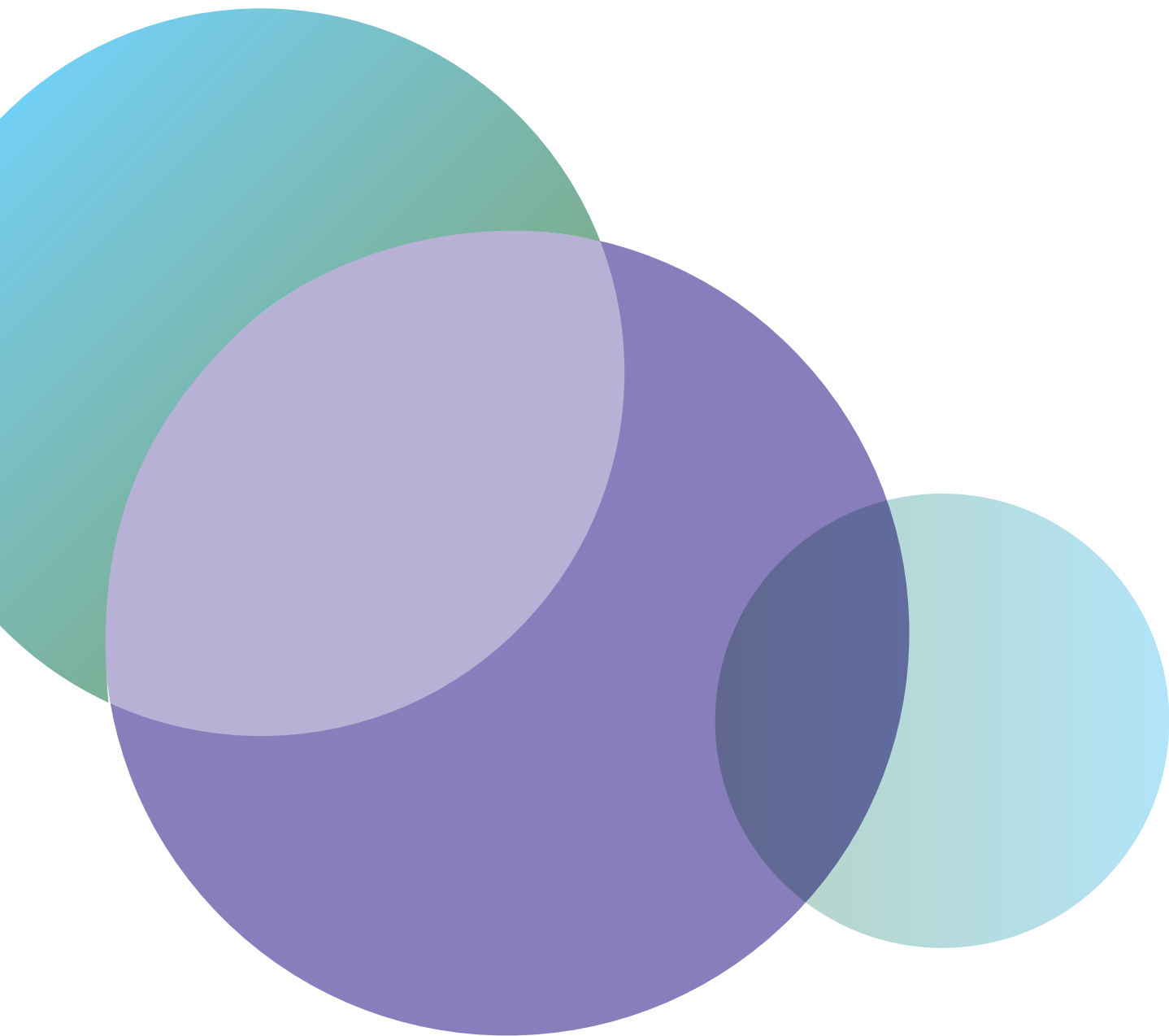
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solutions for change



“AARNet is firmly focused on delivering solutions that will help the research and education sector solve some of the most pressing challenges of our time.”

CHRIS HANCOCK, CEO AARNET

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our values

One Team

Everyone counts and is accountable.
We are committed to teamwork and partnerships –
collaboration is at our heart.

Creativity

Strive to innovate – it's in our DNA.
We embrace creative solutions to problems, seek out
diverse perspectives and enjoy what we do.

Trust

Communication is open and transparent.
We are honest and ethical, and always respect
and support each other.

Who we are & what we do

our vision

is of a high bandwidth, globally connected
Research and Education Network that
connects Australian educators and researchers
to those with whom they wish to collaborate
anywhere in the world, with ease, speed and
convenience that makes the issue of physical
separation irrelevant. Unashamedly we care
about enabling outcomes that benefit future
generations of Australians.

our mission

to enable globally competitive research,
education and innovation by providing
transformational connectivity and
collaboration services to meet the unique
needs of our customers.

Since 1989, AARNet, Australia's Academic and Research Network, has provided ultra high speed, ultra high quality broadband and collaboration services to institutions within the Australian education and research sector.

AARNet is a national resource, a national research and education network, run by AARNet Pty Ltd, a not for profit company owned by 38 Australian universities and CSIRO.

AARNet's customers include the shareholder universities (listed on page 41) and CSIRO, Australia's national science agency, as well as most of the publicly funded research agencies, such as Australian Nuclear Science and Technology Organisation, Geosciences Australia and Australian Institute of Marine Science, several state government agencies, hundreds of schools, many TAFEs and hospitals, and most state and federal galleries, libraries, archives and museums.

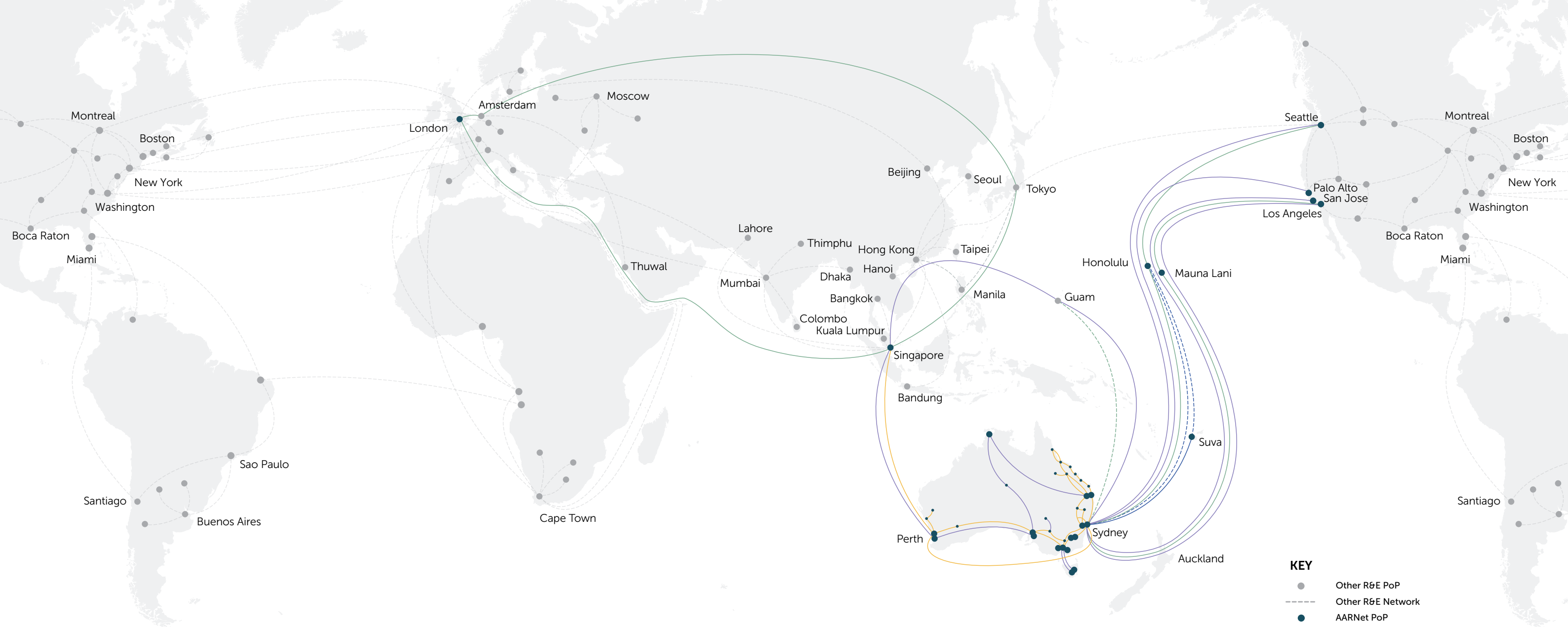
AARNet infrastructure interconnects over two million users—researchers, faculty, staff and students—at institutions across Australia with each other and research and education institutions worldwide, the public internet, and resources such as scientific instruments, data storage and high performance computing facilities. We also interconnect content and service providers and organisations that collaborate with the research and education community.

AARNet underpins education across the life-long learning spectrum and research across a diverse range of disciplines in the sciences and humanities, including high energy physics, climate science, genomics, radio astronomy and the arts.

For researchers and educators working in today's increasingly globalised data-intensive world, AARNet removes barriers to discovery and innovation.

WHAT SETS AARNET APART?

We pride ourselves on being future focused and providing what commercial operators are unequipped or unable to provide: an ultra high speed network and over-the-top services that push the boundaries of networking technology whilst delivering cost-effective and sustainable infrastructure for Australia. The research and education community relies on AARNet for outstanding service availability and service quality.



KEY

- Other R&E PoP
- Other R&E Network
- AARNET PoP
- 5 Gbps
- - - 5 Gbps backup
- 10 Gbps
- 100 Gbps
- n* 100G DWDM Transmission
- - - Subsea cable investment (JGA Project)



This map is designed to be a conceptual representation of the international R&E network

AARNET INTERNATIONAL NETWORK

AARNET NATIONAL NETWORK



AARNet provides critical national telecommunications infrastructure to support innovation in teaching and learning and seamless data access and movement between researchers, instruments, tools and resources.





Message from the Chair

Thirty years is a long time, especially in the technology business. Yet this is where we find ourselves – thirty years since the Vice-Chancellors of Australia's universities established the project that brought the internet to Australia, and which went on to become AARNet. When we "plugged Australia in" permanently in June of 1989, few foresaw exactly how the internet would evolve to play a role in almost every part of our lives.

While we celebrate this important milestone it is apt to look forward to the next decade, during which the trends of the last decade will surely accelerate. Teaching and learning online is now the norm and big science, as well as the humanities, are exploring new ways to use technologies such as artificial intelligence and machine learning. These technologies are hungry for data, and AARNet provides the fabric for moving, and the tools for storing, sharing and handling this data.

As we become increasingly connected, and rely more heavily on the online world, trust becomes more important than ever. AARNet has established a focus on meeting the sensitive data handling needs of researchers through extending the CloudStor data storage and sharing service. 2019 also saw the team embark on a major project to establish a Security Operations Centre for the research and education sector. This innovative new facility will support our shareholders and customers in responding more thoroughly and rapidly to security threats and incidents. In a world that is entering uncertain times like never before, trust is the currency of the future and these projects will help to further develop a level of trust for the higher education and research sector.

The new Indigo subsea cable system, in which AARNet is a consortia partner along with Google, Indosat, Singtel, SubPartners and Telstra, went live this year, connecting Sydney to Perth and Singapore.

Leveraging the new connectivity and capacity provided by Indigo, and collaborating with other National Research and Education Networks, AARNet played a key role in establishing the CAE-1 (Collaboration Asia Europe) link connecting Singapore to London, and the AER (Asiapacific-Europe-Ring), which provides a stable and fast network ring connecting Singapore, London, Amsterdam, Tokyo and Hong Kong. These projects and the JGA South subsea cable system project (connecting Sydney to Guam, in which AARNet is also a consortia partner) are all multi-decadal in nature, and assure that AARNet will remain an infrastructure company dedicated to meeting the needs of Australia's research and education community for many years to come.

As Chair of the AARNet Board, I would like to sincerely thank my fellow Board members for their ongoing support, our CEO, Mr Chris Hancock for his exceptional leadership, and our senior management and staff for their dedication and hard work throughout the year. Thank you too, to our shareholders and customers, represented by the AARNet Advisory Committee, for providing candid advice and invaluable support. Finally, I would like to acknowledge the Australian Government for their belief in AARNet as critical infrastructure for the growth and success of science, research, innovation, teaching and learning in this country.

All of us at AARNet are pleased that we have delivered value for all our shareholders and customers during 2019. We look forward to supporting Australia's academic and research endeavours even more so in these unprecedented times of global change in the year ahead, and for the next thirty years to come.

Gerard Sutton AO, Chair, AARNet Board

Message from the CEO

2019 was an exciting year for AARNet as we delivered on our mission, expanding our network infrastructure and services to support teaching and learning and help ensure researchers address some of the most pressing challenges of our time.



Looking back at 2019, our thirtieth year in operation, society is changing as the global coronavirus outbreak is rapidly evolving in 2020 and massively impacting our shareholders, customers and the entire world. During the rapid transition to remote learning and working, the provision of reliable network connectivity and collaboration services has never been more vital and we're proud to be delivering the robust connectivity and services the sector needs right now.

2019 marked the second of our five-year 2018-2022 strategic plan, which lays out the strategic platform and priorities that guide our investments in network and technology solutions for our shareholders and customers. Operating in an environment where change is the only constant, the five pillars of our strategic platform drive our performance and success: one, operating Australia's research and education network; two, growing our communities; three, developing technology services to meet the needs of our customers; four, ensuring financial sustainability; and five, evolving and optimising our organisation.

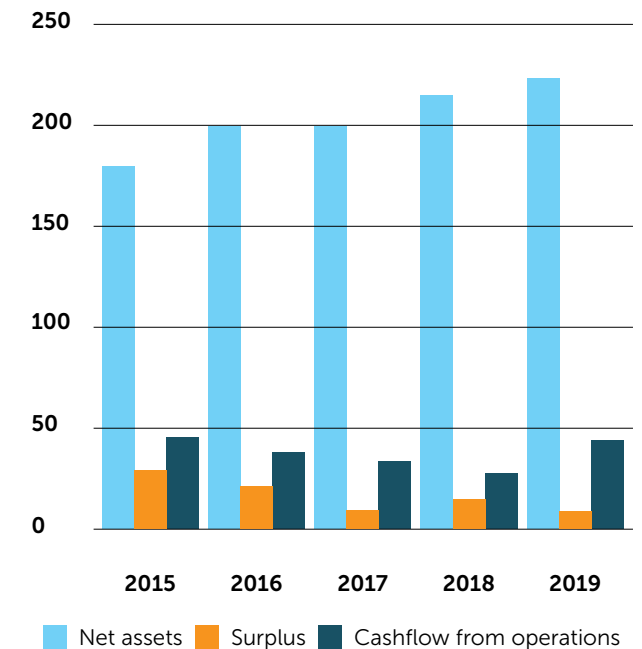
All of our activities are focused on delivering against our strategic priorities. In 2019, AARNet devoted more investment than in any previous years towards upgrading the capacity of the AARNet network and to expanding its geographic reach. Within Australia, this priority is about owning fibre optic cable in the ground, and adding diversity and triversity to the AARNet backbone in the form of fully redundant and diverse paths, to further strengthen the reach and reliability of our services. Internationally, this is exemplified by the subsea cable projects that went live in 2019, Indigo and CAE-1, as well as JGA-South, which is on track to go live in 2020. Wherever possible, we have continued to focus on our priority for building Regional Infrastructure, leveraging opportunities to extend the reach of the network to improve access to high-speed broadband services for campuses, study hubs, precincts and scientific instruments across regional Australia.

Throughout the year, we strengthened our engagements with the health and medical research community, partnering with the Australian Bioinformatics Commons Pathfinder project and progressing sensitive data and targeted initiatives for health and medical research. We also continued working in close collaboration with the eResearch community on developing a National Collaborative Research Data Storage Platform, with AARNet's CloudStor service as the foundation – another key priority. We added new capabilities to CloudStor storage, including data analysis, and the service logged approximately 80,000 users by the end of 2019.

With Denial of Service (DoS) attacks and other malicious cyber threats to network availability and information security increasing, we focused effort and resources on developing AARNet's cyber security capability. Our Early Warning and DDoS Detection systems proved their value by minimizing the impact of attacks on AARNet and our customers' networks, and our Security Operations Centre project achieved a significant milestone, concluding the initial proof-of-concept phase with several universities already onboarded during December 2019.

Importantly, this year we placed a heavy focus on developing our people and company culture. We provided enhanced professional skills development and training programs across the organisation, and our three core values of One Team, Creativity and Trust were further embedded in our recruitment, training and performance management processes.

SELECTED FINANCIAL DATA (\$M)

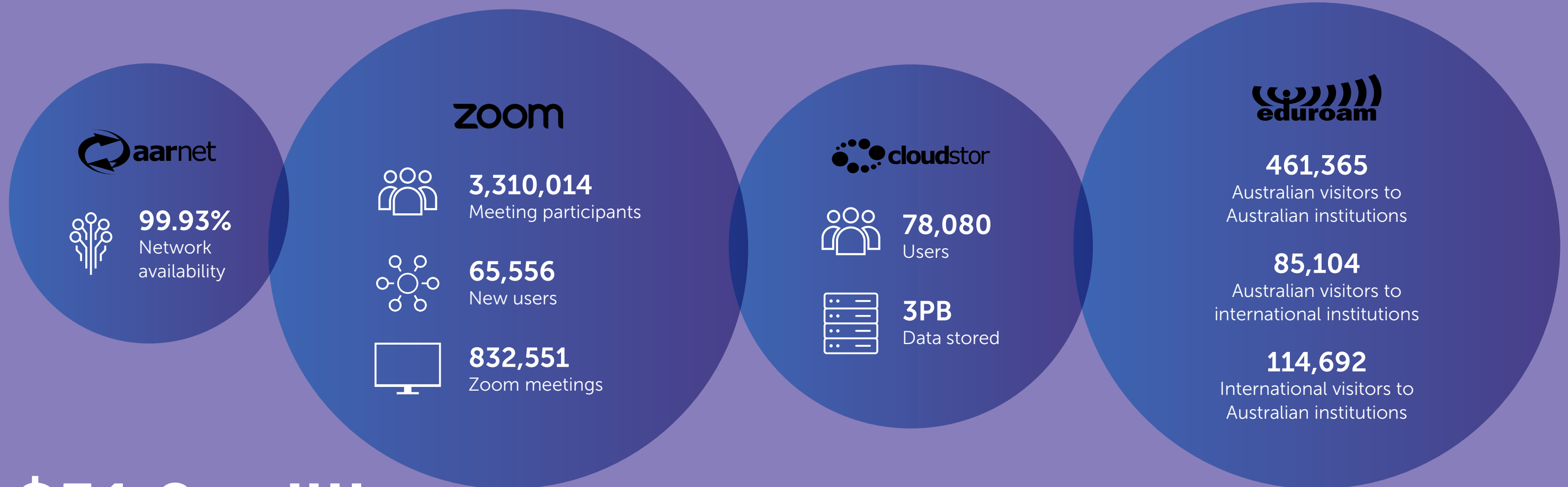


Figures for 2015-2016 do not include the effect of the adoption of AASB15: Revenue from Contracts with Customers. Figures for 2019 include the effect of the adoption of AASB16: Leases.

None of these achievements in 2019 would have been possible without a committed AARNet Board, AARNet Advisory Committee and our highly-dedicated team of people. I would like to personally thank our shareholders, customers and team, and everyone engaged with AARNet this past year for their support and we look forward to continuing to deliver vital infrastructure services that support the nation's research and education challenges through this most critical time of change.

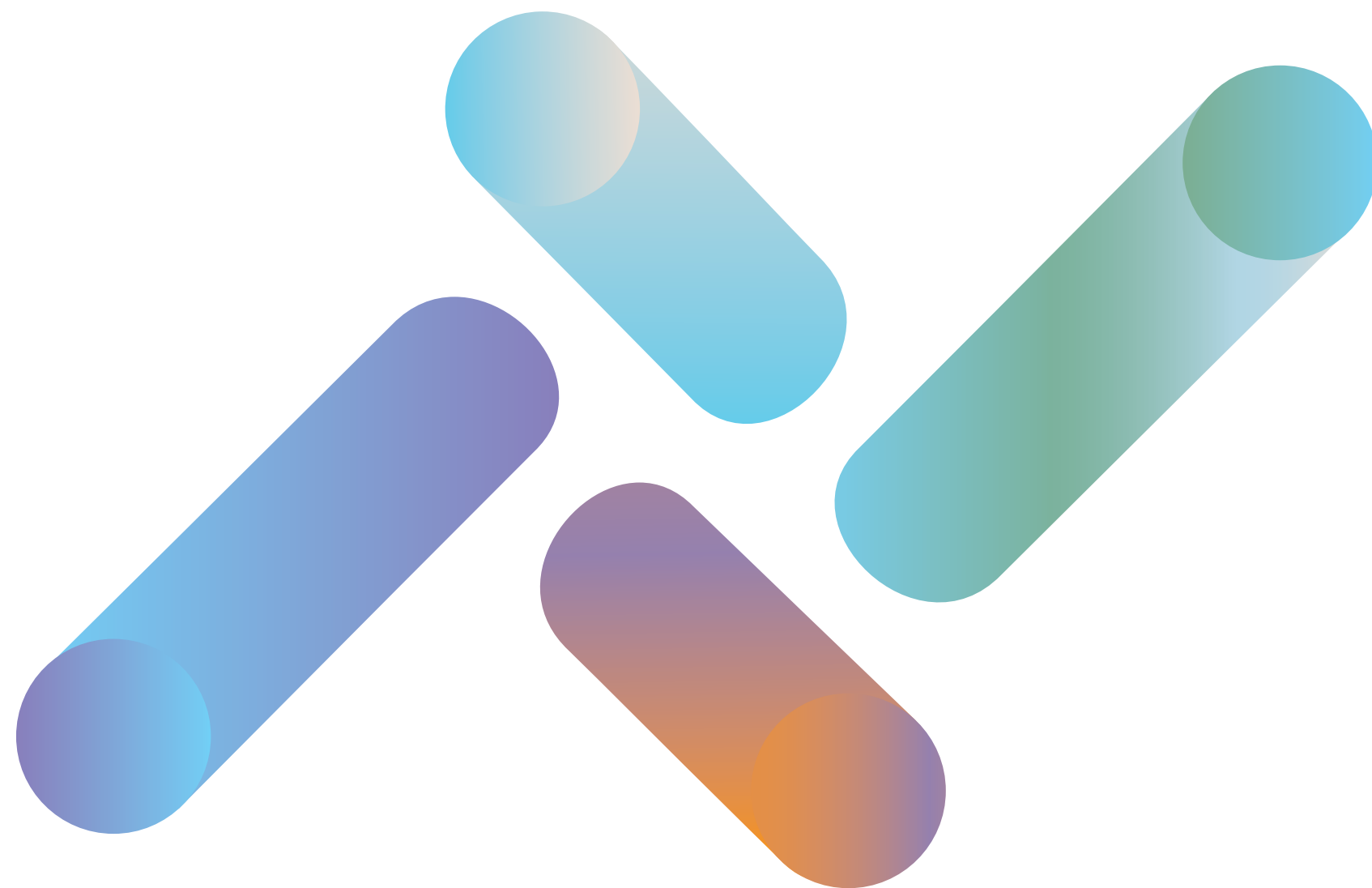
Chris Hancock, Chief Executive Officer, AARNet

\$222.80
NET ASSETS IN MILLIONS



\$51.9 million
INVESTED DURING 2019

1000000000000 BITS
TERABIT NETWORK FOR RESEARCH AND EDUCATION



The year in review

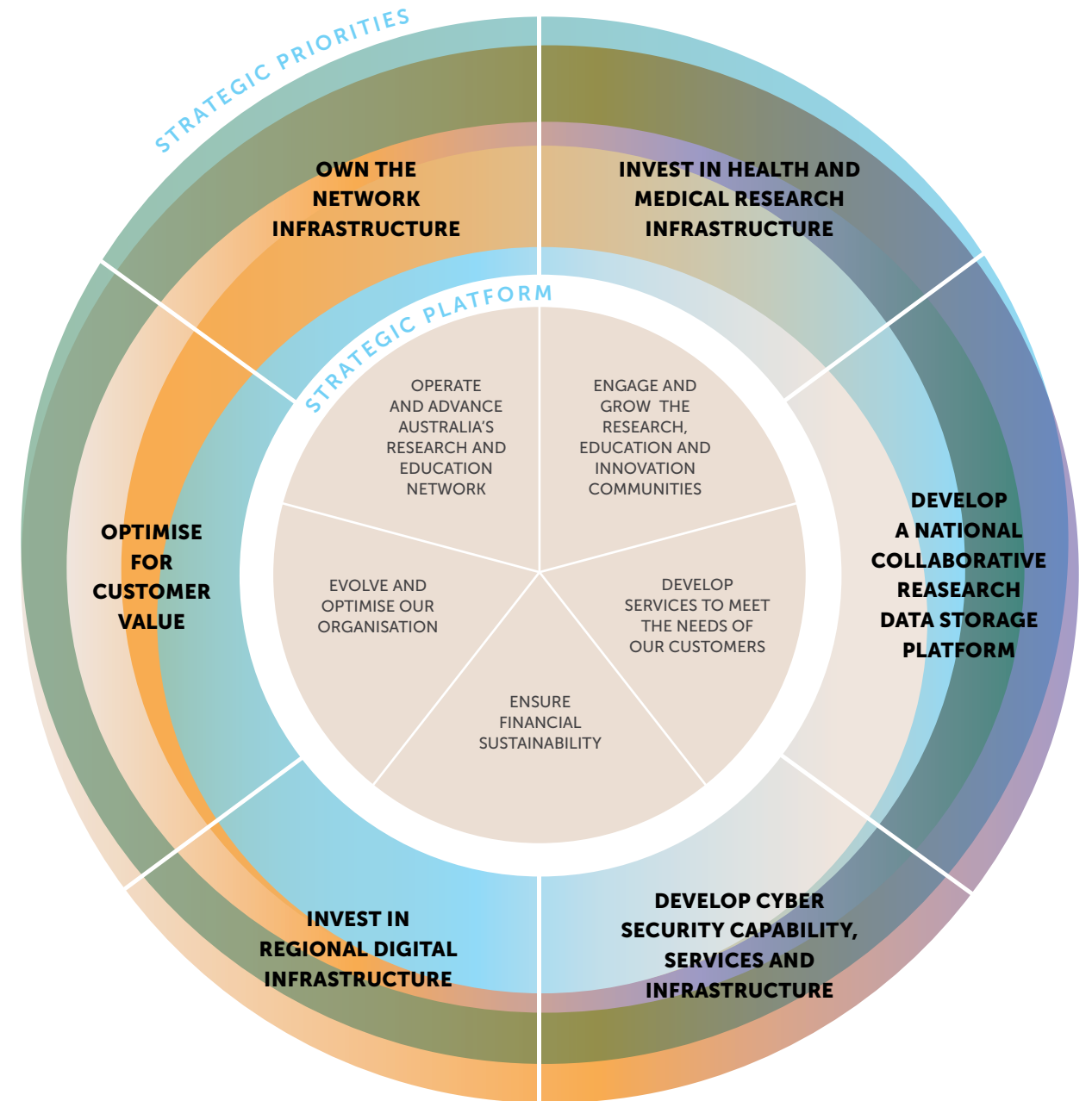
AARNet's operational activities are aligned to our ***strategic plan*** and ***priorities***. Our activities during 2019 included the provision of internet and ***advanced*** telecommunications and network services, as well as ***security***, data storage and ***collaboration*** services.

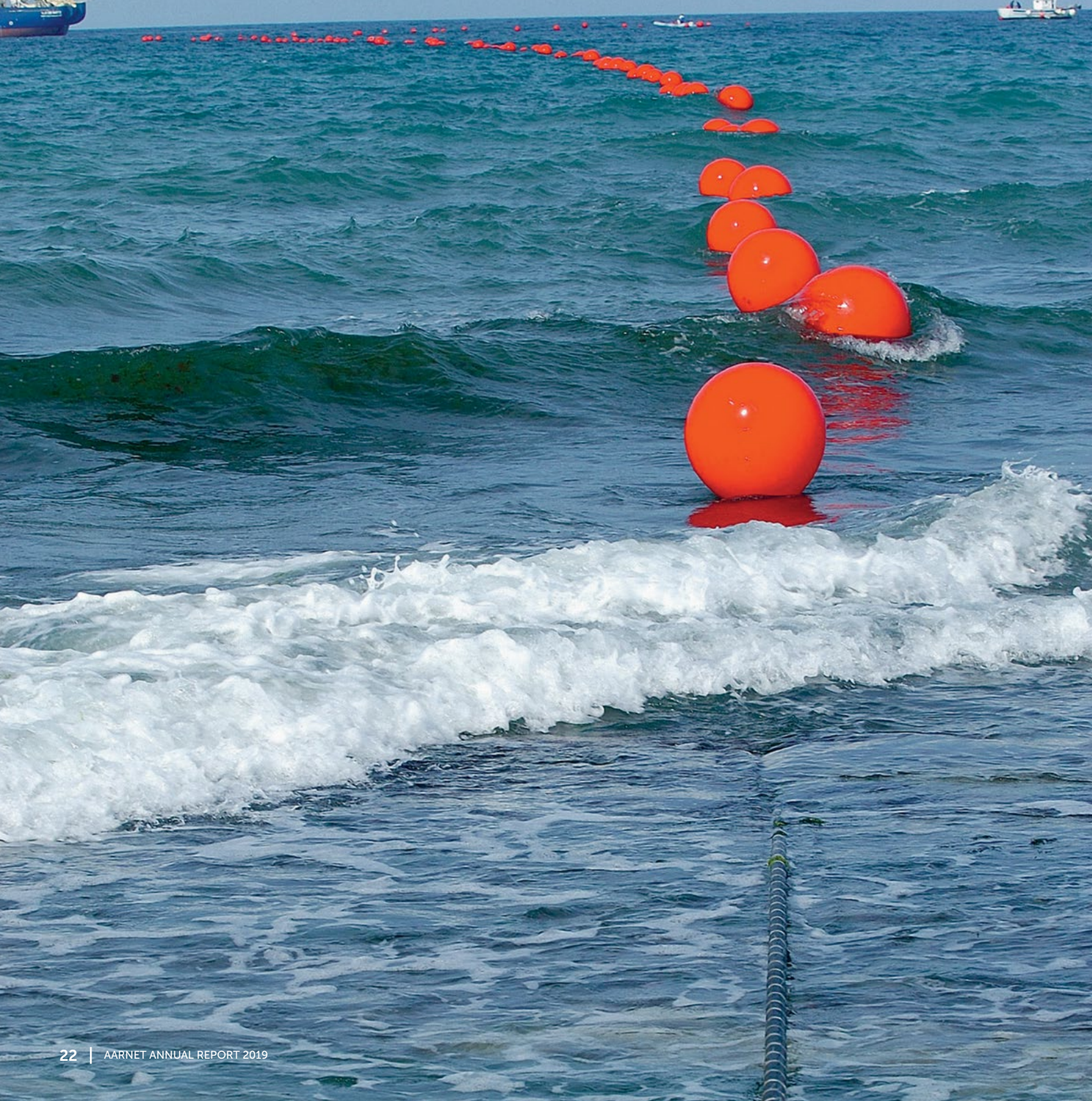
We collaborated with our ***shareholders*** and ***customers*** to ensure we continue to provide services and ***solutions*** that meet the ***unique needs*** of Australia's research and education community. This is at the heart of everything we do.

Strategic Plan

The AARNet 2018-2022 Strategic Plan defines a **long-term vision** for a globally networked data-sharing ecosystem that **accelerates knowledge creation and innovation**, reinforces the resilience of AARNet's infrastructure and builds out **new capabilities** to meet the evolving digital needs of our customers.

We will **continue to develop new and innovative products** and services to accelerate Australia's participation in teaching, learning and research on a **global scale**.





Operating & advancing Australia's research & education network

The core of AARNet's mission is the operation of a fast, ultra-high quality, highly available and resilient national and international telecommunications network to meet the unique needs of the research and education sector.

NETWORK AVAILABILITY

AARNet provided excellent network performance and availability in 2019. The average network availability was 99.93% which was slightly higher than the level achieved in 2018 (99.92%). Network availability in 2019 was affected only by scheduled maintenance, specifically core backbone router upgrades; excluding the effect of those outages the level of availability would have been 100%.

This exceptionally high level of reliability is achieved over the vast geographic footprint of our infrastructure through strategic long-term planning and carefully designed network redundancy. Diversity and triversity in the network design and equipment enables the operations team to deploy alternate paths and minimise the impact of outages on AARNet customers.

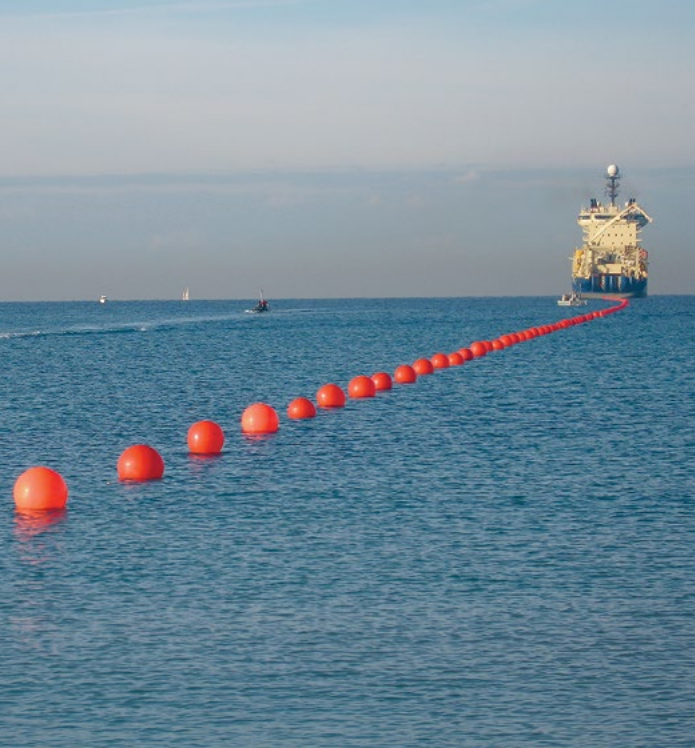
This meticulous design and careful operation of the network enabled AARNet to minimise the impact of outages during the bushfires in New South Wales and Queensland that began in late 2019. Just as communities were severely impacted, the bushfires posed a hazardous threat to the network in several locations across the eastern seaboard. Recognising how critical network services are to our customers, backbone traffic between Sydney and Brisbane was diverted to the alternate inland path at times, and in emergency cases links were manually reconfigured and restored by routing the connections via alternate paths.

One of the distinguishing features of a research and education network such as AARNet is careful capacity planning to remain ahead of the demand curve, and to accommodate the increasingly data-intensive requirements of research. The peak demands of the academic year determine the sustained capacity required, and the needs of the most data-intensive research disciplines, such as radio astronomy, climate science and bioinformatics, determine the absolute peak capacity.

We continually monitor the network load of the AARNet backbone links to determine when upgrades are required. This approach enables us to provide the high-quality service our customers rely on.

Hardware upgrades of the AARNet4 backbone routers continued in 2019, enabling newer generation 100G/200G/400G line cards to be deployed across the network to ensure headroom for large research flows and provide redundancy in case of outages on one of our inter-capital paths.

In December 2019 AARNet's second investment in a submarine cable system, Japan-Guam-Australia (JGA-South) landed into Australia. Image courtesy Alcatel Submarine Networks.



EXPANDING INTERNATIONAL CAPACITY

2019 was a year of many milestones in international connectivity for AARNet. The completion of the Indigo cable connecting Sydney and Perth to Singapore in May marked a significant milestone for one of our two investments in international submarine cable systems. Indigo provides AARNet with lifetime ownership of underpinning infrastructure to meet the future growth in collaborative research and transnational education between Australia and our important Asian partners. Indigo Central (connecting Perth to Sydney) extends AARNet's wider terrestrial network to provide diverse undersea connectivity around Australia.

This year, extending Indigo to Europe became a priority for AARNet and we led a consortium of eight NRENs to acquire long term capacity from Singapore to London. This link from Singapore to London, known as Collaboration Asia Europe or CAE-1, when combined with Indigo, effectively provides a 100G circuit from Sydney to London and much needed diversity for AARNet's transpacific capacity on the Southern Cross Cable System to the United States and Europe. The CAE-1 international collaboration and aggregation of financial resources is seen by the global NREN community as

a future model to optimise the use of international services. Agreement was also reached with NRENs NII in Japan and KAUST in Saudi Arabia for mutual backup in the event of outages on any of these systems.

In December 2019 our second investment in a submarine cable system, Japan-Guam-Australia (JGA-South) landed into Australia. JGA South (connecting Sydney to Guam) will, in the future, form an essential link to all points north in Asia. AARNet, as the Sydney landing party, also built the seaward duct, land cable and cable station infrastructure to enable the on-time completion of the marine activities.

These long-term investments in subsea cable systems provide AARNet with control over scalable international capacity upgrades at the wholesale level for at least the next two decades. This boosts our network diversity and resilience, further reinforcing our position as a leading provider of national and international connectivity and data services. AARNet's participation in the development of these new international systems not only benefits the research and education sector in Australia, but also provides new and much needed competitive infrastructure for the nation's commercial telecommunications market.

EXPANDING CAPACITY AND REACH IN AUSTRALIA

Our customers increasingly value the reliability of the AARNet network, particularly for accessing cloud services and content providers that are critical for business operations, as well as for teaching, learning and research. To improve the performance and availability of these services for AARNet customers, we increased capacity to selected domestic service providers and will continue to enter into partnerships to directly connect popular global content and service providers to the AARNet network. We also extended our network and upgraded capacity into several major metropolitan and regional data centres, including lighting a new link for James Cook University into the iSeek NQRDC in Townsville, Queensland, and multiple direct connect links to Amazon Web Services and Microsoft Azure for AARNet customers.

Throughout 2019 we continued to work on expanding our network footprint further into regional areas across Australia, in order to improve access to reliable high-speed telecommunications services for the broader research and education community. Projects included fibre builds in the

Illawarra region of New South Wales to improve connectivity to the various campuses of the University of Wollongong, lighting a high-speed link out to CSIRO's Boorowa Agricultural Research Station, construction of a fibre tail to the Molonglo Observatory Synthesis Telescope for the University of Sydney, and, in Queensland, connections to schools in the Catholic Education Office of the Diocese of Rockhampton and the rollout of the optical network on the Regional Broadband Blackspot Program network from Toowoomba through to Longreach.

During the year, customers across the sector and the country, including universities, schools, hospitals, medical and other research institutes, upgraded their connections to meet their growing bandwidth needs. Many universities and larger research facilities upgraded to multiple 100Gbps connections to support not only big science research, but also day-to-day business operations. Similarly, K-12 schools required multiple 10Gbps network links over diverse paths rather than the 1Gbps internet connections of the past, as they increasingly depend on the AARNet network for curriculum delivery and operations.

NETWORK SECURITY

AARNet's Early Warning System (EWS) and Distributed-DoS (DDoS) Detection System, which was commissioned for AARNet's international borders in April 2019, proved their value. 84 attacks were detected, enabling the AARNet Operations team to notify any affected customers and filter out unwanted traffic to minimise the impact of these attacks on our network and connected institutions.

AARNet, along with 10 other NRENs in Europe, USA and China, and a number of commercial providers, is a member of the Mutually Agreed Norms for Routing Security (MANRS). This is a global initiative with the aim of protecting the stability and reliability of the internet. Throughout the year, MANRS shared information with network operators and provided crucial fixes to reduce routing threats, including route hijacking, route leaks, and IP address spoofing.

AARNet is a founding member of the Global NREN Security group, which consists of representatives from 12 NRENs. During 2019, the Group made progress on a number of initiatives, including sharing best practices and the development of a global NREN Security Incident Response Plan.



Backfilling and compacting a conduit trench near Nowra, New South Wales.

To provide Australian universities with the best defence against cyber threats, AARNet has commenced work on establishing an international cyber threat-intelligence sharing capability in collaboration with AusCERT and other NRENs globally, including Internet2 (USA), Indiana University / OmniSOC (USA), CANARIE (Canada) and JISC (UK). The intention is to share this threat-intelligence information with relevant Australian government agencies for the protection of the Australian Higher Education and Research sector. AARNet is grateful for the support of AustCyber and the Australian Government and the funding they are providing for this project.

The undersea cable laying ship, Ile de Brehat, pictured top left, laid cable for the JGA and Indigo projects. Image courtesy Alcatel Submarine Networks.

Growing The Research, Education & Innovation Communities

AARNet fosters collaboration, knowledge sharing and discovery by connecting organisations with a research and education mission across Australia and working closely with them to provide the infrastructure and services they need to deliver excellence in research and education.

SUPPORTING INNOVATION IN HEALTH AND MEDICAL RESEARCH AND EDUCATION

By connecting researchers and educators at university campuses, health research organisations, health systems and health precincts across Australia, AARNet underpins and enables life-changing research and innovation in education for the next generation of health researchers and medical practitioners.

The number of health education and research facilities connected to AARNet continued to grow during 2019, while eduroam was deployed in more hospitals and health-related institutions to support mobility between campuses, research facilities and hospitals for students, faculty and researchers.

With the volumes of data used in health research increasing exponentially – primarily due to rapid advances in imaging and genomic sequencing capabilities – the need for high-speed network access has become vital for moving data generated in a clinic or laboratory to supercomputing resources for analysis and on to researchers at institutions across the country.

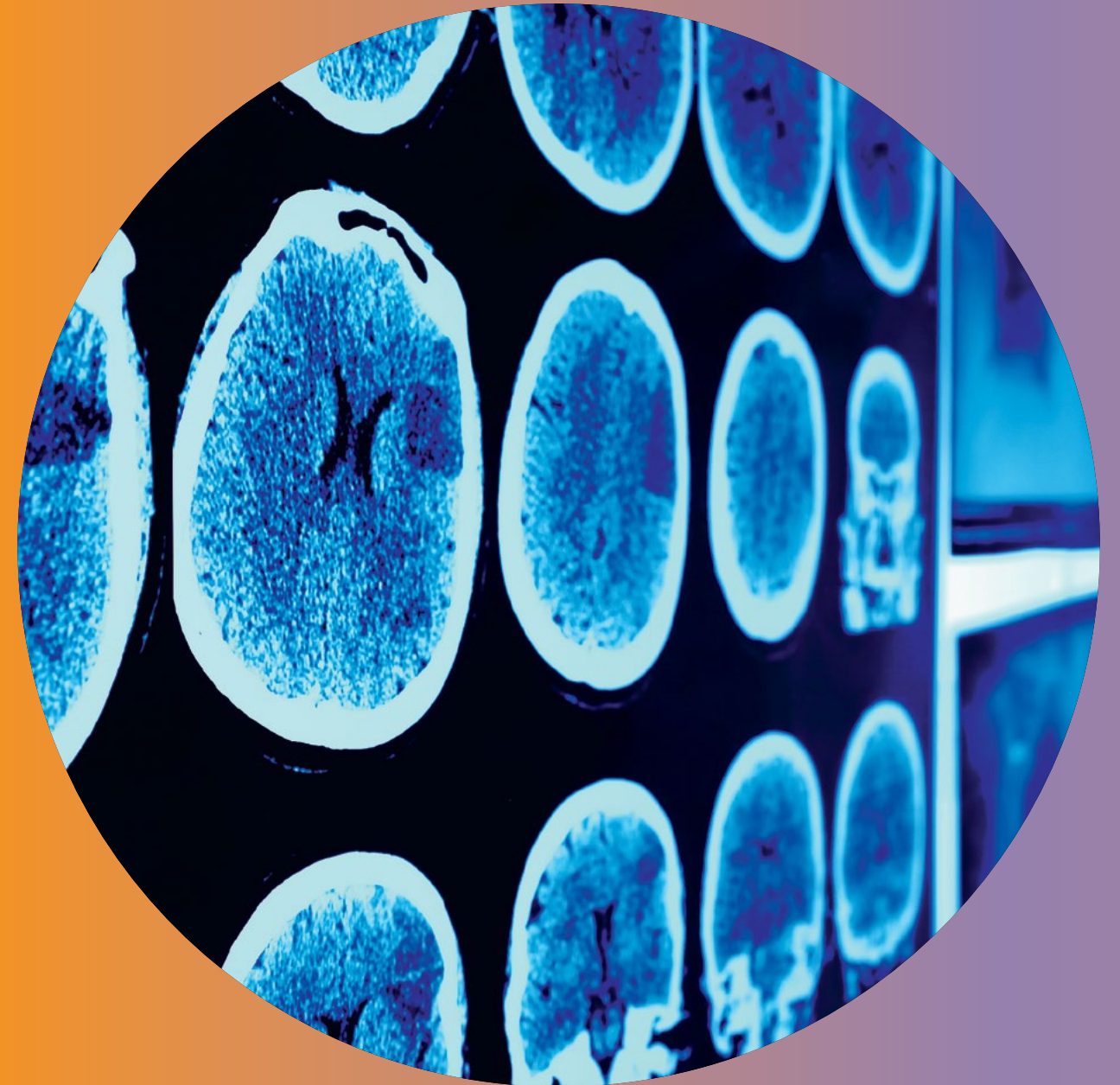
During the year, we conducted workshops with the health and medical research and education community as part of

our collaboration with customers and sector stakeholders to develop infrastructure to address the specific data transfer issues of health and medical researchers.

DIGITAL PRESERVATION INFRASTRUCTURE FOR GLAMS

Many of Australia's state and national galleries, libraries, archives and museums (GLAMs) are now connected to AARNet. With this underlying network connectivity in place, AARNet is focused on delivering services "above the network" to enable the GLAM community to preserve and share their collections. AARNet's CloudStor plays a key role in this endeavour and helps GLAMs strengthen their capacity to seize new opportunities for collaborative research, engagement and outreach, and develop large scale, data driven services. GLAMs working with AARNet have the opportunity to leverage unequalled access to storage and compute resources all connected to the research network, enabling humanities, arts and social science research and partnerships to flourish.

In October 2019, AARNet became a member of the Digital Preservation Coalition, an international organisation that seeks to secure the preservation of the world's digital legacy.





Through our membership we aim to help improve digital preservation literacy and technologies for AARNet-connected institutions and more broadly across Australia's research, education and cultural heritage domains.

AARNet is also a partner in the Play It Again Australian Research Council Linkage project which aims to recover and preserve the history of Australian-made videogames of the 1990s. AARNet's role is to help demonstrate and evaluate the emulation of otherwise obsolete operating systems and programs in a cloud-based environment to document, preserve, and exhibit digital cultural heritage. The project is led by Swinburne University with collaborators Australian Centre for the Moving Image, RMIT, Unesco PERSIST and Freiburg University, Germany.

K-12 SCHOOLS AND TAFES

Throughout 2019, Australian schools and TAFEs continued to take advantage of the benefits of AARNet; both new customers

accessing powerful research and education network bandwidth for the first time, as well as schools already connected to AARNet that used their access to leverage online content and cloud services, and innovate in teaching and learning.

By the end of 2019 over 600,000 K-12 school students at more than 1,200 schools were connected to AARNet. AARNet continued to focus on improving access to high speed telecommunications services for K-12 schools in regional Australia, notably connecting 39 schools in central Queensland for the Catholic Diocese of Rockhampton, as well as schools in Ballarat, Bendigo and Shepparton in regional Victoria, and also upgrading connectivity for 12 state schools in South Australia.

AARNet worked with many K-12 schools, delivering network solutions and seeding interactions and collaborations between school students and universities, galleries, libraries and museums connected to AARNet.

CO-DEVELOPING SOLUTIONS FOR COMMON CHALLENGES

AARNet is aligning effort and strategy across research disciplines in the sciences and humanities to find common research infrastructure elements that can then be rolled out more broadly, as services, to aid researchers at AARNet shareholder institutions.

During 2019, AARNet strengthened its collaboration with the national Data and Digital eResearch Platforms (DDeRPs): the Australian Research Data Commons (ARDC), Australian Access Federation (AAF), the National Computational Infrastructure (NCI) and the Pawsey Supercomputing Centre.

In partnership with the DDeRPs, AARNet participated in strategic discussions with NCRIS (National Collaborative Research Infrastructure Strategy) facilities and is working closely with the DDeRPs and wider eResearch community to develop solutions to address the collective need for sustainable persistent data tools and data services, secure cloud storage, transfer and compute services for sensitive data and a sustainable model for national data collections. To facilitate a greater collective understanding of the eResearch challenges faced by Australian researchers, we hosted the inaugural AARNet eResearch Roundtable event. The event was positively received and will be repeated in 2020.

In addition, we conducted workshops with the Australia Radio Astronomy community to explore technical data transfer and workflow challenges being experienced in the SKA-Precursor projects. We also continued working with both the Council of Australian University Librarians (CAUL) and the Council of Australasian University Directors of IT (CAUDIT) on collaborative projects to support the Australian research community; and with the Australian Academy of the Humanities to provide information and advice to support initiatives aimed at scoping national research infrastructure for humanities, arts and social sciences.

In February 2019, AARNet, Bioplatforms Australia, and ARDC officially launched the Pathfinder Project, an ambitious new digital capability that aims to accelerate Australian research through the establishment of the Australian Bioinformatics Commons (BioCommons). The activities of the project will significantly enhance our understanding of state-of-the-art life science data infrastructure with the specific future goal of establishing an Australian life science data infrastructure that will enable over 30,000 life science researchers across

Australia. AARNet is leading the project's data movement work package.

AARNet is also one of many sector partners involved in the Australian Characterisation Commons at Scale (ACCS) project announced by ARDC in December 2019. ACCS will run for three years to develop a coherent and accessible compute and data environment that promotes collaboration, increases ROI for the characterisation instruments, and delivers value for thousands of researchers in domains including health, advanced manufacturing, soil and water, food, energy and transport, and resources. AARNet has committed in-kind resources to solve the data movement part of the workflow.

Our engagement with the international NREN, eResearch and research data communities, including the Research Data Alliance, also continued throughout the year to ensure that our services are leading edge and leveraging innovations from the international community.

TRAINING THE TRAINERS IN DATA AND DIGITAL SKILLS

The more technology intensive learning and research become, the more important it is that knowledge workers, researchers and educators build awareness of digital platforms and networked capabilities. Data processing and data handling practices need to be extended and strengthened.

With the aim of helping researchers make the most of the powerful AARNet infrastructure available to them and in recognition of the leadership role library, information technology, and research support professionals are taking, and how that plays into critical skills development in the research community, AARNet's eResearch team delivered workshops on Network Know-How, Software Carpentries, Digital Dexterity and Jupyter Notebooks on university campuses across the country.

Previous Page: Advances in imaging are contributing to the exponential growth in data used in health and medical research; Top left: Schools connected to AARNet are accessing online resources to deliver the curriculum in new and exciting ways.



Great performance and an intuitive user interface are key contributors to the rapid uptake of the Zoom video conferencing service. Image courtesy Zoom.

Developing services to meet the needs of our customers

In addition to AARNet's primary focus, the provision of network and other telecommunications services, we are increasingly developing services and solutions that leverage the network to enable seamless and secure collaboration, data flow and mobility for the research and education sector.

We also work closely with customers' eResearch and IT teams to help researchers make the most of AARNet's powerful network infrastructure. AARNet's portfolio of services includes network, consulting, collaboration, storage, cloud and security services.

VIRTUAL PRIVATE NETWORKS

During 2019, there was 71% growth in the number of AARNet4 VPNs (Layer-2 and Layer-3 virtual private networks) in service compared with 2018. The high growth rate was driven by the uptake of direct connect services to AARNet's partner cloud service providers such as Amazon Web Services and Microsoft Azure, which account for 75% of all new VPNs delivered.

The AARNet Architecture and Applications team continues to explore opportunities and requests by our customers for partnerships with leading cloud technology companies, an approach that has led to a number of our most successful partnerships to date. Our goal is to facilitate access to services and drive cost efficient initiatives for the benefit of research and education.

ZOOM

The Zoom videoconferencing service continued to grow, with 88 customers subscribed to the product by the end of 2019, including universities, K-12 schools and cultural institutions. Great performance and an intuitive user interface are key contributors to the rapid uptake of the Zoom video conferencing service.

Zoom combines cloud video conferencing, online meetings for up to 300, 500 or 1,000 participants, webinars, group messaging and content sharing in one easy-to-use platform accessible on multiple devices. We host Zoom servers in Australia directly on the AARNet network, providing our customers with the best possible video conference experience, local Zoom support and Zoom cloud recording integration with our storage service, CloudStor.

2019 saw Zoom usage peak in August, when over 357,000 users participated in around 87,000 meetings, totaling over 15 million Zoom minutes in that month – a 46% increase from the equivalent period in 2018. We also saw significant growth in the number of Zoom Rooms deployed across institutions throughout the year and Zoom Cloud Recording stored in

CloudStor generated about three terabytes of video content per month. We continued to work closely with Zoom to fine-tune features to meet the specific needs of our customers.

PANOPTO

With Panopto launching cloud services in Australia in 2019, AARNet decided to cease hosting Panopto and migrate existing customers to Panopto's cloud offering. We are pleased to have been able to partner with Panopto to bring a high-quality video content management service to the research and education sector in Australia.

EDUROAM

The reach and usage of eduroam continued to grow. EduroamAU logged 461,365 Australian and 114,692 international visitors to Australian institutions, and 85,104 Australian visitors to international institutions in 2019, a 6% increase on 2018 figures. Eduroam, the secure global roaming wireless network for the research and education sector, is now available at more than 12,000 locations in over 100 countries worldwide, including 38 Australian universities, CSIRO and other AARNet customers. AARNet continued to work with customer institutions and local councils to extend access to eduroam in metropolitan and regional Australia.

CYBER SECURITY

Malicious cyber threats to network availability and information security are rapidly increasing in the research and education sector. In response, AARNet is building out a portfolio of integrated security services. We are co-developing services with our customers to detect and help them respond to incidents quickly and keep AARNet and our customers' networks and services up and running.

DDoS Detection and Early Warning Systems

A Denial of Service (DDoS) Detection System was commissioned in April 2019 to help defend the AARNet network and our connected institutions from malicious cyber attacks. The AARNet Early Warning System (EWS) complements the DDoS Detection System by providing early notification of issues affecting the performance of the network. Customers nominate critical services, such as public websites and learning management systems to be monitored 24x7 by the EWS system. Our Operations Centre is alerted when a nominated service at a customer site is not responding or not meeting expected performance metrics, allowing teams to respond quickly to DDoS threats and other incidents impacting network availability. 23 customers have now signed up for the AARNet EWS.

Our systems detected 84 DDoS attacks in 2019, including one major attack against a university which caused business disruption. The AARNet Operations Centre is alerted within minutes of a suspected DDoS attack, 24x7, allowing us to quickly notify affected customers and filter out unwanted traffic to minimise the impact to our network and connected institutions.

Security Operations Centre Services

During 2019 significant progress was made on developing a Security Operations Centre (SOC) capability on behalf of our shareholder Australian universities and CSIRO, Australia's national science agency. The SOC will assist universities and other customers to be at the forefront of cyber security threat detection and response. The SOC will operate 24/7 to monitor and protect the networks and information of our universities and other customers, and identify and respond to threats and compromises. The Pilot phase commenced with small group universities in 2019, with production services slated for mid 2020. AARNet was also successful in an Australian Government AustCyber Projects Fund bid, and will receive funding in 2020 for developing an international cyber

threat intelligence capability and for on-boarding universities to AARNet SOC services.

Cyber Security for Schools

AARNet's CyberSecurity for Schools service launched in 2019. This service is a unique learning enablement and cybersafety platform, designed to keep students safe while allowing them to access the online resources they need to accelerate their own learning. Co-developed by AARNet in partnership with customers and CyberHound exclusively for AARNet Direct Connect schools, the service offers a comprehensive and integrated set of network and security services. AARNet is continuing its collaboration with CyberHound to bring additional enhancements to this service in 2020.

Partnerships

AARNet, AAF, AusCERT, CAUDIT and REANNZ have partnered to deliver the Australasian Higher Education Cybersecurity Service (AHECS) initiative, aligning activities with the aim of safeguarding the reputation of the Australasian Higher Education Sector through coordinated, complementary cyber security-related portfolios of activity.

AARNet is an industry participant in the Cyber Security Cooperative Research Centre (CSCRC). The CSCRC connects participants from industry, government and leading cyber security research organisations (including six universities) to develop and potentially commercialise products and services that improve the cyber security posture of Australia. The CSCRC plays an important role in raising cyber security awareness more broadly and exploring key cyber security issues with respect to the legal, policy and regulatory implications of cyber security risks.

As part of AARNet's customer engagement program, the AARNet Cyber Security team conducted state-based cyber security update sessions and table-top incident response exercises with customers.

ENTERPRISE SERVICES

The Enterprise Services team provides highly-valued professional, engineering and technical consulting services to assist with the provision of campus information technology across the research and education sector. Enterprise Services experienced its sixth consecutive year of growth, delivering assignments to both shareholder and non-shareholder customers.

Assignments included major network, data centre, cloud and security reviews for shareholder customers, complex multi-tenant university network architecture design guidelines, data centre and cloud migrations, technical support for eResearch and IT services for the delivery of connectivity solutions, and assisting K-12 schools with implementing diverse connections. The team also actively supported the design and delivery of on-boarding activities for AARNet's Security Operations Centre, developing and facilitating customer workshops and information gathering exercises.

In addition, the Enterprise Services team established a Community of Practice (CoP) focused on network automation skills and technology. This CoP includes participants from each state across Australia, with informal meetups throughout the year providing the sector's technical community with an opportunity to share best practices and knowledge around network automation technologies.

CLOUDSTOR

CloudStor is a research data storage, sharing and analysis service designed and built by AARNet to support data-intensive research collaborations. It is an on-net service for AARNet-connected institutions, providing individual researchers and staff with personal allocations of one terabyte free storage, with larger group allocations available on request. CloudStor storage is located in Australia and is hosted on equipment owned and operated by AARNet, avoiding data sovereignty issues.

CloudStor usage grew strongly in 2019, with over 78,000 registered user accounts from 105 institutions logged by the end of 2019; up 28% from the end of 2018. CloudStor is used by universities and other AARNet customers to share data with their collaborators in the research and education community, industry and government.

February saw the launch of a fourth CloudStor storage node, located at the National Computational Infrastructure (NCI) at the Australian National University in Canberra. This node has increased the storage capacity of CloudStor and will support a deeper strategic partnership between AARNet and NCI.

The focus for much of 2019 was on improving the reliability and performance of CloudStor. To this end, we implemented multiple infrastructure upgrades and co-developed and deployed a new high performance S3 storage facility for several customers.

Usage of SWAN (Service for Web-based ANalysis) within our CloudStor environment grew in 2019. SWAN provides a Jupyter Notebook (scientific notebook) capability to all users of CloudStor. Jupyter Notebook has gained widespread worldwide adoption as the preferred electronic lab book for researchers, enabling them to combine narrative with code and output in the one document. This adds processing and analysis to the data storage capability of CloudStor. SWAN has been enthusiastically taken up by researchers across many disciplines and complements CloudStor's other capabilities, such as OnlyOffice document editing, FileSender data sharing, data ingest tools, data visualisation tools, and the packaging of data collections.

In response to demand from customers and stakeholders in the sector, this year, the Cloud Services team began exploring services for data preservation and the handling of sensitive/

classified data. We are collaborating closely with several customers to develop these capabilities.

The Cloud Services team has also been actively collaborating with engineers from the European Organization for Nuclear Research, known as CERN, on the EOS file system that underpins CloudStor, as well as on the European Union-funded Science Mesh project that aims to develop seamless interchange services between international research data stores. In October, AARNet hosted key members of the CERN storage services team at our Brisbane office and jointly presented on the Science Mesh project at the eResearch Australasia conference. The eResearch community has responded very positively to these developments.

As CloudStor grows, AARNet is focused on continually developing and extending the service into a national collaborative research data platform to meet current and future needs of the research sector.

Right: Researcher using SWAN (Service for Web-based ANalysis) within the CloudStor environment. SWAN provides a Jupyter Notebook capability to all users of CloudStor.



Our team

Throughout 2019, we continued to develop our organisation through building the expertise of and deeply engaging with our people. Over the course of the year, the AARNet team grew from 124 to 133 people, with significant expansion seen in the Cyber Security team.



During 2019 AARNet focused on three key areas: AARNet Values, Staff Training, and development of our Cyber Security structure and posture.

AARNET VALUES

The AARNet Values - One Team, Creativity and Trust - continued to play an important role continued to play an important role in employee engagement, and are solidly embedded into our recruitment, training, and KPI processes. In 2019, the AARNet Values became a key platform for day-to-day workplace conversations, at all levels of the company, showing that the values are now an integral and non-negotiable part of our cultural fabric.

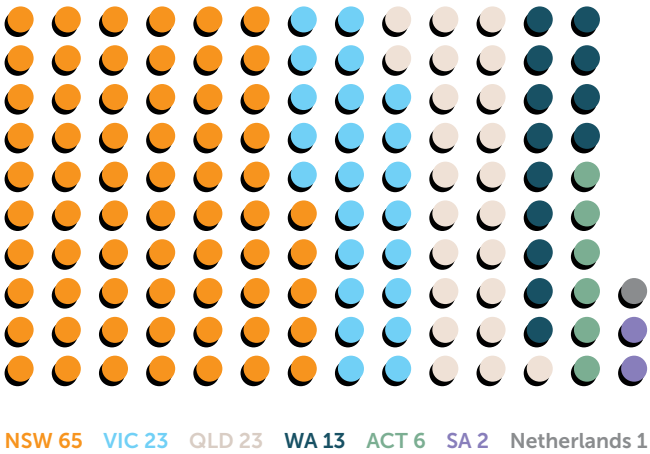
EMPLOYEE TRAINING & DEVELOPMENT

Under the guidance of our Human Resources team, AARNet has made a significant commitment to employee training and development with key focus on the areas of presentation and public speaking skills, corporate and personal resilience, team leadership skills, and communication and influencing skills. In 2020 this work will continue. AARNet has continued to take a leadership role within our global NREN community, developing a two-year Leadership Training Programme for the global NREN group. The programme covers various areas of personal leadership skills and development as well as having a strategic technical focus on cyber security. It is expected that the first intake for the programme will commence in mid-2021.

Left: AARNet Associate Director - Infrastructure
Jodie O'Donohoe in the field at Saddleback Mountain;
Top right: Annual planning and team building activities.



AARNET STAFF AS AT END 2019, TOTAL: 133



CYBER SECURITY TALENT

AARNet made significant steps in 2019 to position our Cyber Security offering as best in class to our shareholders and customers. Most significantly we recruited a world class Chief Information Security Officer and General Manager Security Operations. The experience of the Security team encompasses strong security engineering and a deep understanding of government and the broader intelligence community relating to security of the higher education and research sectors. This has allowed AARNet to accelerate the development and introduction of our Security Operations Centre (SOC).

Additionally, during 2019, AARNet developed a Cyber Security Internship Programme. The programme consists of two eight-week blocks with a focus on the SOC and cyber security more generally. The Cyber Security Internship Programme is AARNet's opportunity to participate in the development of professional cyber security talent, leveraging our unique position in the sector to source talented graduates directly from our university SOC subscribers. This will allow the Cyber Security Internship Programme participants to be placed on a path to industry certification, as we do with our existing SOC analysts, providing

practical experience that builds on their tertiary education. AARNet's opportunity to leverage its SOC analysts as trainers provides invaluable hands-on experience that is rewarding to both the interns and to our SOC analysts – providing the first steps to developing mentoring relationships. The exposure and experience that Cyber Security Internship Programme participants will gain, will prepare them for a challenging and rewarding career within AARNet Cyber Security.

R+E COMMUNITY ENGAGEMENT

AARNet is involved in a broad range of research and education community events, including sponsorship and network support for conferences, workshops, working groups, forums and mentoring.

Technologists working on networking and networked technologies at AARNet-connected universities and research institutions gathered in Melbourne on 6 and 7 June 2019 for the third edition of Networkshop, a two-day, technical, community-building event organised and hosted by AARNet. With an emphasis on technical collaboration, skills development and the exchange of ideas, Networkshop was well received by over 100 attendees and will be repeated in 2020.

In 2019, AARNet provided in-kind sponsorship – typically network connectivity, streaming and/or manpower – for research and education community conferences and events including Universities Higher Education Conference, Science Meets Parliament, FIRST® Robotics Competition, VALA Tech Camp, Museums Australia National Conference, International Particle Accelerator Conference, World Science Festival, AIS ICT Conference, RoboCup, CSIRO Conference on Computational and Data Intensive Science (C3DIS), GEO Ministerial Summit, ModSim2019, Digital Directions, eResearch Australasia, and Data Mover Challenge 2020.

Our staff participated as speakers, workshop hosts and delegates in a wide range of sector-relevant conferences and events, including Managers of IT in Education (MITIE), VALA Tech Camp, Museums and Galleries Australia, Australian eResearch Organisation (AeRO) Forum, The Higher Education Technology Agenda (THETA2019), The International Association of University Libraries Conference, ResBaz Sydney and Melbourne, National Collaborative Research Infrastructure Strategy (NCRIS) Forum, C3DIS, eResearch Australasia, International Association of University Libraries Conference, Health Informatics Conference, AusCERT, CAUDIT Members Meetings, Australian Cybersecurity Education Summit, World Digital Preservation Day, and others.

AARNet supports STEM (Science, Technology, Engineering and Maths) programs in our community as part of our commitment to inspiring young people to pursue tertiary STEM studies.

For the fifth year running, in addition to providing network connectivity and streaming, AARNet staff participated in judging the FIRST®Australia Robotics Competition hosted by Macquarie University. Teams from a number of universities and schools connected to AARNet took part.

AARNet staff also volunteered as judges for the National Young ICT Awards, an annual event that challenges school children from Year 3 to Year 12 to put the national ICT curriculum into practice by designing any technology project they are inspired to create.

AARNet continued its support for Australian Indigenous Mentoring Experience (AIME) by providing the high-speed broadband connectivity and Zoom video conferencing this innovative education program needs to strengthen and expand the services it offers Indigenous kids the length and breadth of Australia.



INTERNATIONAL ENGAGEMENT

AARNet continued to host and oversee content production for the In The Field website (inthefieldstories.net), a global collaboration for sharing impact stories and promoting the value of research and education networks worldwide. By the end of the year, there were 320 stories published on the site, covering a wide range of topics in the sciences and humanities and featuring 100 networks.

AARNet staff continued to collaborate with their global peers and were involved in international projects, working groups, conferences and forums for the benefit of the research and education community. These included Research Data Alliance, Science Mesh, Asia Pacific Research Platform (APRP) Working Group, Asia Pacific Advanced Network (APAN) meetings, PITA Conference, DARIAH Summit, EGU General Assembly, Plan-E Plenary, TEIN*CC, Global Network Architecture Group, GLIF, Global NREN CEO Forum, Global NREN PR Network, Global NREN Security Group, Internet2 Global Summit and Technology Exchange, TNC2019, eResearch NZ, Supercomputing 2019, CS3 Workshop, NSF Cyber Security Conference, International Digital Humanities 2019, RDA Plenary, International Conference on Digital Preservation, Educause 2019, the International Council on Archives Conference, and others.

Right: AARNet CEO Chris Hancock opening Networkshop 2019;
Top right: AARNet eResearch Director Carina Kemp speaking about CloudStor at the HAC Summit - DARIAH Beyond Europe event in March 2019.



Corporate Governance

THE ORGANISATION

AARNet Pty Ltd [ACN 084 540 518] is the not-for-profit company that operates the AARNet network, Australia’s national research and education network, also known as an NREN.

Shares in AARNet Pty Ltd [AARNet] are held by 38 Australian Universities and the CSIRO as listed on page 41.

AARNet is a licensed Australian telecommunications carrier [#61 under the Telecommunications Act 1997 Cth].

The Chief Executive Officer is charged with the efficient and cost-effective operation of the company and reports to the Board of Directors, as listed on page 41.

THE AARNET BOARD OF DIRECTORS

The Board of Directors is responsible for the overall direction and management of AARNet.

For 30 years, AARNet and its predecessor have shared and exchanged expertise with shareholders and customers in many ways, supporting national and international collaboration and innovation in networking and associated services for research and education.

AARNet has been effective in making representations to government on policy, legislation, strategy and programs to improve the telecommunications facilities and services available not only to the education and research sector, but to all Australians.

THE AARNET ADVISORY COMMITTEE

The AARNet Advisory Committee [AAC] represents the interests of the members and is a source of advice on policy and business matters. Regional Network Organisations, which are generally state based, elect one representative to the AAC. Members of the AAC are listed on page 41.

LIST OF SHAREHOLDERS

Australian National University
Commonwealth Scientific and Industrial Research Organisation
University of Canberra
Charles Sturt University
Macquarie University
Southern Cross University
The Australian Catholic University
University of New England
University of New South Wales
University of Newcastle
University of Sydney
University of Technology, Sydney
Western Sydney University
University of Wollongong
Charles Darwin University
Bond University
Central Queensland University
Griffith University
James Cook University
Queensland University of Technology
University of Queensland
University of Southern Queensland
University of the Sunshine Coast
Flinders University of South Australia
University of Adelaide
University of South Australia
University of Tasmania
Deakin University
La Trobe University
Monash University
RMIT University
Swinburne University of Technology
The University of Melbourne
Federation University Australia
Victoria University
Curtin University
Edith Cowan University
Murdoch University
The University of Western Australia



A collaboration space inside the new AARNet office in Chatswood, New South Wales.

BOARD OF DIRECTORS

Chairman: Emeritus Professor Gerard Sutton AO*
Executive Director: Mr Chris Hancock (CEO)
Dr Christine Burns
Professor John Dewar AO
Professor Annabelle Duncan (until 5 July 2019)
Mr Robert Fitzpatrick*
Mr David Formica (appointed 25 March 2020)
Professor Brigid Heywood (appointed 22 October 2019)
Mr Jeff Murray (until 25 March 2020)
Ms Fiona Rankin (appointed 25 June 2019)
Mr John Rohan*
Professor Deborah Terry AO
Emeritus Professor Mark Wainwright AM*
Dr David Williams
*Denotes Independent Director

AARNET ADVISORY COMMITTEE

Chairman: Mr Jeff Murray (TAS, University of Tasmania) (until 25 March 2020)
Chairman: Mr David Formica (ACT, University of Canberra) (appointed 25 March 2020)
CEO AARNet: Mr Chris Hancock
Mr Malcolm Caldwell (NT, Charles Darwin University)
Mr Vito Forte (WA, Edith Cowan University)
Mr Tim Mannes (NSW, Charles Sturt University)
Ms Bev Wright (SA, University of Adelaide)
Mr Tom Minchin (CSIRO)
Mr Scott Sorley (QLD, University of Southern Queensland)
Mr Zoran Sugarevski (VIC, Victoria University)



SPOTLIGHT

Here's a closer look at some of the discoveries and ***success stories*** in the research and education community enabled by our powerful network and collaboration services. To read more stories, go to news.aarnet.edu.au

Co-developing a cyber security solution for schools

Ballarat Clarendon College implements an improved managed security service from AARNet in partnership with CyberHound. The solution enables access to cloud services and online learning resources, while also securing and protecting data.

When Ballarat Clarendon College was searching for a security solution they turned to AARNet and CyberHound as collaborators. The trio have co-developed a cyber security platform that offers an integrated set of network and security services to all AARNet Direct Connect schools.

Ballarat Clarendon College is a school where learning comes first and is not confined to the classroom. It is a coeducational school associated with the Uniting Church in Australia, enrolling students from Early Learning to Year 12. The College has a number of campuses catering for different year levels and learning experiences. In addition to their 1,200 day students they cater for a community of 150 boarding students.

The College's learning environment has progressively transitioned to a predominantly digital experience, placing greater demands on the network. Providing high speed access to cloud-based services and online learning

resources, while also securing and protecting data to ensure they meet compliance and regulatory requirements was a constant challenge and a key focus for the College.

Of further importance was the health and wellbeing of its students. In this new connected world, the College felt it lacked adequate visibility and controls to identify exactly what was happening across the network. With a 24x7 duty of care and special considerations for their boarding students, enhanced visibility to support pastoral care efforts has become increasingly important.

The existing managed security solution was restricted in terms of performance, security and functionality and did not sufficiently cater for the specific requirements of a K-12 education environment. As the demands on the network grew it was unable to cope with these changing requirements and they needed more.



With such business-critical requirements, the College's ICT team wanted to ensure that they implemented a solution to meet current and future needs. To achieve this goal, they turned to the expertise of their trusted network infrastructure partner AARNet as a collaborator. Following an extensive review and testing process, leading security provider CyberHound was selected to partner with AARNet and the College to co-develop a solution specifically for schools directly connected to the AARNet network.

Both AARNet and CyberHound have extremely strong pedigrees in the education sector, with a combined 50 years of sector-targeted service development and innovation and a similar long-term approach to customer satisfaction.

A key requirement for the solution was performance to maximise the College's high speed AARNet network service while allowing scalability for the future. The solution needed to provide comprehensive security capabilities and best practice support and change management processes to ensure the same high standard of service reliability the College has experienced from AARNet over many years.

With CyberHound's capabilities, the solution provides a broad range of differentiated and specialised security and application controls, including full SSL visibility, enhanced malware/threat detection and granular reporting with CyberHound's XGen platform. Data visibility was enhanced with the ability to log key data to the College's intelligent central data repository.

The College's student welfare program was enhanced through the inclusion of CyberHound's behavioural analytics technology, ClearView. This capability delivers a new level of visibility, reporting and actionable intelligence to assist staff in providing immediate support for students.

The AARNet and CyberHound solution for AARNet Direct Connect schools is delivering other benefits to the College, including improved network security and data protection; enhanced visibility and control with customisable reporting; improved throughput for enhanced network performance; superior quality of service with best practice change management; and responsive support by highly experienced industry experts.

Cyber security is paramount in an environment where teaching and learning is a predominantly digital. Image courtesy Ballarat Clarendon College.

Visualising the story of Australia's largest ever naval loss

An ambitious project to create digital 3D reconstructions of shipwrecks for virtual underwater heritage museum experiences relies on the AARNet network for the transfer of huge volumes of data from the research lab to supercomputer.

The Sydney-Kormoran Project, a Curtin University and Western Australian Museum collaboration, is using the latest imaging technology, research networking, supercomputing and advanced visualisation techniques to tell the story of two of Australia's most significant shipwrecks – the HMAS Sydney (II) and the German raider HSK Kormoran.

The ships met their fate at the bottom of the Indian Ocean on 19 November 1941 after a short but fierce battle ending with the loss of all 645 crew of the Australian vessel. How and why Sydney, a state-of-the-art warship, was defeated by Kormoran, a modified merchant vessel, has long been the subject of much speculation and controversy.

Despite the historical significance of these vessels – whose resting place 200km off the coast of Western Australia was only discovered in 2008 – they have been largely inaccessible to the public due to their isolated location 2,500 meters below the ocean's surface.

Now, thanks to detailed 3D imaging surveys carried out by Dr Andrew Woods, Senior Research Fellow at Curtin University, and his team, haunting images have emerged that reveal new insights about the last moments of the ships, including a previously-undocumented 15-centimetre shell hole through Sydney's bridge.

"The Sydney-Kormoran Project is the first research project in Australia to have undertaken such an ambitious underwater survey and has set a new bar for this type of work," said Woods.

The expedition to the ocean floor involved four years of preparation, 63 crew members and two remotely operated vehicles fitted with 14 digital cameras. Four dedicated 1Gbps links to 2,500 meters were used to transfer images from the cameras to the researchers on board the project's service ship for quality assurance in realtime.

Over 500,000 images and 300 hours of high definition video footage were collected and recorded on hard drives. After pre-processing at Curtin University, the data was seamlessly transferred over the AARNet high capacity network to the Pawsey Supercomputing Centre for processing.

"We can't do our research without AARNet," said Woods. "We've got to move data around and we rely on the AARNet network to do that for us."

The project team is using Pawsey's Magnus supercomputer to generate detailed digital 3D models that will become the basis for a new museum exhibition, giving visitors an interactive and immersive experience of the shipwreck sites and this important piece of Australian history.

Researchers are using Curtin's HIVE (Hub for Immersive Visualisation and eResearch) facility to test the 3D models and experiment with virtual reality scenarios.

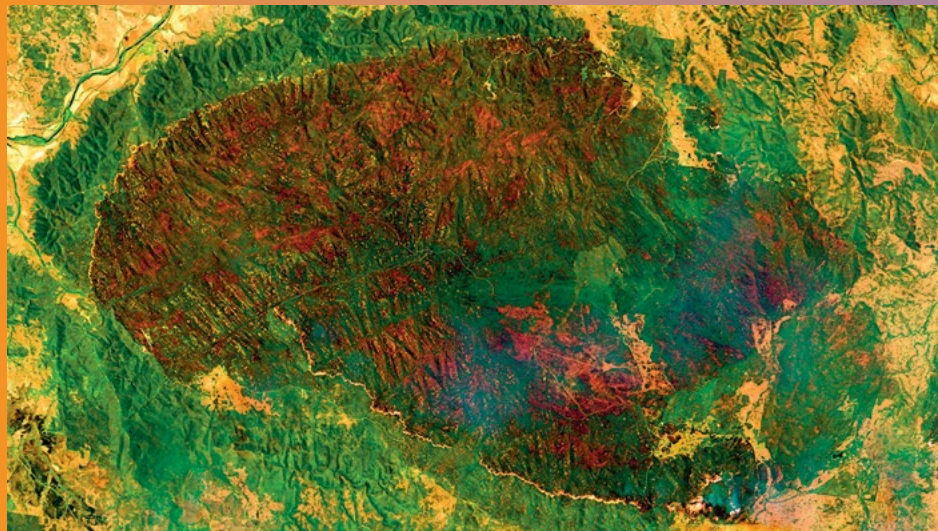
"The plan is to provide underwater virtual heritage experiences at museum sites that will allow people to explore and understand the stories of these two wrecks as if they were down at the wreck sites. It's a powerful way to tell a story and a great way of sharing cultural heritage," Woods said.



Looking at haunting 3D visualisations of the Sydney and Kormoran shipwrecks inside Curtin University's Hub for Immersive Visualisation and eResearch. Image courtesy Curtin University.

USING THE LATEST IMAGING TECHNOLOGY, RESEARCH NETWORKING, SUPERCOMPUTING AND ADVANCED VISUALISATION TECHNIQUES TO TELL THE STORY OF TWO OF AUSTRALIA'S MOST SIGNIFICANT SHIPWRECKS.

**“WE REALISED WE
COULD USE THE DIGITAL
INFRASTRUCTURE AND
TECHNOLOGIES AVAILABLE
TODAY TO LIBERATE OUR
ARCHIVE FROM TAPES IN
STORAGE AND PROVIDE
VALUE TO SOCIETY.”**



Satellite imagery available through the Digital Earth Australia platform is used to track bushfires. Images courtesy Digital Earth Australia.



Using satellite imagery to assess drought & track bushfires

AARNet plays an important role in transporting huge imagery datasets that are captured by satellites orbiting the Earth and used by researchers to help solve real world problems.

Satellites orbiting our planet have been recording physical changes across the Australian landscape for more than 40 years. Digital Earth Australia (DEA), a ground-breaking open source analysis platform, developed by researchers at Geoscience Australia (GA), is making this rich trove of satellite imagery and other Earth observation data useful and accessible for everyone.

Thanks to the DEA program, individuals, communities, industry and government can use this data for making informed decisions about the environment and economy.

Dr Trevor Dhu, Head of GA's National Earth and Marine Observations Branch, says the development of high-speed networks and supercomputers has helped make it possible to transform GA's vast archive of satellite imagery and spatial data.

“We realised we could use the digital infrastructure and technologies available today to liberate our archive from tapes in storage and provide value to society. From the beginning, we set out to build a platform that would help everyone, not just remote sensing experts, to better understand the world around them and how it is changing,” said Dr Dhu.

DEA turns spatial data and satellite images of the physical environment into products that can be used for planning and decision-making purposes. For example, the Water Observations from Space product, a national map of where water has been seen in Australia from 1987 to the present, can be used by farmers and governments to better plan water management strategies. Other DEA products provide information about ground cover, crop health and coastal environments.

Digital Earth Australia is used to assess the status of drought, with this information feeding into state and national drought monitors. The platform is also used to track bushfires and to help support more sustainable farming practices. DEA provides scientists with the ability to measure and consistently track environmental events and activities like these that were previously unmeasurable.

Dr Dhu says AARNet plays an important role in moving satellite imagery data around.

“We capture imagery at the Geoscience Australia Alice Springs ground station and we send it across the AARNet network to the NCI (National Computational Infrastructure) in Canberra where it is stored and transformed into decision-ready products using high performance computing,” he said.

DEA also relies heavily on Australian landscape data captured by European Sentinel satellites and on AARNet for the transfer of this data to and from the Copernicus Australasia Regional Data Hub located at the NCI. AARNet is also relied upon for transferring the data amongst the research and education community more broadly.

“What we've created in Australia with the Digital Earth platform is unique because it is more than a research capability; it is an operational capability. We are producing products that people can rely on for the long term. They are regularly updated and as reliable as weather reports. This is proving to be of great value to society,” said Dr Dhu.

The Earth observation data captured by satellites is freely available globally, and today, the DEA open-source software, known as Open Data Cube, is already being implemented in more than 50 countries.

Moving research data faster around the world

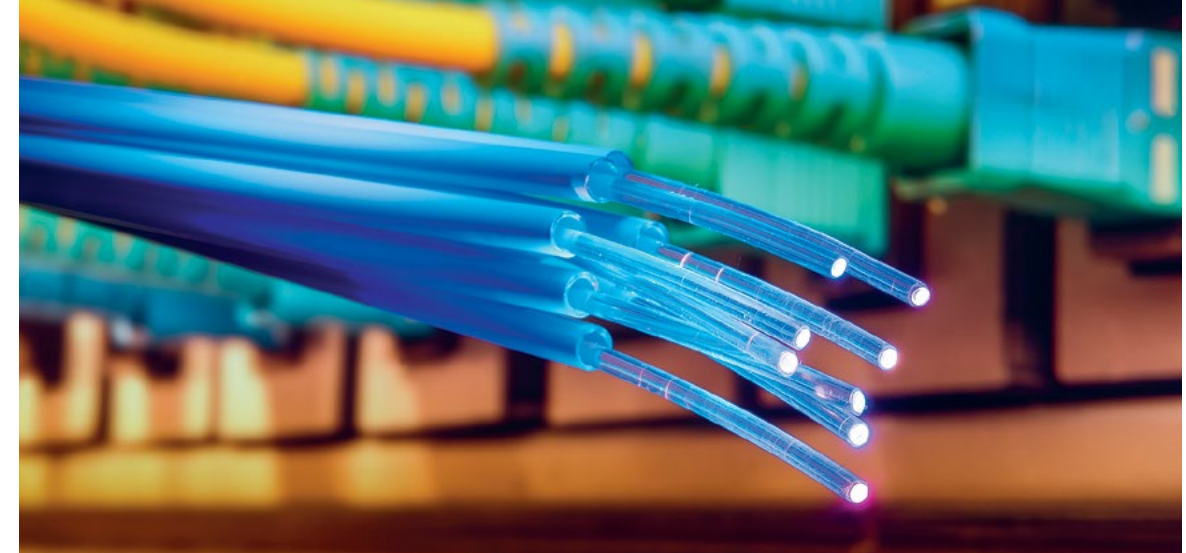
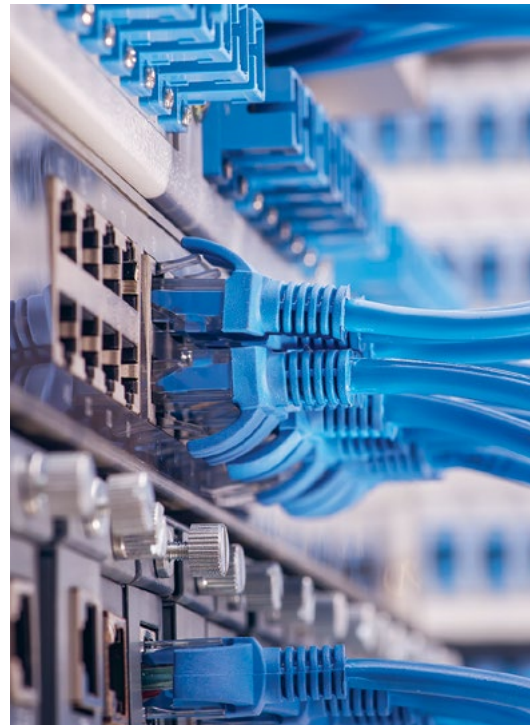
AARNet engineers routinely run experiments and test networking technologies for managing large data flows with colleagues at scientific organisations, supercomputing facilities and research and education networks in Europe, Asia and the United States, as well as optical network equipment vendors.

Testing ensures research network infrastructure meets the current and future big data transfer needs of researchers and scientists collaborating globally in data-intensive fields, such as high energy physics, radio astronomy, climate science and genomics.

In 2019, impressive results were achieved during long distance performance testing with live research data transfers over the AARNet spectrum of the new Indigo subsea cable system connecting Sydney, Perth and Singapore, and over the new CAE-1 (Collaboration Asia Europe) link connecting Singapore to London.

This round of network performance testing involved AARNet engineers collaborating with engineers at CERN (the European Organization for Nuclear Research) to transfer 1000 x 4GB high energy physics data files in parallel from the CERN storage infrastructure used for hosting data from Large Hadron Collider (LHC) experiments, located in Geneva, to Sydney at 49.8 Gbps sustained throughput. This test was run using the LHC Open Network Environment (LHCONE) virtual private network running over the CAE-1 and Indigo cable systems between London and Sydney.

Testing at this time also involved collaborating with engineers at the National Supercomputing Centre of Singapore (NSCC) to transfer data between AARNet servers in Sydney and the



NSCC over the Indigo cable system between Sydney and Singapore at 70Gbps sustained throughput and with iPerf3 recording speeds great than 92Gbps.

"Testing and fine tuning the end-to-end performance of our international networks is vital for ensuring that researchers have the 'friction-free' connectivity they need to share and analyse data. This is a capability that enables scientific discovery," said Chris Myers, AARNet's Solutions Consultant, Network and Systems Architecture, who led the testing.

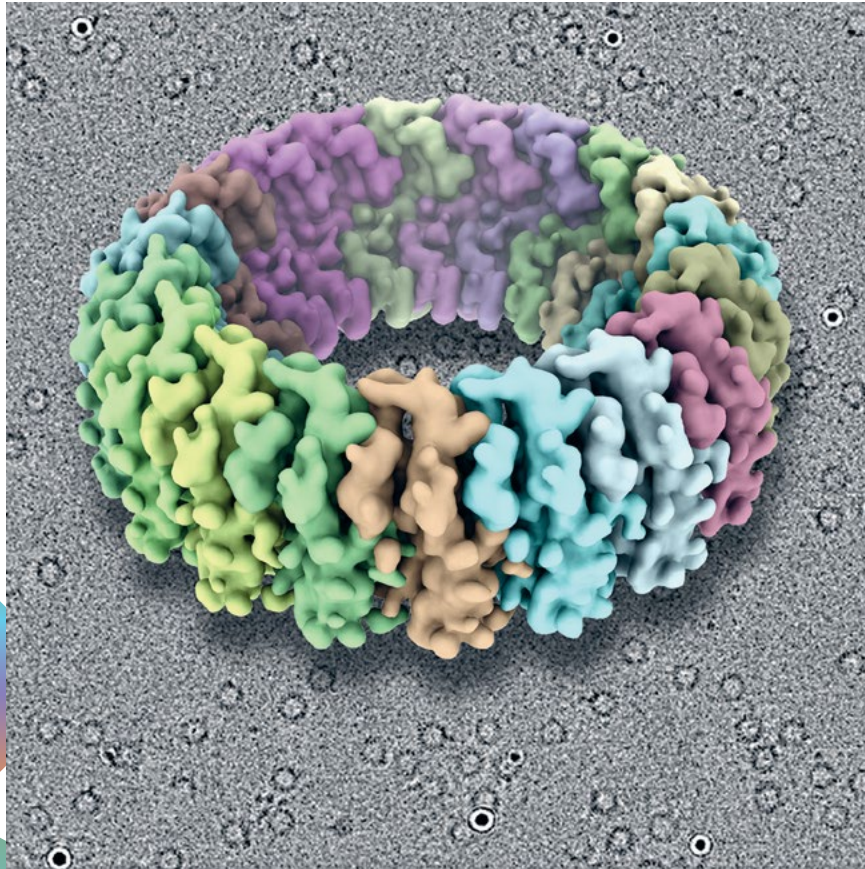
Within Australia, another round of tests were performed with Cisco NCS 1004 and NCS 2000 FlexSpectrum Single Module ROADM platforms in the AARNet production network under real world conditions without interruption to any customer traffic. With the ability to adjust modulation format and baud rate to achieve the maximum data throughput over different distances, ground-breaking results were achieved, including: 600Gbps single wavelength in a metro data centre to data centre environment (approximately 15km) in Perth; 500Gbps single wavelength over regional distances greater than 300km (roughly equivalent from Sydney to Newcastle, Wollongong or Goulburn); and 400Gbps single wavelength over inter-capital distances greater than 750km (roughly equivalent to Sydney to Melbourne).

The University of Queensland (UQ) was the first in a wave of top universities in Australia to go live with a dual 100 gigabit per second (Gbps) connection to AARNet in 2019, and is set to benefit from AARNet's ability to scale.

Areas of data-intensive research at UQ, including genomics, imaging, modelling, microscopy and computing are producing petabytes of data that needs to be transferred over the AARNet network. 100Gbps links will enable faster data transfer for research at UQ and will, for example, enhance the Queensland Brain Institute's research into Alzheimer's disease, schizophrenia and neurodegenerative disorders such as dementia; the Global Change Institute's work to address the impacts of climate change and population growth; and a myriad of other research projects focusing on health, energy, sustainability, water and food security.

"UQ is extremely pleased to be the first university in Australia to migrate to AARNet's 100Gbps service. Petabytes of data are being generated by research activities at UQ, and many of these activities are multi-disciplinary and multi-institutional, so reducing our transmission times for moving data between our national and global research partners is of significant benefit," said Rob Moffatt, Chief Information Officer at UQ.

AARNet's mission is to continuously develop the AARNet network and services to remove barriers to discovery and innovation for Australian researchers. Performance testing is an integral part of how we ensure AARNet-connected universities and research institutes have the bandwidth they can rely on now and into the future.



A preliminary 3D cryo-EM structure of a bacteriophage (bacterial virus) protein reconstructed at Molecular Horizons by Dr Tolun's research group, shown on one of the EM images used for reconstructing this 3D macromolecular structure.

TO ENABLE THIS CRITICAL RESEARCH THE IT TEAM COLLABORATED WITH THE RESEARCH TEAM TO UNDERSTAND THEIR NEEDS, AND UOW INVESTED IN A SUITE OF REVOLUTIONARY TECHNOLOGY.

Supporting researchers in the fight against diseases and antibiotic resistance

The AARNet network is critical underpinning infrastructure for the University of Wollongong's new Molecular Horizons Research Facility, where scientists investigate the inner workings of living tissue at the molecular level.

The University of Wollongong (UOW)'s Molecular Horizons facility is a state-of-the-art life sciences research facility, purpose built and equipped with advanced technologies to help scientists solve some of the world's biggest health and medical challenges. Powerful microscopes, data mining and machine learning are enabling scientists to address challenges such as finding cancer cures, developing new antibiotics and anti-viral agents, and reversing Alzheimer's disease.

To enable this critical research the IT team collaborated with the research team to understand their needs, and UOW invested in a suite of revolutionary technology, including purchasing two of Australia's most powerful biological electron microscopes, a Talos Arctica microscope and a Titan Krios Cryogenic Electron Microscopy (Cryo-EM) microscope. These sensitive microscopes with cameras that can detect single electrons are used for reconstructing 3D images showing the structures of molecules at atomic detail, revealing to researchers the secrets of how our cells respond to diseases and treatments.

The delivery of the Facility involved deploying high-speed 10 gigabit per second connections over the AARNet

network to the microscopes and the associated data storage and processing equipment, both on campus and off campus. High performance computing (HPC) is required for processing and analysis of the images captured by the microscopes. Data is transferred over the AARNet network to on-campus HPC for real-time analysis, and to the Multi-modal Australian Sciences Imaging and Visualisation Environment (MASSIVE), Australia's specialised HPC research facility located at Monash University in Melbourne, for intensive image processing, analysis and visualisation. The deployment of Software Defined Networking technology ensures these huge data sets are delivered efficiently, securely and at the speed required whether on or off campus.

Fiona Rankin, UOW's Director of Information Management and Technology Services, says the AARNet network is fundamental to enabling research at the Molecular Horizons facility.

"Big data needs a big network and AARNet enables us to efficiently and reliably move the ever-increasing volumes of research data this new facility produces around. This is about removing technical barriers to discovery for researchers, and ultimately saving lives."

Collaborating to help researchers solve the world's greatest challenges

For more than thirty years, AARNet and CSIRO, Australia's national science agency, have collaborated on building high capacity data networks to support Australian research.

Over the years, the partnership has seen networking infrastructure extended out to regional and remote parts of the country, interconnecting around 39 facilities and instruments, and supporting the ever-growing data transfer and collaboration needs of CSIRO researchers across many scientific fields, including radio astronomy, agriculture and health.

In outback Western Australia, fast reliable research network connectivity is critical for processing data generated by the radio telescopes located at CSIRO's Murchison Radio-astronomy Observatory (MRO). The telescopes are used by astronomers to study galaxies and explore the origins of the Universe. Several years ago, AARNet expanded its network across the Nullarbor, from Adelaide to Perth and on to the MRO. CSIRO and AARNet engineers collaborated to develop the specialised data transmission networks for the next-generation telescopes located there, the Australian Square Kilometre Array Pathfinder and the Murchison Widefield Array.

The MRO will host 131,000 low-frequency antennas as part of the future Square Kilometre Array, a global science and engineering project to build the world's largest telescope co-located in Australia and South Africa. AARNet provides the network services over its terrestrial and subsea network paths, connecting the telescopes at the MRO to the Pawsey Supercomputing Centre in Perth and to the National Computational Infrastructure in Canberra, CSIRO facilities and partners across Australia and the world.

AARNet also provides network services for three other observatories operated by CSIRO in regional New South Wales: the Parkes radio telescope, fondly known as 'The Dish', the Australia Telescope Compact Array near Narrabri, and the Mopra radio telescope near Coonabarabran.

In November 2019, CSIRO opened its new Boorowa Agriculture Research Station, which is directly connected to AARNet's high speed optical fibre network. Located 100kms from Canberra,

in rural New South Wales, the 290-hectare facility is purpose built for research focused on developing Australian farms of the future. Drones, remote monitoring and advanced data analytics provide scientists with unprecedented accuracy in studying crops and farming systems to help build more resilient agriculture systems and increase food production. The AARNet link will enable scientists working at the research station to share research data efficiently with other CSIRO facilities and partner institutions across Australia.

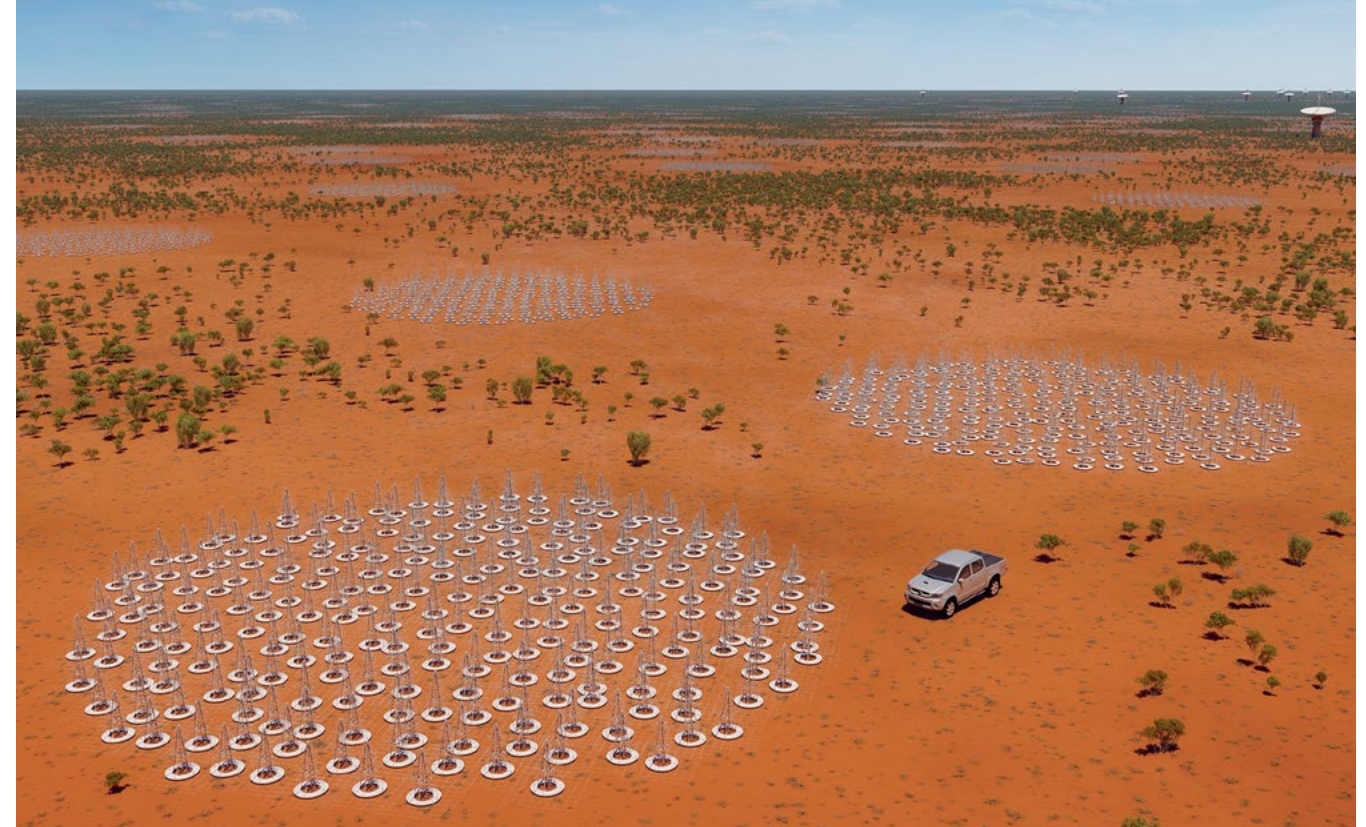
The CSIRO FD McMaster Laboratory near Armidale in regional New South Wales is also connected to the AARNet network. The link went live in 2015, enabling scientists to share large data files with research partners in real time and boosting opportunities for agricultural research collaborations.

In regional Victoria, the AARNet network has been supporting scientific outcomes for the Australian Centre for Disease Preparedness, formerly known as the Australian Animal Health

Laboratory, in Geelong for some time. Operated by CSIRO, this facility is the only bio-secure facility of its kind in the Southern Hemisphere. Research is focused on the highly infectious diseases of animals, including zoonotic diseases that pass from animals to humans, such as Hendra, Severe Acute Respiratory Syndrome (SARS) and COVID-19, with outcomes helping how the world predicts, prevents and manages disease and pandemics. The AARNet link connects researchers to compute and cloud services, as well as other CSIRO facilities and research collaborators.

AARNet is an indispensable partner to CSIRO for the development and deployment of networking technologies, infrastructure and resources that provide for the data transport needs of research ahead of demand.

Image above: An artist's impression of the Square Kilometre Array's antennas in Australia. ©SKA Organisation



AARNet Pty Ltd Financial Report and Directors' Report 2019

for the year ended 31 December 2019

ABN 54 084 540 518



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DIRECTORS’ REPORT

Your Directors present their report on the Company, AARNet Pty Limited (“AARNet”), for the year ended 31 December 2019.

The following persons were Directors of AARNet during the whole of the financial year and up to the date of this report:

- Emeritus Professor Gerard Sutton AO**
Chair of the Board and Chair of the Nomination and Remuneration Committee
- Dr Christine Burns**
- Professor John Dewar AO**
- Mr Robert Fitzpatrick**
Member of the Audit, Finance and Risk Committee
- Mr Chris Hancock**
Chief Executive Officer
- Mr John Rohan**
Deputy Chair of the Board, Chair of the Audit, Finance and Risk Committee and member of the Nomination and Remuneration Committee
- Professor Deborah Terry AO**
- Emeritus Professor Mark Wainwright AM**
Member of the Audit, Finance and Risk Committee and the Nomination and Remuneration Committee
- Dr David Williams**

Professor Annabelle Duncan was a director from the commencement of the financial year until her resignation on 5 July 2019.

Mr Jeff Murray was a director from the commencement of the financial year until his resignation on 25 March 2020.

Ms Fiona Rankin was appointed a director on 25 June 2019, and remains a director at the date of this report.

Professor Brigid Heywood was appointed a director on 22 October 2019, and remains a director at the date of this report.

Mr David Formica was appointed a director on 25 March 2020, and remains a director at the date of this report.

PRINCIPAL ACTIVITIES

AARNet is a not for profit, proprietary company in which 38 Australian universities and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) have an equal shareholding.

AARNet’s principal activity is the provision of internet and advanced telecommunication and network services to its shareholders (“Members”) and to other relevant organisations. Services are provided in accordance with the AARNet Access Policy in order that Members and other customers may:

- a) use AARNet’s internet and other telecommunications facilities and services to provide educational programs and conduct research activities in an efficient and cost effective manner; and
- b) collaborate with other parties (nationally and internationally) in furtherance of research and education objectives.

OTHER ACTIVITIES

In addition, AARNet:

- a) facilitates the construction of optical fibre infrastructure to extend the AARNet backbone and to connect campuses and other locations to facilitate services for Members and customers;
- b) provides applications and services which operate across the AARNet network supporting education and research activities;
- c) assists Members and other customers with network design, engineering and consulting services to optimise the end-to-end performance, robustness and resiliency of campus, data centre and cloud networks via the AARNet4 network;
- d) participates in the design and deployment of advanced network infrastructure in partnership with network organisations in Australia and internationally, to develop national and global research and education networks; and
- e) makes representations to all levels of government on policy, legislation and programs to improve the telecommunications facilities and services available to its Members and other customers.

DIVIDENDS

AARNet’s constitution prohibits the payment of dividends or other distributions to its shareholders. Accordingly, no dividends have been paid, declared or recommended either during the financial year or in the period since that year ended (2018: nil).

REVIEW OF OPERATIONS

Network Performance

Throughout 2019 AARNet’s network continued to perform at consistently high levels while carrying increasing volumes of traffic for Members and other customers.

For 2019 the average availability was 99.93% which was slightly higher than the level achieved in 2018 (99.92%). Network availability in 2019 was affected by scheduled maintenance, specifically core backbone router upgrades; excluding the effect of those outages, the level of availability would have been ~100%.

Telecommunications traffic carried in 2019 was 14% higher than 2018, and within this, traffic carried on behalf of AARNet’s Members grew by just over 20% year-on-year (the key reason why overall traffic grew at a slower rate than Members’ traffic was due to the cessation of services provided to an overseas based national research and education network in mid-2019, see discussion on Subscriptions and Telecommunications Revenues below).

Network Expansion

During 2019 AARNet devoted more investment than in any previous year toward upgrading the capacity of the AARNet network and to expanding its geographic reach.

Overall spending on communication assets (including network infrastructure and equipment) was \$43,297,410 during the year which was substantially higher than the \$27,343,926 invested in 2018 (refer to note 21 to the financial statements).

The increased investment was devoted toward two international submarine cable systems, Indigo and JGA, as well as extensions of AARNet’s domestic fibre network.

Indigo Cable System

The Indigo consortium, of which AARNet is a member, has constructed a high speed, high capacity submarine cable system running around southern Australia, from Sydney to Perth, and then internationally from Perth to Singapore.

Indigo was brought into service during 2019 and is now carrying a substantial portion of AARNet’s traffic. The Sydney to Perth segment provides a direct, high speed path between the east and west coasts of Australia, adding diversity and resilience for AARNet’s domestic network.

The international segment to Singapore, provides AARNet with significantly enhanced capacity to connect with research networks in Asia and also the major research and education networks and facilities in Europe.

JGA South

AARNet is also a member of the JGA South consortium laying a submarine fibre system between Sydney and Guam. Guam is a significant hub for telecommunications services and by participating in the construction and ownership of JGA South, AARNet will

gain high capacity bandwidth able to on-connect to research and education networks in Asia (particularly into North Asia).

We expect JGA to enter service during 2020.

Subscriptions and Telecommunications Revenues

AARNet’s Members pay subscription and related fees for connection to the network and carriage of data across the network (to research and education facilities in Australia, international research and education networks, and to the general internet). These charges form the largest single component of AARNet’s revenues.

During 2019 Members’ subscription and related charges were only 0.6% higher than in 2018 despite the growth in Members’ traffic discussed above.

	2019	2018	Increase
	\$	\$	
Members: Subscription, Traffic and Access	40,825,590	40,593,177	0.6%
Non-Member: Subscription, Traffic and Access	16,456,613	18,153,717	(9.3%)
Other Services	19,453,705	16,915,079	15.0%
Telecommunications Revenue	76,735,908	75,661,973	1.4%

Until mid 2019 a national research and education network based outside Australia used capacity on AARNet’s international network in return for paying a subscription to AARNet. The expiry of this contract resulted in lower non-Member subscription fees in 2019 compared to 2018.

Other Services

AARNet offers a range of other services to Members and other customers. Broadly, these services fall into two categories:

- i) Transmission services providing point-to-point capacity: these enable Members and customers to link together geographically diverse campuses, research centres and remote research instruments; or to provide dedicated high-speed capacity between user facilities and third party data centres; and
- ii) Above the network services which directly support the delivery of education and research outcomes (including Zoom, a video conferencing/meeting service offered in conjunction with Zoom Inc and Cloudstor, a service which is optimised for the storage and sharing of research data sets).

Revenue from these other services rose by 15.0% during 2019. AARNet’s suite of video conferencing and cloud storage services continue to be embraced by users across the research and education sector; and this was supplemented by continued growth in our more traditional services of transmission services and circuits.

Overall, subscriptions and service revenues increased by 1.4% from 2018 after allowing for the expiry of the contract for international capacity, referred to above.

Infrastructure Revenues

Infrastructure establishment fees (income from the provision of new fibre infrastructure) declined slightly in 2019 as the amount of recognised revenue for new fibre and transmission services brought into service was marginally lower than the amount of recognised revenue for contracts at the end of their revenue recognition profile.

	2019	2018	Increase
	\$	\$	
Infrastructure Establishment Fees	4,652,770	4,742,009	(1.9%)
Infrastructure Construction Revenue	1,361,084	1,280,109	6.3%
	6,013,854	6,022,118	(0.1%)

Revenues from infrastructure construction and allied activities (such as services to relocate infrastructure) were 6.3% higher in 2019 than 2018. This income stream is very reactive to the impact of activity by utility providers, other telecommunications carriers and infrastructure projects (such as transport projects) and income can vary significantly from year to year.

Other Revenues

In addition to revenues from the provision of telecommunications services and infrastructure, AARNet also gains income from interest and dividends on invested funds. In 2019, this investment income totalled \$2,759,901 (2018 \$3,210,073) (see note 10 to the financial statements). In 2019 investment returns were lower than the previous year due to lower amounts held in investments (as funds were expended on the investments in network outlined earlier) and the effect of lower interest rates.

In 2019, AARNet again benefited from a significant gain on foreign currency contracts held to hedge against adverse movements in exchange rates. In 2019, a gain of \$1,210,746 was recognised on these contracts compared to a gain of \$3,250,943 in 2018. The gain or loss generated from these contracts largely derives from movements in exchange rates.

Adoption of AASB16 Leases

With effect from 1 January 2019, AARNet implemented the new accounting standard on Leases, AASB16, as more fully described in note 30 to the financial statements.

Under AASB16 rights to use certain property (such as dark fibre, racks and data centre capacity, office space etc), which did not qualify as leased assets under the previous accounting standard on leases (AASB117), are now classified as assets and included in the balance of Property, Plant and Equipment (refer to note 8 to the financial statements). At the same time a lease liability is recognised in respect of the remaining lease payments.

The effect of this is to include in AARNet’s results for 2019 depreciation charges and interest charges in respect of leased assets and liabilities, which were not recognised in 2018 and earlier years.

Conversely, AARNet’s 2018 results include in various expense categories rental payments in respect of leased assets. In 2019 and subsequent years, these payments are no longer recognised as expenses (and are instead applied to reduce related lease liability.

Telecommunication Expenses

Telecommunication expenses for 2019 were almost \$1.0m higher than the previous year. The largest single contributor to this increase was the inclusion of interest expenses related to lease liabilities recognised under AASB16 of \$3,018,895 (refer note 11 to the financial statements). There was no equivalent cost included in Telecommunication Expenses for 2018 as AARNet adopted AASB16 with effect from 1 January 2019.

There were also additional telecommunication costs driven by increases in traffic and capacity on the AARNet network. This includes costs for transmission, duct rental and maintenance as well as charges associated with the Indigo Cable System, which commenced operation during 2019. Also included in this category are increased costs related to the operation of services, such as video conferencing, where demand continued to increase during the year.

Offsetting all these increases was the exclusion from Telecommunication Expenses during 2019 of rental charges on items now accounted for as leased assets which, as explained above, were expensed in 2018 but were treated as a reduction of a lease liability in 2019.

Employee and Administration Costs

To support the growth of our network, AARNet added staff to its infrastructure development team, and to support customers in the use of services, added staff to its service desk, cyber security and eResearch support teams.

Depreciation and Amortisation Charges

Depreciation and Amortisation charges, inclusive of depreciation on equipment, depreciation on infrastructure and amortisation of Indefeasible Rights to Use (IRUs) totalled \$22,068,461 in 2019 compared to \$19,510,010 in 2018.

There were three factors behind this increase:

- a) commissioning of additional assets which expanded the capacity and reach of the network (particularly the Indigo subsea cable between Sydney-Perth-Singapore);
- b) a weakening of the Australian Dollar which has the effect of increasing amortisation charges on certain IRUs (see below); and
- c) the adoption of AASB16 referred to above, which requires recognition of depreciation charges on leased assets.

Amortisation of the IRUs is calculated on the full value of the IRU (including any unpaid portion). Certain of AARNet’s international IRUs are subject to deferred payment terms with an outstanding balance denominated in US Dollars. When the Australian Dollar declines against the US Dollar the total value of the IRU (including the deferred portion, when measured in Australian Dollars) increases; therefore, amortisation charges also increase to reflect the higher asset value.

Other Expenses (including Finance Costs)

These costs of \$897,811 are higher than 2018 (\$104,120) mainly due to losses on foreign currency contracts, incurred as part of AARNet’s hedging activities (refer discussion in note 25).

ACCUMULATED SURPLUS AND RESERVES

In 2019 AARNet recorded a net surplus of \$7,602,686 (2018: \$15,468,460).

In the Board’s view, it is prudent for AARNet to generate a surplus in order that investments in network capability and services may be funded without calling on Members to contribute further equity to the company.

Surpluses earned by AARNet cannot (by virtue of the terms of AARNet’s constitution) be distributed to the shareholders.

Surpluses earned in prior years, aided by conservative financial management, have therefore been accumulated into significant holdings of cash and investments. In 2019 and 2018 a significant portion of these funds were invested in:

- i) the Indigo and JGA South high capacity submarine cable systems (as described earlier);
- ii) extensions and enhancements to AARNet’s own terrestrial fibre infrastructure to improve the reach, resilience and capacity of the domestic network.

These investments are expected to continue into future years. In addition, AARNet intends to use further funds to:

- a) finance investments in technology to enhance the delivery of services to Members and other customers;
- b) supplement Members’ subscriptions and other income in future years;
- c) meet obligations to settle lease liabilities which totalled \$46.1m at year end as shown in note 8(i) to the financial statements; and
- d) defray part of the significant financial commitments in respect of capacity commitments (principally rights to use the traffic paths of cable systems operated by other telecommunication carriers) which, at year end, were \$48.8m, refer note 2(b) to the financial statements.

NET ASSETS

Net assets at 31 December 2019 were \$222,798,104 (2018: \$214,198,927). The increase represents the surplus for 2019 plus the change in value of available-for-sale financial assets during 2019.

SIGNIFICANT CHANGES IN THE STATE OF AFFAIRS

Except for the matters discussed under the heading “Review of Operations” there were no significant changes in the Company’s state of affairs during the financial year ended 31 December 2019.

MATTERS SUBSEQUENT TO THE END OF THE FINANCIAL YEAR

In February and March 2020 the COVID-19 virus began to spread throughout Australia. AARNet, following directions issued by the Commonwealth and state governments, and in line with practices adopted by many other businesses, instituted a number of responses to assist in slowing the spread of the virus through the community, and to reduce the health risks to our employees, customers, suppliers and other groups with which we work and interact.

These responses include restrictions on travel, requirements for people to self isolate and the closure of our workplaces with employees directed to work from home.

In order to assist our Members and other customers continue operations while their own campuses and workplaces are also closed, AARNet has invested additional time and resources into supporting both the continued operation of our network and our video conferencing services (in particular, Zoom) which are frequently used for both online teaching and in support of research.

Actions AARNet has taken include:

- i) increasing capacity between Australia and north Asian countries to assist Members offer online teaching to students unable to travel to Australia to continue their courses;
- ii) increasing capacity on the key transmission links between AARNet and certain Australian internet service providers to adapt to increasing traffic across those links as staff and students began to work and participate in online learning from their homes;
- iii) providing incentives and technical assistance to Members and other customers as they transition to video conference based learning (particularly by use of the Zoom video conferencing services which AARNet hosts and operates); and
- iv) reconfiguring and upgrading the hardware on which Zoom and other services operate to accommodate increased demand.

The potential future financial and operational impact of the COVID-19 virus is discussed further in the following section (“Likely developments and expected results of operations”).

Except for matters concerning the COVID-19 virus discussed above, and the matters discussed under the heading “Review of Operations”, no other matter or circumstance has arisen since 31 December 2019 that has significantly affected or may significantly affect:

- a) AARNet’s operations in future financial years;
- b) the results of those operations in future financial years; or;
- c) AARNet’s state of affairs in future financial years.

LIKELY DEVELOPMENTS AND EXPECTED RESULTS OF OPERATIONS

The potential impact of the COVID-19 virus on AARNet’s future operations and financial position is difficult to forecast. A key factor will be the length of time over which businesses will be required to operate without unfettered access to their workplaces.

The financial impacts of the COVID-19 virus are also difficult to quantify. AARNet now expects to benefit from savings in travel expenditure and some office costs (eg utilities) but these are likely to be more than offset by additional traffic and transmission costs, along with amounts expended to increase capacity on key services.

Volatility in investment markets resulting from the COVID-19 outbreak will impact AARNet during 2020. Since the end of the financial year, the value of AARNet’s fixed interest investments

have declined by some 3.5% or approximately \$1.8m. AARNet does not intend to sell any of these investments prior to maturity and, absent a default by an issuer, expects to recover most of this value over the period until each security matures.

AARNet also holds a smaller value of equity investments which, since 31 December 2019, have declined in value by 31.1% or just under \$3.0m. AARNet does not expect to sell any of these investments in the foreseeable future, but to avoid realising any of these losses, the value of these securities would need to recover before the investment is disposed of.

While AARNet does not presently intend to liquidate any significant portion of its portfolio, it may, should markets not recover, eventually be required to sell investments and crystallise a loss.

Ongoing economic and investment market disruption may also reduce the investment income that AARNet would otherwise generate from its investment portfolio in future.

Similar volatility in foreign exchange markets has resulted in the Australia dollar depreciating against the US Dollar throughout the early part of 2020. Without any reversal of this currency movement across the remainder of 2020, AARNet would expect higher costs for equipment and services denominated in USD but would also expect these additional costs to be substantially offset by gains on our foreign exchange hedging instruments and holdings of foreign currency.

Despite this, AARNet expects to continue investing during 2020 in its domestic fibre network and in the JGA South submarine cable system. JGA South is now expected to enter service later in 2020 and will provide AARNet’s Members and other users with a high capacity path to South East Asia and beyond.

Notwithstanding the disruption to AARNet’s operations and the operations of our Members and other users, in the view of the Directors, AARNet’s financial position remains sound.

ENVIRONMENTAL REGULATION

AARNet’s operations are not adversely affected by any significant environmental regulation. AARNet believes its greenhouse gas emissions are substantially below the thresholds that are subject to the reporting requirements of either the *Energy Efficiency Opportunities Act 2006* and the *National Greenhouse and Energy Reporting Act 2007*.

INSURANCE FOR OFFICERS

During the financial year, AARNet paid a premium of \$40,759 (2018: \$33,091) in respect of liability insurance for the Company’s Directors and Officers. The liabilities insured against are costs and expenses that may be incurred in defending civil or criminal proceedings that may be brought against the Directors and Officers in their capacity as Directors and Officers of AARNet, and any other payments arising from liabilities incurred by the Officers in connection with such proceedings, other than where such liabilities arise out of conduct involving a wilful breach of duty by the Directors or Officers or the improper use by the Directors or Officers of their position or of information to gain advantage for themselves or someone else or to cause detriment to AARNet. It is not possible to apportion the premium between amounts relating to the insurance against legal costs and those relating to other liabilities.

No known liability has arisen under these indemnities to the date of this report.

AGREEMENT TO INDEMNIFY OFFICERS

Under the terms of its Constitution, AARNet provides indemnity to persons who are, or have been, an officer or auditor of AARNet, but only to the extent permitted by law and to the extent that the officer or auditor is not indemnified by Directors’ and Officers’ liability insurance maintained by AARNet. The indemnity is against liability incurred by that person as an officer or auditor of AARNet to another person and for costs and expenses incurred by the officer or auditor in defending such proceedings.

Separately, AARNet and each director of AARNet have entered into a Deed of Indemnity under which AARNet indemnifies each director against any liability:

- a) to a third party (that is, other than to AARNet) unless the liability arises out of conduct involving a lack of good faith; and
- b) for legal costs incurred in successfully defending civil or criminal proceedings or in connection with proceedings in which relief is granted under the *Corporations Act 2001*.

No known liability has arisen under these indemnities as at the date of this report.

AUDITOR

A copy of the Auditor’s Independence Declaration as required under s.60-40 of the Australian Charities and Not-for-profits Commission Act 2012 is included on page 11 of this financial report.

PricewaterhouseCoopers continues in office in accordance with section 327 of the *Corporations Act 2001*.

This report is made in accordance with a resolution of Directors.

Emeritus Professor MS Wainwright AM	Mr JF Rohan
Director	Director
Sydney	
8 th April 2020	



Auditor's Independence Declaration

As lead auditor for the audit of AARNet Pty Limited for the year ended 31 December 2019, I declare that to the best of my knowledge and belief, there have been no contraventions of any applicable code of professional conduct in relation to the audit.

A handwritten signature in black ink, appearing to read 'SW'.

Scott Walsh
Partner
PricewaterhouseCoopers

Sydney
8 April 2020

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Liability limited by a scheme approved under Professional Standards Legislation.

STATEMENT OF SURPLUS

	Notes	2019 \$	2018 \$
Services revenue	9	82,749,762	81,684,091
Other revenue	10	4,839,425	7,046,915
Grants and contributions received	10	554,333	403,189
Total revenue		88,143,520	89,134,195
Telecommunications expenses		(20,129,253)	(19,145,255)
Depreciation and amortisation - Telecommunications	11	(14,849,014)	(12,306,825)
Employee benefits expense - Telecommunications		(20,216,618)	(17,816,893)
Administration - Telecommunications		(10,806,926)	(10,111,623)
Infrastructure project construction		(2,668,950)	(2,837,920)
Depreciation and amortisation - Infrastructure projects	11	(7,219,447)	(7,203,185)
Employee benefits expense - Infrastructure Development Group		(3,042,773)	(3,226,181)
Administration - Infrastructure Development Group		(710,042)	(913,733)
Other expenses (including finance costs)	11	(897,811)	(104,120)
Total expenses		(80,540,834)	(73,665,735)
Net surplus		7,602,686	15,468,460
Other comprehensive income			
Movement in the fair value of financial assets		996,491	(837,368)
Total comprehensive surplus for the year		8,599,177	14,631,092

The above Statement of Surplus should be read in conjunction with the accompanying notes.

BALANCE SHEET

	Notes	31 December 2019 \$	31 December 2018 \$
ASSETS			
Current assets			
Cash and cash equivalents	12	21,826,815	23,702,332
Receivables	14	55,394,340	51,997,349
Derivative financial instruments	15	418,344	797,885
Accrued income	17	24,503,602	33,557,323
Financial instruments at amortised cost	25	752,667	834,915
Total current assets		102,895,768	110,889,804
Non-current assets			
Financial instruments at amortised cost	18	35,470,029	38,192,198
Financial assets at fair value through other comprehensive income	19	15,880,605	9,302,267
Receivables	20	-	214,195
Property, plant and equipment	21	188,802,379	107,615,408
Indefeasible Rights of Use traffic paths	22	65,905,781	67,448,514
Derivative financial instruments	25	25,131	485,492
Total non-current assets		306,083,925	223,258,074
Total assets		408,979,693	334,147,878
LIABILITIES			
Current liabilities			
Payables	3	20,921,837	11,929,419
Income in advance	4	64,635,938	56,311,337
Provisions	6	5,750,872	5,171,758
Lease liabilities	8	1,586,377	-
Other liabilities		308,130	326,746
Total current liabilities		93,203,154	73,739,260
Non-current liabilities			
Income in advance	5	47,602,483	45,468,827
Provisions	7	877,679	740,864
Lease liabilities	8	44,494,632	-
Derivative financial instruments	25	3,641	-
Total non-current liabilities		92,978,435	46,209,691
Total liabilities		186,181,589	119,948,951
Net assets		222,798,104	214,198,927
EQUITY			
Contributed equity	23	39,039	39,039
Reserve (accumulated unrealised gain/loss on investments)	24	747,980	(248,511)
Retained earnings	24	222,011,085	214,408,399
Capital and reserves attributable to members of AARNet Pty Ltd		222,798,104	214,198,927
Total equity		222,798,104	214,198,927

The above Balance Sheet should be read in conjunction with the accompanying notes.

STATEMENT OF CHANGES IN EQUITY

	31 December 2019 \$	31 December 2018 \$
Total equity at the beginning of the financial year	214,198,927	199,567,835
Net surplus for the year	7,602,686	15,468,460
Other comprehensive income		
Changes in financial assets at fair value, net of tax	996,491	(837,368)
Total comprehensive surplus for the year	8,599,177	14,631,092
Total equity at the end of the financial year	222,798,104	214,198,927

The above Statement of Changes in Equity should be read in conjunction with the accompanying notes.

STATEMENT OF CASH FLOWS

	Notes	31 December 2019 \$	31 December 2018 \$
Cash flows from operating activities			
Receipts from members and customers (inclusive of goods and services tax)		109,192,855	91,861,883
Payments to suppliers and employees (inclusive of goods and services tax)		(65,732,198)	(63,609,595)
Interest received		2,152,199	2,460,594
Interest payment on leases		(3,018,895)	-
Net cash inflow from operating activities	13	42,593,961	30,712,882
Cash flows from investing activities			
Payments for property, plant and equipment		(43,165,837)	(30,894,755)
Payments for Indefeasible Rights of Use traffic paths (intangible assets)		(6,161,095)	-
Payments for financial assets at fair value through other comprehensive income		(9,111,402)	(1,889,492)
Payments for financial instruments at amortised cost		(69,906,202)	(89,569,935)
Proceeds from sale of financial assets at fair value through other comprehensive income		3,482,648	4,647,677
Proceeds from financial instruments at amortised cost		81,508,050	86,611,580
Dividends received		766,384	518,049
Proceeds from sale of property, plant and equipment		46,658	-
Net cash outflow from investing activities		(42,540,796)	(30,576,876)
Cash flows from financing activities			
Principal elements of lease payments		(1,928,682)	-
Net cash (outflow) inflow from financing activities		(1,928,682)	-
Net (decrease)/increase in cash and cash equivalents		(1,875,517)	136,006
Cash and cash equivalents at the beginning of the financial year		23,702,332	23,566,326
Cash and cash equivalents at end of year	12	21,826,815	23,702,332

The above Statement of Cash Flows should be read in conjunction with the accompanying notes.

NOTES TO THE FINANCIAL STATEMENTS

1. BASIS OF PREPARATION

These general purpose financial statements have been prepared in accordance with Australian Accounting Standards and interpretations issued by the Australian Accounting Standards Board and the Australian Charities and Not-for-profits Commission Act 2012. AARNet Pty Ltd is domiciled in Australia and is a not-for-profit entity for the purpose of preparing the financial statements. The registered address of AARNet Pty Ltd is Tower A, Level 7, 799 Pacific Highway, Chatswood, NSW, 2067.

Historical cost convention

The financial statements have been prepared on a historical cost basis, except for the following: financial assets at fair value through statement of other comprehensive income, financial assets and liabilities (including derivative instruments) and certain classes of property, plant and equipment.

Income tax

AARNet is exempt from income tax under Section 50-5 of the Income Tax Assessment Act 1997 and therefore, no provision for income tax is included in these financial statements.

2. COMMITMENTS AND CONTINGENCIES

(a) Expenditure and capital commitments

	31 December 2019 \$	31 December 2018 \$
Within one year	22,184,680	26,154,945
Later than one year but not later than five years	5,695,480	6,665,797
Later than five years	9,539,874	102,600
	37,420,034	32,923,342

(b) Capacity commitments

	31 December 2019 \$	31 December 2018 \$
Within one year	13,643,217	10,714,908
Later than one year but not later than five years	22,031,491	50,107,150
Later than five years	13,107,998	60,826,167
Commitments not recognised in the financial statements	48,782,706	121,648,225

The 2018 Capacity Commitments total includes operating leases under AASB 117 Leases. See Note 8 for more detail on the application of AASB 16 Leases and Note 30 for the reconciliation between the 31 December figure of \$121,648,225 and the 1 January 2019 lease liability figure of \$47,346,908.

(c) Contingent Liabilities

AARNet’s bankers have issued bank guarantees in favour of the Company’s landlords and a third-party contractor with total face value of \$1,035,269 (2018: \$906,363).

3. CURRENT LIABILITIES - PAYABLES

	31 December 2019	31 December 2018
	\$	\$
Current liabilities		
Trade payables	10,982,121	3,795,181
Other payables	9,939,716	8,134,238
	20,921,837	11,929,419

Trade payables and accruals are expected to be paid within 30 days.

These amounts represent liabilities for goods and services provided to AARNet prior to the end of the financial year which are unpaid. The amounts are unsecured and are usually paid within 30 days of recognition.

Accounting Policy

The fair value of financial liabilities for disclosure purposes is estimated by discounting the future contractual cash flows at the current market interest rate that is available to AARNet for similar financial instruments.

4. CURRENT LIABILITIES - INCOME IN ADVANCE

	31 December 2019	31 December 2018
	\$	\$
Infrastructure establishment fees	24,109,009	18,085,038
Other deferred income	803,242	1,271,242
Infrastructure service fees	8,408,864	7,359,282
Subscriptions	31,314,823	29,595,775
	64,635,938	56,311,337

Accounting Policy

The Accounting Policy for Income in Advance is described in note 9.

5. NON-CURRENT LIABILITIES - INCOME IN ADVANCE

	31 December 2019	31 December 2018
	\$	\$
Infrastructure establishment fees	44,951,317	42,262,308
Infrastructure projects	1,232,495	1,475,755
Other deferred income	1,418,671	1,730,764
	47,602,483	45,468,827

Accounting Policy

The Accounting Policy for Income in Advance is described in note 9.

6. CURRENT LIABILITIES - PROVISIONS

	31 December 2019	31 December 2018
	\$	\$
Employee benefits	5,750,872	5,171,758

Accounting Policy

Wages and salaries and annual leave

Liabilities for wages and salaries, including non-monetary benefits and leave entitlements expected to be settled within 12 months of the reporting date, are recognised in respect of employees' services up to the reporting date and are measured at the amounts expected to be paid when the liabilities are settled.

7. NON-CURRENT LIABILITIES - PROVISIONS

	31 December 2019	31 December 2018
	\$	\$
Employee benefits	393,620	303,961
Make good on leased premises	484,059	436,903
	877,679	740,864

Movements in provisions

Movements in each class of provision during the financial year, other than employee benefits, are set out below:

2019	Make good on leased premises
	\$
Non-current liabilities - Provisions	
Carrying amount at start of year	436,903
Additional provision to make good	47,156
Carrying amount at end of year	484,059

2018	Make good on leased premises
	\$
Non-current liabilities - Provisions	
Carrying amount at start of year	120,063
Additional provision to make good	343,491
Decrease in provision recognised	(26,651)
Carrying amount at end of year	436,903

Accounting Policy

Employee benefits

These are liabilities for long service leave and annual leave not expected to be settled wholly within 12 months after the end of the period in which the employees render the related service. They are therefore recognised in the provision for employee benefits and measured as the present value of expected future payments to be made in respect of services provided by employees up to the end of the reporting period using the projected unit credit method.

Consideration is given to expected future wage and salary levels, experience of employee departures and periods of service. Expected future payments are discounted using market yields at the end of the reporting period of corporate bonds with terms and currencies that match, as closely as possible, the estimated future cash outflows. Re-measurements as a result of experience adjustments are recognised in the Statement of Surplus.

Make good on leased premises

Provisions for make good costs on leased premises are recognised when AARNet has a present legal or constructive obligation as a result of past events; it is more likely than not that an outflow of resources will be required to settle the obligation; and the amount has been reliably estimated.

8. LEASES

This note provides information for leases where AARNet is the lessee.

i) Amounts recognised in the balance sheet

The balance sheet shows the following amounts relating to leases:

	31 December 2019 \$	1 January 2019 \$
Right-of-use assets		
Communication assets	44,730,203	47,346,908
	44,730,203	47,346,908
Lease liabilities		
Current	1,586,377	1,888,545
Non-current	44,494,632	45,458,363
	46,081,009	47,346,908

The movement in the right-of-use assets over the year are as follows:

	\$
Opening Right-of-use assets as at 1 January 2019	47,346,908
Depreciation charge of right-of-use assets	(3,279,488)
Additions to right-of-use assets	662,783
Right-of-use assets recognised as at 31 December 2019	44,730,203

ii) Amounts recognised in the Statement of Surplus

The statement of surplus shows the following amounts relating to leases:

	2019 \$
Depreciation charge of right-to-use assets	
Communication assets	3,279,488
Interest expense (included in Telecommunication Expenses)	3,018,895
Expense related to short-term leases (included in Administration Expenses)	1,270,790
Expenses related to leases of low-value assets that are not shown above as short-term leases (included in Administration Expenses)	29,181
Expenses related to variable lease payments not included in lease liabilities (included in Administrative Expense)	185,648

The total cash outflow for leases in 2019 was \$7,784,002.

iii) AARNet’s leasing activities and how these are accounted for

AARNet leases various offices, data centre space and dark fibre. Rental contracts are typically made for fixed periods of 1 to 20 years, but may have extension options as described in (iv) below.

Contracts may contain both lease and non-lease components. AARNet allocates the consideration in the contract to the lease and non-lease components based on their relative stand-alone prices. However, for leases of real estate for which AARNet is a lessee, it has elected not to separate lease and non-lease components and instead accounts for these as a single lease component.

Lease terms are negotiated on an individual basis and contain a wide range of different terms and conditions. The lease agreements do not impose any covenants other than the security interests in the leased assets that are held by the lessor.

Until the start of the 2019 financial year, leases of property, plant and equipment were classified as either finance leases or operating leases. From 1 January, 2019, leases are recognised as a right-of-use asset and a corresponding liability at the date at which the leased asset is available for use by AARNet.

Assets and liabilities arising from a lease are initially measured on a present value basis. Lease liabilities include the net present value of the following lease payments:

- Fixed payments (including in-substance fixed payments), less any lease incentives receivable
- Variable lease payments that are based on an index or a rate, initially measured using the index or rate as at the commencement date
- Amounts expected to be payable by AARNet under residual value guarantees, and
- Payments of penalties for terminating the lease, if the lease term reflects AARNet exercising that option.

Lease payments to be made under reasonably certain extension options are also included in the measurement of the liability.

The lease payments are discounted using the interest rate implicit in the lease. If that rate cannot be readily determined, which is generally the case for leases at AARNet, the lessee’s incremental borrowing rate is used, being the rate that the individual lessee would have to pay to borrow the funds necessary to obtain as asset of similar value to the right-of-use asset in a similar economic environment with similar terms, security and conditions.

To determine the incremental borrowing rate, AARNet uses a build-up approach that starts with a risk-free interest rate adjusted for credit risk for leases held by AARNet.

AARNet is exposed to potential future increases in lease payments based on an index or rate, which are not included in the lease liability until they take effect. When adjustments to lease payments based on an index or rate take effect, the lease liability is reassessed and adjusted against the right-of-use asset.

Lease payments are allocated between principal and finance cost. The finance cost is charged to Statement of Surplus over the lease period so as to produce a constant periodic rate of interest on the remaining balance of the liability for each period.

Right-of-use assets are measured at cost comprising the following:

- The amount of the initial measurement of lease liability
- Any lease payments made at or before the commencement date less any lease incentives received
- Any initial direct costs, and
- Restoration costs

Right-of-use assets are generally depreciated over the shorter of the asset’s useful life and the lease term on a straight-line basis.

Payments associated with short-term leases and leases of low-value assets are recognised on a straight-line basis as an expense in Statement of Surplus. Short-term leases are leases with a lease term of 12 months or less. Low-value assets comprise of equipment and small items of office furniture.

iv) Extension and termination options

Extension and termination options are included in a number of leases. These are used to maximize operational flexibility in terms of managing the assets used in AARNet’s operations. The majority of extension and termination options held are exercisable only by AARNet and not by the respective lessor.

9. SERVICE REVENUE

	31 December 2019 \$	31 December 2018 \$
Telecommunications		
Members: Subscription, Traffic and Access	40,825,590	40,593,177
Non-Member: Subscription, Traffic and Access	16,456,613	18,153,717
Other Services	19,453,705	16,915,079
	76,735,908	75,661,973
Infrastructure & service agreements		
Infrastructure Establishment Fees	4,652,770	4,742,008
Infrastructure Project Construction	1,361,084	1,280,110
	82,749,762	81,684,091

a) Disaggregation of revenue from contracts with customers

AARNet derives revenue from the transfer of goods and services over time and at a point in time in the following major product lines:

	Teleco- Members	Teleco- Non-Member	Teleco- Other Services	Infra Establishment Fees	Infra Project Construction	Total
2019						
At a point in time	-	-	-	-	1,361,084	1,361,084
Over time	40,825,590	16,456,613	19,453,705	4,652,770	-	81,388,678
Total	40,825,590	16,456,613	19,453,705	4,652,770	1,361,084	82,749,762

	Teleco- Members	Teleco- Non-Member	Teleco- Other Services	Infra Establishment Fees	Infra Project Construction	Total
2018						
At a point in time	-	-	-	-	1,280,109	1,280,109
Over time	40,593,177	18,153,717	16,915,079	4,742,009	-	80,403,982
Total	40,593,177	18,153,717	16,915,079	4,742,009	1,280,109	81,684,091

b) Assets and liabilities related to contracts with customers

AARNet has recognised the following assets and liabilities related to contracts with customers:

	31 December 2019 \$	31 December 2018 \$
Current Liabilities- Income in Advance in relation to:		
Infrastructure Establishment Fees	24,109,009	18,085,038
Other Deferred Income	803,242	1,271,242
Infrastructure Service Fees	8,408,864	7,359,282
Subscriptions	31,314,823	29,595,775

	31 December 2019 \$	31 December 2018 \$
Non-Current Liabilities- Income in Advance in relation to:		
Infrastructure Establishment Fees	44,951,317	42,262,308
Infrastructure Projects	1,232,495	1,475,755
Other Deferred Income	1,418,671	1,730,764

(i) Significant changes in contract assets and liabilities

Contract liabilities for Infrastructure and service agreements have increased due to an increase in establishment fees for new projects that have not been completed as at 31 December 2019, despite no change in the timing of satisfied performance obligations; the nature of the goods supplied; nor the terms of payment.

(ii) Revenue recognised in relation to contract liabilities

The following table shows how much of the revenue recognised in the current reporting period relates to carried forward contract liabilities.

	31 December 2019 \$	31 December 2018 \$
Revenue recognised that was included in the contract liability balance at the beginning of the period		
Members: Subscription, Traffic and Access	26,321,311	22,304,930
Non-Members: Subscription, Traffic and Access	3,274,464	3,103,862
Other Services	7,657,765	4,585,761
Infrastructure Establishment Fees	4,219,599	4,083,926
Infrastructure Project Construction	243,261	36,667
Total Service Revenue	41,716,400	34,115,146
Other Revenue	481,610	745,684
Total Revenue	42,198,010	34,860,830

There are no material amounts of revenue recognised for both financial years in relation to performance obligations satisfied in previous periods.

(iii) Unsatisfied long-term transmission service contracts

As permitted under the provisions in AASB 15, the transaction price allocated to (partially) unsatisfied performance obligations is not disclosed where the entity has a right to invoice the customer in the amount that corresponds directly with the value of the entity's performance completed or the original expected duration of the underlying contract is one year or less. For Infrastructure establishment fees the total amount allocated to unsatisfied performance obligations is \$69,060,326. The anticipated timing for revenue recognition of liabilities related to contracts with customers (including Infrastructure establishment fees) is as follows:

	31 December 2019 \$	31 December 2018 \$
Within one year	64,635,938	56,311,337
Later than one year but not later than five years	16,754,318	16,935,177
Later than five years	30,848,166	28,533,650
	112,238,422	101,780,164

Accounting Policy

Service revenues (derived from contracts with customers) have been accounted for under the accounting standard, AASB15 Revenue from Contracts with Customers.

(i) Transmission Services

Transmission services consist of a series of performance obligations where revenue is recognised as data services have been delivered in accordance to the contract.

The performance obligation for Transmission services is coupled with a performance obligation relating to access rights to the AARNet network, for the service agreement performance obligation cannot be executed without an access agreement.

An establishment fee forms part of the transaction price for transmission services. The establishment fee is not a consideration for a performance obligation in its own right, for the work to enable a transmission service cannot be separated from the transmission service itself.

(ii) Infrastructure Project Construction Revenue

Revenue from the provision of infrastructure where the infrastructure becomes the property of the customer is recognised when the underlying performance obligation is completed.

(iii) Stand alone selling price in the application of AASB15 Revenue from Contracts with Customers

The stand alone selling price in relation to all performance obligations contained within service contracts with customers is judged to be the fair value of those performance obligations if bought on a stand-alone basis.

(iv) Discounts and Taxes

Amounts disclosed as revenue are net of any discounts or taxes paid.

(v) Income in Advance

Amounts received or due and receivable in respect of future subscription periods or for services which have not been delivered are recorded as Income in Advance and appear as a liability (refer notes 4 and 5). Income in Advance is classified as either a current liability or a non-current liability depending on when the relevant subscription expires or the related service is expected to be delivered.

10. OTHER REVENUE, GRANTS AND CONTRIBUTIONS RECEIVED

In 2019 and 2018 AARNet recorded significant amounts of Other Revenue, Grants Received and Other Contributions.

These amounts are a material component of the surplus recorded by AARNet.

	31 December 2019 \$	31 December 2018 \$
Interest	2,083,861	2,507,380
Gain on foreign currency transactions	1,210,746	3,250,943
Other income	822,120	585,899
Dividends	676,040	618,516
Net gain on disposal of property, plant and equipment	46,658	-
Gain on financial assets at fair value through other comprehensive income	-	84,177
Other Revenue	4,839,425	7,046,915
Grants and Contributions received	554,333	403,189

Gain on Foreign Currency Contracts

AARNet hedges a significant proportion of its exposure to foreign currency movements (refer note 25) and does not apply hedge accounting. The accounting policy adopted with respect to derivatives and hedging activities is described below. During 2019 movements in the Australian dollar produced a gain (including realised and unrealised gain) on the hedging instruments held during and as at the end of the year of \$1,210,746 (2018: gain of \$3,250,943).

Grants and Contributions Received

This item includes amounts received by AARNet by way of grants and contributions where AARNet does not supply a service to the organisations providing the funding, however grants and contributions are recognised only upon completion of all performance obligations and when there are no unfulfilled conditions or other contingencies attaching to the grants.

Accounting Policy

Interest and Dividend Income

Interest and dividend income is recognised as it accrues and dividends are recognised as revenue when the right to receive payment is established.

Foreign Currency Contracts

At year end, Foreign Currency Contracts are recognised at fair value as described in note 25 (see Derivative Financial Instruments). Realised and unrealised gain or losses on such contracts are taken into account each year in the Statement of Surplus. AARNet does not apply hedge accounting.

Contributed Assets

Contributed assets (including the contribution of funds by government agencies or other persons to facilitate the construction of infrastructure for the AARNet network) are recognised at fair value when title and control of the asset passes or when the conditions to receive or retain funding are met.

11. EXPENSES

		31 December 2019 \$	31 December 2018 \$
Depreciation			
Communication assets		12,366,904	9,326,292
Office equipment		1,620,564	1,203,732
Leasehold improvements		339,263	627,276
Software		34,630	51,466
Buildings		3,272	3,071
Total depreciation	21	14,364,633	11,211,837
Amortisation			
Intangibles - Indefeasible Rights of Use traffic paths	22	7,703,828	8,298,175
Total depreciation and amortisation		22,068,461	19,510,012
Other expenses (including finance costs)			
Interest expense on leases		3,018,895	-
Loss on foreign currency contracts		546,360	-
Loss on financial assets at fair value through other comprehensive income		238,857	-
Loss on disposal of assets		112,593	1,531
Loss on foreign currency transactions		-	102,589
Total other expenses		3,916,705	104,120
Rental expense relating to operating leases			
Minimum lease payments - premises		-	1,619,850
Superannuation expense		2,892,067	2,596,928

Accounting Policy

Depreciation and Amortisation

The accounting policy for depreciation and amortisation is described in notes 21 and 22 respectively.

12. CURRENT ASSETS - CASH AND CASH EQUIVALENTS

	31 December 2019 \$	31 December 2018 \$
Current assets		
Cash at bank and in hand (AUD)	8,036,392	12,865,159
Cash at bank (USD and EUR)	9,191,540	2,265,361
Deposits at call - all denominated in AUD	4,598,883	8,571,812
	21,826,815	23,702,332

Cash at bank and on hand

Cash at bank and on hand is held at interest rates varying between 0.00% and 0.90% (2018: 0.00% and 1.36%). During the year, cash is transferred to or from term deposits to meet liquidity requirements.

Deposits at call

Interest bearing deposits at call attracted interest rates between 0.10% and 1.70% (2018: 0.40% and 0.50%).

Accounting Policy

For the purpose of presentation in the Statement of Cash Flows, cash and cash equivalents includes cash on hand, deposits held at call with financial institutions, bank overdrafts and other short-term, highly liquid investments with original maturities of three months or less that are readily convertible to known amounts of cash and which are subject to an insignificant risk of changes in value.

13. RECONCILIATION OF NET SURPLUS TO NET CASH INFLOW FROM OPERATING ACTIVITIES

	31 December 2019 \$	31 December 2018 \$
Surplus for the year	7,602,686	15,468,460
Depreciation and amortisation	22,068,461	19,510,012
Dividend income	(676,040)	(618,516)
Net loss (gain) on sale of investments	238,857	(84,177)
Net amortised interest income	(17,908)	(41,798)
Net loss on sale of property, plant and equipment	65,935	1,531
Write off of CRC share	-	1
Decrease/ (increase) in trade receivables	5,005,433	(14,495,477)
Decrease/ (increase) in accrued income	289,197	(100,379)
Decrease/ (increase) in prepayments and other debtors	(8,188,229)	(968,959)
Decrease/ (increase) in derivative financial instruments	546,249	(3,250,944)
Increase in trade payables	4,550,906	873,864
Increase/ (decrease) in other operating liabilities	(18,616)	133,198
Increase in provisions	668,773	367,565
Increase/(decrease) in income received in advance	10,458,257	13,918,501
Net cash inflow from operating activities	42,593,961	30,712,882

14. CURRENT ASSETS - RECEIVABLES

	31 December 2019 \$	31 December 2018 \$
Trade receivables	43,206,574	48,212,007
Provision for impairment of receivables	(255,000)	(255,000)
	42,951,574	47,957,007
Prepayments and Other Debtors	12,442,766	4,040,342
	55,394,340	51,997,349

Trade Receivables

Trade receivables are due for settlement no more than 30 days from the date of recognition.

At 31 December 2019, trade receivables included balances of \$1,499,426 (2018: \$1,015,845) which are past due but not impaired or considered uncollectable. These amounts have been outstanding for more than 90 days. These relate to a number of customers for whom there is no history of default.

Prepayments and Other Debtors

Payments for goods and services which are to be provided in future years are recognised as prepayments.

Other debtors generally arise from transactions outside the usual operating activities of AARNet. Interest is not normally charged.

Fair Value

Due to the short-term nature of these receivables, their carrying amount is assumed to approximate their fair value.

Accounting Policy

Trade receivables are recognised initially at the amount of consideration that is unconditional, unless they contain significant financing components when they are recognised at fair value. They are subsequently measured at amortised cost, less provision for impairment.

Collectability of trade receivables is reviewed on an ongoing basis. Debts which are known to be uncollectible are written off. The group applies the simplified approach to providing for expected credit losses prescribed by AASB 9, which permits the use of the lifetime expected loss provision for all trade receivables. To measure the expected credit losses, trade receivables have been grouped based on shared credit risk characteristics and the days past due. The amount of the provision is recognised in the Statement of Surplus in Administration-Telecommunications expenses.

The carrying value less impairment provision of trade receivables is assumed to approximate fair value due to the short-term nature of the receivables.

15. CURRENT ASSETS - ACCRUED INCOME

	31 December 2019 \$	31 December 2018 \$
Current assets		
Infrastructure projects	221	34,356
Other	98,652	267,467
Accrued interest receivable	319,471	496,062
	418,344	797,885

16. FINANCIAL ASSETS AND INVESTMENTS

AARNet holds financial assets and investments (other than prepayments or trade receivables) including

- Financial instruments at amortised cost (notes 17 and 18)
- Financial assets at fair value through other comprehensive income (note 19)
- Derivative financial instruments (shown on the Balance Sheet)

Accounting Policy

Financial instruments at amortised cost

Financial instruments at amortised cost are non-derivative financial assets with fixed or determinable payments and fixed maturities that management has the positive intention and ability to hold to maturity. If AARNet were to sell other than an insignificant amount of financial instruments at amortised cost, the whole category would be tainted and reclassified as financial assets at fair value through other comprehensive income. Financial instruments at amortised cost are included in non-current assets, except for those with maturities less than 12 months from the end of the reporting period, which are classified as current assets.

At initial recognition, AARNet measures a financial instrument at amortised cost at fair value plus transaction costs that are directly attributable to the acquisition of the investment. Financial instruments at amortised cost are subsequently carried at amortised cost using the effective interest method.

If a financial instrument at amortised cost has a variable interest rate, the discount rate for measuring any impairment loss is the current effective interest rate determined under the contract. As a practical expedient, AARNet may measure impairment on the basis of an instrument’s fair value using an observable market price.

Purchases and sales of financial assets are recognised on the date on which AARNet commits to purchase or sell the asset. Financial assets are derecognised when the rights to receive cash flows from the financial assets have expired or have been transferred and AARNet has transferred substantially all the risks and rewards of ownership.

Financial assets at fair value through other comprehensive income

Financial assets at fair value through other comprehensive income are held at fair value with gains and losses recognised in other comprehensive income. Debt or equity securities that are not held to maturity are recognised as financial assets at fair value through other comprehensive income. They are included in non-current assets unless the investment matures or management intends to dispose of the investment within 12 months of the end of the reporting period.

At each reporting period, AARNet assesses whether any financial assets at fair value through other comprehensive income are impaired.

Impairment exists if one or more events have occurred which have a negative impact on the security’s estimated cash flows which can be reliably estimated.

If financial assets at fair value through other comprehensive income are impaired, the cumulative loss - measured as the difference between the original cost and the current fair value, less any impairment charge previously recognised in the Statement of Changes in Equity - is removed and recognised in the Statement of Surplus.

Impairment losses on equity financial assets at fair value through other comprehensive income previously recognised in the Statement of Surplus are not reversed in subsequent periods. If the fair value of a debt security which has been impaired increases, due to an event which has occurred after the impairment was recognised, the impairment charge is reversed through the Statement of Surplus.

When securities classified as financial assets at fair value through comprehensive income are sold, the accumulated fair value adjustments recognised in other comprehensive income are reclassified to net surplus.

Derivatives and hedging activities

Derivatives are initially recognised at cost on the date a derivative contract is entered into and are subsequently remeasured to their fair value at each reporting date.

AARNet has entered into forward exchange contracts which are economic hedges for foreign currencies to be traded at a future date but do not satisfy the requirements for hedge accounting. Any changes in fair values are taken to other comprehensive income immediately.

Fair value measurements

AARNet measures and recognises the following assets and liabilities at fair value on a recurring basis:

- Financial assets at fair value through profit or loss; and
- Derivative financial instruments.

AASB 13 Fair Value Measurement requires disclosure of fair value measurements by level of the following fair value measurement hierarchy:

- Level 1: quoted prices (unadjusted) in active markets for identical assets or liabilities;
- Level 2: inputs other than quoted prices included within level 1 that are observable for the asset or liability, either directly or indirectly; and
- Level 3: inputs for the asset or liability that are not based on observable market data (unobservable inputs).

The following table presents the company’s assets and liabilities measured and recognised at fair value at 31 December 2019 and 31 December 2018:

31 December 2019	Level 1	Level 2	Level 3	Total
	\$	\$	\$	\$
Assets				
Derivative financial instruments	-	777,798	-	777,798
Financial assets at fair value through other comprehensive income				
Equity securities	9,606,181	-	-	9,606,181
Bonds	6,274,424	-	-	6,274,424
Total assets	15,880,605	777,798	-16,658,403	
Derivative financial instruments	-	(3,641)	-	(3,641)
Total liabilities	-	(3,641)	-	(3,641)

31 December 2018	Level 1	Level 2	Level 3	Total
	\$	\$	\$	\$
Assets				
Derivative financial instruments	-	1,320,407	-	1,320,407
Financial assets at fair value through other comprehensive income				
Equity securities	5,200,622	-	-	5,200,622
Bonds	4,101,645	-	-	4,101,645
Total assets	9,302,267	1,320,407	-10,622,674	

The fair value of financial instruments traded in active markets (such as financial assets at fair value through other comprehensive income are based on quoted market prices at the end of the reporting period. These instruments are included in level 1.

The fair value of financial instruments that are not traded in an active market (such as derivative financial instruments) are determined using valuation techniques. These valuation techniques maximise the use of observable market data where it is available and rely as little as possible on entity specific estimates. If all significant inputs required to fair value an instrument are observable, the instrument is included in level 2.

17. CURRENT ASSETS - FINANCIAL INSTRUMENTS AT AMORTISED COST

	31 December 2019	31 December 2018
	\$	\$
Debt securities (fixed and floating rates)	8,503,602	3,757,323
Term deposits	16,000,000	29,800,000
	24,503,602	33,557,323

Bank guarantee and credit facilities

AARNet has a \$1,500,000 Bank Guarantee Facility provided by the National Australia Bank. AARNet has drawn on this facility to provide bank guarantees in favour of the landlords for leased premises and a third party contractor. AARNet has an unsecured credit card facility of \$300,000.

18. NON-CURRENT ASSETS - FINANCIAL INSTRUMENTS AT AMORTISED COST

	31 December 2019	31 December 2018
	\$	\$
Debt securities (fixed and floating rates)	35,470,029	38,192,198

19. NON-CURRENT ASSETS - FINANCIAL ASSETS AT FAIR VALUE THROUGH OTHER COMPREHENSIVE INCOME

	31 December 2019	31 December 2018
	\$	\$
Non-current assets		
Debt securities (fixed and floating rates)	6,274,424	4,101,645
Equity securities	9,606,181	5,200,622
	15,880,605	9,302,267

20. NON-CURRENT ASSETS - RECEIVABLES

	31 December 2019	31 December 2018
	\$	\$
Prepayments	-	214,195

21. NON-CURRENT ASSETS - PROPERTY, PLANT AND EQUIPMENT

	Freehold buildings	Leasehold improvements	Office equipment	Communication assets	Software	Total
	\$	\$	\$	\$	\$	\$
At 1 January 2018						
Cost or fair value	-	2,527,412	7,656,237	152,406,631	1,155,015	163,745,295
Accumulated depreciation	-	(1,834,388)	(5,565,592)	(67,595,166)	(1,066,763)	(76,061,909)
Net book amount	-	693,024	2,090,645	84,811,465	88,252	87,683,386

Year ended 31 December 2018

Opening net book amount	-	693,024	2,090,645	84,811,465	88,252	87,683,386
Additions	81,927	2,121,196	2,589,341	27,343,926	9,000	32,145,390
Disposals	-	-	(1,531)	-	-	(1,531)
Additions (finance leases)	-	-	-	260,796	-	260,796
Disposal (finance leases)	-	-	-	(1,260,796)	-	(1,260,796)
Depreciation charge	(3,071)	(627,276)	(1,203,732)	(9,326,292)	(51,466)	(11,211,837)
Closing net book amount	78,856	2,186,944	3,474,723	101,829,099	45,786	107,615,408

At 31 December 2018

Cost or fair value	81,927	4,521,238	10,226,227	178,261,159	1,164,015	194,254,566
Accumulated depreciation	(3,071)	(2,334,294)	(6,751,504)	(76,432,060)	(1,118,229)	(86,639,158)
Net book amount	78,856	2,186,944	3,474,723	101,829,099	45,786	107,615,408

	Freehold buildings	Leasehold improvements	Office equipment	Communication assets	Software	Total
	\$	\$	\$	\$	\$	\$
At 1 January 2019						
Opening net book amount	78,856	2,186,944	3,474,723	101,829,099	45,786	107,615,408
Impact of transition to AASB16	-	-	-	47,346,908	-	47,346,908
Opening net book amount (restated)	78,856	2,186,944	3,474,723	149,176,007	45,786	154,962,316

Year ended 31 December 2019

Opening net book amount	78,856	2,186,944	3,474,723	149,176,007	45,786	154,962,316
Additions	-	1,105,757	2,494,202	43,297,410	757,137	47,654,506
Additions (Right-of-Use Assets)	-	-	-	662,783	-	662,783
Disposals	-	-	(2,246)	(110,347)	-	(112,593)
Depreciation charge	(3,272)	(339,263)	(1,620,564)	(12,366,904)	(34,630)	(14,364,633)
Closing net book amount	75,584	2,953,438	4,346,115	180,658,949	768,293	188,802,379

At 31 December 2019

Cost or fair value	81,927	4,209,954	12,098,157	267,602,762	1,921,152	285,913,952
Accumulated depreciation	(6,343)	(1,256,516)	(7,752,042)	(86,943,813)	(1,152,859)	(97,111,573)
Net book amount	75,584	2,953,438	4,346,115	180,658,949	768,293	188,802,379

Communication Assets- Finance Leases

AARNet provides other parties with rights of use components of AARNet’s fibre and other infrastructure in return for that party providing AARNet with similar rights of use components of its fibre and infrastructure.

These arrangements are in the nature of two separate finance leases with each party acting as lessor and lessee. Each lease is treated as settled when both sides of the swap agreement come into force. Consequently, there is no lease finance cost or outstanding lease liability arising in respect of such transactions.

Right-of-use assets

Communication assets include both assets and leased right-of-use assets. See Note 8 for more detail on right-of-use assets.

Assets in the course of construction

Included in the carrying amounts of the assets shown above are assets that were in the course of construction as at the end of the reporting period. The relevant amounts are as follows:

	31 December 2019 \$	31 December 2018 \$
Communication assets	25,884,091	34,931,114
Office equipment	1,226,847	1,601,048
Leasehold improvements	14,630	464,155
Software	737,389	-
Total assets in the course of construction	27,862,957	36,996,317

Accounting Policy

Acquisition

Property, plant and equipment is stated at historical cost less depreciation. Historical cost includes expenditure that is directly attributable to the acquisition of the items.

Subsequent costs are included in the asset’s carrying amount or recognised as a separate asset, as appropriate, only when it is probable that future economic benefits associated with the item will flow to AARNet and the cost of the item can be measured reliably.

Fibre and Infrastructure Swaps

AARNet may enter into arrangements granting other parties the right of use AARNet’s fibre or infrastructure in return for receiving rights of use fibre or infrastructure owned by the other party (“swaps”). Where such swaps involve significant values of assets, AARNet records an asset disposal in respect of the assets used by the other party at the carrying value of the relevant assets at the time the swap becomes effective. AARNet then recognises an asset

of equivalent value, being the right of use the fibre or infrastructure of the other party.

Unincorporated Joint Operations

AARNet accounts for interests in unincorporated joint operations by recognising its share of the assets and liabilities held or owed by the joint operation along with its share of the expenses incurred by the joint operation.

Where the assets held within the joint operation include assets in the course of construction, AARNet’s share of those assets is included in the values for assets in the course of construction shown in this note.

Depreciation

Property, plant and equipment is depreciated using the straight-line method to allocate cost, net of residual value, over each item’s estimated useful life, as follows:

Leasehold improvements	10 years
Office equipment	3 years
Leased communication assets	5 - 6 years
Leased office equipment	3 years
Communication assets	3 - 25 years
Software	2 - 3 years

The assets’ residual values and useful lives are reviewed, and adjusted if appropriate, at the end of each reporting period; such adjustments may result in a revised useful life shorter than that shown above.

Impairment of Assets

Assets that are subject to depreciation or amortisation are reviewed for indicators of impairment whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. An impairment loss is recognised for the amount by which the asset’s carrying amount exceeds its recoverable amount. The recoverable amount is the higher of an asset’s fair value less costs to sell and value in use. As a not-for-profit entity, value in use is calculated on the basis of the depreciated replacement cost, which represents the current replacement cost of an asset less, where applicable, accumulated depreciation calculated on the basis of such cost to reflect the already consumed or expired future economic benefits of the asset.

For the purposes of assessing impairment, assets are grouped at the lowest levels for which there are separately identifiable cash flows (cash generating units). The company has only one cash generating unit.

Gains and Losses

Gains and losses on disposals are determined by comparing proceeds with carrying amount. These are included in the Statement of Surplus.

22. NON-CURRENT ASSETS - INDEFEASIBLE RIGHTS OF USE TRAFFIC PATHS (INTANGIBLE ASSETS)

	Total \$
At 1 January 2018	
Total payments	164,007,918
Accumulated amortisation on a straight line basis	(88,261,229)
Net book amount	75,746,689
Year ended 31 December 2018	
Opening net book amount	75,746,689
Amortisation charge	(8,298,175)
Closing net book amount	67,448,514
Total payments	164,007,918
Accumulated amortisation on a straight line basis	(96,559,404)
Net book amount	67,448,514
Year ended 31 December 2019	
Opening net book amount	67,448,514
Additions	6,161,095
Amortisation charge	(7,703,828)
Closing net book amount	65,905,781
At 31 December 2019	
Cost	170,169,013
Accumulated amortisation	(104,263,232)
Net book amount	65,905,781

AARNet’s intangible assets are indefeasible rights of use (IRU) capacity on traffic paths across communication infrastructure owned by other parties.

Accounting Policy

The value of each IRU is amortised from the date each right become available for service and will continue to be amortised over the term of the right, which varies from 10 to 28 years. The longest remaining amortisation period is approximately 20 years.

Impairment

IRUs are also subject to impairment review as described in note 21.

23. CONTRIBUTED EQUITY

	31 December 2019 Shares	31 December 2018 Shares	31 December 2019 \$	31 December 2018 \$
Ordinary shares				
Fully paid ordinary shares	78	78	39,039	39,039
Movements in ordinary share capital				
Date	Details	Number of shares		\$
1 January 2018	Opening balance	78		39,039
31 December 2018	Balance	78		39,039
31 December 2019	Balance	78		39,039

AARNet’s shareholders are 38 Australian Universities and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). Each shareholder holds two ordinary shares.

Holders of ordinary shares are entitled to one vote per share on resolutions put before the members. Holders of ordinary shares are not entitled to dividends and have no right to receive any distribution during a winding up.

24. RETAINED EARNINGS AND RESERVE

Retained earnings

Movements in retained earnings were as follows:

	31 December 2019 \$	31 December 2018 \$
Balance 1 January	214,408,399	198,939,939
Surplus for the year	7,602,686	15,468,460
Balance 31 December	222,011,085	214,408,399

Reserve - accumulated unrealised gain/loss on investments

Movements in reserve were as follows:

	31 December 2019 \$	31 December 2018 \$
Balance 1 January	(248,511)	588,857
Changes in the fair value of financial assets through other comprehensive income	996,491	(837,368)
Balance 31 December	747,980	(248,511)

25. FINANCIAL RISK MANAGEMENT

AARNet’s activities are exposed to a variety of financial risks including:

- a) Market risk (including currency risk, interest rate risk and equity price risk);
- b) Credit risk; and
- c) Liquidity risk.

This note explains the Company’s level of exposure to these risks, how these risks could affect the Company’s future financial performance and how AARNet manages the impact of these risks.

AARNet’s overall risk management program focuses on managing its liquidity and seeking to minimise potential adverse effects on financial performance. The Board, through the Audit, Finance & Risk Committee, is responsible for setting the overall objectives for risk management and provides specific policies where necessary.

The day to day risk management is carried out by identifying, evaluating and hedging financial risks. This is the responsibility of the Chief Executive Officer (CEO) and the Chief Financial Officer (CFO) and they are supported by operating management.

- a) Market risk
 - (i) Currency risk

AARNet operates equipment at international locations and deals with certain suppliers in foreign currencies and is impacted by changes in foreign exchange rates. The Company is primarily exposed to changes in the US dollar (USD) and to a smaller extent, the Euro (EUR). AARNet currently has monthly requirements in excess of USD200,000, for the purchase of international communications capacity and other services. These requirements are expected to increase over time.

Currency risk is measured using sensitivity analyses and cash flow forecasting, summarised below.

Currency risk is managed by holding foreign currency, entering into forward foreign exchange contracts and purchasing options to acquire foreign currency. At year end, AARNet held USD6,257,490

(AUD8,901,730) in USD denominated bank accounts and EUR181,457 (AUD289,809) in a EUR denominated bank account. AARNet’s risk management policy is to hedge at least 60% of anticipated short-term cash flows (mainly for the purchase of capacity to the USA) in USD.

The following table summarises the sensitivity of the Company’s financial assets and financial liabilities to foreign exchange risk for the year.

	-100 bps			+100 bps		
At 31 December 2019	Carrying amount \$	Surplus \$	Equity \$	Surplus \$	Equity \$	
Cash and cash equivalents	21,826,815	(1,021,282)	(1,021,282)	835,594	835,594	
Trade Receivables	43,206,574	(25,127)	(25,127)	20,559	20,559	
Derivative financial instruments (assets)	777,798	(86,422)	(86,422)	70,709	70,709	
Derivative financial instruments (liabilities)	(3,641)	405	405	(331)	(331)	
Trade payables	(10,982,121)	148,212	148,212	(121,264)	(121,264)	

	-100 bps			+100 bps		
At 31 December 2018	Carrying amount \$	Surplus \$	Equity \$	Surplus \$	Equity \$	
Cash and cash equivalents	23,702,332	(251,707)	(251,707)	205,942	205,942	
Trade Receivables	49,067,561	(357,593)	(357,593)	292,576	292,576	
Derivative financial instruments (assets)	1,320,407	(146,712)	(146,712)	120,037	120,037	
Trade payables	(3,795,181)	201,382	201,382	(164,767)	(164,767)	

- (iii) Interest rate risk

AARNet’s main interest rate risk arises from its cash at bank, cash in deposits and financial instruments at amortised cost.

The Company’s interest rate risk is monitored using sensitivity analysis and is reviewed by management and the company’s external investment consultant.

The following table summarises the sensitivity of the Company’s financial assets and financial liabilities to interest rate risk for the year.

	Interest rate risk				
	-10%			+10%	
At 31 December 2019	Carrying amount \$	Surplus \$	Equity \$	Surplus \$	Equity \$
Financial assets					
Cash and cash equivalents	21,826,815	(35,166)	(35,166)	126,353	126,353
Financial instruments at amortised cost, term deposits	16,000,000	(160,000)	(160,000)	160,000	160,000
Financial instruments at amortised cost, floating rate notes	43,973,631	(439,736)	(439,736)	439,736	439,736

	Interest rate risk				
	-10%			+10%	
At 31 December 2018	Carrying amount \$	Surplus \$	Equity \$	Surplus \$	Equity \$
Financial assets					
Cash and cash equivalents	23,702,332	(126,721)	(126,721)	214,370	214,370
Financial instruments at amortised cost, term deposits	29,800,000	(298,000)	(298,000)	298,000	298,000
Financial instruments at amortised cost, floating rate notes	41,949,521	(419,495)	(419,495)	419,495	419,495

- (iii) assets at fair value through statement of changes in equity (price risk)

AARNet’s equity price risk arises from holding financial assets at fair value through other comprehensive income such as equity instruments, listed bonds and hybrid investments.

Price risk is measured and using sensitivity analysis and is monitored by management and the company’s external investment consultant.

The following table summarises the sensitivity of the Company’s financial assets and financial liabilities to price risk for the year.

	Other price risk				
	-1%			+1%	
At 31 December 2019	Carrying amount \$	Surplus \$	Equity \$	Surplus \$	Equity \$
Financial assets					
Financial assets at fair value through other comprehensive income	15,880,605	-	(158,806)	-	158,806

	Other price risk				
	-1%			+1%	
At 31 December 2018	Carrying amount \$	Surplus \$	Equity \$	Surplus \$	Equity \$
Financial assets					
Financial assets at fair value through other comprehensive income	9,302,267	-	(93,023)	-	93,023

- b) Credit risk

Credit risk arises where a debtor fails to make contractual payments to AARNet as and when they fall due. AARNet is exposed to credit risk on its holdings of cash and cash equivalents, term deposits, corporate bonds and loan notes, hybrid securities and derivative financial instruments. Further credit risk arises from credit exposures to customers in the form of outstanding receivables and committed transactions.

AARNet’s credit risk is mainly managed through the following measures:

Credit risk source	Management
Bank deposits and derivative financial instruments	<ul style="list-style-type: none">• Principally deal with highly rated financial institutions.
Investments in hybrid loan notes and bonds	<ul style="list-style-type: none">• Bound by an approved investment policy which stipulates minimum ratings or other criteria for investment funds.• Investment decisions based on recommendations from a licensed investment advisor.
Customers	<ul style="list-style-type: none">• Assessment of credit quality of the customer, taking into account its financial position, past experience and other factors.• Invoicing in advance for significant portion of income.

(i) Trade receivables

AARNet applies the simplified approach to providing for expected credit losses prescribed by AASB 9, which permits the use of the lifetime expected loss provision for all trade receivables. To measure the expected credit losses, trade receivables have been grouped based on shared credit risk characteristics and the days past due.

During the year, no material gain/(loss) was recognised in Statement of Surplus in other expenses in relation to impaired receivables.

In the prior year, the impairment of trade receivables was assessed based on the incurred loss model. Individual receivables which were known to be uncollectible were written off by reducing the carrying amount directly. The other receivables were assessed collectively, to determine whether there was objective evidence that an impairment had been incurred but not yet been identified. For those receivables, the estimated impairment losses were recognised in a separate provision for impairment. The group considered that there was evidence of impairment if any of the following indicators were present:

- Significant financial difficulties for the debtor
- Probability that the debtor will enter bankruptcy or financial re-organisation
- Default or delinquency in payments (more than 60 days overdue).

(ii) Other financial assets at amortised cost

Other financial assets at amortised cost include debt securities and term deposits (previously held-to-maturity). All of these financial assets are considered to have low credit risk, and thus the impairment provision recognised during the period was zero. Management consider 'low credit risk for listed bonds to be an investment grade credit rating with at least one major rating agency. Other instruments are considered to be low credit risk when they have a low risk of default and the issuer has a strong capacity to meet its contractual cash flow obligations in the near term.

c) Liquidity risk

Prudent liquidity risk management implies maintaining sufficient cash to meet the needs of the business. Management monitors AARNet's liquidity and cash and cash equivalents on a rolling forecast expected cash flow basis. This analysis is prepared in Australian Dollars.

AARNet’s Board periodically considers longer range financial forecasts (5+ years) provided as part of the normal course of its deliberations. The Board also considers the expenditure commitments disclosed in note 2 when assessing the liquidity of the Company.

26. CRITICAL ACCOUNTING ESTIMATES AND JUDGEMENTS

The preparation of financial statements requires the use of certain critical accounting estimates. It also requires management to exercise its judgement in the process of applying the Company’s accounting policies.

Often, this involves estimates and assumptions concerning the future. The resulting accounting estimates will, by definition, seldom equal the related actual results. The estimates and assumptions that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year are discussed below.

(i) Useful life of intangible assets

The Directors have assumed in the ordinary course of business that AARNet’s customers will continue to use AARNet’s services into the foreseeable future. The useful economic lives assigned for intangible assets are based on the contractual terms agreed for each Indefeasible Right of Use.

(ii) Useful life of assets

AARNet is the owner of a significant amount of assets and infrastructure. Estimates are made as to the useful life of these assets which can affect both the amount of depreciation and amortisation expense during the year and the amount of revenue recognised in relation to Establishment Fees.

(iii) Lease term

In determining the lease term, management considers all facts and circumstances that create an economic incentive to exercise an extension option, or not exercise a termination option. Extension options (or periods after termination options) are only included in the lease term if the lease is reasonably certain to be extended (or not terminated).

For leases, the following factors are normally the most relevant:

- If there are significant penalties to terminate (or not extend), AARNet is typically reasonably certain to extend (or not terminate).
- If any leasehold improvements are expected to have a significant remaining value, AARNet is typically reasonably certain to extend (or not terminate).
- Otherwise, AARNet considers other factors including historical lease durations and the costs and business disruption required to replace the leased asset.

The lease term is reassessed if an option is actually exercised (or not exercised) or AARNet becomes obliged to exercise (or not exercise) it. The assessment of reasonable certainty is only revised if a significant event or a significant change in circumstances occurs, which affects this assessment, and that is within the control of the lessee.

27. DIRECTORS

The Directors of AARNet Pty Ltd during the financial year were:

Chairman - non-executive
Emeritus Professor Gerard Sutton AO*

Executive Directors
Mr Chris Hancock, CEO

Non-executive Directors
Dr Christine Burns
Professor John Dewar AO
Professor Annabelle Duncan (resigned 5 July 2019)
Mr Robert Fitzpatrick*
Professor Brigid Heywood (appointed 22 October 2019)
Mr Jeff Murray
Ms Fiona Rankin (appointed 25 June 2019)
Mr John Rohan*
Professor Deborah Terry AO
Emeritus Professor Mark Wainwright AM*
Dr David Williams

*Denotes independent director

28. KEY MANAGEMENT PERSONNEL DISCLOSURES

Key management personnel compensation

The key management personnel are those who had authority and responsibility for planning, directing and controlling the activities of AARNet, directly or indirectly, during the year. The remuneration for key management personnel including directors is as follows:

	31 December 2019 \$	31 December 2018 \$
Short-term and long-term employee benefits	3,270,448	2,722,364
Post-employment benefits	407,842	335,417
	3,678,290	3,057,781

Transactions with key management personnel

Several directors (Mr J Murray, Dr C Burns and Ms F Rankin) are members of the Council of Australasian University Directors of Information Technology (CAUDIT) to which AARNet provides payroll bureau services. AARNet receives no consideration for this service.

Other directors represent, act for, or hold offices at certain AARNet shareholders and customers. AARNet provides services to these shareholders on arm’s length terms.

29. REMUNERATION OF AUDITORS

PricewaterhouseCoopers

Audit and other assurance services

	2019 \$	2018 \$
Audit and other assurance services		
Audit and review of financial statements	225,000	217,500
Total remuneration for audit and other assurance services	225,000	217,500
Taxation services		
Taxation services	27,250	54,208
Other services		
Remuneration for advisory services	15,000	65,540
Total remuneration of PricewaterhouseCoopers	267,250	337,248

30. OTHER SIGNIFICANT ACCOUNTING POLICIES

New, revised or amending Accounting Standards and Interpretations adopted

AARNet has applied the following standards and amendments for the first time for their annual reporting period commencing 1 January 2019:

- AASB 16 Leasing (AASB 16)
- AASB 1058 Income of Not-for-Profit Entities (AASB 1058)
- AASB 2018-1 Amendments to Australian Accounting Standards - Annual Improvements 2015-2017 Cycle

AARNet had to change its accounting policies and make certain retrospective adjustment following the adoption of AASB 16. The other amendments listed above did not have any impact on the amounts recognised in prior periods and are not expected to significantly affect the current or future periods.

AARNet has adopted AASB 16 Leases retrospectively from 1 January 2019, but has not restated comparatives for the 2018 reporting period, as permitted under the specific transition provisions in the standard. The reclassifications and the adjustments arising from the new leasing rules are therefore recognised in the opening balance sheet on 1 January 2019. The new accounting policies are disclosed in note 8.

On adoption of AASB 16, AARNet recognised lease liabilities in relation to leases which had previously been classified as ‘operating leases’ under the principles of AASB 117 Leases. These liabilities were measured at the present value of the remaining lease payments, discounted using the lessee’s incremental borrowing rate as of 1 January 2019. The weighted average lessee’s incremental borrowing rate applied to the lease liabilities on 1 January 2019 was 6.47%.

(i) Practical expedients applied

In applying AASB 16 for the first time, AARNet has used the following practical expedients permitted in the standard:

- Applying a single discount rate to a portfolio of leases with reasonably similar characteristics
- Accounting for operating leases with a remaining lease term of less than 12 months as at 1 January 2019 as short-term leases
- Excluding initial direct costs for the measurement of the right-of-use asset at the date of initial application, and
- Using hindsight in determining the lease term where the contract contains options to extend or terminate the lease.

(ii) Measurement of lease liabilities

	31 December 2018 \$
Opening lease and capacity commitments disclosed as at 31 December 2018	121,648,225
Less contracts not assessed as lease contracts	(48,305,672)
Less discounting using the lessee’s incremental borrowing rate of at the date of initial application	(25,708,519)
Less low-value leases not recognised as a liability	(285,236)
Less short-term leases not recognised as a liability	(1,890)
Lease liability recognised as at 1 January 2019	47,346,908
	31 December 2019 \$
Of which are:	
Current lease liabilities	1,888,545
Non-current lease liabilities	45,458,363
	47,346,908

(iii) Measurement of right-of-use assets

Right-of-use assets were measured at the amount equal to the lease liability, adjusted by the amount of any prepaid or accrued lease payments relating to that lease recognised in the balance sheet as at 31 December 2018.

(iv) Adjustments recognised in the balance sheet on 1 January 2019

The change in accounting policy affected the following items in the balance sheet on 1 January 2019:

- Right-of-use assets - increase by \$47,346,908
- Lease liabilities - increase by \$47,346,908

Foreign currency translation

Foreign currency transactions are translated into the functional currency using the exchange rates prevailing at the dates of the transactions. Foreign exchange gains and losses resulting from the settlement of such transactions and from the translation at year end exchange rates of monetary assets and liabilities denominated in foreign currencies are recognised in the Statement of Surplus.

Revenue recognition

The accounting policies for the group’s revenue from contracts with customers are explained in Note 9.

Leases (in comparative period)

As explained above, AARNet has changed its accounting policy for leases where AARNet is the lessee. The new policy is described in note 8 and the impact of the change on the balance sheet is noted above.

Until 31 December, 2018, leases of property, plant and equipment where AARNet, as lessee, has substantially all the risks and rewards of ownership are classified as finance leases. Finance leases are capitalised at the lease’s inception at the fair value of the leased property or, if lower, the present value of the minimum lease payments. The corresponding rental obligations, net of finance charges, are included in other short-term and long-term payables. Each lease payment is allocated between the liability and finance cost. The finance cost is charged to the Statement of Surplus over the lease period so as to produce a constant periodic rate of interest on the remaining balance of the liability for each period. The property, plant and equipment acquired under finance leases are depreciated over the asset’s useful life or over the shorter of the asset’s useful life and the lease term if there is no reasonable certainty that AARNet will obtain ownership at the end of the lease term.

AARNet may, as described in note 21, enter into arrangements which are considered off-setting finance leases. Such leases are considered to be settled immediately after coming into effect with the result that no finance cost, or finance income is recognised, and no finance liability or receivable remains outstanding. Assets acquired under such arrangements are depreciated over the shorter of the asset’s useful life or the lease term.

Leases in which a significant portion of the risks and rewards of ownership are not transferred to AARNet as lessee are classified as operating leases. Payments made under operating leases (net of any incentives received from the lessor) are charged to the Statement of Surplus on a straight-line basis over the period of the lease.

Goods and Services Tax (GST)

Revenues, expenses and assets are recognised net of the amount of associated GST, unless the GST incurred is not recoverable from the Australian Taxation Office (ATO). In this case it is recognised as part of the cost of acquisition of the asset or as part of the expense.

Receivables and payables (except accrued expenses) are stated with the amount of GST included.

The net amount of GST recoverable from, or payable to, the ATO is included as a current asset or liability in the Balance Sheet.

Cash flows are included in the Statement of Cash Flows on a gross basis.

The GST component of cash flows arising from investing and financing activities which are recoverable from, or payable to, the ATO are classified as operating cash flows.

Investments and other financial assets

The accounting policies for the group’s revenue from investments and other financial assets are explained in Note 10.e group’s revenue from investments and other financial assets are explained in Note 10.

31. EVENTS OCCURRING AFTER THE REPORTING PERIOD

In February and March 2020 the COVID-19 virus began to spread throughout Australia. AARNet, following directions issued by the Commonwealth and state governments, and in line with practices adopted by many other businesses, instituted a number of responses to assist in slowing the spread of the virus through the community, and to reduce the health risks to our employees, customers, suppliers and other groups with which we work and interact.

The potential impact of the COVID-19 virus on AARNet’s future operations and financial position is difficult to forecast. A key factor will be the length of time over which businesses will be required to operate without unfettered access to their workplaces.

The financial impacts of the COVID-19 virus are also difficult to quantify. AARNet now expects to see benefits in ‘Administration - Telecommunications’ section of the Statement of Surplus but these are likely to be more than offset by additional costs in ‘Telecommunication expenses’.

Volatility in investment markets resulting from the COVID-19 outbreak may also impact AARNet during 2020 and may reduce the investment income that AARNet would otherwise receive and also reduce the value of our financial instruments and assets portfolio. Since the end of the financial year:

- AARNet’s fixed interest investments have declined by some 3.5% or approximately \$1.8m. AARNet does not intend to sell any of these investments prior to maturity and, absent a default by an issuer, expects to recover most of this value over the period until each security matures.
- AARNet’s equity investments (for which AARNet holds a smaller value), have declined by 31.1% or just under \$3.0m. AARNet does not expect to sell any of these investments in the foreseeable future, but to avoid realising any of these losses, the value of these securities would need to recover before the investment is disposed of.

Similar volatility in foreign exchange markets has resulted in the Australia dollar depreciating against the US Dollar throughout the early part of 2020. Without any reversal of this currency movement across the remainder of 2020, AARNet would expect higher costs for equipment and services denominated in USD but would also expect these additional costs to be substantially offset by gains on our foreign exchange hedging instruments and holdings of foreign currency.

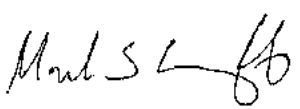
Despite this, AARNet does not see a change in its commitments and contingencies and expects to continue investing during 2020 in its domestic fibre network and in the JGA South submarine cable system.

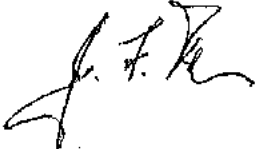
DIRECTORS’ DECLARATION

In the Directors’ opinion:

- (a) the financial statements and notes set out on pages 10 to 34 are in accordance with the Australian Charities and Not-for-profits Commission Act 2012, including:
 - (i) complying with Accounting Standards and other mandatory professional reporting requirements, and
 - (ii) giving a true and fair view of the entity’s financial position as at 31 December 2019 and of its performance for the year ended on that date, and
- (b) there are reasonable grounds to believe that the Company will be able to pay its debts as and when they become due and payable.

This declaration is made in accordance with a resolution of Directors.





Emeritus Professor MS Wainwright AM

Mr JF Rohan

Director

Director

Sydney

8th April 2020



Independent auditor's report

To the members of AARNet Pty Limited

Our opinion

In our opinion:

The accompanying financial report of AARNet Pty Limited (the Company) is in accordance with Division 60 of the *Australian Charities and Not-for-profits Commission (ACNC) Act 2012*, including:

- (a) giving a true and fair view of the Company's financial position as at 31 December 2019 and of its financial performance for the year then ended
- (b) complying with Australian Accounting Standards - Reduced Disclosure Requirements and Division 60 of the *Australian Charities and Not-for-profits Commission Regulation 2013*.

What we have audited

The financial report comprises:

- the balance sheet as at 31 December 2019
- the statement of surplus for the year then ended
- the statement of changes in equity for the year then ended
- the statement of cash flows for the year then ended
- the notes to the financial statements, which include a summary of significant accounting policies
- the directors' declaration.

Basis for opinion

We conducted our audit in accordance with Australian Auditing Standards. Our responsibilities under those standards are further described in the *Auditor's responsibilities for the audit of the financial report* section of our report.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Independence

We are independent of the Company in accordance with the ethical requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants (including Independence Standards)* (the Code) that are relevant to our audit of the financial report in Australia. We have also fulfilled our other ethical responsibilities in accordance with the Code.

Other information

The directors are responsible for the other information. The other information comprises the information included in the annual report for the year ended 31 December 2019, but does not include the financial report and our auditor's report thereon. Our opinion on the financial report does not cover the other information and accordingly we do not express any form of assurance conclusion thereon.

In connection with our audit of the financial report, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial report or our knowledge obtained in the audit, or otherwise appears to be materially misstated.

If, based on the work we have performed on the other information that we obtained prior to the date of this auditor's report, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Responsibilities of the directors for the financial report

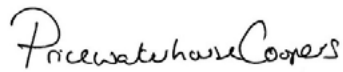
The directors of the Company are responsible for the preparation of the financial report that gives a true and fair view in accordance with Australian Accounting Standards - Reduced Disclosure Requirements and the *Australian Charities and Not-for-profits Commission (ACNC) Act 2012* and for such internal control as the directors determine is necessary to enable the preparation of the financial report that gives a true and fair view and is free from material misstatement, whether due to fraud or error.

In preparing the financial report, the directors are responsible for assessing the ability of the Company to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the directors either intend to liquidate the Company or to cease operations, or have no realistic alternative but to do so.

Auditor's responsibilities for the audit of the financial report

Our objectives are to obtain reasonable assurance about whether the financial report as a whole is free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of the financial report.

A further description of our responsibilities for the audit of the financial report is located at the Auditing and Assurance Standards Board website at: http://www.auasb.gov.au/auditors_responsibilities/ar4.pdf. This description forms part of our auditor's report.



PricewaterhouseCoopers



Scott Walsh
Partner

Sydney
8 April 2020

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