AARNet International Network

Please note this map is designed to be a conceptual representation of the international R&E Network.
A message from the chair

The rise of Asia – and the importance of the network

Dear Shareholders

2013 marks my second term as Chair of the AARNet Board and it has been a privilege to witness at first hand, the immense economic impact that AARNet has had on research and education.
For almost 25 years AARNet has been delivering a world class network to enable research and education in Australia, to sustain our competitiveness in an increasingly global business. This year I want to give my perspective on one of the biggest economic changes in the world today – the rise of Asia - and its impact on research and education in Australia. This major realignment of economic, political and strategic power is at a speed and on a scale the world has not seen before.

While China and India dominate our network links, simply because of their sheer size and economic impact, the Asian region is filled with other rapidly emerging economies, the largest of which is our close neighbour Indonesia. Together with the advanced economies of Japan, South Korea and Singapore, this growth is clear evidence of our need to continually invest in our international network.

The world of research and education is changing and network connectivity will be at the very heart of enabling these changes. The international network will rise in importance, as the need to capitalise on collective research capabilities around the world becomes more pressing. This capability is vital for Australian research and education to flourish.

New technologies are resulting in dramatic changes in the ways in which people live, learn, work, and discover. The rapid development of emerging economies around the globe is resulting in more individuals and organizations valuing education and relying on the outputs of research to underpin their growing economies and living standards. Network technology is making it increasingly easier to reach, and serve, the broader education communities. Our people, and core capabilities, provide a unique opportunity to play a lead role in this new globally connected era.

I would like to commend our CEO Mr Chris Hancock for his leadership role in the Global CEO Forum. National Research and Education Networks (NRENs) are swiftly moving to reinvent themselves in this global open exchange world - the concept of becoming Global Research Education Networks (GRENs) to meet the future demand for high-performing international data connectivity is imminent.

We are on the verge of an exciting new era for AARNet. We are uniquely positioned to serve a growing mix of customers. Today AARNet is a model business, an exemplar of academic/business partnership that has endured in the highly regulated world of telecommunications to become one of the world’s leading NRENs. This presents both opportunities and challenges particularly in connecting to Asia.

The upgrade in our network west to Singapore is key to delivering the research and education outcomes necessary for Australian economic prosperity and for Australia to remain connected to our international partners who together operate the world’s most advanced networks.

This report is an update about our widespread engagement and the value that we are delivering to our shareholders. It showcases the international collaboration of our customers with Asia.

As Chair of the Board at AARNet I would like to thank my fellow Board Members, the CEO Mr Chris Hancock and the Management and Staff of AARNet for their professionalism and dedication. We are confident that we are creating great value for you and the other members of our community.

I wish to offer my sincere thanks to Mr Nigel Poole from CSIRO, who retired from the Board during the year 2013.

I have no doubt the future for AARNet is an exciting one.

Gerard Sutton AO
Chair, AARNet Board
A new era of Global Collaboration

The use of the network again demonstrated the strong exponential demand for capacity from researchers, educators and administrators. Traffic grew by 50% from the previous year, with domestic traffic (traffic between customers) growing at a very healthy 58% and international on-net traffic at 39%. AARNet’s traffic profile has changed significantly over the past few years with on-net now making up 67% of traffic and the unmetered off-peak traffic system providing substantial benefits to members outside the normal working day. Domestic peering also continues to be one of the most significant benefits to our customers and unmetered traffic now accounts for 85% of all traffic.

Overall, AARNet’s network performance and delivery continued to operate at world-class standards with overall availability achieving 99.97%. The number of 10Gbps links to campuses grew to support the exponential growth of the sector. AARNet extended the AARNet backbone to 100Gbps capability and increased international capacity to the US across the research links on Southern Cross Cable Networks to 40Gbps until the year 2025.

Thanks to the Federal Government, on the infrastructure front, AARNet continued to grow its fibre footprint rolling out the National Research Network (NRN) Project, allowing AARNet to initiate fibre developments for metropolitan Brisbane, North Queensland, metropolitan Sydney, metropolitan Perth, and extending the Perth to Geraldton link, as well as allowing the upgrade of the AARNet optical backbone from Adelaide to Perth. AARNet strengthened its partnership with Nextgen by consolidating the connections for the five National Broadband Network (NBN) Regional Blackspots Program links, with implementation of the Brisbane to Darwin and Perth to Geraldton links. The degree of focus and delivery required by the AARNet team to achieve these infrastructure projects in the space of 12 months has been exceptional.

A message from the CEO

2013 was a remarkable year of achievement for AARNet and one that witnessed the delivery of new products, solutions and services that contributed significantly to the technology shift occurring across the Research and Education sectors in Australia.
AARNet commenced the rollout of its ‘above the network’ services with several new products and solutions being deployed across the sector. During the year AARNet recognized the needs of its customers who have been demanding greater flexibility with focus on more low cost/low risk solutions. To this end, AARNet developed various cloud services with the introduction of the Box cloud collaboration platform to the Australian education marketplace and the extension of AARNet’s large file sender service with the trial of CloudStor+ for all researchers across the country. In addition AARNet developed a hosted telephony solution and extended its video, streaming and recording services to further enhance the remote teaching and learning experience. The Unified Communications Exchange, which allows voice and video calls between universities in order to reduce costs and more efficiently connect researchers and educators between institutions seamlessly, continued to grow at an exponential rate. AARNet also established a new consulting arm, Enterprise Services, which has been highly beneficial to many universities in reviewing and providing advice on network architecture, cloud services, rich media collaboration services and enterprise IT strategy.

Our partnership with NBN Co continued to grow. AARNet has ensured its strategic positioning as the leader of networking developments in Australia with its ability to continue to showcase the network developments and applications that will be essential for the success of the future NBN.

The financial headline indicators in the table below tell a story of growth and sustainability. Record growth in Internet traffic, innovation in product development and a disciplined investment strategy have all contributed to AARNet’s continuing ability to reduce telecommunications charges in real terms to its members and customers.

Included in the 2013 Net Income are $10.8m in NRN contributions, payroll tax recovery of $1.1m and $2.0m from gains on foreign exchange hedging investments. These items account for 50% of Net Income.

The NRN Project is an initiative of the Australian Government conducted as part of the Super Science Initiative and financed from the Education Investment Fund. AARNet uses this funding to extend and expand the reach of our network, greatly enhancing our ability to deliver services to our members and other customers. I would like to take this opportunity to thank the Department of Industry for their vision, funding and support for the NRN projects and Paul Sherlock at the University of South Australia for his outstanding management of this highly successful program.

The evolution of truly global science projects like the Large Hadron Collider and the Square Kilometre Array, the emergence of massive open online course programs (MOOCs), the development of campuses throughout the world, particularly in Asia, all require ongoing and expanded global leadership.

AARNet has played an integral role in the past year along with the National Research Networks of China, US, Canada, UK, Germany, France, South America, New Zealand, Africa, Mexico and the Nordic countries in developing a shared global fabric for next generation networking. This group has developed detailed plans for several major initiatives that will ultimately strengthen innovation, stimulate global research, foster economic development, promote Internet freedoms and expand education across the globe.

Finally, I would like to thank our Chairman, Professor Gerard Sutton, and the AARNet Board, the AARNet Advisory Committee and CAUDIT for their support during what has been an outstanding year of deliverables by AARNet to the sector.

This was an amazing year of achievements for AARNet. Full credit goes to the dedicated staff who continually strive to deliver above and beyond to achieve the leading-edge outcomes that AARNet has become known for, both across the Research and Education communities and at the forefront of technology development in Australia.

Chris Hancock
Chief Executive Officer

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**Selected Financial Data ($m)**

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* *$16.3m was earned during the year due to an IRU with Southern Cross Cable Networks  **The figures above have been restated to reflect the change in accounting policy. Refer to note 1(c) in the 2012 Financial Annual Report  " (net assets $107.9m less intangible assets $55.9m)  "" (net assets $130.3m less intangible assets $66.2m)*
Eliminate Dengue: a Momentum of Partnerships

Monash University is leading an international collaboration project, Eliminate Dengue, in conjunction with key researchers from three other Australian universities including Professor Ary Hoffmann from the Bio21 Institute at Melbourne University, who has been a pioneer in dengue fever research.

20 years ago, geneticist Ary Hoffmann took a closer look at the humble fruit fly. He found that insects living in many kitchen fruit bowls carry bacteria, called Wolbachia, that live naturally inside their cells, and spread by manipulating the fly’s reproduction. The bacteria also prevent the flies from passing a virus onto other fruit flies.

This research led Professor Hoffmann to try the same form of bacterial immunisation on the mosquito, the world’s most important disease carrying insect.

Working with colleagues from Monash University and James Cook University Professor Hoffmann found certain strains of Wolbachia do stop mosquitoes transmitting dengue, a disease that kills around 40,000 people each year with no vaccines or specific treatments currently available. There have been around 2400 cases of dengue infection in Northern Australia in recent years.

However, the bacteria causing the strongest blockage of dengue have been difficult to spread within the mosquito population because they reduce the mosquitoes’ ability to lay viable eggs.

Professor Hoffmann has shown that by introducing an insecticide resistance gene alongside the Wolbachia bacteria into the mosquito the insects pass on the disease-blocking bacteria to other mosquitoes much more effectively.

This could mean the spread of the disease can be stopped faster, and fewer infected mosquitoes would need to be released in a disease control program.
APAN hosts Dengue Fever Workshop

The recent Asia Pacific Advanced Networking (APAN) meeting, held in January in Bandung, Indonesia, hosted a dedicated Dengue Fever workshop in the programme for the established APAN Medical Working Group.

A joint APAN-TEIN*CC initiative, the workshop took place on 20 January 2014, attracting over 30 attendees, including clinicians and researchers from within the multi-disciplinary dengue fever community, public health officials as well as National Research and Education Network (NREN) representatives from across the Asia-Pacific region including Dr. Sheryl Maher, from Charles Darwin University. Dr. Maher was able to utilise the network to participate remotely and represent the Australian consortiums’ research.

The workshop also provided an opportunity to explore how NREN communities on a regional, national and global level can support the medical community’s international collaborative efforts to combat dengue fever in endemic countries and to prevent its spread. AARNet enabled participants from Australia to join speakers from Pakistan, the Philippines, Bangladesh, Singapore, Sri Lanka, Malaysia and Japan to join discussions and view presentations in real time using multi-point videoconferencing system. Participants agreed to build on the positive experience of NREN supported videoconferencing and to follow up with virtual meetings. Professor Francis Lee Bu Sung, Chair of Governors of TEIN*CC, said the event was very inspiring, and he hoped it would act as a catalyst for more joint actions.

Discussions are now underway with NRENs in other world regions about adapting this workshop model to the local context to help build regional communities to address pressing issues.
Operational highlights

- AARNet4 – one of the world’s longest unregenerated high-performance optical networks
- 40Gbps on SXTransPORT to Seattle
- 10Gbps international commodity upgrades to Seattle, San Jose, Palo Alto and Los Angeles
- Domestic peering now accounts for 59% of all traffic
- Tasmanian Government Schools connect to AARNet
- New PoP site in Darwin
- EIF funding built dark fibre in nearly every state

International capacity underpins unmetered network access
Managing the network is our primary function

Continuity in performance over such vast geographic distances can only be delivered by a well-architected network. Our operations group are our quiet achievers.

The 24x7 Network Operations Centre (NOC) is the engine room of our organisation and this year AARNet extended the service into customers networks.

Network reliability again delivered 100% uptime over our own infrastructure and 99.97% in end to end performance. Faults and scheduled maintenance went unnoticed by the user community as a result of deploying alternate paths.

Even on our international legs, faults and scheduled maintenance in our PoP sites were invisible to the wider community. Our customers extended this reliability out to their campuses, commissioning us to build diverse paths into the network backbone.

AARNet operates a world class IP network, equivalent to international “Tier One” ISPs, where our customers receive 100% backbone network reliability with no service degradation during outages, planned or otherwise. Whilst there were no significant outages during the year, AARNet still conducted a number of disaster recovery exercises.

This year we simulated a double inter-capital fault, the failure of corporate systems and an optical node replacement as a result of natural disaster or vandalism.

One of the distinguishing features of a research and education network is the careful capacity planning necessary to remain ahead of the demand curve. AARNet closely monitors all of its circuits to ensure sufficient capacity. The peak demands of the academic year determine the capacity for a highly available and diverse network. AARNet continually monitors the load, as a percentage of the capacity of the link rather than the absolute volume of traffic to determine required network upgrades. This year international on-net traffic grew by 39% meaning Australian research and education is increasing its collaboration internationally and domestic peering now accounts for 59% of all traffic.

10Gbps international commodity upgrades to Seattle, San Jose, Palo Alto and Los Angeles

International on-net meaning research and education traffic between our customers and their international partners grew by 39% over last year.

Not all international research and education partners are connected to their NRENs, meaning their traffic must transit our commodity links rather than our research links on SxTransport. AARNet now has some 4 commercial grade PoPs in the USA. This delivers diversity and redundancy and allows AARNet to safely drive all circuits to maximum capacity.
Australian researchers were able to utilise the network and participate in several programs over the course of the year. The University of Adelaide connected into an Endoscopy session with leading Japanese hospitals.

In January, the Westmead Millennium Institute for Medical Research was able to use the network to participate in a demonstration of measurement procedures on hepatic vein pressure. For the first time, hospitals from Bangladesh and Pakistan were able to connect in and participate.

The driving goal of TEMDEC is to make accessible world class health care, education and training accessible regardless of geographical or time zone constraints. As of February 2014 300 hospitals across 45 countries in the greater Asia-Pacific region are now connected participants.

Telemedicine continues to have wonderful support and growth; new connecting sites that have joined include the Fiji School of Medicine (FSM) at the University of the South Pacific in Oceania. Through collaboration with their endoscopic centre, TEMDEC hopes to strengthen this mutually beneficial relationship.

There’s no doubt that medical practitioners and researchers demand the highest quality content delivery when it comes to being an engaged and active participant in a telemedicine session.
**TEMDEC in Australia**

While the advanced capabilities of NRENs worldwide provide a sound basis for distributing vision of absolute clarity, the capture and broadcast of multiple diagnostically significant images from a range of instrumentation in itself is a challenge not for the faint hearted.

This challenge has been welcomed with open arms by James Bishop, Supervisor of Technical Services at the Clinical Skills Development Service, Royal Brisbane and Women’s Hospital. James has engineered and technically directed the telemedicine sessions for two Endoscopic Ultrasound Symposia from the Skills Centre enabling participation from professionals in Australia and throughout South East Asia.

“Unlike broadcast for TV, we have the liberty of distributing many video streams concurrently to multiple screens in multiple locations. A surgeon in theatre may wish to see an endoscope image on one monitor at full resolution, and an ultrasound image on the other also at full resolution. Remote viewers will need to see this exactly as the surgeon sees it, but may also want to see the particular technique being demonstrated by the surgeon as well. Rather than relying on the conventional picture-in-picture or cutting back and forth between several images, we can use the network to send all of these images at full HD resolution at the same time.”

And on the managing of audio between so many locations and environments? “Don’t get me started!!” he says. “Suffice it to say that while it’s always juggle the result makes the effort worthwhile.”

James’ work demonstrates how harnessing the network adds a new dimension to medical teaching and learning methodology.

Below: Remote viewers are able to see an endoscope image on one monitor, and an ultrasound image on another exactly as the surgeon sees it, whilst observing the particular technique being demonstrated.
Rolling out AARNet4

AARNet4 is upgrading and building out the underlying optical transmission network to support up to 80 channels each of 100Gbps, as well as interconnecting the various inter-capital legs to allow more dynamic redundancy and provisioning of new services.

It replaces the AARNet3 routed backbone with a distribution layer of 100Gbps-capable devices, capable of layer-2 and layer-3 VPN services in addition to the current routed Internet access. It is enabling the use of more economic customer equipment. The benefit of evolving towards the three-layered approach of AARNet4 is a higher speed optical backbone, with a distribution network allowing consequential regional switching and VPN functionalities, and a central Internet routing core.

This year we have completed the optical network from Adelaide to Perth and on to the Murchison Radio-Astronomy Observatory (MRO) in remote Western Australia.

Spanning approximately 3500 kilometres this terrestrial network is capable of providing 80 channels each of 100Gbps and transmission speeds of up to 8 Terabits per second (Tbps). This was a feat of engineering with Cisco and AARNet’s optical engineers working together to install equipment at some 30 repeater sites across remote and inhospitable terrain. On the East Coast we installed 100G transponders on our existing optical network to upgrade the Canberra to Sydney link to 100Gbps.

Massive boost for international connectivity to the USA

In June AARNet completed the 40Gbps upgrade on the northern path of the SXTransport submarine optical fibre link connecting Sydney to Seattle.

This upgrade boosts bandwidth from 10Gbps to 40Gbps, for ‘big data’ transport ahead of anticipated demand, and to ensure that Australia continues to play an integral role in major research programs, such as radio astronomy, climate modelling and high energy physics. AARNet customers are now benefitting from optimised international unmetered use of the network regularly achieving individual data streams of 7Gbps.

The partnership between AARNet and Southern Cross Cable Networks (SCCN) is now into its 10th year and plays a critical role in astronomy projects such as the Square Kilometre Array (SKA), and the Australian Square Kilometre Array Pathfinder (ASKAP) projects.

National Research and Education Networks (NRENs) are rapidly moving to reinvent themselves in this global open exchange world – the concept of becoming Global Research Networks (GRENs) to meet the future demand for high-performing international data connectivity is imminent.
The Black Spots Fibre benefits Geraldton and Darwin

One of the most beneficial announcements from the Commonwealth Government was the RBBP or Blackspots Program announced in February 2009.

The RBBP is separate to the NBN and AARNet has an IRU or services on all sections of the RBBP. One section Toowoomba, Darwin (some 2,500 kms) has given a quantum upgrade to 10Gbps for our NT customers, who now connect to our new commercial PoP in Darwin. Northern Territory schools now connect at 1Gbps making them some of the best regionally connected schools in Australia.

Building the last mile

The Education Investment Fund (EIF) allowed AARNet to build dark fibre in nearly every state. While the network design builds in diversity and redundancy across all elements of the backbone, the last mile will continue to be a significant undertaking for AARNet.

We built fibre tails into the Sunshine Backbone in Queensland connecting customers from Brisbane to Cairns.
We built three fibre rings; two in the Sydney Basin and one in Perth, replacing leased services with lifetime fibre to connect university campuses and countless fibre tails for schools, cultural institutions and medical research in just about every state of Australia.

In Victoria we built fibre to connect some nine schools in Kew.

As well, AARNet has collaborated with councils and with other carriers and utilities to build or swap fibre in order to connect customers in the most cost-effective manner and extend our reach to new areas. In all AARNet has built more than 50,000 pair kms of dark fibre generating a great asset of some 15 million pair kilometres of optical fibre Australia wide.

Our Infrastructure Development Team is a dedicated group of optical specialists enabling significant growth in our optical backbone and will be instrumental to the success of AARNet4.

...and many more 10Gbps customer connections

AARNet continued to replace and upgrade customer connections from 1Gbps to 10Gbps extending capacity and performance out to the network edge, facilitating the ever increasing bandwidth intensive applications.

Most large universities are now dual connected at 10Gbps and increasingly the regional universities such as Griffith University now connect at 10Gbps. AARNet connected its first school Scotch College at 10Gbps and many research customers such as DERM in Queensland.
Asia ConneXions: Connecting Minds, Creating Futures

Five-year-olds who start school in Australia today will enter their adult lives at the time the Asian region will host the world’s most influential economies. Preparing for a hyper connected Asian-centric world requires school age students to develop global competencies including knowledge and understanding of Asian societies, cultures, beliefs and environments, and the connections between the peoples of Asia, Australia and the rest of the world.
Students studying Mandarin at Abbotsleigh, for example, conferenced with students in Hong Kong to practice speaking skills and learn about life in each other’s countries.

“It’s an authentic experience – the girls are making real global connections. It’s linking them to the real world.”

NAOMI MANNING, ICT INTEGRATOR, ABBOTSLEIGH

Year 7 students at Knox, connected with students the same age at a school in South Korea. Over several sessions the students shared information with each other about national landmarks, interests and what they do in their spare time.

“We learnt so much about Korea – it was like going on an exchange without leaving the classroom.”

KNOX GRAMMAR SCHOOL YEAR 7 STUDENT

The program also fostered a visit by the Korean Ministry of Education’s Student Welfare Policy Division accompanied by twenty primary and secondary school teachers who visited Knox Grammar and St Aidan’s Anglican Girls School to observe how Australian schools are using Information Communications Technology (ICT) for teaching and learning.
Global CEO Forum gathers momentum

The Global NREN CEO Forum held its third face-to-face meeting in Cape Town, South Africa on December 12th and 13th to review key global initiatives for adding value to the research and education community at the global level.

The focus was on the practical implementation of a global network architecture, realtime communications, global services, and federated identity management. Two new areas of challenge were identified; security and mobility.

There was a great sense of community with the CEOs developing an NREN Action Team that will look at how established research and education networks can help developing NRENs, and how research collaborations, e.g. in health, that emerge can use the services of the R&E Networks effectively. Being in South Africa there was keen interest in how to best form and shape the dialogue between the Square Kilometer Array (and possibly other big science disciplines) and the network community.

AARNet’s Unified Communications Exchange (UCX) continues as an NREN global initiative

A service for AARNet customers to extend video calls beyond the enterprise to other participating AARNet connected customers was endorsed by the global NREN CEO’s as one of the first product developments to be deployed globally.

The AARNet UCX supports the full range of Unified Communications from high-end telepresence systems, through to room-based video conferencing, video phones, desktop video conferencing to mobile applications on Android and iOS. Early adopters, such as AIMS, CSIRO, ANU, Monash, Deakin, Swinburne, Victoria University and more, have enjoyed using the UCX for several years with some excellent results.

AARNet has direct SIP peering links to Internet2 in the USA for full immersive Telepresence systems and predominantly uses ENUM (E.164 Number Mapping) addressing protocols to route UCX calls. These protocols which are an extension of the Internet Domain Name System (DNS) are now being used by the National Research and Education Networks in over 30 countries around the world in Europe, Asia and the Americas.
Eduroam’s expanding footprint

Eduroam, the global secure roaming connectivity service for education and research, has seen improved global governance through the establishment of the Global Eduroam Governance Committee.

Eduroam’s footprint is increasing steadily in Australia. All except one Australian university participate in Eduroam AU and other research organisations including CSIRO, ANSTO, NICTA, AIMS and Intersect. NSW Health commenced participation in Eduroam AU during 2013, joining QLD Health and various other health institutions in other states and territories. AARNet’s TAFE customers are also participating in Eduroam. As education and research users increase reliance on wireless connectivity, Eduroam usage continues to increase exponentially.

AARNet is actively involved in improving global Eduroam service delivery through its global collaboration. Standardising ‘ancillary services’ for global service delivery (e.g. services enabling operational deployment, monitoring, metrics and support) is a key goal of AARNet’s Eduroam team.

Bill Efthimiou speaking on the AARNet UCX at the 2013 QUESTNet conference.
NREN Representatives open the inaugural TEIN*CC Governors’ Meeting in Seoul, Korea.
The world’s largest research and education network connecting 55 million researchers; Australia to Asia – Asia to Europe
Two thousand years later, Asia and Europe are reconnected through the Trans-Eurasia Information Network (TEIN), with its noble goal of “Co-prosperity for Asia and Europe.”

In 2010 the 8th Asia-Europe Meeting (ASEM8) Summit in Brussels, endorsed the 4th phase of the TEIN project and the establishment of the TEIN*Cooperation Center (TEIN*CC). TEIN is the world’s largest research and education network providing dedicated high-capacity Internet connectivity for research and education communities across Asia-Pacific. Today the “Digital Silk Road” has over 55 million users in universities and research centres across China, India, Indonesia, Japan, Korea, Malaysia, Nepal, Pakistan, the Philippines, Singapore, Sri Lanka, Thailand, Vietnam, Australia, Bangladesh and most recently Cambodia.

Starting with a single circuit between France and Korea in 2001, TEIN now bridges the digital divide and tackles the challenges of earth observation, climate research, food security, delivery of e-health and e-learning. TEIN is a model collaboration overseen by Governors from the Member States and the peak body, the Steering Committee, elected by the Governors. The future for TEIN is in reinforcing unity among the regional research education networks and in expanding its global IT leadership to include the developing countries of the Asia-Pacific.
Box and CloudStor lead our ‘above the network’ services program

Box has been deployed widely across the higher education sector internationally and counts among its customers an impressive list of prestigious universities in the USA, including Stanford University, University of California – Berkley, Cornell University and Carnegie Mellon University.

Box features will be customised for Australia’s research and education sector; AARNet customers will be able to rapidly deploy Box services to their entire organisation and manage how content is distributed across multiple devices and shared between internal users and external collaborators. Box services will be integrated with university provisioning and security systems, and the Australian Access Federation.

Early adopters across the University, VET and K-12 sector are currently rolling out trials of the service, an important part of the evaluation process.

Research and education institutions are moving away from their legacy systems and instead seek technology that mimics what students have become accustomed to in their personal lives. Box marries ease of use with enterprise-class security and management features. Box for AARNet is being offered as part of AARNets ‘above the network’ services program to provide a choice of ‘above the network’ services customised to meet the needs of the AARNet community. The AARNet ‘above the network’ services program leverage the high capacity, high performance AARNet4 network.

Australian first for Box

AARNet can now provide Box’s cloud content and collaboration management platform to all research and education institutions in Australia, via an Enterprise Customer Agreement customised for the Australian Research and Education sector.

The Box service provides a simple, secure and scalable method for campuses to rapidly deploy Box’s content sharing and collaboration service to their entire community; students, faculty and staff.
CloudStor grows up into Cloudstor+

CloudStor, the web platform enabling researchers to transmit files too large to be sent using email, has grown into what can only be described as a phenomenon.

The platform was introduced in June 2010 and was developed by a cooperative of NRENs from across the globe. In three short years 11,000 users have flocked to the service in Australia alone transferring files every hour of every day of the year. Last year, on average one file was transferred every five minutes.

These new users have brought with them many new ideas and AARNet, as part of the international community that developed the software on which CloudStor is based, has turned them into a reality.

Users wanted to ensure file integrity; in effect a digital “seal”. We are working with Australia’s peak measurement body, the National Measurement Institute, and the Australian Government’s VANguard program to provide cryptographic time stamping and verification to do just that.

The user community also identified security as an issue. Most systems secure data by uploading an unencrypted file and encrypting it on the server, meaning the server must know the password, representing a security weakness.

AARNet has employed encryption using the user’s browser to provide the highest level of assurance. These features are now in beta with plans to bring them into production later in 2014.

During 2013, AARNet launched CloudStor+ “Personal Storage for Super Users” – providing 100 gigabytes of storage for individual researchers. The platform was integrated with the Australian Access Federation (AAF) and rolled out in Brisbane, Melbourne, and Perth. This unique geographic approach has achieved previously unseen transfer speeds to the researchers desktop.

Over the past year, some 56 institutions have helped test the platform, entrusting the storage and transferring many terabytes of data to the service. With the help of our customers, we are now progressively rolling out CloudStor to researchers around the country.
Revolutionising Plant Pest and Disease Diagnostics in South East Asia

The Australian Centre for International Agricultural Research (ACIAR) has, along with Dr Gary Kong from the Cooperative Research Centre for National Plant Biosecurity in collaboration with CSIRO and the Australian, Queensland and Thai departments of agriculture, put Australia at the forefront of technology-based biosecurity support with the development a remote microscope network.

This remote microscopy network has linked Thai quarantine officers to Australian experts in plant pests and diseases, dramatically increasing Thailand’s capability to respond to potential or real incursions from across its borders. The success of this program has led to its expansion to other countries in the region, including Laos and Cambodia. Some national research highlights include improved production and profitability from central Vietnam’s sandy soils, developments in the use of teak and paper mulberry in Laos, and identification of elite rice lines well suited to Cambodia’s lowlands.

There are currently 58 remote microscopes throughout Australia and in Thailand, Vietnam, Laos, Singapore, Malaysia, Indonesia, East Timor, Papua New Guinea, the Solomon Islands and New Zealand.

This network enables remote diagnostics of biosecurity threats with fast and accessible information on outbreaks of exotic plant pests and diseases through a web-based diagnostic system. The concept of Remote Microscope Diagnostics (RMDs) is attractive because it allows non-experts in remote locations, to interact with diagnostic experts in real time, to identify a pest specimen. Of immediate application to insect identifications, RMDs use the Internet to connect a microscope to a computer in another location.
The network provides information ranging from basic biology to molecular and taxonomic methods, meeting the needs of industry, scientists and government.

Dr Kong’s team, which led the development of the remote microscopes service, was recently awarded a Queensland Premier’s Award for Excellence in Public Service Delivery, which recognises excellence, best practice and improvements in public service delivery, and also won the inaugural Australian Innovation Award in the category of Agriculture and Food.

The Australian Centre for International Agricultural Research (ACIAR) is a statutory authority that operates as part of the Australian Aid Program. The Centre encourages Australia’s agricultural scientists to use their skills for the benefit of developing countries and Australia.

ACIAR funds research projects that are developed within a framework reflecting the priorities of Australia’s aid program and national research strengths, together with the agricultural research and development priorities of partner countries.
Huge volumes of complex satellite and weather data must be captured, analysed and shared quickly. Only high-speed data networking can ensure that the right information gets to the right people in time to make a real difference. Indonesia has the world’s third largest area of tropical rainforest after the Amazon and Congo basins and suffers fires every year. These are most fierce when El Niño creates drought and windy conditions; an increasingly common occurrence. The 1997/98 wildfires alone spewed as much carbon into the atmosphere as the entire planet’s biosphere removes from it in a year. The fires, which destroyed nearly 5 million hectares of forest, released as much as 2.5 gigatonnes of CO₂ — the primary greenhouse gas — significantly fuelling global warming.

Wildfires scorching Indonesia often also blanket neighbouring countries in a choking haze, adding to regional pollution, causing severe long-term health problems and wreaking havoc on transportation. FireWatch Indonesia is a collaborative project that aims to reduce the impact of wildfires.

FireWatch Indonesia is a collaborative project that aims to reduce the impact of wildfires. Major wildfires bring devastation, loss of life and damage to property and the environment. Tackling them effectively requires an accurate flow of up-to-date information on fire movements and dangerous hotspots.

Western Australia’s FireWatch: Helping Indonesia Mitigate the Impact of Fire

Indonesia’s Ministry of Environment is working with Western Australia’s Landgate FireWatch team to provide near real-time monitoring, using data collected by two satellites that regularly cross Indonesia.
Based on Landgate’s Firewatch System for Australia, the project has designed, built and installed a fire monitoring system covering the whole of Indonesia to enable the generation of valuable fire monitoring information to effectively fight fires. This information will enable early detection of fires leading to their suppression and minimising the spread of fires into Indonesia’s forest and peatland habitats.

FireWatch Indonesia delivers essential fire monitoring information via a web-based data delivery system called IndoFire.

The system will provide free and open access to all stakeholder groups including public and private sector agencies at all levels. IndoFire is designed to integrate with Indonesia’s developing Forest Monitoring Systems (FRIS). The data is sent via AARNet and INHERENT, the research and education networks of Australia and Indonesia respectively, to key agencies in Indonesia. TEIN4, the regional backbone network, creates the interconnection between the two national counterparts.
The Organisation
AARNet Pty Ltd [ACN 084 540 518] is the not-for-profit company that operates the AARNet network, providing high-capacity Internet services to Australia’s universities, research institutions including CSIRO, DSTO and ANSTO, and other research and education organisations.

 Shares in AARNet Pty Ltd [AARNet] are held by thirty-eight Australian Universities and the CSIRO as listed in the enclosed AARNet Financial Report. AARNet is a licensed Australian telecommunications carrier [#61 under the Telecommunications Act 1997 Cth].

The Chief Executive Officer reports to the Board of Directors listed in the enclosed AARNet Financial Report Appendix A. 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.

The AARNet Board of Directors
The Board of Directors, see the enclosed AARNet Financial Report, is responsible for the overall direction of AARNet and for providing benefits to the shareholders as required under the constitution.

For more than 20 years, AARNet has shared and exchanged expertise with our shareholders and customers in many ways, supporting national, international collaboration and innovation in research and education and networking.

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.

...and our team
The skill of our people and the culture they have created has resulted in a small effective group of highly motivated, dedicated and expert staff.

The CEO, together with the Senior Management Team, continually strive to add depth to the AARNet experience.

The dedication of our team has enabled our national research and education network to develop and maintain one of the largest operational footprints in the world.

John Batchelder
Manager, Business Development
Owning and operating our own optical infrastructure has transformed AARNet into an asset owner and operator. With this capability AARNet requires skilled and competent network operations, infrastructure resources and the commercial expertise to continue to deliver to our customer freedom of connectivity not previously seen in Australia.

During 2013, the total number of AARNet employees grew to 74. The growth in our numbers reflects the need to efficiently resource the organization for improved customer service and infrastructure growth to meet the demands of our customers and shareholders.

This year the AARNet team welcomed Stephen O’Brien, Paul Hii, Tao Ren, Waran Naidu, May Kho, Mark Van Dyk and IuPati Tumaalii. AARNet also welcomed back Peter Elford, who took up the inaugural position as Director, Government Relations.

It is with much sadness that we farewelled Mike Rebbechi who retired after 33 years in the research and education sector. Mike has been associated with AARNet for more than 25 years. Starting as an academic in engineering at Charles Sturt University, Mike then became the CIO. Mike served for 6 years on the AARNet Board, the AAC and most recently headed up the health initiative in Business Development for AARNet. Mike has worked across the spectrum of AARNet with great distinction and will be greatly missed for his wisdom and good humour.

AARNet will continue to require higher financial resources and a greater number of expert and skilled staff for long-term planning and operation of the network to meet the growing dependence on networking technology, services and applications for research and education. In parallel AARNet will continue to foster and develop its technical and business staff and management who are working to deliver enhanced customer service, network, and infrastructure growth to the Australian research and education community.

Important Publications

Previous Annual Reports:

AARNet’s Access Policy:

AARNet’s Peering Policy:

AARNet’s Content Policy:
CSIRO is increasing its outreach across the Asia-Pacific region to support the adoption and impact of research to build on science excellence and to forge strategic alliances that will provide benefit to Australia and the greater region.

More specifically the Flagship is working to increase access to safe water and to inform policies and strategies that support effective water resource management.

Collaboration with key partners is central to CSIRO's ability to deliver science excellence on an international scale. The Flagship represents approximately AUD 85 million per annum investment in applied water-related research. It is the largest water research partnership in Australia with the equivalent of nearly 260 full-time staff. The Flagship brings together scientists from a wide range of disciplines, to form interdisciplinary teams to solve complex water resource challenges in the context of a changing climate and increasing population.

The Flagship has utilised AARNet to demonstrate an ability to design and deliver trans-boundary integrated water resources management solutions.

Water management is highly connected to other sectors, in particular food and energy production.

Water: a Finite Resource

CSIRO's Water for a Healthy Country Flagship is growing and strengthening our engagement in international water-related research.
One such ground-breaking collaborative project is the CSIRO driven India-Australia Water Science and Technology Partnership, where CSIRO is helping to strengthen water resources management in India, supporting poverty alleviation and sustainable development. CSIRO has also partnered with the University of Melbourne to establish the Australia-China Joint Research Centre on River Basin Management. The Exploring Mekong Region Futures project, a trans-boundary project led by CSIRO, focuses on the dynamic interactions that occur with the management of food, energy and water at local and regional scales in countries in the Mekong region, and the work with the Jiangxi Institute of Water Science in China has completed a study on the removal of excess nutrients and other contaminants from agricultural and domestic wastewaters in Jiangxi Province, China.

CSIRO is a powerhouse of ideas, technologies and skills for building prosperity, growth, health and sustainability. It serves governments, industries, business and communities across the nation.

The advanced network connectivity provided by AARNet makes this work possible. Almost everything the Centre accomplishes through its world leading research collaborations relies on the capabilities of AARNet.
Panoramic Immersion at the Forefront of Virtual Heritage

A virtual life-size human-scale replication of China’s Dunhuang caves provides students with the opportunity to dynamically explore and interact with one of the most important cultural sites in the world in new and exciting ways.
Through immersive interactive 3D projections of high-resolution archaeological datasets, audiences are transported inside the caves as if they were physically there. They are able to interactively explore the spatial layouts of several caves as well as cultural objects, including sculptures and wall paintings, guided by teacher experts.

Research leader at the National Institute for Experimental Arts Professor Sarah Kenderdine’s research has transformed this environment into a world touring exhibition.

The next stage is to create a groundbreaking immersively-shared virtual classroom bringing content-rich humanities data for Silk Road studies across three distributed learning sites - City University of Hong Kong, The University of Hong Kong and the University of New South Wales - using Internet and broadband-connected Integrated Visualization System (IVS) technologies. Real-time broadband data transmission and integration of graphics, video and audio, utilising HARNET, AARNET and the Internet2 backbone, enables real-time distributed cross-cultural interactivity for teachers and students.
Enterprise Services turns 1

The Enterprise Services group, an independent technical consulting service completed its first full year of operation.

The group was formed following requests from customers for access to vendor neutral expertise that is committed to and understands the needs of the education and research community. This year the group has focussed on network architecture and technology services, cloud infrastructure services, rich media collaboration services and enterprise IT planning services – the team also formed strategic partnerships with AUSCERT for an independent network security review and Smart Services CRC for benchmarking and reporting capabilities for the end-to-end performance of cloud service providers. Services are expected to launch in 2014.

A Customer Forum for each University

AARNet has taken the initiative this year to hold Customer Forums for each of the shareholders and conduct them on an institutional basis.

The aim of the Customer Forums is to obtain feedback from shareholders on AARNet’s performance at all levels across the institution and to gain knowledge to develop products and services that utilise the AARNet network for the benefit of the research and education sector.

Each forum has attracted a wide range of university staff including CIO’s, Directors of IT and staff from across the IT departments of the University. Researchers as well as teaching and learning staff have also participated and provided valuable input.
AARNet Advisory Committee

2013 Annual Report
The AARNet Advisory Committee (AAC) represents ICT management across the AARNet member community.

The AAC makes recommendations, advises and represents a consensus of views held by the member community. AAC also assists AARNet Pty Ltd (APL) to effectively communicate with its members, both directly and via regional network organisations (RNOs) where they exist.

During 2013 the AAC met on four occasions providing advice to the AARNet Board and senior management on a range of operational and strategic matters. Meetings were held once in Canberra, twice in Melbourne, and once by Videoconference.

Initiatives
Following the revision of AARNet’s strategic plan in 2013 the AAC focused on assisting AARNet with the implementation of new “above the network” business initiatives including NET+ services, development of the CloudStor/CloudStor+ and the new enterprise consulting services.

The AAC recognised the importance of AARNet4, and to the implementation of the various National Research Network (NRN) projects, all of which were well progressed by the end of 2013.

The focus on regional matters was maintained with great interest in the three prospective commercial submarine cable builds from Perth to Singapore.

The Future
As AARNet moves toward a national and international 100Gbps backbone, the AAC contributed to the development of AARNet’s Future Technology Roadmap, where we will see 1Tbps (1,000Gbps) interconnections between cities over an optical backbone capable of multiple 10Tbps bearers.

It is this roadmap that will support the emerging data centre, cloud and mobility landscapes, and the growth of the research and education sector over the next ten years. The road map feeds into AARNet’s long range strategy which provides a sustainable vision for the organisation and the network into the foreseeable future.

AARNet would like to sincerely thank the AAC committee for their invaluable input and support during the year.
University of Adelaide Vice-Chancellor and President, Professor James McWha AO, said the partnership offered a unique model of operation. “It’s an exciting venture that can only strengthen the ties between our two countries and we are very grateful for the support of China’s State Administration for Traditional Chinese Medicine.”

“This significant partnership offers a unique model of operation; bringing together an Australian university, a Chinese university, and direct investment from a Chinese company in a ground-breaking development that offers tremendous opportunities for creative research and new discoveries with potential health benefits for us all.

AARNet allows the universities to diminish time and space, utilising the network to share data in real time and work to bring together exponents of traditional Chinese medicine with molecular science - opening the way for new funding and the expansion of interest in traditional Chinese medicine and its potential use in global healthcare.

The Zhendong Centre was launched at an event which also marked the 40th anniversary of diplomatic relations between Australian and China. Those present at the event included the Vice Minister of Health and Director of the State Administration of Traditional Chinese Medicine Wang Guoqiang, Australian Ambassador to China Frances Adamson, Executive Chairman of China Pharmaceutical Industry Research and Development Association Song RuiLin,
Shanxi College of Traditional Chinese Medicine President Professor Zhou Ran, Zhendong Pharmaceutical Company Chairman Li Anping and University of Adelaide Vice-Chancellor and President Professor James McWha.

At the University of Adelaide, the Zhendong Centre will be based within the School of Molecular and Biomedical Science. The Centre will investigate the mode of action of Traditional Chinese Medicine using the rapidly growing field of Systems or Network Biology which looks at the regulation of complex biological systems in the body.

“The application of systems biology to Traditional Chinese Medicine is particularly exciting because it explores what effects there may be on the molecular/genetic networks that are altered in sickness,” said Director of the Zhendong Centre, Professor David Adelson.

“This not only will provide us with an understanding of how Traditional Chinese Medicine acts – supporting its evidence-based integration into Western medicine – but will also increase our understanding of the molecular mechanisms underlying disease.”
Appendix A

List of Shareholders
The Australian National University
The Commonwealth Scientific and Industrial Research Organisation
University of Canberra
Charles Sturt University
Macquarie University
Southern Cross University
The Australian Catholic University
The University of New England
The University of New South Wales
The University of Newcastle
The University of Sydney
University of Technology, Sydney
University of Western Sydney
University of Wollongong
Charles Darwin University
Bond University
Central Queensland University
Griffith University
James Cook University
Queensland University of Technology
The University of Queensland
University of Southern Queensland
University of the Sunshine Coast
The Flinders University of South Australia
The 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
University of Ballarat
Victoria University
Curtin University
Edith Cowan University
Murdoch University
The University of Western Australia

Board of Directors
Emeritus Professor GR Sutton AO
Chair of the Board and Chair of the Nomination and Remuneration Committee
Professor MN Barber
Mr OJ Barrett
Deputy Chair of the Board and member of the Audit, Finance and Risk Committee
Mr CM Hancock
Chief Executive Officer
Professor L Kristjanson
Mr P Nikoletatos
Chair of the AARNet Advisory Committee
Mr JF Rohan
Chair of the Audit, Finance and Risk Committee and member of the Nomination and Remuneration Committee
Dr I Tebbett
Emeritus Professor MS Wainwright AM
Member of the Audit, Finance and Risk Committee
Professor IR Young AO
Mr N Poole
(to 31 December 2013)
Member of the Nomination and Remuneration Committee
Mr M Bailey
(to 4 March 2014)
Dr David Williams
(from 10 January 2014)
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