# REANNZ ANNUAL REPORT

Year ended 30 June 2021

REANNZ

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# VISION /

To support and enable data intensive research in New Zealand.

# MISSION /

Design, build and operate New Zealand's high-performance network and provide supporting services that enable members and users to connect and collaborate with each other and the global NREN ecosystem.

# VALUES AND DRIVING PRINCIPLES /

›   **Being fair, open and respectful**: to be open minded and respectfully discuss and debate thoughts, ideas and plans to broaden and further inform beliefs and approaches. To be a reliable, stable, non-commercial and neutral partner for members.

›   **Being good partners**: collaboration and strategic partnerships are fundamental to improving science and research outcomes for New Zealand. REANNZ is developing partnerships that benefit all parties and increase public value.

›   **Exercising responsible stewardship**: careful and responsible management of the assets and resources that have been entrusted to the care of REANNZ.

The driving principles are:

›   Technical excellence

›   Focus on the important

›   Leverage off strengths for the common good

›   Be flexible and adaptive

›   Be outward looking and curious

# TE TIRITI O WAITANGI /

REANNZ is committed to the principles of Te Tiriti o Waitangi. REANNZ's goal is to foster meaningful connections between Māori and the research and innovation system, and to grow opportunities for Māori science, research and innovation. REANNZ will support the Government's aims to build a more inclusive and diverse research, science and innovation community.

# BOARD CHAIR'S REPORT /

On behalf of the REANNZ Board and team I am pleased to present the Annual Report for 2020/21.

This year has seen REANNZ continue to focus on building shareholder confidence. This is an ongoing journey but responses from our stakeholders suggest that this has largely been achieved. The allocation of additional funding from the Government also recognised the important role that REANNZ plays to support and enable data-intensive research collaboration both in New Zealand and on a global scale.

The ongoing need for remote learning and working, real-time collaboration, increasing regional research collaborations and the sharing of research data continues to reflect the importance of the REANNZ network during times of flexibility and change. Offering consistent latency and reliable international connectivity remains crucial to supporting REANNZ members and the Government's future strategies for the Research, Science and Innovation (RSI) sector.

REANNZ now has the opportunity to position itself for the future with confidence and to enable New Zealand's ability to participate in global data-intensive research collaboration with international partners. The team, Management and the Board continue to be committed to REANNZ's success.

Engagement continues to grow across multiple levels within the community and has resulted in increased opportunities for collaboration. It is REANNZ's role to ensure that members gain the full value of having access to both an international and national research and education network.

This year also saw the departure of Dianna Taylor as REANNZ CEO. Through her leadership, knowledge and enthusiasm, Dianna made a large and positive contribution to REANNZ since her appointment. The Board has undertaken a comprehensive recruitment process and are pleased to welcome Amber McEwen to the role of CEO of REANNZ. Amber joins REANNZ at an exciting time in the organisation's development and is recognised as a highly capable leader.

REANNZ Chair Janine Smith, MNZM

Finally, my thanks go to my fellow Directors and to the REANNZ team for their continued enthusiasm and dedication during these periods of change. Thank you also to the members for your support during another important year. REANNZ remains committed to supporting your collaborations and work, that continues to demonstrate New Zealand's world class researching capabilities, both during the COVID-19 response and beyond.

We look forward to working with you next year and further understanding your needs and future direction, so that REANNZ can ensure that we deliver to your requirements.

Janine Smith MNZM
Chair

# CHIEF EXECUTIVE'S REPORT /

Kia ora tātou

REANNZ has seen another successful year and I am proud to reflect on the organisation's achievements during my time as CEO. We made significant progress towards becoming an organisation that is focused on member engagement and effective delivery. I am confident that the team are well positioned to support and enable data-intensive research collaboration both in New Zealand and on a global scale.

The board and I welcomed the Government's Budget allocations for 2021 that provided REANNZ with additional funding under the Strategic Science Investment Fund - Infrastructure category. This funding will provide financial sustainability and enable the organisation to continue to support the Research, Science, Innovation (RSI) and Education sectors of New Zealand. This investment has been a result of the hard work that the REANNZ team have done to re-orientate the business, focus on operating costs and better support our members and wider community.

With the extended impact of the pandemic becoming clearer over time, our focus remains to support our members' and their changing needs and continue to learn from our experiences. Despite the challenges caused by COVID-19, the RSI community in New Zealand has demonstrated its commitment to data-intensive research collaboration through their essential contributions to New Zealand's COVID-19 response.

Collaboration is a key value that is shared across the RSI sector and the wider NREN community. This was celebrated during the eResearch NZ 2021 conference in February, hosted by the REANNZ team and sector partners NeSI and Genomics Aotearoa at Victoria University of Wellington. The event saw representation from across the eResearch community and provided the opportunity to build connections and demonstrate the work of key collaborations and research projects across the sector.

REANNZ's key purpose is to enable New Zealand research institutions to access and participate in international research and science collaboration. This year has seen our partnerships and internal projects enable us to better meet these growing research needs, with purposeful engagement with members, key sector partners and the global NREN community.

Dianna Taylor, Chief Executive

There are exciting opportunities ahead as the organisation delivers on the strategic initiatives for the coming year, detailed in the Statement of Performance Expectations 2021-2022. Our priority initiatives will ensure that the products, services and the network that we provide are fit for purpose and sustainable. A huge percentage of the community agree that a number of science initiatives with large scale data requirements could not occur without the reach, reliability and speed of an advanced network and it is REANNZ's role to continue to enable and facilitate its use.

I have thoroughly enjoyed my time at REANNZ, most of all working with our members and the wider sector. I am proud to have worked alongside a community that is so passionate and committed. Thank you for your ongoing support of REANNZ, as the organisation continues to support and enable members in its role as New Zealand's National Research and Education network (NREN).

Ngā mihi,

Dianna Taylor
Chief Executive

# ABOUT REANNZ /

## Our Board

### Janine Smith MNZM, Chair

Janine Smith MNZM, was appointed a Director and Chair of REANNZ in November 2018. She has over 20 years' experience as a non-executive director with experience in public-listed, private and Crown-owned companies. Janine has held her most recent role as Chair of Asure Quality for the last nine years. Janine also trains and advises board's in governance through her role as an executive director of The Boardroom Practice Ltd. She is currently a member of the AUT University Council, an independent member of Fonterra's Governance Development Committee, President of London Business School's Auckland chapter and a director of several private companies. Janine was awarded a Member of the New Zealand Order of Merit in 2015 for services to corporate governance. Her appointment as Chair of the REANNZ board is until 30 June 2024.

### Ross Peat, Deputy Chair

Ross is Executive Director and co-owner of health technology companies Health Soft New Zealand Ltd and Health Soft Australia Ltd, and is Chair of AUT Ventures Ltd. He is a Founding Investor of the Tuhua Ventures Fund (angel and early stage investment), a director of e-waste recycler Mint Innovation, and is deputy Chair of the NZ Health IT (NZHIT) industry body. Ross' appointment to the REANNZ board has been renewed until 31 December 2022.

### David Skinner

David is an executive director of Gravelroad Consulting specialising in infrastructure and public policy risk economics. He has had a management career in telecommunications, electronic banking, and defence. Previous positions include Managing Director of Netway, Hypercom, and COO positions in Clear Communications. He has lived and worked previously in the UK, Europe, and Australia. He holds a BE from Canterbury University and an MBA from Auckland University and is an associate fellow of the NZIM. David is appointed until 30 June 2024.

### Liz Gosling, People and Culture Committee Chair

Liz is the Chief Information Officer at Auckland University of Technology (AUT). She brings three decades of experience in the IT sector in New Zealand, the US, UK and Europe. She was a Director and faculty member of the Council of Australasian University Directors of Information Technology (CAUDIT) Leadership Institute in Australia, and the New Zealand invited representative on the CAUDIT Executive. Liz has chaired the Universities NZ Information and Communications Technology Committee and is a previous Chair of TUANZ. Liz has an MBA (HR Management) and is appointed until 30 June 2022.

### Professor Jim Metson

Professor Jim Metson is the Deputy-Vice Chancellor (Research) at the University of Auckland. He is a materials scientist, was a founding member of the MacDiarmid Institute for Materials Science and Nanotechnology, a co-founder of the University of Auckland Research Centre for Surface and Materials Science and of the Light Metals Research Centre. Jim chaired the MoRST Research Infrastructure Advisory Group and represented the New Zealand Government on the Australian National Science Advisor Committee that oversaw the development of the Australian Synchrotron. He served as Chief Science Advisor to MBIE from 2013-2016. Jim is appointed until 30 June 2022.

### Sara Brownlie, Finance, Risk & Audit Committee Chair

Sara is the Managing Director of Fargher Woods Ltd providing Programme Management services, an Independent Director for Catalyst.net Ltd and Independent Member of the Risk and Assurance Committee for Upper Hutt City Council. She is a Fellow Member of CPA Australia and a Chartered Member of the Institute of Directors in New Zealand and the Chartered Accountants Australia and New Zealand. Sara has had an extensive career working in senior management roles in the public sector. Sara is appointed until 30 June 2023.

# WHO WE ARE /
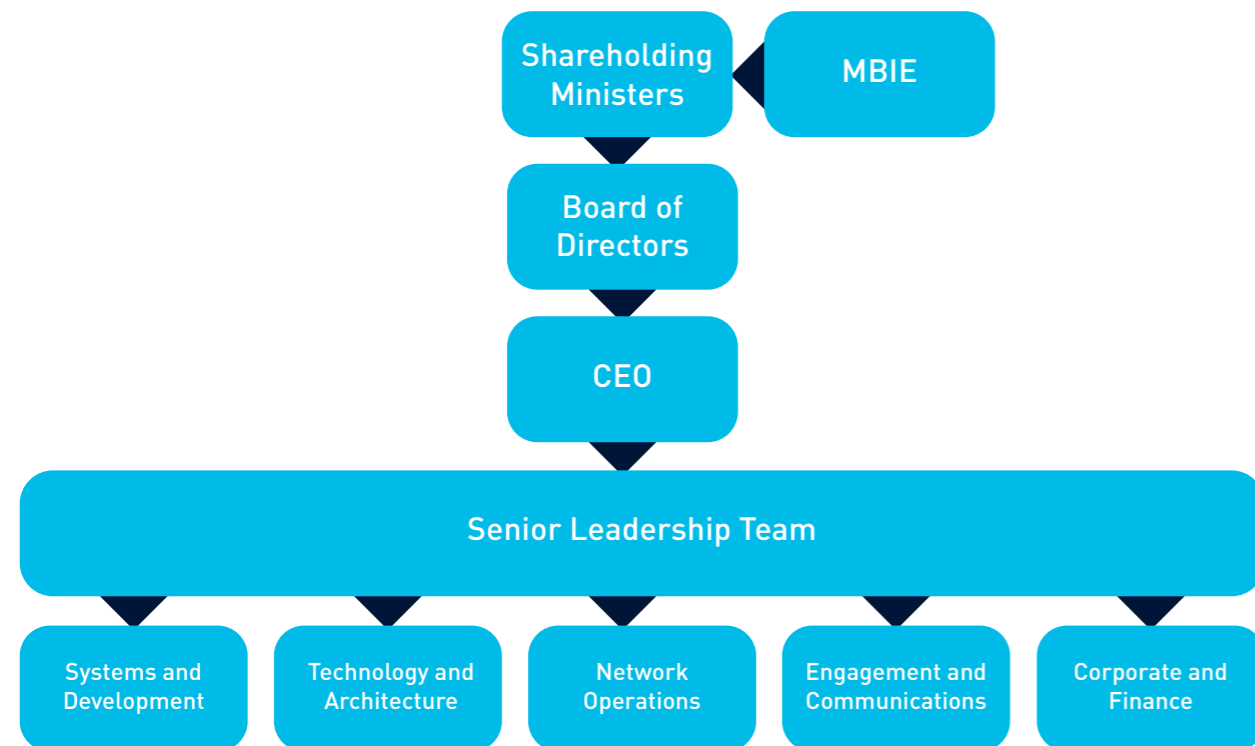


REANNZ teams support a number of functions across technical, corporate and engagement operations to meet the needs of our members and stakeholders:

The systems and development team are operationally responsible for desktop, server and cloud software and infrastructure as well as several products including eduroam and Tuakiri. They oversee the software engineering activity within REANNZ, working closely with the network team in developing solutions that support the REANNZ membership.

The technology and architecture team develop solutions that resolve technical issues, support member's network infrastructure and service needs in order to facilitate the secure, uninterrupted transfer of research data.

The network operations team monitor and design the network, working in partnership with member's technology teams to support an end-to-end view of the connectivity solutions in place. REANNZ Network Engineers are on call and available 24/7 for our members.

The engagement team work closely with our member's technology teams and researchers to support their use of the network. They facilitate collaboration and connection at a people level between our members and the wider community. The regional model established has brought the team closer to REANNZ members providing greater understanding and opportunity to develop deeper relationships.

Communications and marketing work alongside each function to coordinate communications activities and materials. They also participate in community and stakeholder engagement to surface and share examples of sector collaborations and research outcomes that have been enabled by access to REANNZ.

The Corporate and Finance team provides business support to the company and is responsible for financial and performance compliance reporting.

# ENABLING OUR MEMBERS AND SUPPORTING NZ'S SUCCESS /

With the growth of data and computationally intensive research happening across an increasing number of fields, both in New Zealand and internationally, organisations that support research infrastructure continually work to build relationships and partnerships that underpin the collaborative nature of the sector.

We believe in New Zealand's ability to lead in research, science and innovation. We provide the specialist network infrastructure and tools to shape the best solutions for members' needs and support their contributions to solving the world's science challenges.

REANNZ is a passionate advocate for the work our members do and the positive impact that the RSI community has on New Zealand's future. As a part of Aotearoa's eResearch ecosystem we enable our members to connect with the tools, people and resources that they need to be successful – at speed, anywhere in the world.

# OUR YEAR /

**100 Gbps**

National bandwidth available

**100 Gbps**

International network capacity to Australia and the United States

**38,438 devices**

no. of device connections via eduroam from overseas visitors

**2.6 million sessions**

Total number of sessions using Tuariki service

**1.1 million sessions**

Total number of sessions using eduGAIN services

**< 0.01% packet delay variation**

(< 0.01% of hourly measurements across the core network have over 20ms of packet delay variation)

**< 0.0001% packet loss**

(< 1 packet lost in every 1 million packets sent)

**95.92 Petabytes**

Total traffic flows

**99.9982% availability**

International network availability

## Our people

The challenges of recent times have presented opportunities for organisations to grow and support their teams, not only to ensure continuity and a high quality standard of operations, but to also support their people. REANNZ is continuing to learn from these experiences in order to grow and develop as a team and an organisation, formalised into frameworks that support our people and provide excellent service to our members. Business continuity during periods of lockdown and heightened alert levels have embedded a flexible working culture that is supporting our people to maintain a positive work and life balance.

## Our members

This year has also seen increased momentum for exciting projects and opportunities to support our members to use the network to its full value. Some examples include upgrading the capacity of NIWA's network ring to 100Gbps and converting Lincoln University over to REANNZ services at speed.

There have been many examples of the community coming together to support each other, demonstrating the collaborative nature of the research and education community here in New Zealand. A fibre cut caused by roadworks in Rotorua resulted in three core backbone links that connected members Scion, NIWA and Toi-Ohomai to lose connectivity. Working together with Toi-Ohomai's engineers, a clever solution was quickly established to deliver a VLAN (virtual local area network) across Toi-Ohomai's resilient infrastructure. This successfully restored connectivity to each site. More examples of how REANNZ members collaborate on both a national and international scale, and use REANNZ tools and services to support their contributions to research, science, education and innovation in New Zealand can be found in our Case Studies on page 22.

## Outreach

There has been increasing uptake of the unique NREN services that REANNZ provides, that are specifically designed to support the global research and education community to connect and collaborate including eduGAIN and eduroam. REANNZ has also established new services that reduce the barriers to accessing research instruments, tools and services remotely including eduVPN, Tuakiri Hosted IdP, DC Connect and MAE Lite. These outcomes have been the result of input and collaboration across our members, to gather requirements and ensure that our offerings are refined to meet members' needs. This approach is continuing to gather momentum with the successful establishment of a regional model for engagement and increasing communications. A full list of products and services can be found on page 34.

## Partnerships

REANNZ's role as New Zealand's NREN is to enable research collaboration through the network, access to services, specialist support and the partnerships that we forge. This includes relationship building across the RSI community here in New Zealand, around the world with international NRENs and our industry partners.

This year we have been able to grow our partnerships, enabling direct connectivity with key providers to better support the research community. A large project for this year was the International Network Completed Resiliency project, that was completed through our key partnerships with the University of Hawai'i, University of Guam and Hawaiki (Page 24). These relationships were further strengthened through the establishment of the APOnet a partnership (Page 22).

We are also committed to growing our partnerships and deepening our relationships with key sector organisations. Our shared objectives to enable the RSI community through access to eResearch skills, technologies and infrastructure increases the impact of research and science for New Zealand. These partners include New Zealand eScience Infrastructure (NeSI), Science NZ, Universities NZ and our members. Working in partnership across research and technology teams has been positively received by our stakeholders and we look forward to continuing to grow as a member centric, delivery focused organisation.

## eResearch NZ 2021

Theme: LEVEL UP

83 submissions received

153 people in attendance
– 92 in person and 61 virtually

The eResearch NZ conference series has provided an important national forum for strategic discussions, community building, and career development for New Zealand's research, science and innovation sector. The event brings the worlds of eResearch together with a wide-ranging group of participants. With active involvement from researchers, academics, students, technologist and their international colleagues, the conference is an opportunity to connect and share knowledge across countries and research fields.

Delegates explore innovative work-in-progress or recent project results where digital tools were applied, highlight current and emerging priorities, trends, and best practices in eResearch approaches, provide opportunities for skills training, professional development, and mentoring in digital research tools and eResearch applications. The event provides the opportunity to draw experience and inspiration from eResearch programmes and projects in other regions and build communities of practice that foster collaboration and knowledge-sharing within and beyond New Zealand's research sector.

In February 2021 the eResearch NZ conference took place both in-person and online for the first time, bringing communities in New Zealand and overseas together through virtual tools and in flexi learning spaces provided by Victoria University of Wellington. 2021's event was hosted by REANNZ with the valuable support and collaborative work between cohosts Genomics Aotearoa and NeSI. The conference tackled some key themes and ideas, with presentations and panel discussions on a variety of topics. The Keynote sessions considered the importance of communication through data, be that through the genomics sequencing that informed New Zealand's COVID-19 response and the collaborative effort across the sector that supported it, or through storytelling with data and the creative ways researchers can communicate their findings.

The variety and breadth of discussion across the event highlighted the multidisciplinary reach of the eResearch community and the value that this brings to the sector. Panel discussions on Te Ao Māori in eResearch, infrastructure funding, research resiliency and the technology and tools that support research organisations were some of the key topics discussed.

Hon. Dr Ayesha Verrall, Associate Minister of Research, Science and Innovation, opened the conference, sharing ways the government would look to grow the impact of the eResearch sector. This included levelling up funding, the quantity of data-intensive research, representation and diversity in the research workforce and strengthening connections. These key themes can continue to be built upon by sharing skills, experiences and resources across the communities of interest that gather at the eResearch NZ conference each year.

Organisation for this year's conference reflected the ability of the sector to adapt with increasing speed in order to respond to change and collaborate on solutions, levelling up to put together a hybrid event and preparing contingency plans for potential changes to alert levels. The hybrid structure provided many learnings, a huge number of attendees enjoyed the accessibility of a virtual platform and the ability to re-watch the recorded presentations. They also valued the opportunity for connection and networking. Developing engaging ways that this same interaction can be facilitated virtually will be a key take away for the organising committee for events to come. eResearch NZ 2022 will look to build on the collaborative momentum that has been seen across the sector in facing the challenges of the COVID-19 pandemic and other social and political areas of the eResearch community including mātauranga Māori and Te Ao Māori in eResearch.The impact when the community has come together to collaborate is seen every day here in New Zealand, and the eResearch NZ conference will continue to bring New Zealand's creators and sharers of knowledge together and support the exploration and implementation of technologies that help to solve New Zealand's science challenges.

# OUR ROLE /

## REANNZ, the Research and Education Advanced Network New Zealand, is New Zealand's designated National Research and Education Network (NREN).

REANNZ operates and supports a specialist high-performance digital network that is engineered to meet the unique performance demands of scientists, researchers, innovators and educators.

The network is used by researchers to access, move and share data-intensive research around the country and across the world. Members of REANNZ are able to connect and collaborate with each other and their international research partners.

We are a not-for-profit Crown-owned company under Schedule 4A of the Public Finance Act 1989. Our Shareholding Ministers are the Minister of Finance and the Associate Minister of Research, Science and Innovation. We are governed by our Board of Directors who are appointed by the Minister of Research, Science and Innovation. REANNZ is funded through MBIE's Strategic Science Investment Fund (SSIF) and by our member organisations.

Our small team supports member organisations from New Zealand's Universities, Crown Research Institutes, Institutes of Technology and Polytechnics, Wānanga and the wider education, research, science and innovation sectors.

### Who are we?

We are New Zealand's National Research and Education Network (NREN).

As an NREN, REANNZ supports research, productivity and collaboration through data movement at a scale not commonly found outside of the research and education sector. We work together on a not-for-profit basis working for the benefit of our users and stakeholders to support global research.

REANNZ acts as a fundamental part of the science, research and innovation system in New Zealand, connecting people, knowledge and capability to support developing ideas and contribute back to the sector.

### What do we do?

REANNZ engineers and the engagement team work closely with our member's technology teams and researchers to support their use of the network.

REANNZ engineers develop solutions that resolve technical issues, support a member's network infrastructure needs and facilitate the uninterrupted transfer of research data. REANNZ offers a range of services and products specifically designed to meet the needs of end users operating in these specialist environments.

## Our purpose

### Managing the advanced network, tools and services that support New Zealand research

Managing the advanced network, tools and services that support New Zealand research

REANNZ provides the pathways and connections to global research partners that work with New Zealand's scientists, researchers and academic institutions.

Globally, research is becoming increasingly data-intensive. Research conducted in New Zealand is world class, with continued innovation in areas like climate change, healthcare and agriculture. Access to the REANNZ network, team and services enables the generators of ideas and research projects to collaborate and contribute to world-leading research for the benefit of New Zealand and the world.

### Moving research data at speed and scale

Moving research data at speed and scale

The underlying network is anchored in connections, be that at a people or infrastructure level. Today's research is becoming increasingly distributed and data-intensive and the scale of global collaboration is increasing, especially in light of the COVID-19 pandemic. New Zealand's isolation should not limit its ability to participate in collaboration and contribute to world class research. In fact, it drives the need for continued, reliable connectivity so that the work of New Zealand's researchers is accessible to the world.

### Mobilising knowledge and global collaboration

Mobilising knowledge and global collaboration

We are an active member of the international community made up of over 120 National Research and Education Networks (NRENs). REANNZ and these national networks have agreed protocols and settings that enable them to provide seamless data transfers and coordinate opportunities for collaboration.

## The Network

The REANNZ network is specialist in that it is designed to move and share data around the country, and across the world, at a scale that isn't consistently possible using a standard network. Capacity alone is not sufficient, other technical features and dedicated data transfer support make it possible for researchers in New Zealand to contribute to data-intensive research fields and international collaboration.

The network acts as a pillar of New Zealand's eResearch infrastructure through access to hardware and software platforms. The network connects into high performance computing tools like NeSI (National eScience Infrastructure) and provides access to specialist scientific instruments like the Australian Synchrotron, international radio-telescopes and on-site storage arrays. Services like Tuakiri that are supported by the network, allow single sign on access to services, research projects and instruments.

REANNZ operates a network that extends the length of the country - from Invercargill in the South Island, through major centres of the North Island to Auckland, and then to Mangawhai Heads in Northland where it connects to the Hawaiki Cable system. The international network includes sites in Sydney, Guam, Hawaii and Seattle where collaboration with NREN's and their communities around the world is facilitated through Research and Education (R&E) peering exchanges.

REANNZ uses a 'ladder' topology for the main sites in our national network. The ladder's two sides run north to south through New Zealand, interconnecting periodically with 'rungs' that provide efficient geographical coverage for members and resilience.

The international NREN community, with our common goals and collaborative approach, are at the heart of empowering research and education across the globe.

Being a member of this community is one of the ways REANNZ can guarantee consistent data transfer capability worldwide.

Another is the network itself but it's not the infrastructure that is different it's what we do with it that is.

REANNZ uses a 'ladder' topology for the main sites in our national network. The ladder's two sides run north to south through New Zealand, interconnecting periodically with 'rungs' that provide efficient geographical coverage for members and resilience.



## REANNZ NATIONAL NETWORK MAP

NB lines are indicative only

— 100Gbps national backbone network
— 20Gbps and under
— Hawaiki Capacity

These lines are indicative only and do not show precise routes.

Seattle
Portland (Oregon)

Sydney

Hawaiki Capacity

Los Angeles

The REANNZ network is built on commercial optical transmission services. Most member sites are connected by at least one dedicated fibre optic cable running from its site to a REANNZ Point of Presence (PoP - a location where REANNZ has equipment). This is similar to the way fibre connections to people's homes run back to the local exchange to enable the Internet Service Provider to deliver services.  Some sites have two separate fibre connections to support resiliency and traffic is re-routed to ensure that service is continuous should there be a fibre cut. We are also able to connect our member's more remote or smaller scale research sites through our MAE Lite service. MAE Lite enables connectivity and collaboration at a scale that previously was not available, expensive or difficult to acquire.

## Technical characteristics of the network

National research and education networks are engineered to ensure low packet loss (dropped packets or data not successfully received) and with sufficient headroom capacity to support bursts of data intensive traffic, commonly found in research fields like Bioinformatics, Climate Modelling and Radioastronomy.

The network itself is made up of multiple parts, each designed to accomodate research and science traffic by managing capacity in a way that prevents congestion:

› Submarine and terrestrial fibre optic cables: the network's capacity is managed in a manner designed to support the community's need for big, bursty traffic flows that can be made up of petabytes and terabytes of data.

› Ultra-fast transfers: the transfer times of large datasets are drastically reduced from months to weeks, from days to minutes.

› High quality: the network processes massive volumes of data without disruption to transfers, which can be catastrophic for research processing.

› Agility and flexibility: we maintain high levels of control over infrastructure so that we can be agile and flexible in meeting the needs of our community as well as offering bespoke solutions that meet changing research needs.

› Visibility and control: the network is measured and monitored against criteria that is critical for data intensive research ensuring consistent performance.

› Specialised support: we provide targeted, specialised support that enables research and high performance outcomes.

Purpose-built network platforms like the one REANNZ and our global NREN partners provide are the foundation for successful data-intensive research collaboration, enabling our communities to connect to their national and international peers.

## Our users

The ability to connect and collaborate is crucial now more than ever, with the growing body of research projects and collaboration opportunities across all fields of science. Our users and their organisations are able to contribute to research, science, innovation and education in New Zealand and globally. Our small team supports member organisations from New Zealand's Universities, Crown Research Institutes, Institutes of Technology and Polytechnics, Wānanga and the wider education, research and innovation sector.

People are at the heart of the research, science and innovation community in New Zealand. Across the country more than 350,000 researchers, academics, educators, innovators, staff and students have access to the REANNZ network. REANNZ actively and purposefully partners and collaborates with services, vendors and other members of New Zealand's RSI ecosystem for the benefit of our members. We collaborate on, participate in and organise key activities and events, like the annual eResearch conference, that bring together the whole community.

Our users also have access to the wider NREN community, that have agreed processes and protocols that enable them to collectively provide a seamless international research infrastructure for the benefit of New Zealand research organisations. Access to this wider community supports collaboration and the development of solutions for global challenges, and enables opportunities to share expertise and research infrastructure.

## Our global role and relationships

Establishing a research and education network gives a country access to the world, to scientific instruments, computational resources and cloud services, all at high-speed. In 2005 the Crown formed REANNZ with the constitutional purpose to "establish and operate the New Zealand research and education network that provides research and education users with high speed, wide bandwidth, and domestic and international connections to enable new forms of research and new research collaborations."

## NRENs are...

As New Zealand's NREN, REANNZ acts as a fundamental part of the science, research and innovation system in New Zealand, connecting people, knowledge and capability to support developing ideas and contribute back to the sector.

There are four common denominators for all NRENs, they:

› provide services for a closed user or member group,

› are not-for-profit organisations - their mission is to provide services at the lowest possible cost,

› provide national and international connectivity at a minimum, and

› provide additional services that support and enable effective use of the advanced networks.

## Shared tools and infrastructure

The global NREN community also develop and manage services that are designed to meet the needs of their research, science and innovation communities.

These services include eduroam (education roaming: the secure, worldwide roaming access service developed for the international research and education community) and eduGAIN (the global federated identity management system).

The development and management of these services has been essential and especially valuable as an offering for all NREN users during the COVID-19 pandemic. They facilitate research collaboration on a global scale and have supported the ongoing transition and capability of member organisations to work in a distributed way. Some of these services include:

› eduroam, the secure world-wide roaming wifi service,

› Tuakiri and eduGAIN, the federated identity services,

› and eduVPN, the secure virtual personal network that supports remote access to organisation's internal networks.

## New Zealand's NREN

REANNZ participates actively in groups like the Global NREN CEO Forum. This group works towards a collaborative model for evolving the world's Global Research and Education Network (GREN) and its services to meet the changing needs of the global research and education community.

REANNZ is also a member of the Global Network Advancement group and APAN - the Asian Pacific Advanced Network. This community in the Asia Pacific region connects, coordinates and shares collaborative research successes and explores networking technologies and innovations across NRENs.

REANNZ works closely with and builds relationships with both regional and individual NRENs, including the APOnet Collaboration. This collaboration connects East Asia, Southeast Asia, Oceania, and North America in order to contribute resources and support a high-speed trans-oceanic network that is more resilient, flexible, and consistent.

Publicly funded Research and Education (R&E) networks created the foundation for what the Internet has become today. NRENs have since evolved to provide more and be more for their users, thriving on collaboration and their unique design to empower research outcomes across the globe.

# GLOBAL RESEARCH AND EDUCATION COMMUNITY /



NorduNet
Europe/Géant
UK/Jisc
Netherlands/SURFnet
CERN
LONDON

MONTREAL
USA
LONDON
AMSTERDAM
SAO PAULO
CAPE TOWN

NORDUnet
Jisc
GÉANT
Runet
TEIN
BEIJING
SEOUL
TOKYO
LAHORE
THIMPHU
THUWAL
HONG KONG
HANOI
TAIPEI
MUMBAI
DHAKA
BANGKOK
COLOMBO
KUALA LUMPUR
SINGAPORE
BANDUNG
MANILA
UbuntuNet Alliance

SEATTLE
PORTLAND
PALO ALTO
LOS ANGELES
SAN JOSE
INTERNET2
NEW YORK
MIAMI
canarie

HONOLULU
MAUNA LANI
GUAM
SUVA

aarnet
PERTH
SYDNEY
AUCKLAND

RedCLARA
SAO PAULO
SANTIAGO
BUENOS AIRES

REANNZ
INTERNATIONAL NETWORK

NB lines are indicative only, they do not show precise routes and includes committed services.

REANNZ

# CASE STUDIES /

## How do REANNZ members use the network?

### How REANNZ connects

REANNZ exists to connect. The connection is physical, linking New Zealand to countries around the globe through kilometres of fibre optic cable beneath the sea, but it's also a connection of ideas and expertise. REANNZ partners with other NRENs to connect scientific enterprises together, providing researchers with access to the infrastructure and resources they need to impact the world through their findings.

#### Why NRENs exist

A National Research Education Network is an essential piece of infrastructure for any country. It's a high-speed, specialist network, that links Universities, research organisations and industries together.

REANNZ was established to support New Zealand's globally competitive science and research. Almost every form of

research requires data transfer. While this is possible through traditional connection methods and the Internet for some fields of research, the data volumes involved in data and compute intensive fields are ever increasing.

In 2020 Auckland University of Technology researchers put the network to the test to see if it would be possible, by using an FPGA card, custom software and the network, to directly transfer raw data at line rate straight into GPUs (graphics processing units), where the data could then be analysed in real time before being sent on to storage. This was a part of the Square Kilometre Array (SKA) project, the world's largest radio telescope which combines radio arrays in seven countries to precisely map the Milky Way.

Huge data loads like those involved in the SKA and other major research projects need specialist equipment. NRENs use leading edge hardware and technologies that

are all linked together through hundreds of kilometres of fibre optic cable, to provide ultra-high-speed connections to research organisations, optimising transfer times and enhancing workflows, all at lightning speed. Sending data from Auckland to Sydney across the REANNZ network can currently be as fast as 27ms – less time than it takes for the human eye to blink.

#### How and why REANNZ interacts with NRENs

Part of making New Zealand's research globally accessible is cooperating with other research facilities around the world. To do this, NRENs need to connect to each other, forming regional partnerships that promote research collaboration.

The Asia Pacific Oceania network (APOnet) is a partnership of 11 NRENs that connects East Asia, Southeast Asia, Oceania, and North America. This partnership helps users collaborate on an international scale through direct connections between these countries. These interconnected networks have custom pathways and protocols to protect against network failures, provide added resiliency and speed up data transfers. These NRENs are also not for profit, meaning they work solely to bring value to their communities.

But NRENs are more than their physical connections of fibre and hardware. NRENs use their partnerships as bridges for the research community. REANNZ is part of the Australasian eResearch Organisation (AERO). This group meets with Universities, high-performance computing centres and other NRENs to work together to make research collaboration easier, tackling technical issues and making connections between the people that make it all happen. This includes participating in and organising events like eResearch NZ and eResearch Australasia, where researchers, data experts and engineers all meet to share their methods and celebrate their successes. NREN's empower their users by managing the complex, technical operations of providing a specialist network behind the scenes, so that more time can be dedicated to facilitating the networks use with training, knowledge sharing and solutions that support their data needs.

In February 2021, REANNZ partnered with NeSI (New Zealand eScience Infrastructure) and Genomics Aotearoa to host eResearch NZ. The annual conference took place

both in-person and online for the first time, bringing communities in New Zealand and overseas together. The conference sessions considered the importance of communication through data, be that through the live genomics sequencing that informed New Zealand's COVID-19 response and the efforts across the sector that supported it, through to storytelling with data and the creative ways that researchers can communicate their findings. The partnerships that come together to both host and participate in events like these, help to foster a collaborative research ecosystem. These events occur on both a national and international scale, helping researchers from around the world to learn from each other while also connecting with the services and the people that help to make global research collaboration possible.

All NREN's have a shared objective, to connect. Be that at a people level or an infrastructure level, research is only possible through collaboration and sharing ideas.

A collaboration between three international high-performance computing centres made use of this global infrastructure, working together to share earthquake mapping and simulations. The team at QuakeCoRE, New Zealand's Centre for Earthquake Resilience, formed international partnerships with the high-performance computing facilities (HPC) facilities TACC in the United States and KISTI in South Korea.

This international collaboration involved data transfers between participating supercomputer centres in each country to adapt an existing data pipeline from these two different HPCs to QuakeCoRE's model. The team at QuakeCoRE used KISTI's Nurion supercomputer to simulate 20,000 New Zealand earthquake scenarios, while assisting South Korean researchers to set up the NZ-made workflow for their own earthquake analysis.

These large datasets moving regularly between each facility flowed efficiently across REANNZ but would have been slow and impractical if the team were to use a standard internet connection. Collaborations like these are why the underlying infrastructure supported by NREN's and collaborative nature of the global eResearch community are both vital to enabling impactful research outcomes.



aponet ASIA PACIFIC OCEANIA NETWORK (APOnet)
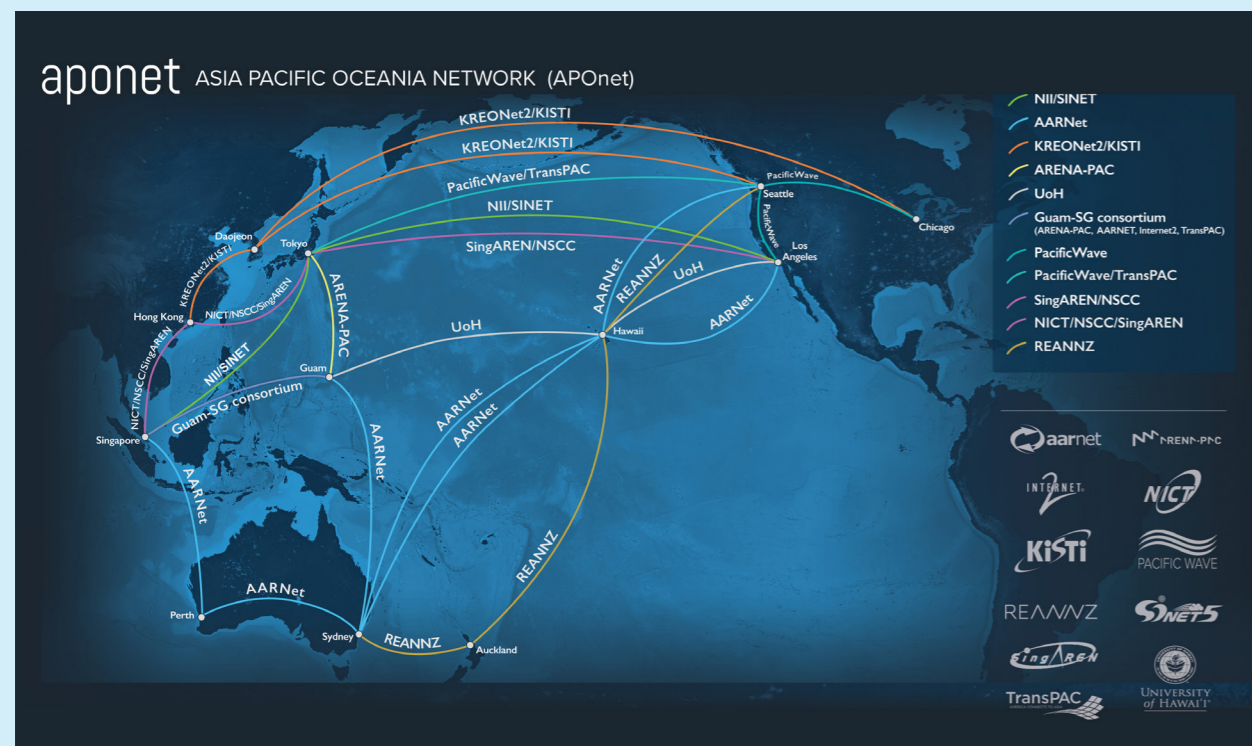
# Moving research data on a global scale

In December 2020, work was completed to strengthen the international network with additional capacity and completed resiliency.

Working closely with Hawaiki and NREN partners (University of Hawaii and the University of Guam), REANNZ engineers and remote teams in both locations were able to implement a resilient solution. Completion of the project has been a testament to the collaborative nature of the global NREN (National Research and Education Network) community.

REANNZ's key purpose is enabling New Zealand's research institutions to use and participate in international research collaboration. Increasing REANNZ's presence and networking capabilities within the international NREN community removes the barriers to international data mobility. With access to large data transfer capabilities and network tools that encourage multi-institutional collaboration, New Zealand's researchers have access to the world's unique science facilities, instruments and research projects. REANNZ and its members are closer to developing more collaborative relationships with NREN partners and their users.

The key design principles behind the project were to scale bandwidth and availability to meet the current and future needs of our members, ensure that the International Network is fault tolerant and expand the reach of REANNZ's Research and Education connectivity. The foundation of REANNZ's international network is the Hawaiki subsea cable system and other cable partners that provide REANNZ with connectivity to the US, Australia, Hawaii and Guam.

REANNZ now has 50Gbps of capacity to both Australia and the US via Hawaiki. REANNZ's second Sydney PoP has been commissioned to provide 50Gbps of resilient connectivity back to New Zealand. An interim solution has been replaced for our connectivity between Sydney and Seattle. The US site includes connectivity to the high-speed, purpose-built PacificWave NREN fabric that provides connectivity to the other NRENs across Europe, the United States, Asia, South America and Africa. The additional PoP locations of Hawaii and Guam have now completed a resilient ring of connectivity and initial testing into Asia has shown significant latency improvements.

## What makes up the international network?

› Physical links to other countries via subsea cable systems,

› peering with other network operators that provide direct access for traffic to them and their users,

› dedicated links with large content providers,

› research and education peering which provides direct access to the other research networks around the globe, and IP transit.

Guam is connected to Sydney at 20Gbps capacity. To connect Hawaii and Guam, the University of Hawai'i have provided access to their 100Gbps connectivity, which is funded as a part of the Pacific Island Research Education Network (PIREN) initiative.

The University of Guam's team were instrumental in the physical equipment install, in first taking the initial delivery of the various shipments including Juniper gear, optics and cables, then completing the install within the new GNC Data Centre. The install went smoothly and was completed to an excellent standard.

REANNZ engineers are currently exploring options with the University of Hawai'i to provide resilient connectivity back to Internet2 (the US NREN) giving the network the added benefit of resilient NREN connectivity. REANNZ have also provided the university with a backup path for NREN connectivity as a way of supporting and enabling simplified connectivity for each partner and their users.

Guam is a landing point for multiple subsea cable systems and hosts the GOREX (Guam Open Research & Education Exchange) that offers a rich array of NREN onnectivity and services, especially into Asia. Supporting systems like the GOREX peering exchange allows for traffic to easily transverse partnering networks to reach its global destination.

The completion of this work is a step towards ensuring that the REANNZ network remains fit for purpose and able to meet the future needs of our members. As New Zealand's National Research and Education network (NREN), REANNZ is a member of a global community with a shared mission to support and enable international research collaboration. Through the network, REANNZ members have direct access to this community of innovative people and research organisations, as well as the technologies and tools supported by NRENs around the world.

# Typical round-trip time between:

## Auckland - Sydney = 27ms to 34ms
depending on the path (two separate subsea cable paths to Sydney)

## Auckland - Seattle = 131ms

## Auckland - Hawaii = 83ms

## Auckland - Guam = 104ms

**134 milliseconds – time taken by light to travel around the Earth's equator**

# Accelerating New Zealand's Climate research

**Global collaboration and eResearch infrastructure.**

› Climate modelling research is made up of massive amounts of data and relies heavily on international collaboration.

› NIWA scientists collaborating on the Deep South Science Challenge need to transfer and process this climate modelling data. This requires regular and reliable access to key eResearch infrastructure like the REANNZ network.

› The speed of data transfer across the network is enhanced by using New Zealand's National Data Transfer Platform, managed by New Zealand eScience Infrastructure (NeSI) and powered by Globus to provide fast, secure, and reliable transfers.

› Together with HPC processing, these tools make new workflows possible for Dr Jonny Williams and his colleagues.

For NIWA climate scientist Dr Jonny Williams, global climate models are key to uncovering the future state of New Zealand's climate. The mountains of numerical data that make up these simulations enable scientists to forecast climate scenarios by tracking and predicting future sea surface temperatures, weather and greenhouse gas levels. Jonny's research contributes to global projects that compare the modelling data from New Zealand to these other global models.

**Fast data transfers for global co-operation**

Jonny uses REANNZ, NeSI's National Data Transfer Platform, and Globus' data management tools to shift data worldwide with the click of a button.

"It allows us to transfer data much faster than traditional methods. Because the data volumes that we need to transfer are so large, traditional methods are just simply not fast enough,"

"One simulation that we run with our collaborators can easily produce 50-to-100 terabytes of data. That's not seen as a large amount of data in the climate research world. On a daily basis, I can deal with individual files that are 100 gigabytes in size."

**Zooming in on New Zealand**

Regional modelling teams have been enhancing the resolution of New Zealand's climate modelling, contributing their techniques and the data collected to build more accurate models.

"We work very closely with regional modelling teams. Even though they're modelling a much smaller area, they're modelling it at a higher resolution. The amount of data that they produce can be even larger," says Jonny.

The scale of information collected, stored and shared in global climate research makes it extremely data intensive. While comparing a New Zealand model to



Model A        REANNZ/NIWA        Model B

"Without international collaboration, we wouldn't be able to do the work we do.

The computer models that we run are some of the most complex pieces of software in the world. Our international partners provide us with a code base to work with.

The code that we use has been developed by hundreds of scientists over decades, it has a very long history. That is just simply not something that you can do on your own."



a UK model, Jonny and his colleagues may shift tens, sometimes hundreds, of terabytes of data across the world. That's where access to national eResearch infrastructure with international reach becomes crucial.

"Without international collaboration, we wouldn't be able to do the work we do. The computer models that we run are some of the most complex pieces of software in the world. Our international partners provide us with a code base to work with. The code that we use has been developed by hundreds of scientists over decades, it has a very long history. That is just simply not something that you can do on your own."

The scale of data being produced in fields like climate research continues to grow. In New Zealand, two High Performance Computing (HPC) systems are used to power the Deep South Challenge's large-scale modelling and analysis of massive datasets.

NIWA's contribution to the latest Intergovernmental Panel on Climate Change Report requires Jonny and his colleagues to share data reliably overseas. Projects like this need to access remote equipment and analysis platforms.

"The HPC at NIWA produces the data that needs to be analysed, but we also rely heavily on communication with other parts of the world. The ability to share our data comes from the interconnection between the HPC and the network. The international network that REANNZ provides here is essential."

### Computing NZ's challenges

The research that Jonny and the team at NIWA are collaborating on is a part of the Deep South Challenge: Changing with our Climate. The National Science Challenges tackle the biggest science-based issues facing New Zealand. They bring together top researchers to work across disciplines, institutions and borders to solve these challenges.

"Other parts of the world have many thousands of climate researchers and are very heavily studied. Compared to that, the Southern Ocean and Antarctica are very poorly studied. They're very big, they're very remote and they're difficult to get to."

Global climate processes are seeing significant impacts to the future climate of the New Zealand region.

"By strengthening our ability to understand and anticipate our future climate, we're giving New Zealanders the best possible chance to adapt and manage risk in the years to come." Olaf Morgernstern, Earth System Modelling Programme Lead, Deep South Challenge.

The physical isolation of the Southern Ocean and Antarctica is not limiting researchers' ability to investigate and discover the impacts of global climate as a part of the Deep South Challenge. New Zealand's isolation should not limit its ability to participate in collaboration and contribute to world class research. In fact, it drives the need for continued, reliable connectivity so that the work of New Zealand's researchers is accessible to the world and continues to make a valuable contribution to the field of climate research.

NIWA is a Crown Research Institute that works on climate, freshwater and ocean science. One aspect of NIWA's work is in global climate modelling. They collaborate with international partners on simulations that simulate the flow of air, water and sea ice around the world. They also study how these physical processes react and interact with chemical and biological cycles in the air, on the land and in the sea.

REANNZ is New Zealand's research and education network (NREN). As an NREN, the network enables research, productivity and collaboration through data movement at a scale rarely found outside of the research and education sector.

New Zealand eScience Infrastructure (NeSI) designs, builds, and operates a specialised platform of shared high performance computing (HPC) infrastructure and a range of eResearch services. As the New Zealand research sector looks to answer national science imperatives across institutional boundaries, NeSI seeks to build national capability in running and optimising use of HPC and eResearch infrastructure. Collaborations with partners like NIWA, REANNZ, and Globus have been vital to supporting the needs of researchers like Jonny who require powerful computing resources and the ability to transfer research data at speed and scale.

### What has that speed done for your workflow?

The way I see it personally, is that it hasn't just sped up a workflow it's actually enabled a new workflow; that is,

to routinely shift multiple tens or hundreds of terabytes around the world at the click of a button.

Having access to these resources means that we can take part in projects that we would not be able to otherwise, like working on the Aerosol and Chemistry Model Intercomparison Project (AerChemMIP) as a part of the recent IPCC report. This involved us running some simulations on behalf of the UK Met Office and collaborating with them in that data analysis. However, the data analysis tools were installed on machines in the UK on a dedicated data processing platform and so we shifted the data over to that platform and performed the data analysis there.

People used to joke that you shouldn't underestimate the bandwidth of a horse and cart filled with USB sticks if you just wanted to shift one large amount of data once - but we needed to do this routinely and regularly. If we were still relying on the older computer transfer technologies - such as SCP and rsync - then that workflow would just simply not be possible. It's not just a case of speeding up something that we were able to do before and making it more efficient, this has actually enabled us to perform completely new workflows and to take part in these very large international collaborations.



## What do you think REANNZ can do to help support your work further?

I think one thing that we as a community can do is actually just learn more about workflows. I've worked with colleagues who have tried shifting large amounts of data from one place to another. When the technologies that you are using work it's not always clear to see that there are improved ways of doing the workflow. Ways that make it quicker, easier and more efficient. Raising awareness of new ways of doing your work more efficiently - and without a steep learning curve - can help everyone involved.

## Where do you see the trend for research going in terms of data production, transfer, analysis and storage?

There has been very large growth in other data intensive fields, particularly bioinformatics for example. I think there's a lot of data sets out there that people would like to get their hands on but can't because of the data transfer speeds. There's always an appetite for increased power from HPC. It's all very well to produce this data but you need to do something with it, you need to transfer it somewhere, you need to archive it. With the increasing speeds the next bottleneck becomes how fast you can process it.

# Next generation sequencing

## Compute, connectivity and collaboration.
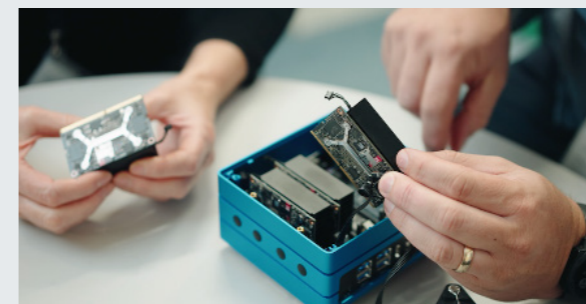


> There are many infrastructure challenges in the field of bioinformatics due to the scale of the data that is produced.

> The Institute of Environmental Science and Research (ESR) Human Genomics Group have come up with a solution for portable, in-the-field genomics sequencing.

> REANNZ are working closely with the team to take their research to the next level through connectivity and service solutions.

Breakthrough technologies are helping researchers to create new ways to sequence huge amounts of genetic data quickly. ESR researchers are innovating these technologies to be able to remotely sequence genomes far from the lab, improving treatment times and helping communities keep their people and environments safe.

The Human Genomics Group are collaborating with international partners to make portable sequencing technologies readily available to the research community. Senior bioinformatician, Dr Miles Benton leads the research into portable sequencing. It uses technology from Oxford Nanopore that sequences genomes using less compute power. It lets researchers perform genome sequencing in any environment by making it easy and portable.

Long read genomics sequencing produces large amounts of data. Nanopore devices can generate gigabytes of data every few hours, the larger GridION sequencers that ESR have onsite generate up to four terabytes a day.

## Data-driven genome research

ESR bioinformatician Leah Kemp, specialises in analysis of these large datasets. As part of the Clinical Genomics Project, Leah went from analysing single genes when diagnosing patients with genetic disorders, to whole genomes.

"We're taking a big leap in data scale, so that brings in a whole different set of tools that researchers need to utilise to work with that data. The scale of data computation has dramatically increased in recent years, so genomic technologies have also advanced."

The Human Genomics Group are using portable sequencing to make real-time point-of-care diagnosis for hospital emergency patients. The technology makes diagnosis cheaper and faster.

"We have a couple of use cases where we are working with a hospital's emergency department, looking at screening blood or spinal fluid of suspected sepsis patients. That usually requires culturing the bacteria and takes about three to four days for the results," says Miles.

Through portable sequencing, diagnosis is available in as little as an hour, transforming emergency patient care.

"We've also been working with the neonatal unit which is great because my story has come full circle. My son was born 8 weeks premature, and he had to have a lumbar puncture a couple of days in. That's where this idea of portable, bedside sequencing came from."

## Computing on the fringe

This new wave of remote compute processing is being termed fringe computing. It allows researchers to move beyond the lab bench and conduct data processing in the field. The equipment itself is cheap, portable and self-sufficient, typically using 15 watts of energy, running on batteries or solar panels.

"Much of my research is trying to make the smaller devices portable; the devices are literally the size of a Mars Bar and they can be powered by very small computers. At $600 a unit you can deploy it anywhere,

stow it beneath your work table when you're done, and plug it into a touch-screen monitor to see your results. That's one of the really exciting things about this new wave of sequencing technology - the fact that it has many use cases and is not limited to the lab bench anymore."

Molecular microbiologist, Matt Storey is another Human Genomics Group researcher. You can find him in the field as often as you will find him in the lab, undertaking DNA extraction and processing samples that need to be sequenced and analysed.

"Fringe computing is where we take reasonably high-performance computing hardware out to point-of-care or places where we don't have access to the computing resources that we need. It allows us to process the data on-site, rather than transporting it to a central place," says Matt.

There are technical challenges that make accessing and processing the data onsite difficult. Genome sequencing produces huge data sets. Moving this raw data to the lab is almost impossible using standard methods. To solve this, the group designed its fringe computers to process data on-site, reducing the size needed for transport.

With successful use cases and the portable nature of the devices already having an impact for the wider community, Miles, Matt and the team are looking to take their fringe computers even further.

"We have partnered with local Iwi in Christchurch to monitor bacteria present in the harbour. We're hoping that we can stream the data from the device to the Cloud while we are on site. You take a sample of the water, load it onto the device, get the read, then you're able to identify the types of bacteria in the water and stream the raw data to the Cloud. If we stream the raw data, a solid connection would mean that we can use cheaper compute or offload some of the heavy lifting to Cloud GPU compute. To do that we'd need a really solid and fast network connection."

REANNZ works closely with member's technology teams and researchers, like Miles and the team at the Human Genomics Group, to support their use of the network and develop solutions that resolve technical issues.

Currently the teams are working together to come up with a solution for taking these devices further afield. "I think the big thing for me with partnering with REANNZ would

be the remote connectivity, so we can really push the boundaries of where we can take these devices. We can sequence anywhere but having that network connectivity would really take it to the next level."
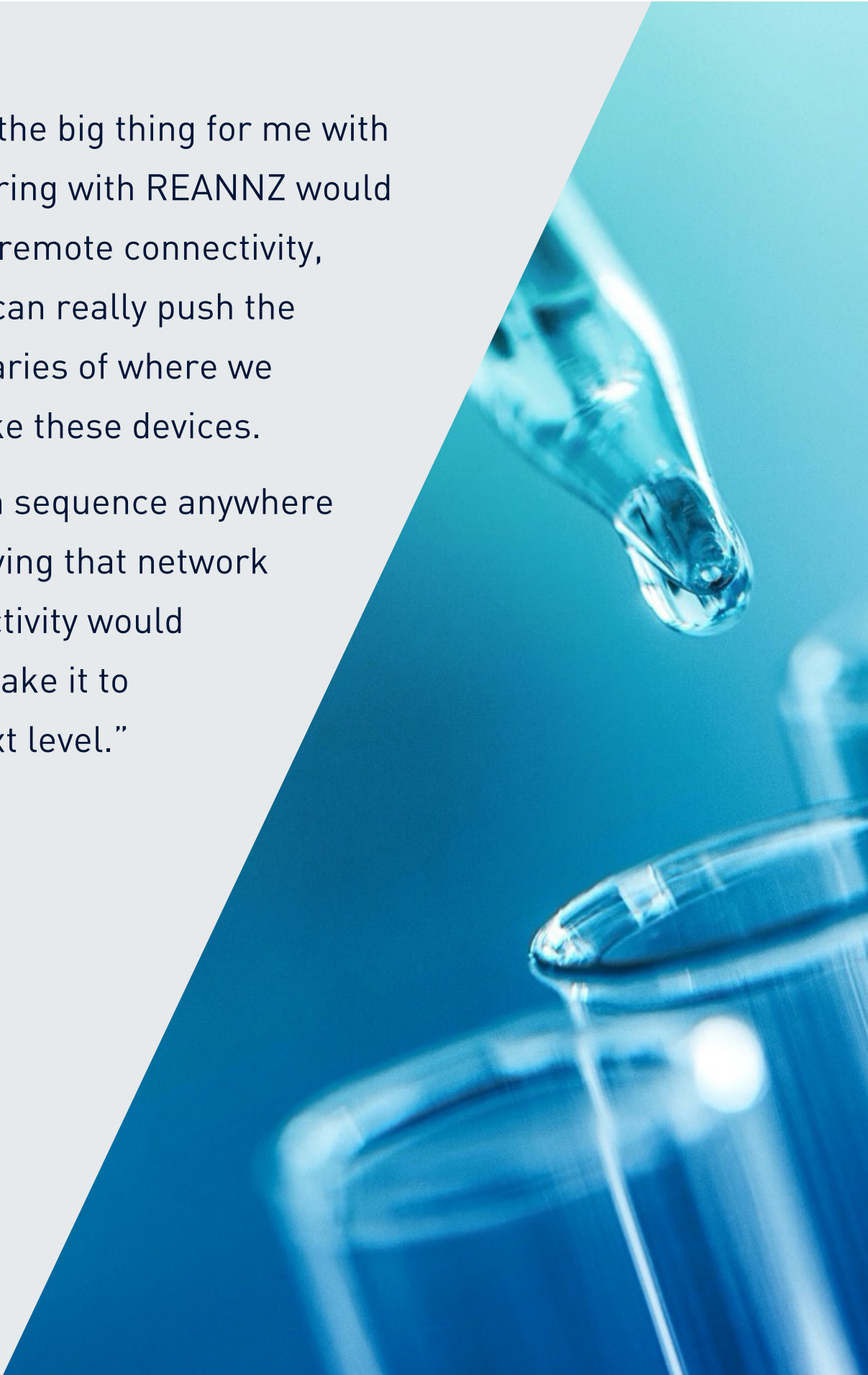
REANNZ was able to support ESR's ability to transfer whole human genomes from testing points to their lab at the University of Otago, which would fail due to the datasets size.

Collaboration is paramount for ESR and the Human Genomics Group. They work closely with Crown Research Institutes and Universities both in New Zealand and internationally and are dedicated to making their research accessible. A large community of researchers worldwide are using this portable sequencing technology for multiple use cases. Making this technology readily available is having a huge impact.

"A PhD student from Germany has been monitoring the health of insect colonies using the device. There was also the first use case reported where DNA was extracted during a surgical procedure, put through the sequencer, classification happened within an hour, and they had the results back to the surgeon while they were still operating. The surgeon was then able to tailor the surgery based on that report," says Miles. "It's just really humbling seeing all of these ideas, the international community is amazing. Collaboration has been key to the successes this technology has had."

ESR's Miles, Leah and Matt are paving the way for the next generation of genomic sequencing technologies. It's improving the treatment of patients, helping communities, and making access to sequencing cheaper and easier than ever before. REANNZ supports ESR and its members by providing fast, stable connectivity across New Zealand and expertise on data intensive transfer capability. Collaborations like these are leading to impactful innovations across multiple fields of research including bioinformatics and healthcare.

The Institute of Environmental Science and Research - Te Whare Manaaki Tangata, Taiao hoki is a New Zealand Crown Research Institute (CRI). Its purpose is to deliver scientific and research services to the public health, food safety, security and justice systems, and the environmental sector to improve the safety of, and contribute to the economic, environmental and social well-being of people and communities in New Zealand.

"I think the big thing for me with partnering with REANNZ would be the remote connectivity, so we can really push the boundaries of where we can take these devices.

We can sequence anywhere but having that network connectivity would really take it to the next level."

# PRODUCTS & SERVICES /

REANNZ develops and supports a range of products and services that meet the specialist needs of our members in the education and research, science and innovation sectors.

### Managed Access and Edge
Connecting member's local network with the REANNZ network.

Managed Access and Edge (MAE) devices connect a member's local network with the REANNZ network, enabling data transfers both nationally and internationally.

REANNZ managed edge devices are engineered and configured for high performance to meet the specialist needs of the research community when transferring large volumes of data. It also supports Science DMZ infrastructure to enable unhindered data transferring capability.

### MAE Lite
Connecting smaller or remote research sites to the REANNZ network.

MAE Lite enables members to connect their smaller or remote research sites to REANNZ's high speed network, at a significantly lower cost, providing an effective solution for research and science grade connectivity for difficult to connect locations.

While largely similar to the Managed Access and Edge (MAE) offering, MAE Lite does not require dedicated dark fibre which can be difficult to access in remote locations.

MAE Lite enables connectivity and collaboration at a scale that was not previously available, expensive or difficult to acquire.

### Science DMZ
A lightweight and high performing on-ramp to the REANNZ international research and education network.

Science DMZ provides a lightweight and high performing on-ramp to the REANNZ international research and education network. It creates a dedicated path that facilitates the transfer of large volumes of data, from multi-gigabyte to petabytes and terabytes, all while retaining the integrity of the data.

The Science DMZ is a portion of the network, built at or near the campus or laboratory's local network perimeter. It is designed so that the equipment, configuration, and security policies are optimised for high-performance scientific applications, rather than for general-purpose business systems or "enterprise" traffic.

The Science DMZ is scalable, incrementally deployable, and easily adaptable to incorporate high performance and advanced technologies such as 100 Gigabit network services and virtual circuits.

### Cloud Connect
Leverage your REANNZ network connection to connect directly with your cloud service provider.

The nature of research and enterprise IT continues to evolve with the accelerated adoption of Cloud services to satisfy the needs of both the business and researchers.

REANNZ Cloud Connect enables members to use their existing high-performance network connection to connect directly to the Cloud service provider of their choice and leverage private access which does not go over the Internet.

This results in greater stability and predictability of the connection without needing to expose the information to the Internet.

### Tuakiri - Trust and Identity
Tuakiri provides trusted and secure federated identity and access management.

Tuakiri allows an end-user to consume services, access resources, and otherwise collaborate within New Zealand while using their home institution's identity. This means that the end-user does not require a unique identity with every remote organisation they are working with, simplifying the workflow of both the end-user, and the IT staff as the service being accessed gets trusted identity that has been verified by the home organisation.

The same capability is recreated in many nations around the world, each operating their own equivalent service. These national level services can be linked together using eduGAIN, enabling that same simplified workflow across the globe.

### Tuakiri Hosted IdP
Simplified access to Tuakiri through a scalable solution

Tuakiri allows an end-user to consume services, access resources, and otherwise collaborate within New Zealand while using their home institution's identity. However, a barrier to joining Tuakiri for some organisations has been the requirement to run an Identity Provider (IdP) server. Tuakiri Hosted IdP is a scalable solution, that simplifies joining Tuakiri by removing this barrier.

This scalable service is designed to make setting up or supporting Tuakiri easier for members, enabling their organisations to access the resources that are available through Tuakiri.

Tuakiri Hosted IdP is the option to have REANNZ host the Tuakiri IdP on behalf of the member. The Hosted IdP instance connects to an Identity Management System run by the member, offering flexibility through multiple options including cloud identity stores like Google Apps/GSuite or Office 365/Azure AD.

## eduroam

### Simple, easy and secure roaming wifi service, provided at thousands of hotspots across more than 100 countries.

eduroam is a free, secure, world-wide roaming wifi service. It provides researchers, staff and students from participating institutions the ability to roam and access free Wi-Fi services. Today, 30 New Zealand institutions are using and providing eduroam with up to 18,000 unique devices using eduroam in New Zealand each month.

eduroam was developed and is maintained by GÉANT (the pan-Europe research and education network) for the international research and education community and is available worldwide in 106 territories.

## eduGAIN

### Enabling simple, secure, single-sign on access to thousands of research and education resources.

Tools like Tuakiri and eduGAIN provide access to resources and services that are essential to the work and study of the hundreds of thousands of researchers, scientists, students and academics that use an NREN. Opting-in to join eduGAIN allows an institution's users to access a number of services on a global scale, including licensed software and journals, research collaborations, databases and instruments. eduGAIN is a global service with more than 70 international federations participating, providing access to over 3,400 service providers and their offerings. eduGAIN provides an effective and flexible way for institutions and their users to interconnect to these infrastructures and resources.

## eduVPN

### Access the internet or your institution's network via an encrypted connection.

eduVPN is an easy to deploy VPN solution designed for and by the research and education community. eduVPN acts as a private network, sending and receiving data as if a user's device was directly connected. Users benefit from quicker functionality and additionally security, from a service that is simple to deploy.

With more people working from home or working remotely in other locations, organisations have increased demand on their VPN. While eduroam is a secure environment with authenticated access to the internet and local encryption, many public WiFi services can be insecure.

## DC Connect

### High bandwidth, cost effective connectivity services into Data Centres and Cloud providers.

The nature of research and business IT continues to evolve with the accelerated adoption of Cloud services to satisfy the needs of both business operations and research. Data Centre Connect (DC Connect) is a service that REANNZ can provide at selected Data Centre sites around the country, allowing for high bandwidth, cost effective connectivity into the REANNZ Network.

This is an alternative option to our Managed Access and Edge service that requires a dedicated Fibre from the Data Centre to the nearest REANNZ PoP. This service uses preinstalled equipment and diverse connectivity at the Data Centre, bringing the edge of the REANNZ Network into the facility which allows the quick delivery of new services and ensures high uptime and availability. DC Connect uses shared REANNZ infrastructure to then connect into the wider REANNZ Network and other Cloud providers.

## Professional Services
### Working in partnership to support REANNZ members.

REANNZ operates and supports a specialist high-performance network that is engineered to meet the unique demands of scientists, researchers, innovators and educators. Through the large data transfer capabilities of the network and the support of REANNZ engineers and engagement team, New Zealand's research and education community can access the world's unique science facilities and global collaboration opportunities.

eResearch infrastructure provides the tools that support multi-institutional research collaboration. REANNZ works closely with community partners and our members to strengthen connections across the sector, at a people level and an infrastructure level.

Through our Professional Services the team here at REANNZ work to ensure that member's researchers and technology teams are able to leverage the tools and services that they need. Our focus is on supporting the current and future needs of our members through engagement and consultancy, in order to support their objectives and enable access to the expertise shared within the global NREN community.

Our objective is to support our member's goals and needs, working alongside their teams in partnership for the best outcome.
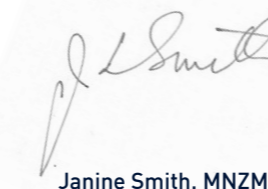
# Statement of Responsibility

The Board of REANNZ accept responsibility for the preparation of the annual financial statements and statement of performance, and for the judgements made in them.

The Board is responsible for any end-of-year performance information provided by REANNZ under Section 19A of the Public Finance Act 1989.

The Board and management of REANNZ accept responsibility for establishing and maintaining a system of internal control designed to provide reasonable assurance as to the integrity and reliability of the financial reporting.

In the opinion of the Board, the financial statements and statement of performance fairly reflect the financial position and operations of REANNZ for the year ended 30 June 2021.

**Janine Smith, MNZM**
**Chair**

**Sara Brownlie**
**Finance, Risk & Audit Committee Chair**

**16 December 2021**
**Signed on behalf of the Board**

# INDEPENDENT AUDITOR'S REPORT /

## To the readers of Research and Education Advanced Network New Zealand's financial statements and performance information for the year ended 30 June 2021

The Auditor-General is the auditor of Research and Education Advanced Network New Zealand (REANNZ). The Auditor-General has appointed me, Stephen Usher, using the staff and resources of Audit New Zealand, to carry out the audit of the financial statements and the statement of performance, of REANNZ on his behalf.

### Opinion

We have audited:

- the financial statements of REANNZ on pages 53 to 69, that comprise the statement of financial position as at 30 June 2021, the statement of comprehensive revenue and expense, statement of changes in equity and statement of cash flows for the year ended on that date and the notes to the financial statements including a summary of significant accounting policies and other explanatory information; and
- the statement of performance of REANNZ on pages 46 to 52.

In our opinion:

- the financial statements of REANNZ on pages 53 to 69:
  - present fairly, in all material respects:
    - its financial position as at 30 June 2021; and
    - its financial performance and cash flows for the year then ended; and
  - comply with generally accepted accounting practice in New Zealand in accordance with Public Benefit Entity Reporting Standards Reduced Disclosure Regime; and
- the statement of performance on pages 46 to 52:
  - presents fairly, in all material respects, REANNZs performance for the year ended 30 June 2021, including:
    - for each class of reportable outputs:
      - its standards of delivery performance achieved as compared with forecasts included in the statement of performance expectations for the financial year; and
      - its actual revenue and output expenses as compared with the forecasts included in the statement of performance expectations for the financial year; and
  - complies with generally accepted accounting practice in New Zealand.

Our audit was completed on 16 December 2021. This is the date at which our opinion is expressed.

The basis for our opinion is explained below. In addition, we outline the responsibilities of the Board and our responsibilities relating to the financial statements and the statement of performance, we comment on other information, and we explain our independence.

### Basis for our opinion

We carried out our audit in accordance with the Auditor-General's Auditing Standards, which incorporate the Professional and Ethical Standards and the International Standards on Auditing (New Zealand) issued by the New Zealand Auditing and Assurance Standards Board. Our responsibilities under those standards are further described in the Responsibilities of the auditor section of our report.

We have fulfilled our responsibilities in accordance with the Auditor-General's Auditing Standards.

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

### Responsibilities of the Board of REANNZ for the financial statements and the performance information

The Board is responsible on behalf of REANNZ for preparing financial statements and statement of performance that are fairly presented and comply with generally accepted accounting practice in New Zealand. The Board is responsible for such internal control as it determines is necessary to enable it to prepare financial statements and statement of performance that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements and the statement of performance, the Board is responsible on behalf of REANNZ for assessing REANNZ's ability to continue as a going concern. The Board is also responsible for disclosing, as applicable, matters related to going concern and using the going concern basis of accounting, unless there is an intention to merge or to terminate the activities of REANNZ, or there is no realistic alternative but to do so.

The Board's responsibilities arise from the Crown Entities Act 2004 and the Public Finance Act 1989.

### Responsibilities of the auditor for the audit of the financial statements and the performance information

Our objectives are to obtain reasonable assurance about whether the financial statements and the statement of performance, as a whole, are 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 carried out in accordance with the Auditor-General's Auditing Standards will always detect a material misstatement when it exists. Misstatements are differences or omissions of amounts or disclosures, and can arise from fraud or error. Misstatements are considered material if, individually or in the aggregate, they could reasonably be expected to influence the decisions of readers, taken on the basis of these financial statements and the statement of performance.

For the budget information reported in the financial statements and the statement of performance, our procedures were limited to checking that the information agreed to REANNZ's statement of performance expectations.

We did not evaluate the security and controls over the electronic publication of the financial statements and the statement of performance.

As part of an audit in accordance with the Auditor-General's Auditing Standards, we exercise professional judgement and maintain professional scepticism throughout the audit. Also:

- We identify and assess the risks of material misstatement of the financial statements and the statement of performance, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- We obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of REANNZ's internal control.
- We evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Board.
- We evaluate the appropriateness of the reported statement of performance within REANZ's framework for reporting its performance.
- We conclude on the appropriateness of the use of the going concern basis of accounting by the Board and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on REANNZ's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements and the statement of performance or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause REANNZ to cease to continue as a going concern.
- We evaluate the overall presentation, structure and content of the financial statements and the statement of performance, including the disclosures, and whether the financial statements and the statement of performance represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with the Board regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Our responsibilities arise from the Public Audit Act 2001.

## Other information

The Board is responsible for the other information. The other information comprises the information included on pages 2 to 45 but does not include the financial statements and the statement of performance, and our auditor's report thereon.

Our opinion on the financial statements and the statement of performance does not cover the other information and we do not express any form of audit opinion or assurance conclusion thereon.

In connection with our audit of the financial statements and the statement of performance, our responsibility is to read the other information. In doing so, we consider whether the other information is materially inconsistent with the financial statements and the statement of performance or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If, based on our work, 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.

## Independence

We are independent of REANNZ in accordance with the independence requirements of the Auditor-General's Auditing Standards, which incorporate the independence requirements of Professional and Ethical Standard 1: International Code of Ethics for Assurance Practitioners issued by the New Zealand Auditing and Assurance Standards Board.

Other than in our capacity as auditor, we have no relationship with, or interests, in REANNZ.

Stephen Usher
Audit New Zealand
On behalf of the Auditor-General
Wellington, New Zealand

# GOVERNANCE STATEMENT /

## Organisational form

REANNZ is a not-for-profit Crown-owned company under Schedule 4A of the *Public Finance Act 1989*. Our shareholders are the Minister of Finance and the Minister of Research, Science and Innovation. At balance date, each shareholder held 908 shares on behalf of the New Zealand public.

REANNZ acts in a manner consistent with the *Crown Entities Act 2004*. REANNZ is subject to the *Official Information Act 1982*.

## Role of the Board

REANNZ's Shareholding Ministers appoint a governing Board of Directors. The company's constitution sets the size of the Board at a minimum of two and a maximum of nine directors.

The Board is responsible under the company's constitution to manage, direct and supervise the company's business affairs. In practice, day-to-day management of the company is delegated to the Chief Executive.

The Board establishes the company's strategic and business plans, approves annual budgets and monitors management's performance against established goals. The Board also considers and approves new policies and business initiatives, authorises transactions outside the prescribed delegated authorities of management and appoints the Chief Executive. Procedures are in place at Board, corporate and operational levels to safeguard the company's assets and its wider commercial interests.

A well-established regime of regular reporting is designed to maintain a high standard of internal communication, and to ensure the Board remains appropriately informed of all aspects of the company's business and activities. Board fees are set by the Shareholding Ministers.

## Risk management

The Board is also responsible for ensuring that the company has effective policies in place to manage its risks. The Board decides the level and nature of the risks that are acceptable to the company, taking advisement from the Finance, Risk and Audit Committee. The Chief Executive is delegated responsibility for managing normal business risks. As part of managing its broader risk profile, the Board maintains and regularly reviews a risk register, and approves and reviews all company policies.

## Legislative compliance

The Board acknowledges its responsibility to ensure the organisation complies with all legislation. The Board has delegated responsibility to the Chief Executive for the development and operation of a programme to systematically identify compliance issues and ensure staff are aware of relevant legislative requirements.

## Board composition

There were six directors for the year ending 30 June 2021. In addition, Judith Johnston was engaged as a Board Advisor from July 2020 to March 2021. She had previously been a director to 30 June 2020. Four directors were appointed to 30 June 2021, but their tenures have been extended by the Shareholders. They are: Janine Smith (Board Chair), Ross Peat (Deputy Chair), Sara Brownlie (Finance, Risk and Audit Committee Chair) and David Skinner.

## Board meetings

The Board generally meets every six weeks. These meetings are supplemented with additional meetings as required for strategic planning purposes and to progress specific decisions. The Board held eight scheduled meetings for the year ended 30 June 2021. In addition, there were out-of-cycle approvals for time sensitive matters.

### Board committees

The Board has formally constituted two committees.

During the year, the Strategy and Risk Committee was disbanded due to the reduced number of directors. Risk management transferred to the Finance and Audit Committee. In addition to risk, the renamed Finance, Risk and Audit Committee has a focus on the integrity of financial reporting, internal controls and compliance of financial statements with appropriate standards and legislation. The Committee recommends the approval of statutory financial statements for approval by the Board. The Committee is comprised of three directors. Two meetings were held during the year.

There are two directors on the People and Culture Committee. The Committee provides oversight on the company's People and Culture strategy and policy. This includes remuneration, performance management and employment conditions of the Senior Leadership team as well as health and safety, and other employment matters. A committee member is involved in the recruitment of any senior manager, including the Chief Executive. Four committee meetings were held during the year.

All Directors are entitled to attend committee meetings.

### Interest procedures

The REANNZ Board has a documented conflict of interest policy that sets out procedures for identifying and addressing potential conflicts of interest. This policy applies to the directors and staff of REANNZ.

The key determination when considering whether an interest might create a conflict is whether it incentivises the director or staff member to act in a way that may not be in the best interests of REANNZ. It must be determined whether a reasonably informed objective observer would perceive from the circumstances that the director or staff member's judgement is likely to be influenced.

A register of director and all staff's interests is maintained and updated regularly.

### Auditor

Audit New Zealand, acting on behalf of the Controller and Auditor-General, is the auditor of REANNZ in accordance with Section 32 of the *Public Audit Act 2001*.

### Registered office

Research and Education Advanced Network New Zealand Limited

Level 13, Plimmer Towers,

2-6 Gilmer Terrace,

Wellington 6011.

# GOOD EMPLOYER STATEMENT /

## REANNZ as a good employer

Policies are in place to guide REANNZ in what it means to be a good employer, and to ensure we provide equal employment opportunities and support our people.

### Capability

As a small organisation, REANNZ is critically dependent on its people. The highly specialised nature of REANNZ's work means that they are highly valued. REANNZ promotes and supports a flexible working environment that encourages our team to maintain a positive work-life balance. This includes the ability to agree flexible working hours as well as the option to split time between remote working and our office spaces. The nature of our work provides exciting, leading edge opportunities for personal and professional development.

### Leadership, accountability and culture

REANNZ has a small and dynamic team, with fewer than 30 staff. The culture is built upon a platinum rule: 'treat others as they would like to be treated'. We encourage all members of the team to lead by example, supporting others to behave in a way that is consistent with our culture and the values of being fair, open and respectful, being good partners to our members and wider community and exercising responsible stewardship of the assets, people and skills within REANNZ.

### Recruitment, selection and induction

REANNZ recruits new staff members through a number of channels, some through a recruitment agency and others through industry networks and recommendations. All positions are openly advertised. Prospective employees have the option to meet the team as part of the interview, allowing staff to participate in the recruitment process and have open engagement with their potential co-workers.

### Employee development, promotion and exit

Being a small and diverse organisation, there is opportunity for continual development and experience across multiple disciplines. External training and development is also encouraged and specific budget is set aside for courses and conferences to ensure staff remain current in their field.

### Remuneration, recognition and conditions

There is a commitment to attracting, retaining and motivating high-performing people. REANNZ continues to provide an environment that identifies, encourages and rewards excellence, innovation and high-quality services by using a remuneration structure that is competitive and fair. Flexible working hours are offered by agreement and REANNZ invests in the right tools and systems to make work easier from any location.

### Harassment and bullying prevention

The REANNZ policy on harassment and bullying has a zero-tolerance approach. An employee assistance programme is available to all staff to enable them to get confidential support. Open communication between staff and the leadership team is supported and encouraged.

### Safe and healthy environment

Health and safety is taken seriously at REANNZ and policies and procedures are in place to minimise risks, particularly when handling network equipment or when visiting our point of presence (PoP) locations. Staff wellbeing is high priority and REANNZ supports the processes, work environment and culture that enables the team to be successful, happy and healthy.

# STATEMENT OF PERFORMANCE /

## Outcomes

REANNZ is one of many international contributors to the high-performance, data intensive and globally connected research, science and innovation system. REANNZ provides trusted and secure pathways and high speed connectivity so that New Zealand's research institutions can fully participate and partner in digitally advanced research, science and innovation initiatives, wherever they occur.

REANNZ has three outcomes to achieve over the long term:

› **Advanced Network** – establish and operate the Advanced New Zealand Research and Education Network.

› **Collaboration** – support and enable New Zealand's connection with global research, science and innovation systems.

› **Business Performance –** ensure New Zealand has an affordable and sustainable REANNZ business.

These outcomes are to be delivered by pursuing five strategic intentions as described in the Statement of Intent 2020-2024:

› Grow international recognition of REANNZ as a high-quality National Research and Education Network (NREN).

› Improve the suite of network related applications and reports that enrich the end to end use of the network.

› Improve member and user outcomes and experiences.

› Increase key partnership arrangements that create value for the REANNZ network.

› Sustainable funding streams and business performance improvements developed and implemented.

## Grow international recognition of REANNZ as a high-quality National Research and Education Network (NREN)

As New Zealand's designated NREN, REANNZ is an active member of the global community of over 120 national and regional research and education networks. Through this global network of NRENs, New Zealand researchers gain access to a worldwide, multi-billion-dollar eResearch infrastructure, dedicated to the pursuit of science and research.

The way in which members use the REANNZ network and their own technical environments have changed dramatically over the last twelve months due to the COVID-19 pandemic. This has led to REANNZ working closely with members to provide more distributed access to connectivity and building up resilient access to online resources. An example of this was the successful deployment of the new MAE Lite (ubiquitous connectivity service) product based around a flexible UFB offering. MAE Lite enables members to connect their smaller or remote research sites to REANNZ's high speed network, at a significantly lower cost to provide an effective solution for research and science grade connectivity in difficult to connect locations.

### Network Capacity – speed

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
|---|---|---|---|
| Bandwidth Available | | | |
| - national backbone capacity | 100 Gbps | 100 Gbps | **100 Gbps** |
| - international network capacity | 60 Gbps | 60 Gbps | **100 Gbps** |

The successful delivery of large volumes of data is measured by the distance that the data travels, multiplied by the speed that the data travels then multiplied by the packet delivery ratio.

REANNZ has no control over the distance that the data is required to travel, but we can impact the speed that the data travels through network capacity and packet delivery through the availability of the finely tuned and monitored network. The increasing capacity of the network, both nationally and internationally, demonstrates the improved ability of the network to deliver large data sets.

### Packet Delay Variation

Packet Delay Variation can be an indicator of an unstable or congested network. This can cause delays and result in packets being received out of order. Delay can impact the ability of a researcher to tune their data transfers so that they can account for the distance that the data needs to travel and for any impacts to real-time network interaction.

Previous testing by REANNZ and others has shown that Packet Delay Variation causes significant issues for data transfers and can have an impact on real-time interactive sessions.

Networks can delay some packets more than others. Some applications can compensate for this, by collecting and storing the received packets to create a pool from which a steady stream of data can be drawn. In doing so, they trade packet delay variation (the receiving of packets at different times and in the wrong order) for increased packet delay.

Low levels of Packet Delay Variation ensure that the network is stable and efficiently transferring large data sets.

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
|---|---|---|---|
| Packet delay variation | N/A | At least 99.9% of hourly measurements across the core network have less than 20ms of packet delay variation* | **99.99%** |

* Packet Delay Variation, a statistical measure, may be defined in a variety of ways. We have selected the stringent Y.1540 6.2.4 definition of Packet Delay Variation, the difference between the 99.9th percentile and the minimum latency sampled over a given test episode.

## Packet Loss

Packet delivery is a key element of network quality and one of the defining features of research and education networks. Research and education networks aim to eliminate 'packet loss' because it is catastrophic for large data transfers, that are typical of our shared user groups and required for supporting international research collaboration. Packet loss directly effects the quality of the user experience and the integrity of the information transferred.

National and international network availability measures the reliability of the network. Network downtime includes faults and other connectivity or hardware outages, but excludes planned maintenance outages.

Network availability is crucial for our users to be able to perform their work when they need to. Network design is one way to maintain availability (even during an outage) though the use of physically diverse paths, fail-over hardware and protected circuits. REANNZ's impressive network availability statistics are the result of our focus on operational excellence and designing for network resilience.

Poorly tuned networks that experience hardware or software faults or network congestion will drop packets – this is referred to as 'packet loss'. Our community, who globally collaborate and participate in research, science, education and innovation, cannot accept packet loss. If they did, the time it would take to transmit large datasets would extend from hours or days into weeks and months. This would significantly impact a researcher's workflow and productivity, and in the worst-case scenario datasets couldn't be sent and members simply couldn't collaborate.

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
| --- | --- | --- | --- |
| Packet Loss | 0.0000004993% | Less than 0.0001% | 0.00001931% |

REANNZ focuses on operating a 'packet loss-less' network. We actively measure packets sent, and if packet loss is found, it is immediately minimised or eliminated. Some packet loss (errors) can occur while we're fixing a network segment, but traffic would have been diverted to a different path because of our resilient design. Therefore most packet loss does not impact our community, and the majority of the time our network is without packet loss. This is invaluable to our research community.

That is why our packet delivery targets are well beyond the levels of a commercial telecommunications provider and it is the reason why we have reported an average packet delivery of over 99.9999% across our network over the last 3 years. Commercial telecommunications providers aim for 99.90%.

## Improve the suite of network related applications and reports that enrich the end to end use of the network

REANNZ provides tools that facilitate collaboration between institutions, specialised services that enhance members' ability to use the network, and products and services that enhance the effectiveness and efficiency of members' collaboration activities. Applications provide authentication, identity federation and reporting for further networking with global NREN and research partners.

REANNZ is currently in the process of moving to a Application Programming Interface (API) driven member portal, that will allow operational data (including network and service performance or availability) to be shared in near real time with REANNZ members. This work will also enable REANNZ to present "live" operational data on the website to increase visibility of what the network does and what it enables REANNZ members to do. It will provide useful and timely status information, which in turn helps demonstrate the capability of the network, the REANNZ team and its membership.

### Increased use of international access federated services

The global NREN community work together to develop and manage services that are designed to meet the needs of their research, science and innovation communities.

These services include eduroam (education roaming: the secure, worldwide roaming access service developed for the international research and education community) and eduGAIN (the global federated identity management system).

Tuakiri acts as New Zealand's Identity Federation, enabling researchers, academics and students to access research and education resources both on a national scale, and on a global scale through access to eduGAIN.

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
| --- | --- | --- | --- |
| Number of device connections made to eduroam by NZ users at other sites in NZ or Overseas | 100,100 | Increase on previous year | 107,939 |
| Number of members using Tuakiri and eduGAIN | 15 | Increase on previous year | 23 |

Increasing the usage of these services demonstrates their value to both our members and visitors to New Zealand from within the global research and education community, by supporting seamless wifi connectivity and the availability of resources provided by participating institutions, anywhere in the world. While this year's results are an increase on last year, these results have been impacted by COVID-19 restrictions, resulting in less travel. Had these restrictions not been present the number of device connections made to eduroam would have been higher.

### Member and user satisfaction

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
| --- | --- | --- | --- |
| The proportion of network users that consider the REANNZ network essential or valuable to their work | 82% | Greater than 80% | 94% |

The FY2021 Annual Member Survey was sent to 788 respondents (prior year 384) covering 40 members. There were 53 individual respondents of which 79% (prior year 68%) were from our core member base. It was noted that some non-core and non-data intensive members responded with a neutral reply.

This question was based on a scale (with 1 being strongly disagree and 5 being strongly agree). Responses between 4 and 5 were either positive or strongly positive with scores of 3 being neutral. All respondents that selected between 3-5 have been included that they consider the REANNZ network essential or valuable to their work.

## Improve member and user outcomes and experiences

REANNZ is a member focused organisation, specialising in meeting the unique needs of its community.

During the year REANNZ has worked closely with members to support their changing needs as they work through the impacts of the COVID-19 pandemic on their businesses, both financially and technically, in order to support the changing ways that collaborative research and innovation is undertaken in this environment.

Specific solutions that were put in place to support member's needs as a result of COVID-19 include:

› Increasing member awareness and adoption of Tuakiri/eduGAIN that support remote access to global research repositories, collaboration projects and scientific instruments.

› A VPN solution was quickly implemented for a member to enable remote working and the continuation of research activity during lockdown – the existing solution they had in place could not meet the demand of remote access of research data.

The increased capacity to engage more with members has highlighted that there are areas within our member organisations that do not have an understanding of REANNZ's available offerings. The focus for the Engagement team this year has been on increasing the awareness of the tools and services that REANNZ supports, enabling members to maximise their utilisation. The Engagement team's aim is to engage wider within REANNZ members to increase the understanding of member's needs across their organisations.

### Customer Satisfaction and engagement

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
| --- | --- | --- | --- |
| Customer satisfaction and engagement | N/A | A new survey providing the benchmark for future years | 88% |

The FY2021 Annual Member Survey was sent to 788 respondents (prior year 384) covering 40 members. There were 53 individual respondents of which 79% (prior year 68%) were from our core member base.

This is a new measure for FY2021. Understanding and fulfilling the needs of members is essential as a member focused organisation. REANNZ must build close relationships with members, understanding the challenges that they are facing and tailoring solutions that provide optimal results. The question asked was "In response to member feedback, REANNZ have made changes to reflect how we engage with our membership and community. In your view, how would you rate this?" The responses were rated on a three point scale (with 1 being needs improvement through to 3 being definite improvement made). Scores of 2 and 3 are counted as customers being satisfied as some improvements have been made. The results show that REANNZ provides capabilities and services that support research and enables data intensive research through the advanced network. There is further opportunity for REANNZ to promote more awareness of the value and role of REANNZ to the wider research community.

## Timeliness of issue resolution

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
|---|---|---|---|
| The proportion of members that consider any issues are resolved in a timely manner | 90% | Greater than 80% | 91% |

The speed at which we identify and resolve faults and other network performance issues is not only a measure of the quality of our customer service, but also a measure of the timeliness of our network management activity. We actively manage the network to identify issues before they affect our members, and proactively advise of issues rather than simply being reactive to member calls. The REANNZ helpdesk also logs incident reports from users, and although we have internal resolution time targets, the true test of our timeliness is our members' opinion of our responsiveness to their challenges.

Our target of 80% of responses resolved in a timely manner represents an appropriate balance between responsiveness and the cost of resourcing to increase responsiveness. Falling below this target would indicate that we had not adequately resourced the helpdesk facility.

## Case Studies

REANNZ case studies are developed to demonstrate the value of the network and REANNZ's role as an NREN.

This is achieved by highlighting the ways that members use the network and services, but also by providing a platform to celebrate the work and collaboration between members and the eResearch community.

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
|---|---|---|---|
| Case studies | 4 Case studies | 4 Case studies | 4 Case studies |

Case studies provide examples that support wider understanding of how REANNZ members find value in and use the network. They also provide examples of how members data transfer needs are supported, collaborative research outcomes that have been achieved and the ways that the community have come together to build capability and solve data movement challenges.

## Increase key partnership arrangements that create value for the REANNZ network

Through REANNZ, New Zealand's science, research and innovation sector is a part of a global partnership and community of research organisations supported by 120 national research and education networks (NRENs) worldwide. They each have a shared commitment to high performance that allows REANNZ users to collaborate with their peers and provide a seamless connectivity experience from source to destination.

Through these partnerships with the global NREN community, REANNZ is participating in the development of next generation technology at a global scale and bringing this work and knowledge building to New Zealand. REANNZ also contributes to sharing the unique understanding developed in New Zealand's environment to the global research community.

REANNZ continues to build strong relationships with key government agencies providing research and innovation infrastructure (e.g. New Zealand eScience Infrastructure (NeSI), Science NZ and Universities NZ) to leverage from one another's strengths across the research ecosystem in support of member outcomes.

## Strategic Alliances memorandum of understanding

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
|---|---|---|---|
| Strategic Alliances memorandum of understanding | N/A | 2 Memorandum of Understanding agreed. | 1 Memorandum of Understanding* |

During the year, REANNZ has entered into an MoU with 11 other NRENs around the Asia Pacific region forming the Asia Pacific Oceania Network (APOnet). This gives a mechanism for greater connectivity and collaboration around the Asia Pacific Oceania region, enabling a greater number of options for members who collaborate in this part of the world.

*REANNZ also entered into a Partnership Agreement with Microsoft for data centre connectivity, however this is not included in the above count as it is not considered an official Memorandum of Understanding.

## Knowledge Sharing Sessions

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
|---|---|---|---|
| Knowledge Sharing Sessions | N/A | 4 presentations at relevant conferences / workshops | 9 presentations |
| | | 8 Lunchtime information sessions | 4 Lunchtime information sessions |
| | | Site visits to all Universities and CRIs' | 8 /8 Universities visited, 7/8* CRI's Sites visited |

'* all but one CRI was visited in person, however due to COVID-19 restrictions one CRI was not visited with in person but communication occurred via virtual meetings.

In order to increase general awareness of REANNZ's high-performance network and data transfer capabilities among our member's teams and the wider research community; tailored presentations and external sessions were coordinated at forums and events where members already have a presence, rather than a higher number of internally driven sessions. This proved successful and opportunities to continue this approach will be sought as a part of the ongoing Knowledge Sharing initiative in FY 2021.

## Sustainable funding streams and business performance improvements developed and implemented

A strong financial platform enables the provision of high quality services and products that members and users expect. REANNZ is continuously improving the member and user experience, while increasing financial sustainability and membership fee stability. An area of focus going into FY2022 is membership pricing and the National Network Strategic Review. If we are not cost-effective in providing valuable networking solutions, or able to obtain funding to support the specialist network services at a level that keeps prices affordable for members, our members will have to make choices about their participation in data-intensive research and REANNZ membership.

REANNZ addresses a niche market that commercial networks cannot – the provisioning of the unique services that meet the needs of science, research and education. Direct comparisons of cost with commercial telecommunications providers are misleading. Not only is our network designed to support time-sensitive and bursty traffic flows globally, but the network has other performance attributes, such as very low packet loss thresholds and low jitter, that commercial networks are not designed to support.

Organisational culture and capabilities underpin REANNZ's ability to deliver on our strategic intentions. This is achieved by attracting the right people, at the right time, into the right roles and by growing and developing our existing capabilities and talent.

## Employee Satisfaction

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
|---|---|---|---|
| Employee Satisfaction | N/A | A new survey providing the benchmark for future years | Measure assessed as not being valid refer to explanation below |

Due to the size of REANNZ, the employee satisfaction survey will not be undertaken this year as the results are easily traceable back to an individual staff member, and therefore not anonymous. Reliance will instead be placed on employee retention/turnover measures, rather than satisfaction.

## Employee Retention

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
|---|---|---|---|
| Employee Retention* | 69% | 85% | 70% |

*  calculated using the number of employees who have left (excluding redundancies) divided by the 30 June FTEs

The intention of the employee retention measure is to show REANNZ's ability to keep employees motivated and satisfied. Although employee retention is below target, it does not signal a trend. A significant percentage of the 30% that left REANNZ during the year were as a result of two restructures. REANNZ continues to value its people and is committed to growing and developing employees capabilities and talent.

## Actual expenditure to budget variance

| Performance Measure | Result June 2020 | Target June 2021 | Result June 2021 |
|---|---|---|---|
| Actual expenditure to Budget variance | 16% Underspent | Within 10% | 19% Underspent |

Refer to the financial statements for a detailed breakdown of the above results along with Note 24 of the financial statements for explanations of major variances against budget.

## Output: The advanced research, education and innovation network and related tools

| | Actual 2021 $ 000 | Budget 2021 $ 000 |
|---|---|---|
| **Revenue** | | |
| Strategic Science Investment Fund grant | 3,000 | 3,000 |
| Network revenue | 6,202 | 6,189 |
| Other revenue | 4,539 | 4,263 |
| **Total Revenue** | **13,741** | **13,452** |
| | | |
| **Expenses** | | |
| Depreciation and amortisation | 2,280 | 2,403 |
| Network expenses | 10,067 | 11,929 |
| Operating expenses | 3,050 | 4,599 |
| **Total Expenditure** | **15,397** | **18,931** |
| | | |
| **Operating surplus / (deficit)** | **(1,656)** | **(5,479)** |
| Foreign currency gains / (losses) | (343) | 0 |
| | | |
| **Surplus/(deficit)** | **(1,999)** | **(5,479)** |

# FINANCIAL STATEMENTS /

Research and Education Advanced Network New Zealand Limited

## Statement of Comprehensive Revenue and Expense for the year ended 30 June 2021

| | Note | Actual 2021 $ 000 | Budget 2021 $ 000 | Actual 2020 $ 000 |
|---|---|---|---|---|
| **Revenue** | | | | |
| Grant revenue | 2 | 3,000 | 3,000 | 3,000 |
| Network revenue | | 6,202 | 6,189 | 6,094 |
| Other revenue | 2 | 4,306 | 4,002 | 4,147 |
| Interest revenue | | 233 | 261 | 510 |
| **Total Revenue** | | **13,741** | **13,452** | **13,751** |
| **Network Expenses** | | | | |
| Depreciation and amortisation | | 2,160 | 2,254 | 2,220 |
| Employment expenses | | 1,864 | 1,997 | 2,034 |
| Network operating expenses | 3 | 8,203 | 9,932 | 7,763 |
| **Total Network Expenses** | | **12,227** | **14,183** | **12,017** |
| **Gross Surplus/(Deficit)** | | **1,514** | **(731)** | **1,734** |
| Less: | | | | |
| **Operating Expenses** | | | | |
| Audit | | 35 | 35 | 34 |
| Depreciation and amortisation | | 120 | 149 | 154 |
| Directors fees | 4 | 146 | 180 | 180 |
| Employment expenses | | 2,062 | 2,430 | 1,590 |
| Other operating expenses | | 551 | 991 | 538 |
| Professional services | | 139 | 356 | 65 |
| Operating leases | | 74 | 347 | 658 |
| Travel expenses | | 43 | 260 | 68 |
| **Total Operating Expenses** | | **3,170** | **4,748** | **3,287** |
| **Surplus/(Deficit) excluding gains** | | **(1,656)** | **(5,479)** | **(1,553)** |
| Foreign currency gains/(losses) | 5 | (343) | – | 354 |
| **Surplus/(Deficit)** | | **(1,999)** | **(5,479)** | **(1,199)** |
| | | | | |
| **Other comprehensive revenue** | | – | – | – |
| | | | | |
| **Total Comprehensive Revenue and Expense** | | **(1,999)** | **(5,479)** | **(1,199)** |

Explanations of major variances against budget are provided in note 24.

The accompanying notes form part of these financial statements.

Research and Education Advanced Network New Zealand Limited

## Statement of Financial Position
## as at 30 June 2021

| | Note | Actual 2021 $ 000 | Budget 2021 $ 000 | Actual 2020 $ 000 |
|---|---|---|---|---|
| **CURRENT ASSETS** | | | | |
| Cash and cash equivalents | 6 | 3,401 | 3,248 | 2,165 |
| Receivables and debtors | 7 | 1,991 | 2,556 | 2,063 |
| Investments | 8 | 21,061 | 16,500 | 21,106 |
| Prepayments | | 281 | 271 | 655 |
| Prepaid network expenses | 10 | 1,928 | 2,154 | 1,885 |
| **Total current assets** | | **28,662** | **24,729** | **27,874** |
| **NON-CURRENT ASSETS** | | | | |
| Derivative financial instruments | 9 | 61 | 265 | 73 |
| Prepaid network expenses | 10 | 16,486 | 16,486 | 17,281 |
| Property, plant and equipment | 11 | 7,119 | 7,627 | 9,140 |
| **Total non-current assets** | | **23,666** | **24,378** | **26,494** |
| **TOTAL ASSETS** | | **52,328** | **49,107** | **54,368** |
| **CURRENT LIABILITIES** | | | | |
| Accounts payable and accrued expenses | 13 | 943 | 816 | 1,294 |
| GST payable | | 197 | 143 | 86 |
| Employee entitlements | 14 | 214 | 153 | 219 |
| Revenue in advance | 15 | 2,070 | 1,940 | 1,934 |
| Deferred revenue | 16 | 78 | - | - |
| Provisions | 17 | 4 | - | 301 |
| Derivative financial instruments | 9 | 174 | - | (178) |
| Deferred lease incentive | | - | 14 | - |
| **Total current liabilities** | | **3,680** | **3,066** | **3,656** |
| **NON-CURRENT LIABILITIES** | | | | |
| Deferred revenue | 16 | 94 | - | - |
| Provisions | 17 | - | - | 159 |
| **Total non-current liabilities** | | **94** | **-** | **159** |
| **TOTAL LIABILITIES** | | **3,774** | **3,066** | **3,815** |
| **NET ASSETS** | | **48,554** | **46,041** | **50,553** |
| **EQUITY** | | | | |
| Share capital | | 16,001 | 16,001 | 16,001 |
| Accumulated surplus | | 32,553 | 30,040 | 34,552 |
| **TOTAL EQUITY** | 18 | **48,554** | **46,041** | **50,553** |

Explanations of major variances to budget are provided in note 24.

The accompanying notes form part of these financial statements.

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Research and Education Advanced Network New Zealand Limited

## Statement of Cash Flows
## for the year ended 30 June 2021

| | Actual 2021 $ 000 | Budget 2021 $ 000 | Actual 2020 $ 000 |
|---|---|---|---|
| **CASH FLOWS FROM OPERATING ACTIVITIES** | | | |
| **Cash was provided from/(applied to)** | | | |
| Receipts from the Crown | 3,000 | 3,000 | 3,000 |
| Network revenue | 6,469 | 6,189 | 7,495 |
| Other revenue | 4,362 | 3,907 | 4,275 |
| Interest revenue | 297 | 261 | 535 |
| GST (net) | 77 | 172 | (36) |
| Realised gain on foreign currency | 28 | - | 315 |
| Payments to suppliers and employees | (9,296) | (10,966) | (9,171) |
| Prepayments for network connectivity | (3,533) | (4,124) | (2,774) |
| **Net cash flow from operating activities** | **1,404** | **(1,561)** | **3,639** |
| **CASH FLOWS FROM INVESTING ACTIVITIES** | | | |
| **Cash was provided from/(applied to)** | | | |
| Sale of assets | 196 | - | 21 |
| Purchase of plant and equipment | (345) | (1,006) | (404) |
| Term deposit investments | (19) | 3,000 | (5,000) |
| **Net cash flow from investing activities** | **(168)** | **1,994** | **(5,383)** |
| **CASH FLOWS FROM FINANCING ACTIVITIES** | | | |
| **Cash was provided from/(applied to)** | - | - | - |
| **Net cash flow from financing activities** | **-** | **-** | **-** |
| **Net (decrease)/increase in cash held** | **1,236** | **433** | **(1,744)** |
| Cash at beginning of year | 2,165 | 2,815 | 3,909 |
| **Cash at end of year** | **3,401** | **3,248** | **2,165** |
| Represented by | | | |
| **CASH AT BANK** | **3,401** | **3,248** | **2,165** |

Explanations of major variances to budget are provided in note 24 .

The accompanying notes form part of these financial statements.

Research and Education Advanced Network New Zealand Limited

**Statement of Changes in Equity
for the year ended 30 June 2021**

| | Note | Actual 2021 $ 000 | Budget 2021 $ 000 | Actual 2020 $ 000 |
|---|---|---|---|---|
| **Balance at 1 July** | | 50,553 | 51,520 | 51,752 |
| Total Comprehensive Revenue and Expense for the year | | (1,999) | (5,479) | (1,199) |
| **Equity at end of year** | 18 | **48,554** | **46,041** | **50,553** |

Signed on behalf of the Board:

Janine Smith, MNZM
Chair
16 December 2021
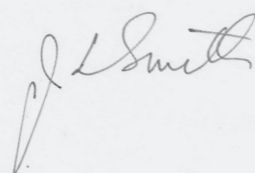
Sara Brownlie
Finance, Risk & Audit Committee Chair
16 December 2021

Explanations of major variances to budget are provided in note 24.

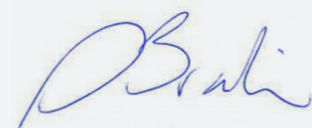The accompanying notes form part of these financial statements.

# NOTES TO THE FINANCIAL STATEMENTS /

# 1. Statement of accounting policies

## REPORTING ENTITY

The reporting entity is Research and Education Advanced Network New Zealand Limited ('REANNZ'), a Crown entity as defined by the Crown Entities Act 2004 and a New Zealand incorporated company. As a Crown entity, REANNZ's ultimate parent is the New Zealand Crown.

REANNZ's primary objective is to establish, own and operate a high-speed communications network for the research and education sector. As such, REANNZ's aim is to provide services to the public, rather than make a financial return.

Accordingly, REANNZ has designated itself as a public benefit entity for the purposes of Public Benefit Entity (PBE) accounting standards with reduced disclosures.

The financial statements for REANNZ are for the year ended 30 June 2021 and were approved by the Board on 16 December 2021.

## BASIS OF PREPARATION

The financial statements have been prepared on a going-concern basis, and the accounting policies have been applied consistently throughout the year.

### Statement of compliance

The financial statements of REANNZ have been prepared in accordance with the Crown Entities Act 2004, which includes the requirement to comply with generally accepted accounting practice in New Zealand (NZ GAAP).

The financial statements comply with Public Benefit Entity accounting standards.

The financial statements have been prepared in accordance with Tier 2 PBE Accounting Standards with reduced disclosures. REANNZ is eligible to report as a Tier 2 reporting entity on the basis that it does not have public accountability and is not large.

### Presentation currency and rounding

The financial statements are presented in New Zealand dollars (NZD) and all values are rounded to the nearest thousand ($000).

## SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Accounting policies are selected and applied in a manner that ensures that the resulting financial information satisfies the concepts of relevance and reliability. REANNZ accounting policies, therefore, are designed to report the substance of the underlying transactions undertaken by the entity.

Significant accounting policies are included in the notes to which they relate. Policies that do not relate to a specific note are outlined below:

### Foreign currency transactions

Transactions in foreign currencies, including those for which forward foreign exchange contracts are held, are translated to New Zealand dollars (the functional currency) at the spot rate on the date of transaction.

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 Comprehensive Revenue and Expense.

### Statement of Cash Flows

The Statement of Cash Flows is prepared exclusive of GST, which is consistent with the method used in the Statement of Comprehensive Revenue and Expense.

Definitions of the terms used in the Statement of Cash Flows are:

"Cash" includes coins and notes, demand deposits and other highly liquid investments readily convertible into cash used by REANNZ as part of its day-to-day cash management.

"Investing activities" are those activities relating to the acquisition and disposal of long-term assets and other investments not included in cash equivalents.

"Financing activities" are those activities relating to changes in equity of REANNZ.

"Operating activities" include all transactions and other events that are not investing or financing activities.

### Goods and Services Tax (GST)

These financial statements have been prepared on a GST exclusive basis except for accounts receivable and accounts payable that are stated inclusive of GST.

The net GST paid to, or received from, Inland Revenue, including the GST relating to investing and financing activities, is classified as an operating cash flow in the Statement of Cash Flows.

Commitments and contingencies are disclosed exclusive of GST.

### Income tax

As a public entity under section CW 38(2) of the Income Tax Act 2007, the company is exempt from income tax. Accordingly, no provision has been made for income tax.

### Budget figures

The budget figures are those that form part of the REANNZ 2020/21 Statement of Performance Expectations dated 30 June 2020 and approved by the Board.

The budget figures have been prepared in accordance with generally accepted accounting practice and are consistent with the accounting policies adopted by REANNZ for the preparation of the financial statements.

### Critical accounting estimates and assumptions

In preparing these financial statements, REANNZ has made estimates and assumptions concerning the future. These estimates and assumptions may differ from subsequent actual results. Estimates and assumptions are continually evaluated and are based on historical experience and other factors, including expectations of future events that are believed to be reasonable under the circumstances.

The estimates and assumptions that have significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year are:

- Useful lives and residual values of property, plant and equipment – refer to note 11.

# 2. Revenue

## Accounting Policy

The specific accounting policies for significant revenue items are explained below:

### Grant revenue

REANNZ is funded in part by the Crown from the Strategic Science Investment Fund (SSIF). The SSIF grant is provided to partially fund the delivery of specialist services and activities to meet the Government's goals for research and education. REANNZ delivers an agreed work plan and the grant is recognised as revenue when paid because there are no other conditions attached.

Other grants are recognised as revenue when they become receivable unless there is an obligation in substance to return the funds if conditions of the grant are not met. If there is such an obligation, the grants are initially recorded as deferred income in the Statement of Financial Position and recognised as revenue when conditions of the grant are satisfied.

### Network and other revenue

Revenue is measured at the fair value of the consideration received or receivable. All transactions are exchange transactions.

### Interest revenue

Interest revenue is recognised by accruing the interest due for the investment on a time proportion basis.

### i. Grant revenue

| | 2021 $ 000 | 2020 $ 000 |
|---|---|---|
| **Non-exchange transactions** | | |
| Ministry of Business, Innovation & Employment Strategic Science Investment Fund contract | 3,000 | 3,000 |
| **Total grant revenue** | **3,000** | **3,000** |

REANNZ and the Ministry of Business, Innovation and Employment ('MBIE') entered into a SSIF Infrastructure Platform Investment contract during the 2018 financial year. The contract is for seven years, expiring on 30 June 2024, and provides REANNZ with an annual grant of $3M (total grant $21M).

All conditions relating to the SSIF contract have been met.

### ii. Other revenue

| | 2021 $ 000 | 2020 $ 000 |
|---|---|---|
| **Exchange transactions** | | |
| Managed services | 2,331 | 2,453 |
| Internet | 1,223 | 1,201 |
| Other | 539 | 493 |
| Lease-related expense reimbursement | 213 | - |
| **Total other revenue** | **4,306** | **4,147** |

## 3. Network operating expenses

| | 2021<br>$ 000 | 2020<br>$ 000 |
|---|---|---|
| **National network** | | |
| Fibre circuits & maintenance | 2,054 | 1,958 |
| Other network expenses | 948 | 763 |
| PoP accommodation | 313 | 324 |
| Connectivity | 21 | 21 |
| **Total national network expenses** | **3,336** | **3,066** |
| **International network** | | |
| International connectivity | 4,337 | 4,131 |
| Fibre Circuits | 212 | 259 |
| Other network expenses | 186 | 187 |
| PoP accommodation | 132 | 120 |
| **Total international network expenses** | **4,867** | **4,697** |
| **Total network operating expenses** | **8,203** | **7,763** |

Network expenses include $211K relating to operating lease expenses recognised during the year (2020: $231K).

## 4. Directors fees

| | 2021<br>$ 000 | 2020<br>$ 000 |
|---|---|---|
| **The total value of remuneration paid or payable to each Board member during the year was:** | | |
| Janine Smith (Chair) | 40 | 40 |
| Ross Peat (Deputy Chair) | 25 | 25 |
| Sara Brownlie | 20 | 20 |
| Liz Gosling | 21 | 16 |
| Jim Metson | 20 | 16 |
| David Skinner | 20 | 21 |
| Judith Johnston* | - | 21 |
| Steve Weaver* | - | 21 |
| **Total directors fees** | **146** | **180** |

* tenure ended 30 June 2020

There were no special director fees paid during the year (2020: $Nil).

Former director Judith Johnston was paid $15K for board advisory services until 31 March 2021.

She attended Board meetings and was a Finance and Audit Committee member.

REANNZ provides a deed of indemnity to directors for certain activities undertaken in performance of REANNZ's functions.

REANNZ holds Directors and Officers Liability and Professional Indemnity insurance cover in respect of the liability of Board members and employees.

No Board members received compensation or other benefits in relation to cessation (2020: $Nil)

## 5. Foreign currency gains/ (losses)

| | 2021<br>$ 000 | 2020<br>$ 000 |
|---|---|---|
| **Realised foreign currency gains/(losses)** | 28 | 315 |
| **Unrealised foreign currency gains/(losses)** | | |
| Fair value gains / (losses) on derivatives* | (364) | 112 |
| Bank account (USD) | (7) | (73) |
| **Total foreign currency gains/ (losses)** | **(343)** | **354** |

*includes reversal of unrealised gains and losses on settlement of trades

Realised gains arose from the settlement of forward contracts to purchase USD and supplier payments in foreign currency.

Unrealised losses were made on forward USD contracts held with the New Zealand Debt Management Office (NZDMO) and ASB reflecting the net movement in the fair value of open contracts for the year. Unrealised gains and losses are reversed on settlement of the trades.

On 30 June 2021, REANNZ held eight forward contracts (2020: eight contracts) to purchase a total of US$4.48M (2020: US$4.03M). Seven contracts will settle during the next financial year. The contracts were entered into to mitigate foreign exchange exposure arising from annual network connectivity payments contractually required to be paid in USD.

## 6. Cash and cash equivalents

| | 2021<br>$ 000 | 2020<br>$ 000 |
|---|---|---|
| Cash at bank and on hand | 3,401 | 2,165 |
| **Total cash and cash equivalents** | **3,401** | **2,165** |

The total above includes NZ$610K held in USD (2020: $819K).

## 7. Receivables and debtors

### Accounting Policy

Accounts receivable are reported at the amount due less an allowance for credit losses. REANNZ applies the simplified credit loss model of recognising lifetime expected credit losses for receivables.

In measuring expected credit losses, receivables have been assessed on an entity-type basis as this determines shared credit risk characteristics.

Receivables are expensed in the Statement of Comprehensive Revenue and Expense when there is no reasonable expectation of recovery. Indicators that there is no reasonable expectation of recovery include the debtor being in liquidation.

| Breakdown of receivables and debtors | 2021<br>$ 000 | 2020<br>$ 000 |
|---|---|---|
| **Exchange transactions** | | |
| Trade receivables | 1,977 | 2,049 |
| Less: provision for uncollectibility | (28) | (18) |
| **Total receivables** | **1,949** | **2,031** |
| Sundry debtors | 42 | 32 |
| **Total receivables and debtors** | **1,991** | **2,063** |

Membership fees are due quarterly in advance and service fees are due monthly in advance. Of the total receivables and debtors above, $1.80M including GST (2020: $1.96M including GST) relate to membership fees and services to be provided by REANNZ during the coming financial year. These fees are shown as income received in advance until the service period begins, at which time the fees are recognised as revenue in the Statement of Comprehensive Revenue and Expense.

REANNZ holds no collateral as security or other credit enhancements over receivables that are past due or impaired.

## 8. Investments

### Accounting Policy

#### Bank term deposits

Investments in bank term deposits are initially measured at the amount invested.

Interest is subsequently accrued and added to the investment balance. A loss allowance for expected credit losses is recognised if the estimated loss allowance is not trivial.

| Breakdown of investments | 2021<br>$ 000 | 2020<br>$ 000 |
|---|---|---|
| Term deposits (maturity one year or less) | 21,061 | 21,106 |
| **Total investments** | **21,061** | **21,106** |

There is no impairment provision for investments as there is no expectation of credit losses. All term deposits are held with major trading banks with Standard & Poor's AA- rating.

## 9. Derivative financial instruments

### Accounting Policy

REANNZ enters into derivative financial instruments, including forward foreign exchange contracts, as part of its normal operations to manage its exposure to foreign exchange rate risk. REANNZ does not hold or issue derivatives for trading purposes. REANNZ has not adopted hedge accounting.

Derivatives are initially recognised at the fair value on the date a derivative contract is entered into and are subsequently re-measured to their fair value at each balance date with the resulting gain or loss recognised in the Statement of Comprehensive Revenue and Expense.

A forward foreign exchange derivative is classified as current if the contract is due for settlement within 12 months of balance date. Otherwise, the full fair value of forward foreign exchange derivatives is classified as non-current.

## 10. Prepaid network expenses

Prepaid network expenses relate to core connectivity and network service operations and management. These prepayments will be expensed to the Statement of Comprehensive Revenue and Expense on a straight-line basis over the contract term.

| | 2021<br>$ 000 | 2020<br>$ 000 |
|---|---|---|
| **Balance at beginning of year** | 19,166 | 19,164 |
| Prepayment expensed during year | (4,299) | (3,403) |
| Payments made during the year | 3,547 | 3,405 |
| **Net book value** | **18,414** | **19,166** |
| **Current/non-current split** | | |
| Current | 1,928 | 1,885 |
| Non-current | 16,486 | 17,281 |
| **Total prepaid network expenses** | **18,414** | **19,166** |

REANNZ and the Hawaiki Submarine Cable Limited Partnership entered into a 25-year lease contract for managed international capacity in July 2014.

The contract required four milestone payments in USD. The milestone payments were converted into NZD at the spot rate on payment date. The total amount of the four milestone payments (including taxes) was NZ$19.34M.

Straight-line amortisation of the initial fee spread over the lease term commenced in August 2018 when the cable was ready for service. The annual expense is $774K.

Annual payments in advance associated with the Hawaiki contract are recognised evenly over the prepaid period. Prepayments of $3.55M were made during the year.

# 11. Property, plant and equipment

## Accounting Policy

Property, plant and equipment consists of six classes, which are measured as follows:

› Leasehold improvements, at cost less accumulated depreciation and impairment losses.

› Routers, switches and optical equipment, at cost less accumulated depreciation and impairment losses.

› Information technology equipment, at cost less accumulated depreciation and impairment losses.

› Office equipment, at cost less accumulated depreciation and impairment losses.

› PoP ('Point of Presence') equipment, at cost less accumulated depreciation and impairment losses.

› Fibre and fibre housing, at cost less accumulated depreciation and impairment losses.

### Additions

The cost of an item of property, plant and equipment is only recognised as an asset when it is probable that future economic benefits or service potential associated with the item will flow to REANNZ and the cost of the item can be measured reliably.

Work in progress is recognised at cost less impairment and is not depreciated.

In most instances, an item of property, plant and equipment is initially recognised at cost. Where an asset is acquired through a non-exchange transaction, the asset will be recorded at fair value at the date of acquisition.

Costs incurred subsequent to initial acquisition are capitalised only when it is probable that future economic benefits or service potential associated with the item will flow to REANNZ and the cost of the item can be measured reliably.

The costs of servicing property, plant and equipment are recognised in the Statement of Comprehensive Revenue and Expense as they are incurred.

### Disposals

Gains and losses on disposals are determined by comparing the proceeds of disposal with the carrying amount of the asset. Gains and losses on disposal are included in the Statement of Comprehensive Revenue and Expense.

### Depreciation

Depreciation on property, plant and equipment (excluding work in progress) is calculated on a straight-line basis, from the time the asset is in the location and condition necessary for its intended use. This basis allocates the cost or value of the asset, less its residual value, over its estimated useful life.

The depreciation method, estimated useful lives and residual values of property, plant and equipment are reviewed annually to assess appropriateness.

The following estimated useful lives are used in the calculation of depreciation:

| | |
|---|---|
| Leasehold improvements | 6 years |
| Routers, switches & optical equipment | 3-8 years |
| Information technology equipment | 3 years |
| Office equipment | 5 years |
| PoP equipment | 8 years |
| Fibre and fibre housing | 20 years |

Leasehold improvements are depreciated based on estimated useful life or the remaining lease term, whichever is shorter.

### Impairment of property, plant and equipment and intangible assets

REANNZ does not hold any cash-generating assets. Assets are considered cash-generating where their primary objective is to generate a commercial return.

### Non-cash generating assets

At each reporting date, assets are reviewed by the directors to determine whether there are any events or changes in circumstances that indicate that carrying amounts may not be recoverable. An impairment loss is recognised as the amount by which the asset's carrying amount exceeds its estimated recoverable amount.

If the carrying amount of an asset exceeds its recoverable amount, the asset is impaired and the carrying amount is written down to the recoverable amount. The impairment loss is then recognised as an expense in the Statement of Comprehensive Revenue and Expense.

Where an item of property, plant or equipment has been revalued, any impairment loss is recognised against the revaluation reserve for that class of asset. Where this results in a debit balance in the revaluation reserve, the balance is recognised in the Statement of Comprehensive Revenue and Expense.

Any reversal of an impairment loss is recognised in the Statement of Comprehensive Revenue and Expense. Impairment losses can only be reversed to the extent that the carrying amount of the asset matches the carrying amount as calculated under the cost less accumulated depreciation method.

For items of property, plant or equipment that have been re-valued, any reversal of impairment loss is credited back to the revaluation reserve. However, to the extent that an impairment loss for that class of asset was previously recognised in the Statement of Comprehensive Revenue and Expense, a reversal of impairment loss is also recognised in the Statement of Comprehensive Revenue and Expense.

### Critical accounting estimates and assumptions

Estimating useful lives and residual values of property, plant and equipment:

At each balance date, the useful lives and residual values of property, plant and equipment are reviewed. Assessing the appropriateness of useful life and residual value estimates of property, plant and equipment requires a number of factors to be considered such as the physical condition of the asset, expected period of use of the asset by REANNZ, and expected disposal proceeds from the future sale of the asset.

An incorrect estimate of the useful life or residual value will affect the depreciation expense recognised in the Statement of Comprehensive Income and Expense, and carrying amount of the asset in the Statement of Financial Position. REANNZ minimises the risk of this estimation uncertainty by:

› Physical inspection of assets,

› Asset replacement programmes, and

› Review of second-hand market for similar assets.

REANNZ has not made significant changes to past assumptions concerning useful lives and residual values.

### Breakdown of property, plant and equipment

Movements for each class of property, plant and equipment are as follows:

| | Office equipment $000 | ICT equipment $000 | National PoP equipment $000 | International PoP equipment $000 | Leasehold improvements $000 | Network services $000 | Fibre and fibre housing $000 | Total $000 |
|---|---|---|---|---|---|---|---|---|
| **Cost or valuation** | | | | | | | | |
| Balance at 1 July 2019 | 132 | 692 | 11,191 | 1,024 | 381 | 25 | 8,210 | 21,655 |
| Balance at 30 June 2020 | 113 | 670 | 11,402 | 1,120 | 401 | 25 | 8,210 | 21,941 |
| Additions | 4 | 51 | 179 | 111 | - | - | - | 345 |
| Sales/write-offs | - | (77) | (290) | - | - | (10) | (97) | (474) |
| **Balance at 30 June 2021** | **117** | **644** | **11,291** | **1,231** | **401** | **15** | **8,113** | **21,812** |
| **Accumulated depreciation** | | | | | | | | |
| Balance at 1 July 2019 | 100 | 588 | 6,915 | 314 | 201 | 25 | 2,409 | 10,552 |
| Balance at 30 June 2020 | 103 | 626 | 8,475 | 488 | 265 | 25 | 2,819 | 12,801 |
| Depreciation expense | 7 | 41 | 1,549 | 205 | 72 | - | 406 | 2,280 |
| Disposals | - | (77) | (265) | - | - | (10) | (36) | (388) |
| **Balance at 30 June 2021** | **110** | **590** | **9,759** | **693** | **337** | **15** | **3,189** | **14,693** |
| **Carrying amounts** | | | | | | | | |
| Balance at 1 July 2019 | 32 | 104 | 4,276 | 710 | 180 | - | 5,801 | 11,103 |
| Balance at 30 June 2020 | 10 | 44 | 2,927 | 632 | 136 | - | 5,391 | 9,140 |
| **Balance at 30 June 2021** | **7** | **54** | **1,532** | **538** | **64** | **-** | **4,924** | **7,119** |

The net carrying amount of fibre held under finance leases is $1.35M (2020: $1.47M). Also refer to note 19.

## 12. Intangible assets

### Accounting Policy

Software is a finite life intangible and is recorded at cost less accumulated amortisation and impairment. Amortisation is charged on a straight-line basis over the estimated useful life of the intangible asset.

Costs associated with maintaining computer software are recognised as an expense when incurred.

Staff training costs are recognised as an expense when incurred.

Costs associated with the development and maintenance of the REANNZ website are recognised as an expense when incurred.

The useful life and associated amortisation rates of major classes of intangible assets have been estimated as follows:

| | | |
|---|---|---|
| Illustration and software licences | 3 years | 33.3% |

### Impairment of intangible assets

Refer to the policy for impairment of property, plant and equipment in note 11. The same approach applies to the impairment of intangible assets.

| Breakdown of intangible assets | Illustration licence $000 | Software $000 | Total $000 |
|---|---|---|---|
| **Gross carrying amount** | | | |
| Balance at 1 July 2019 | 9 | 2 | 11 |
| Balance at 30 June 2020 | 9 | 2 | 11 |
| Additions | - | - | - |
| Disposals | (9) | (2) | - |
| **Balance at 30 June 2021** | **-** | **-** | **-** |
| **Accumulated amortisation** | | | |
| Balance at 1 July 2019 | 6 | 2 | 8 |
| Balance at 30 June 2020 | 9 | 2 | 11 |
| Amortisation expense | - | - | - |
| Disposals | (9) | (2) | (11) |
| Impairment losses | - | - | - |
| **Balance at 30 June 2021** | **-** | **-** | **-** |
| **Carrying amounts** | | | |
| At 1 July 2019 | 3 | - | 3 |
| At 30 June 2020 | - | - | - |
| **At 30 June 2021** | **-** | **-** | **-** |

## 13. Accounts payable and accrued expenses

### Accounting Policy

Short-term payables are recorded at the amount payable.

| Breakdown of payables and accrued expenses | 2021 $ 000 | 2020 $ 000 |
|---|---|---|
| **Exchange transactions** | | |
| Creditors | 892 | 1,241 |
| Accrued expenses | 51 | 53 |
| **Total accounts payable and accrued expenses** | **943** | **1,294** |

## 14. Employee entitlements

### Accounting Policy

Employee benefits due to be settled within 12 months after the end of the year in which the employee provides the related service are measured based on the accrued entitlements at current rates of pay. These include salaries and wages accrued up to balance date, annual leave earned but not yet taken at balance date.

A liability and an expense are recognised for bonuses where there is a contractual obligation or where there is a past practice that has created a constructive obligation and a reliable estimate of the obligation can be made.

| Breakdown of employee entitlements | 2021 $ 000 | 2020 $ 000 |
|---|---|---|
| Accrued salaries and wages | 59 | 54 |
| Annual leave | 155 | 165 |
| **Total employee entitlements** | **214** | **219** |

It is expected that all employee entitlements will be settled within 12 months of balance date.

## 15. Revenue in advance

| | 2021 $000 | 2020 $000 |
|---|---|---|
| **Exchange transactions** | | |
| Fees received in advance | 470 | 216 |
| Fees invoiced but not yet received | 1,566 | 1,718 |
| Oher revenue billed in advance | 34 | - |
| **Total revenue in advance** | **2,070** | **1,934** |

Revenue in advance includes membership fees billed in advance and fees for services billed in advance. All services billed in advance will be provided by REANNZ in the coming financial year. These fees are shown as revenue received in advance until the service period begins, at which time the fees will be recognised as revenue in the Statement of Comprehensive Revenue and Expense.

## 16. Deferred revenue

| | 2021 $000 | 2020 $000 |
|---|---|---|
| **Current** | | |
| Exchange transactions | | |
| Prepayments for services | 78 | - |
| Total current | 78 | - |
| **Non-current** | | |
| Exchange transactions | | |
| Prepayments for services | 94 | - |
| Total non-current | 94 | - |
| **Total deferred revenue** | **172** | **-** |

## 17. Provisions

### Accounting Policy

#### General

Provisions are recognised for future expenditure of an uncertain amount or timing when:

› there is a present obligation (either legal or constructive) as a result of a past event;

› it is probable than an outflow of future economic benefits or service potential will be required to settled the obligation; and a reliable estimate of the obligation amount can be made.

Provisions are measured at the present value of the amount expected to be required to settle the obligation.

#### Restructuring

A restructuring provision is recognised when either an approved formal plan for the restructure has been announced to those affected, or implementation has been started.

#### Onerous contracts

A provision for onerous contracts is recognised when the expected benefits or service potential to or from a contract is lower than the unavoidable cost of meeting the contract obligations.

The provision is measured at the present value of the lower of the expected cost of terminating the contract and the net expected cost of continuing the contract.

| Breakdown of provisions | 2021 $000 | 2020 $000 |
|---|---|---|
| **Current** | | |
| Restructuring | - | 89 |
| Onerous contract | 4 | 212 |
| Total Current | 4 | 301 |
| **Non-current** | | |
| Restructuring | - | - |
| Onerous contract | - | 159 |
| Total Non-current | - | 159 |
| **Total Provisions** | **4** | **460** |

### Restructuring provision

The opening balance of the provision was the estimated cost of redundancy payments resulting from a restructure of the Engagement team. The provision was fully utilised in August 2020. A further provision of $113K was added and used during the year due to a restructure of the Corporate and Finance team.

### Onerous contracts provision

The onerous contract is a non-cancellable lease for office space at 22 The Terrace, Wellington.

As at 30 June 2020, the office space was vacant due to a low-seismic rating on the building. Management deemed the risk to staff unacceptably high and alternative premises were found. The opening balance represents the remaining obligation for lease payments under the contract to March 2022.

During this financial year, the office became unavailable for use when remedial seismic strengthening commenced. From this point, the property owners reimbursed alternate premise lease costs and will continue to do so until the remedial work is completed, expected in late 2021. As a result, most of the opening provision was reversed during the year. The provision at balance date represents the difference between lease payments for 22 The Terrace and the reimbursed amount to the end of the alternate to March 2022.

| | Restructuring $000 | Onerous Lease $000 | Total $000 |
|---|---|---|---|
| Balance 1 July 2020 | 89 | 371 | 460 |
| Provision added | 113 | - | 113 |
| Amounts used | (202) | (367) | (569) |
| **Balance as at 30 June 2021** | **-** | **4** | **4** |

## 18. Equity

### Capital management

REANNZ's capital is its equity, which comprises accumulated funds and contributed capital. Equity is measured as the difference between total assets and total liabilities.

REANNZ is subject to the financial management and accountability provisions of the Crown Entities Act 2004, which impose restrictions in relation to borrowings, acquisition of securities, issuing guarantees and indemnities and the use of derivatives.

REANNZ manages its equity as a by-product of prudently managing revenues, expenses, assets, liabilities, investments, and general financial dealings to ensure REANNZ effectively achieves its objectives and purpose, whilst remaining a going concern.

### Contributed capital

At 30 June 2021, share capital comprised 1,816 ordinary shares (2020: 1,816). All issued shares are fully paid and have no par value.

| Breakdown of equity | 2021 $000 | 2020 $000 |
|---|---|---|
| **Contributed capital** | | |
| Balance at 1 July | 16,001 | 16,001 |
| Capital contribution | - | - |
| Repayment of capital | - | - |
| Balance at 30 June | 16,001 | 16,001 |
| | | |
| **Accumulated surplus/(deficit)** | | |
| Balance at 1 July | 34,552 | 35,751 |
| Surplus/(deficit) for the year | (1,999) | (1,199) |
| Balance at 30 June | 32,553 | 34,552 |
| **Total equity** | **48,554** | **50,553** |

## 19. Capital commitments and operating leases

### i.  Capital commitments

There were no capital commitments at balance date.

### ii.  Operating lease commitments

#### Accounting Policy

An operating lease is a lease that does not transfer substantially all the risks and rewards incidental to ownership of an asset to the lessee. Lease payments under an operating lease are recognised as an expense on a straight-line basis over the lease term.

Lease incentives received are recognised in the Statement of Comprehensive Income and Expense as a reduction of rental expense over the lease term.

Where the leased items are not in use, the operating lease payments will be treated as a prepayment in the Statement of Financial Position. Once the items begin to be used in deriving revenue, these prepayments are released to the Statement of Comprehensive Revenue and Expense on a straight-line basis over the period of the remaining operating lease term.

Operating leases relate to the following activities:

a.  Office premises at 2-6 Gilmer Terrace, Wellington, 22 The Terrace, Wellington, and 40 Kenwyn Street, Parnell, Auckland; and

b.  Network PoP accommodation and associated support facilities

The future aggregate minimum lease payments payable under non-cancellable operating leases are as follows:

| | 2021 $000 | 2020 $ 000 |
|---|---|---|
| Less than one year | 624 | 631 |
| Between one and two years | 186 | 411 |
| Between two and five years | 329 | 80 |
| Later than five years | 26 | - |
| **Total operating lease commitments** | **1,165** | **1,122** |

There are no restrictions placed on REANNZ by any of its leasing arrangements.

### iii.  Connectivity and managed service commitments

Connectivity and managed service commitments relate to:

› Payments to suppliers for national and international connectivity services, and

› Payments to suppliers for service management of the national network.

| | 2021 $000 | 2020 $000 |
|---|---|---|
| Less than one year | 4,317 | 4,259 |
| Between one and two years | 3,578 | 3,682 |
| Between two and five years | 9,080 | 9,689 |
| Later than five years | 38,666 | 45,825 |
| **Total connectivity and managed service commitments** | **55,641** | **63,455** |

In June 2014, REANNZ entered into a 25-year lease of managed capacity with Hawaiki Submarine Cable Limited Partnership. The first condition of the lease was met on 31 March 2016, at which point the contract became non-cancellable.

The first annual connectivity fee was paid in August 2018 when the cable was ready for service. REANNZ will incur annual connectivity charges over the 25-year lease term. These costs are reflected above and form the whole amount of the later than five years total.

### iv.  Finance leases

#### Accounting Policy

A finance lease is a lease that transfers to the lessee substantially all the risks and rewards incidental to ownership of an asset, whether or not title is eventually transferred.

At the commencement of the lease term, prepaid finance leases where REANNZ is the lessee are recognised as an asset in the Statement of Financial Position at the fair value of the leased item.

The amount recognised as an asset is depreciated over its useful life. If there is no reasonable certainty as to whether REANNZ will obtain ownership at the end of the lease term, the asset is fully depreciated over the shorter of the lease term and its useful life.

Indefeasible Rights of Use (IRUs) have been granted to REANNZ over specific fibre pairs and have been accounted for as finance leases as the risks and rewards of ownership have transferred to REANNZ. The net carrying amount of the leased assets is $1.35M (2020: $1.47M).

The finance lease term is for the expected economic life of the asset and has been prepaid. As such, there are no future finance lease payments payable.

REANNZ does not hold an option to purchase the asset at the end of the lease term.

## 20. Contingencies

There were no contingent assets or liabilities at balance date for which disclosure is required (2020: $Nil).

## 21. Related party transactions

REANNZ is a wholly owned entity of the Crown.

Related party disclosures have not been made for transactions with related parties that are within a normal supplier or client/recipient relationship with terms and conditions no more or less favourable than those that it is reasonable to expect REANNZ would have adopted in dealing with the party at arm's length in the same circumstances.

Transactions with other government agencies (for example, government departments and Crown entities) are not disclosed as related party transactions when they are on terms and conditions consistent with standard operating arrangements between government agencies.

### Key management personnel compensation

The compensation of directors, the Board Advisor, the Chief Executive and senior management (the Senior Leadership Team), being the key management personnel of REANNZ, is set out below:

| | 2021 $000 | 2020 $000 |
|---|---|---|
| **Remuneration** | | |
| Directors | 146 | 180 |
| Board Advisor | 15 | - |
| Senior Leadership Team | 1,250 | 1,222 |
| **Total** | **1,411** | **1,402** |
| | | |
| **Full-time equivalent** | | |
| Directors | 0.73 | 0.85 |
| Board Advisor | 0.07 | - |
| Senior Leadership Team | 6.38 | 6.21 |
| **Total** | **7.18** | **7.06** |

The full-time equivalent for Board members has been determined based on the frequency and length of Board and committee meetings, estimated time for Board

members to prepare for meetings, attendance at external stakeholder meetings and advice provided to the Senior Leadership Team.

The Board had six directors for the full year. In addition, Judith Johnston was engaged as Board Advisor from July 2020 to March 2021 based on her extensive sector experience. Judith was a director to 30 June 2020.

An analysis of director remuneration is provided in note 4.

## Chief Executive's remuneration

Dianna Taylor was Chief Executive from 1 July 2020 to 4 June 2021. Neil Fenemor was Acting Chief Executive from 6 to 30 June 2021.

Total remuneration for the Chief Executive role for the year was $379,495 consisting of:

- Salary: $311,702
- Performance based bonus: $34,375
- Benefits: $33,418

Benefits include KiwiSaver, professional development, a car park allowance and Koru club membership.

The Chief Executive's remuneration package does not include any long term incentives. Short term incentives were set at up to 15% of base salary plus 3% KiwiSaver employer contribution. Incentive payments are granted at the discretion of the Board and are based on personal and company performance measures.

## Employee remuneration

Remuneration and other benefits of $100,000 per annum or more paid or payable to employees in their capacity as employees were:

| | 2021 Employees | 2020 Employees |
|---|---|---|
| $100,000 - $109,999 | 2 | 4 |
| $110,000 - $119,999 | 1 | 1 |
| $120,000 - $129,999 | 4 | 3 |
| $130,000 - $139,999 | 2 | 1 |
| $140,000 - $149,999 | 1 | 1 |
| $150,000 - $159,999 | 1 | 2 |
| $160,000 - $169,999 | 2 | 3 |
| $170,000 - $179,999 | 1 | - |
| $180,000 - $189,999 | 1 | 1 |
| $190,000 - $199,999 | 1 | 1 |
| $240,000 - $249,999 | - | 1 |
| $340,000 - $349,999 | 1 | - |

During the year ended 30 June 2021, REANNZ paid $186K in compensation and other benefits to five employees in relation to cessation (2020: $Nil). Of the amount paid, $77K was included as part of the provision for restructuring as at 30 June 2020, and therefore the expense was recorded in the previous financial year, but paid during this financial year.

## 22. Events after balance date

There were no significant events after balance date.

## 23. Financial instruments

### Financial instrument categories

The carrying amount of financial asset and liability categories are as follows:

| | 2021 $000 | 2020 $000 |
|---|---|---|
| **Mandatorily measured at fair value through surplus or deficit** | | |
| Derivative financial instrument assets | 113 | (251) |
| **Financial liabilities measured at amortised cost** | | |
| Accounts payable and accrued expenses (excluding income in advance, taxes payable and grants received subject to conditions) | 943 | 1,294 |
| Finance leases | 1,353 | 1,470 |
| **Total financial liabilities measured at amortised cost** | **2,296** | **2,764** |
| **Financial assets measured at amortised cost** | | |
| Cash and cash equivalents | 3,401 | 2,165 |
| Debtors and other receivables | 1,991 | 2,063 |
| Investments – term deposits | 21,061 | 21,106 |
| **Total financial assets measured at amortised cost** | **26,453** | **25,334** |

## 24. Explanation of major variances to budget

### Statement of Comprehensive Revenue and Expense

#### Revenue

Total revenue exceeded budget by $289K. Unbudgeted other revenue largely from the sale of assets and reimbursement of lease-related costs of $304K was partially offset by interest revenue being under budget by $28K due to falling interest rates.

#### Expenditure

Cash reserves were higher than budgeted throughout the year with network, operational and capital expenditure all lower than anticipated.

*Network expenses*

Total network expenses were $1.96M lower than budget. International network expenses were $1.24M underspent. A key driver of the variance was a stronger NZD against the USD than budgeted. Most international network costs are incurred in USD resulting in significant savings. In addition, ongoing operating expenses were waived by technology partners at new international PoP locations.

National network savings of $432K were from third party services, including PoP accommodation costs. Provisions for additional core network expenses were unused as costs were well managed without compromising network performance. Depreciation was below budget arising from a capital expenditure underspend.

Network maintenance costs were underspent with some technical roles being vacant for part of the year.

*Operating expenses*

Overall operating expenses were under budget for the year by $1.58M.

Roles budgeted for the full year but vacant for part of it resulted in an underspent employment expenses.

Other operating expenses were $440K under spent. A stronger NZD against the USD than budgeted resulted in lower than expected business systems costs. Some marketing and engagement initiatives were deferred until all Engagement team roles were filled. More virtual meetings than planned impacted Board costs.

Use of external consultants and other professional services were minimised due to deferment or using internal resource.

Operating leases were $273K under spent, mostly due to the non-cash use of the onerous lease provision of $366K crediting office rent expense.

Travel costs were minimised with fewer domestic trips taken during the year. An increase in staff based in Auckland and Christchurch reduced the need for the Wellington staff to travel as frequently. Due to the ongoing travel restrictions worldwide due to the COVID-19 pandemic, planned international travel costs were not incurred.

#### Foreign currency gains/(losses)

There were net foreign currency losses of $343K for the year.

Net realised gains of $28K arose from the difference in exchange rates on invoice and payment date of foreign currency denominated supplier invoices, and the settlement of forward contracts to buy USD.

Unrealised exchange losses of $371K resulted mostly from the fair value movement on unsettled forward foreign exchange contracts to purchase USD. Losses on a USD denominated bank account and reversal of fair value gains on settlement of forward foreign exchange contracts also contributed to the total.

### Statement of Financial Position

Actual expenditure for the year was lower than budget across all areas impacting cash, investments and property, plant and equipment.

Fair value gains on derivative financial instruments were budgeted, but the stronger NZD against the USD than budgeted resulted in fair value losses on unsettled forward foreign exchange contracts to purchase USD.

The cost of prepaid network expenses billed in USD were also impacted by a stronger NZD against the USD than budgeted.

Receivables and debtors were under budget as payment for some revenue billed in advance was received ahead of the due date. Revenue in advance exceeded budget at balance date due to some services being paid three-years in advance, instead of monthly or quarterly in advance.

### Statement of Cash Flows

#### Operating cash flows

Net cash flow from operating activities exceeded budget by $3.14M.

Network revenue exceeded budget due to the early payment of core membership fees for Q1 FY2022. Unbudgeted other revenue also contributed to the positive cash inflow variance to budget.

Operational savings from the network and other expenditure resulted in cash payment savings of $1.67M to suppliers and employees. A stronger NZD against the USD compared to budget resulted in prepayments for network connectivity being $591K under budget.

#### Investing cash flows

Minimal investment was required in national network capital expenditure as existing equipment was able to manage capacity increases. International network equipment purchased during the year to establish PoPs in Hawaii and Guam for resiliency was underspent because of a stronger NZD against the USD compared to budget.

With savings in operating and capital expenditure, the expected utilisation of $3M in cash reserves invested in short term deposits was not required.

# REANNZ members as at 1 July 2021

## Universities



## Crown Research Institutes



## Institutes of Technology, Polytechnics and Wānanga



## Research and Education