A REANNZ Vision for Networked Science

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Computing for SKA Colloq
IRASR, AUT, Auckland, NZ
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Overview

- What is REANNZ; Who is Charles
- The REANNZ Network
- A Vision for Science and the Network
- Upcoming Events

About…

REANNZ

- In one sentence:
    - REANNZ is the computer network that connects the universities, CRI's and polytechs to one another and on to the rest of the world.
- In one paragraph:
    - REANNZ is **New Zealand**'s R&E (research and education) network **connecting researchers** to their instruments, data and collaborators. We **help** drive the discoveries and inventions that are powering NZ's economy into the future. The REANNZ network is **designed for "big-data"**, as a result, everything else our members do over our network is **more efficient**. As a Crown-owned company and not-for-profit, REANNZ is charged with **exploring and supporting** the activities that help bring dreams closer to reality.

About…

Charles

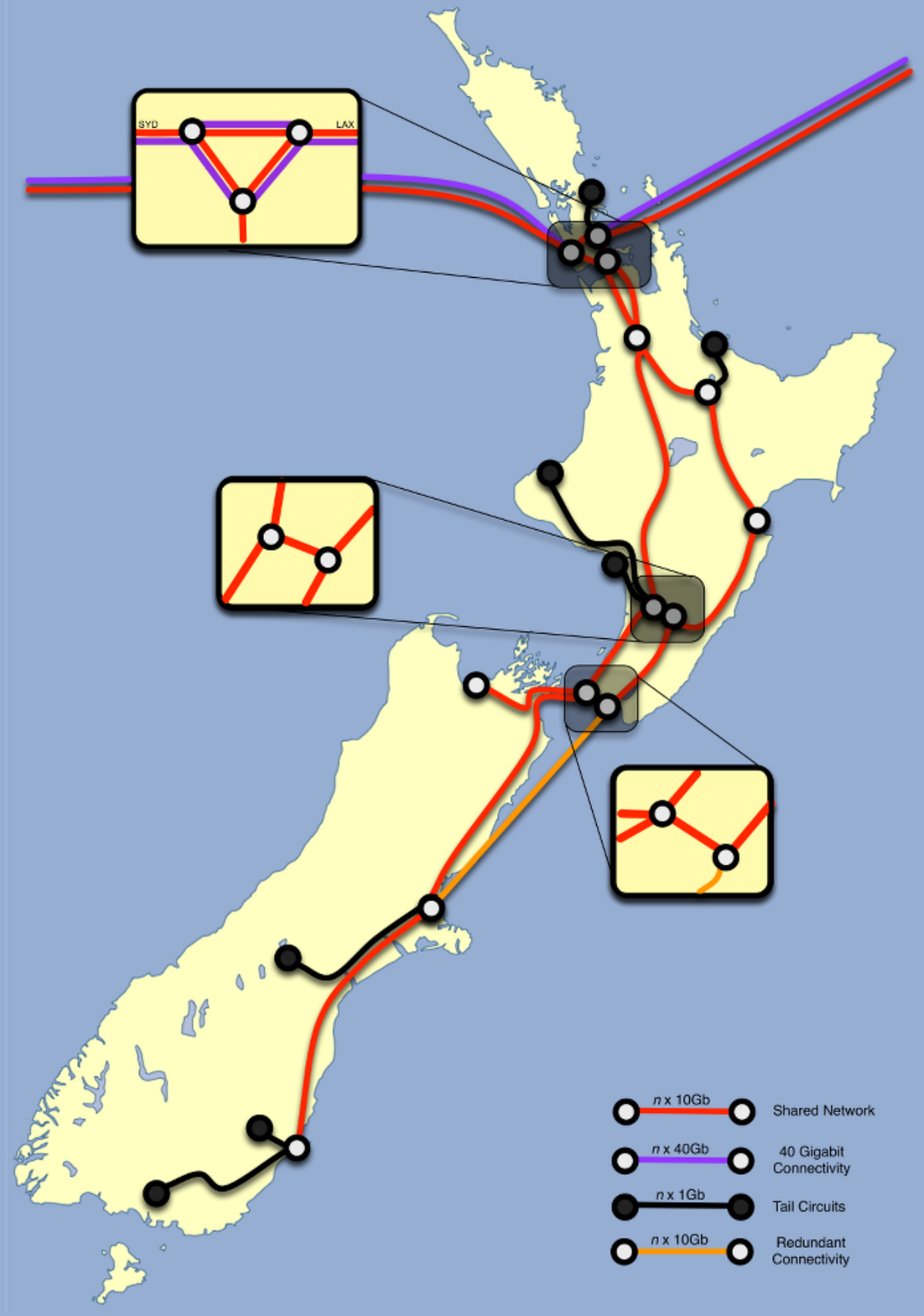
- At REANNZ for just over a year
- Previously with JIVE (e-vlbi, radioastronomy) building the SKA pathfinder technologies
- Previous to that, with Internet2 working to embed the network as a primary tool in large-facility science communities
- Deeper into the past, a software consultant and mechanical engineer (automotive computer aided analysis) and caffeine entrepreneur

About…

A bit about our network

- 99.9+% uptime
- 40x increase in international capacity to AU and US
- 46% growth in traffic volume year-over-year
- ~4.5 Gbps commodity capacity purchased by members
- 2 Tbps national, optical capacity
- 100 Gbps ring around Auckland
- Resilient, “ladder-design” backbone connecting PoPs

…and a few different views of our network


SYD
LAX
n x 10Gb
Shared Network
n x 40Gb
40 Gigabit Connectivity
n x 1Gb
Tail Circuits
n x 10Gb
Redundant Connectivity

Network- Overview

Pushing Bits

- We move data, bit-by-bit (get it! a networking joke!)

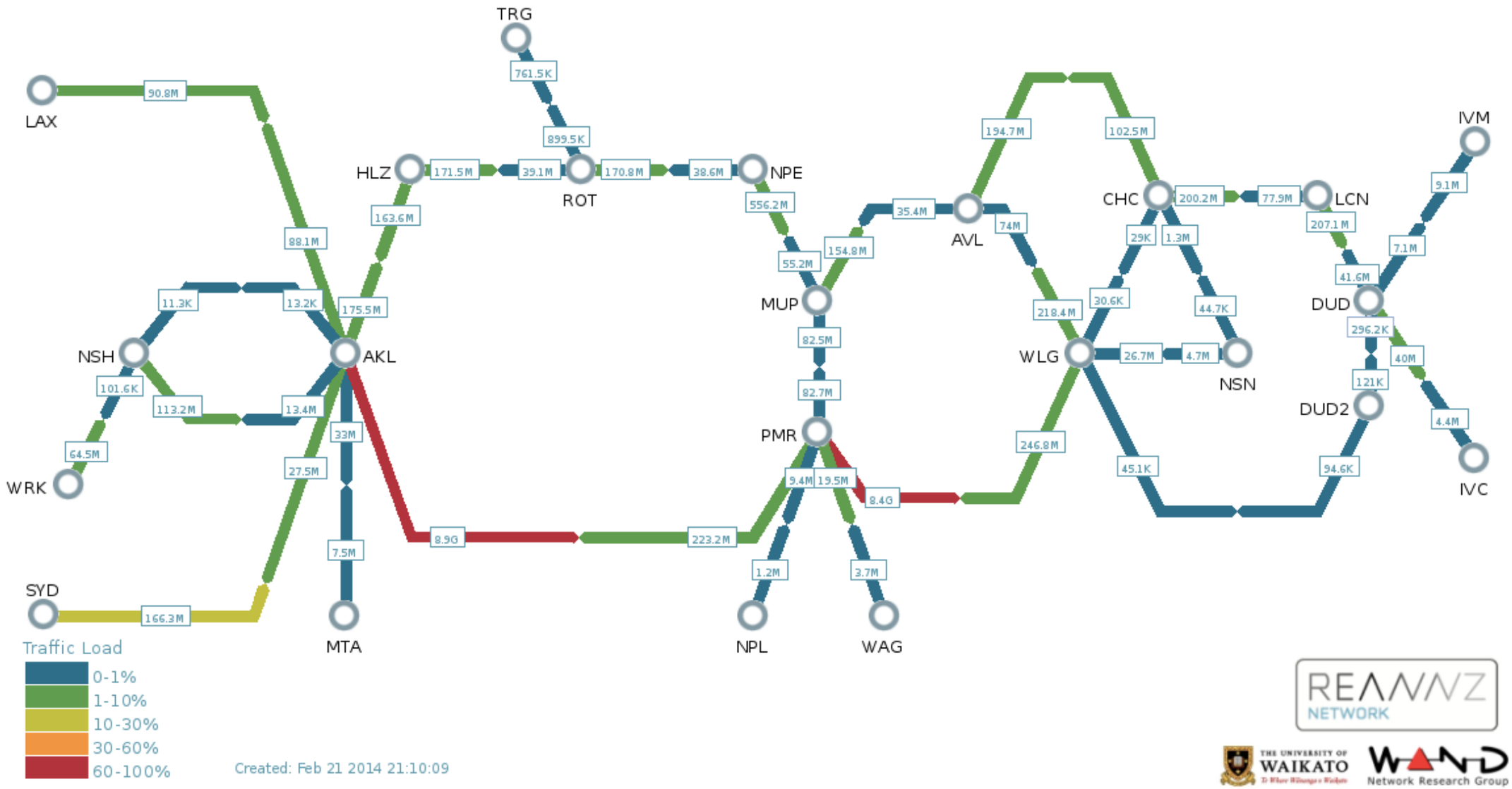
- PoPs: Points of Presence- located throughout the country, connected to the next-in-line PoP, dual connections for resiliency

- Members connect to PoPs

- The backbone is designed to balance capacity along one of the two sides (xref weathermap diagram next) and provide resilience

Network- Overview

REANNZ Weathermap



Network- Overview

International Capacity

- REANNZ has 4+Gbps of commodity internet capacity (videos of cats)

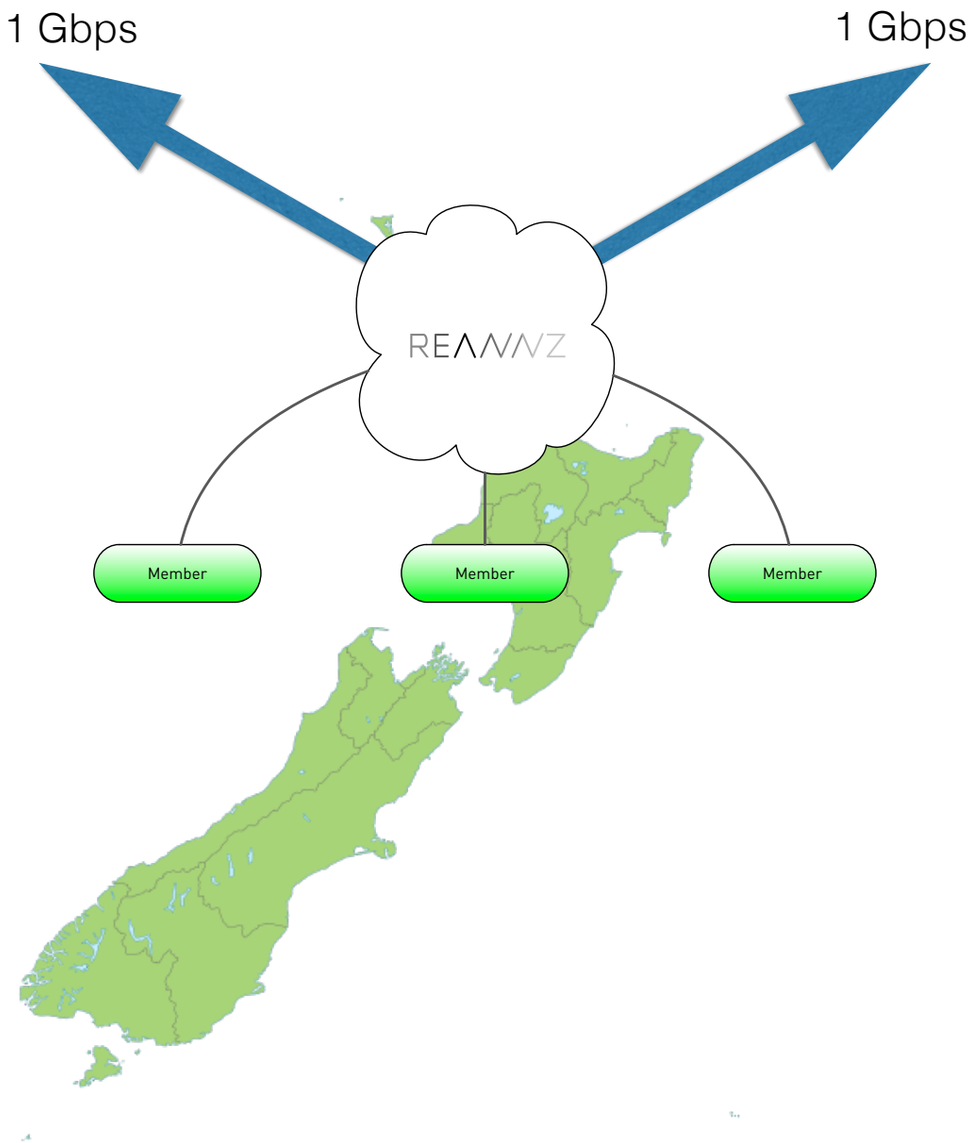
- REANZ provides a dedicated 40 Gbps Science Wave supporting our R&E members research

- There are independent connections to Australia and the United States

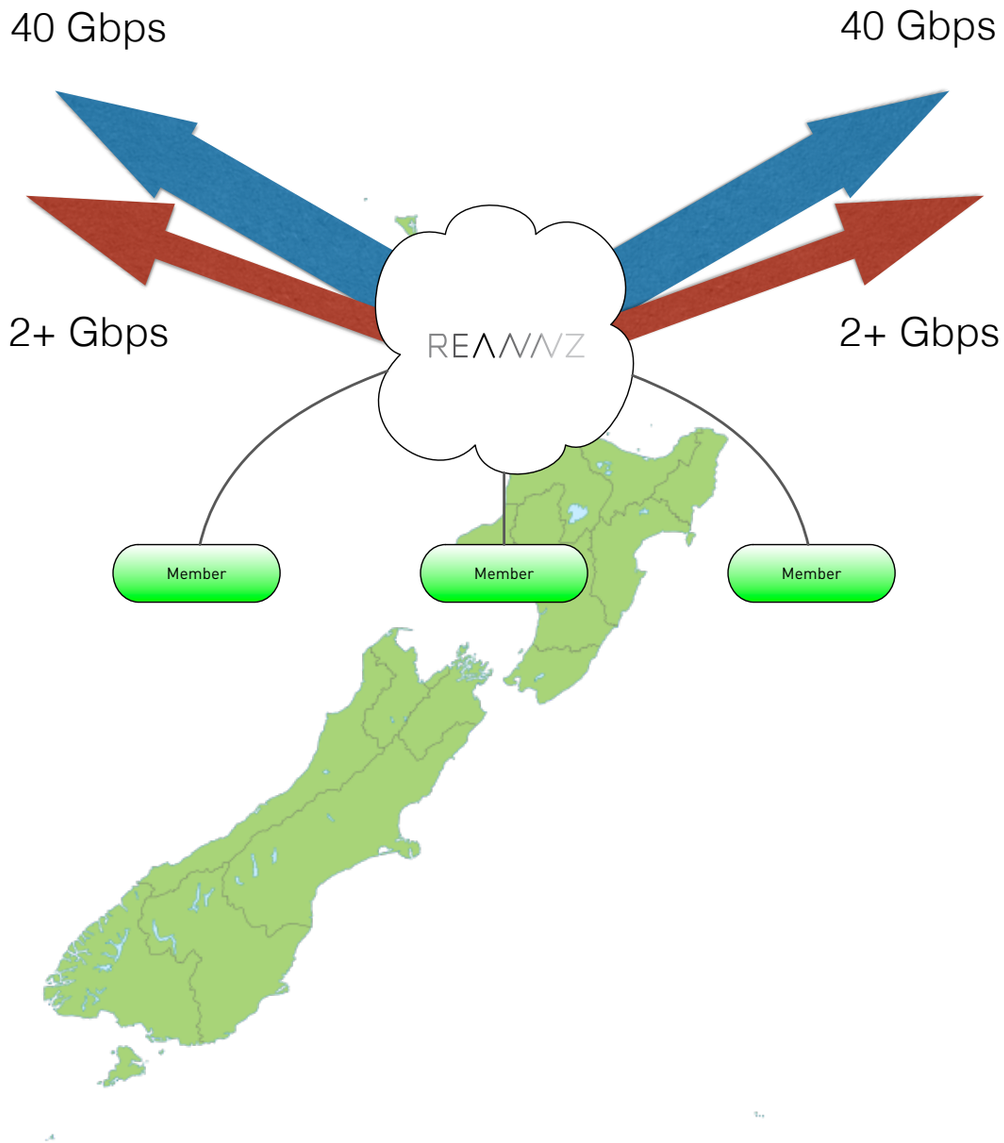
- Specifically: Cooperation with other dishes and the ability to bring that data back to our NZ correlation pipeline

Network- Overview

40 Gbps Science Wave



before Sept 2014



Now (hint 40+Gbps is better)

A Vision for the Network

The network scales up science

- CERN learned how to run their science through a big network
- They helped build the world's networks
  - prediction, construction, testing and verification of science needs
- They run their local network
- …and encouraged NRENs to step up, evolve and grow

A Vision for the Network

REANNZ: world class network

- REANNZ is running a top tier network
  - Best-in-class network statistics: reliability, capacity, up-time
- Partnering internationally
  - R&D, cloud services, test infrastructure
- Building the next generation tools
  - Some are directly related to SKA
  - …some less so

A Vision for the Network

Visualisation Wall

- 8K, single-canvas visualisation display
- 2x2 matrix of 4K displays
- Running SAGE 1.3 and 2.0 (the middleware software infrastructure)
- Built by REANNZ, available to the entire community for testing and use
- First 8K device of this type in the world

A Vision for the Network

Software Defined Networking

- SDN- Software defined networking
- Separation fo control and data plane
- Centralised, programatic control of the network's operations and evolution
- NFV: network function virtualisation
- REANNZ is helping to write the underlying software that will run the future internet and we are testing it now

A Vision for the Network

Network is part of the Instrument

- There is a similarity of the “all science is computer science” statement to “all new facilities are networking facilities”
    - Networking at the SKA site will be important (TN Chan’s 8 TB/s statistic)
- Networking challenges for SKA are legion
    - SDN of some flavour will play a part
    - The LAN, MAN and WAN require significant new thinking
- International networks need to think about how they interact with the SKA data set
    - Learn from the way CERN pushed the evolution of networks

A Vision for the Network

Where can REANNZ assist?

- "…it is a data intensive environment" - Ensor

- REANNZ is able to support data-intensive science at a variety of levels

    - Movement of data: nationally, internationally

    - Systems design, planning and testing

    - Operational verification

    - SDN evolution

A Vision for the Network

the Network…

- is integral: it is no longer a byproduct but considered in the proposal stages as part of the data acquisition process.

- extends into the lab: it removes the tyranny of distance and enables collaboration thus increasing the sources of primary data.

- assumes collaboration: researcher, IT staff, department chair, VC Research, president must all cooperate with one another **and then** the rest of the community—this is how *NETWORKS* operate.

- enables: to be a university/department/researcher of global significance, you have to work with your international peers with the same class of tools. Increasingly, world-class research will be synonymous with world-class access.

A Vision for the Network

REANNZ's Vision

- We have built a world class network
- We are collaborating with the world's best networks and their engineers
- We provide researchers with enviable international capacity
- We are ready for your science

Questions

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upcoming events

Upcoming Events

SDN Workshop

- VUW SDN Workshop

  18-19 Feb 2015

  Railway Building, Wellington, NZ

  http://ecs.victoria.ac.nz/Events/SDNWorkshop?redirectedfrom=Main.SDNWorkshop

- REANNZ is sponsoring and providing several speakers.

- This is an “introduction” course, great if you are technical and understand networks, but do not know SDN.

Upcoming Events

eRNZ 2015

- eResearcch New Zealand 2015

  23-25 March 2015

  Rydges Hotel, Queenstown, NZ

  http://ernz2015.eresearch.org.nz/

- New co-hosting arrangement. Focusing on demonstrations and use of infrastructure.

- Call for proposals is open, submit a talk!

- …I am on the program committee, I have to pitch it.