REANZ

7 April 2025

REANNZ Core IP Network Refresh

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Members

Universities

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The University of Auckland – Te Whare Wānanga o Tāmaki Makaurau – New Zealand

UC University of Canterbury – Te Whare Wānanga o Waitaha – Christchurch New Zealand

Lincoln University – Te Whare Wānaka o Aoraki

Massey University – Te Kunenga ki Pūrehuroa

University of New Zealand

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The University of Waikato – Te Whare Wānanga o Waikato

University of Otago – Te Whare Wānanga o Otāgo – New Zealand

CRIs

agresearch – āta mātai, mātai whetū

ESR – Science for Communities

GNS Science – Te Pū Ao

Manaaki Whenua – Landcare Research

NIWA – Taihoro Nukurangi

Plant & Food Research – Rangahau Ahumara Kai

SCION – Forests • Products • Innovation

CallaghanInnovation – New Zealand's Innovation Agency

Independent research organisations

Lincoln Agritech Ltd

AM – Tāmaki Paenga Hira – Auckland War Memorial Museum

BRANZ

Cawthron – The power of science®

endace

Pacific Edge Ltd – Cancer Diagnostics Company

Malaghan Institute of Medical Research

ITPs and Wānanga

EIT – Eastern Institute of Technology – Te Aho a Māui

Otago Polytechnic – Te Kura Matatini ki Otago

Southern Institute of Technology – Te Whare Wānanga o Murihiku

Te Whare Wānanga o Awanuiārangi

Toi Ohomai Institute of Technology

Unitec Institute of Technology

WelTec – Wellington Institute of Technology – Te Whare Wānanga o te Awakairangi

WITT – Western Institute of Technology at Taranaki – Te Kura Matatini o Taranaki

Whitireia New Zealand

Associates

NZQA – New Zealand Qualifications Authority – Mana Tohu Mātauranga o Aotearoa

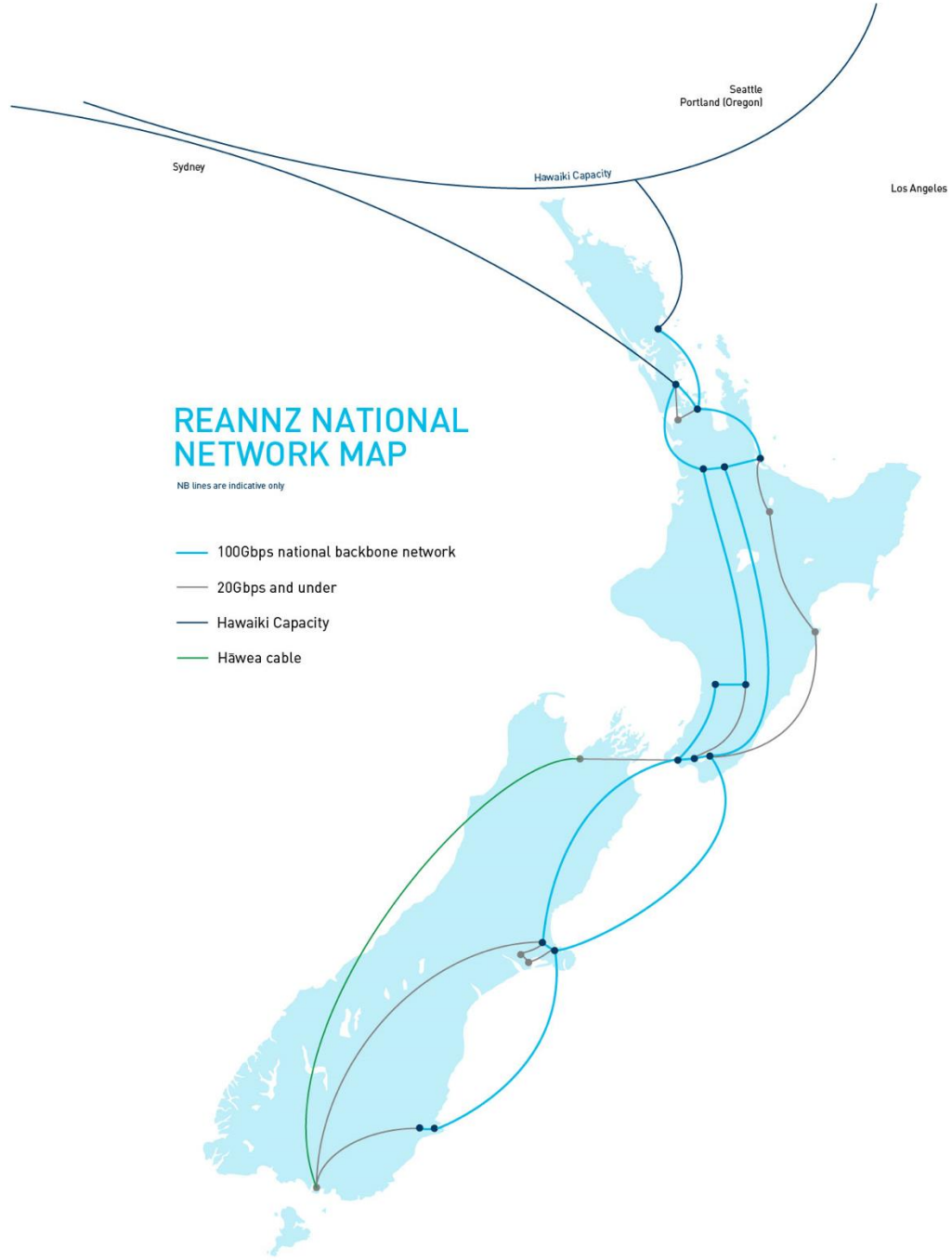
Ministry of Education – Te Tāhuhu o te Mātauranga

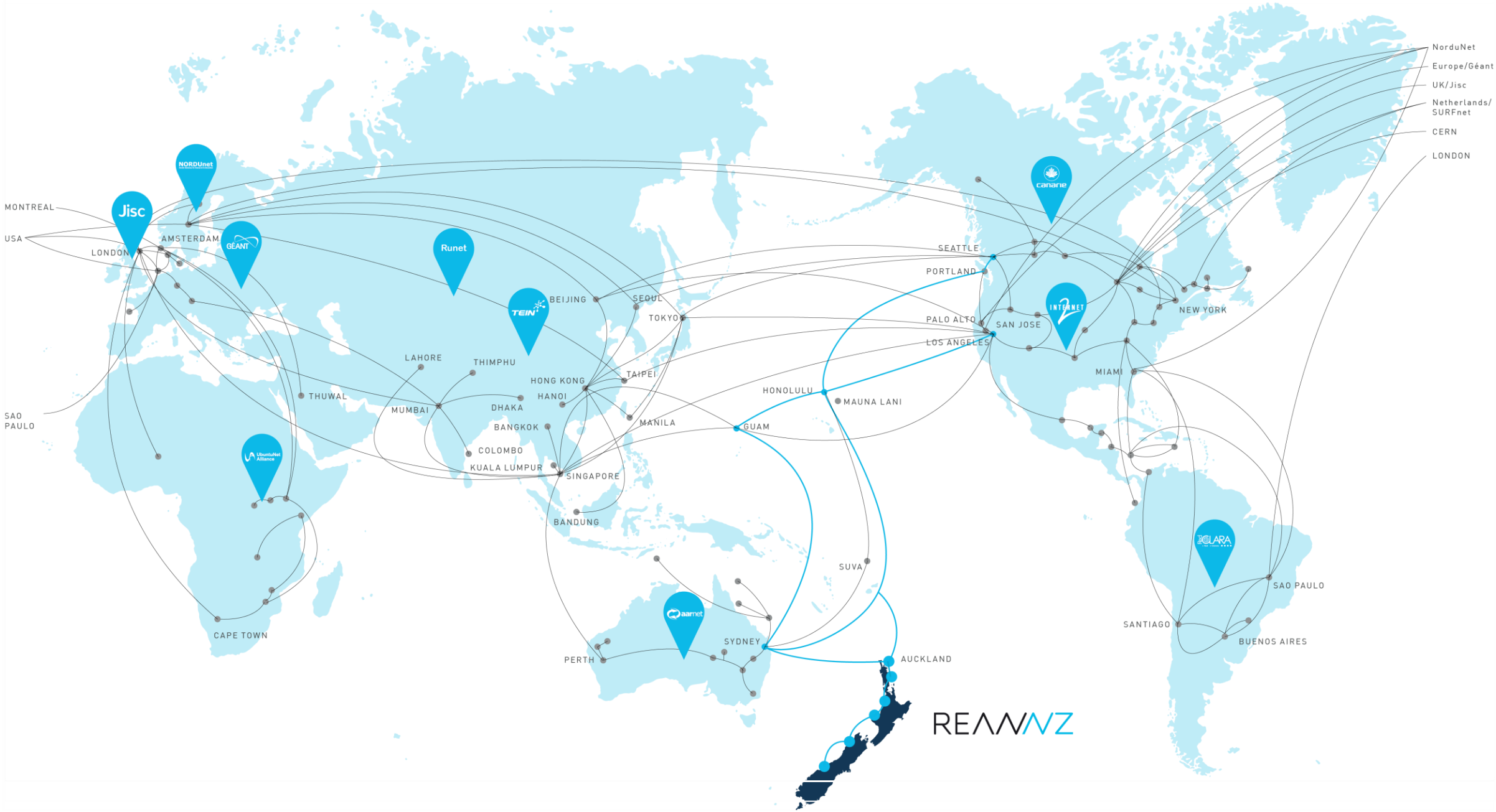
Education Payroll – Rārangi Utu ā-Mātauranga

The College of Law – Te Whare Kura Ture o Aotearoa

Teaching Council New Zealand | Matatū Aotearoa

Tertiary Education Commission – Te Amorangi Mātauranga Matua


Seattle
Portland (Oregon)
Sydney
Hawaiki Capacity
Los Angeles
REANNZ NATIONAL NETWORK MAP
NB lines are indicative only
100Gbps national backbone network
20Gbps and under
Hawaiki Capacity
Hāwea cable


NordunNet
Europe/Géant
UK/Jisc
Netherlands/
SURFnet
CERN
LONDON
MONTREAL
USA
SAO
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AMSTERDAM
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HONOLULU
MAUNA LANI
SEATTLE
PORTLAND
PALO ALTO
SAN JOSE
LOS ANGELES
NEW YORK
MIAMI
SUVA
SYDNEY
PERTH
AUCKLAND
CAPE TOWN
SANTIAGO
BUENOS AIRES
SAO PAULO
Jisc
NORDUnet
GÉANT
Runet
TEIN
canarie
INTERNET2
aarnet
CLARA
UbuntuNet Alliance
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REANNZ Network Services

- Internet + NREN
  - DDoS mitigation
  - MANRS
  - Malware Free Networks (MFN)
- Private L3 WAN
- Private L2 circuits
- Campus Connectivity
  - Dark fibre
  - Ultra-Fast Broadband (Wholesale GPON)
  - IPSec over generic Internet services (Mobile, WISP, satellite, etc.)

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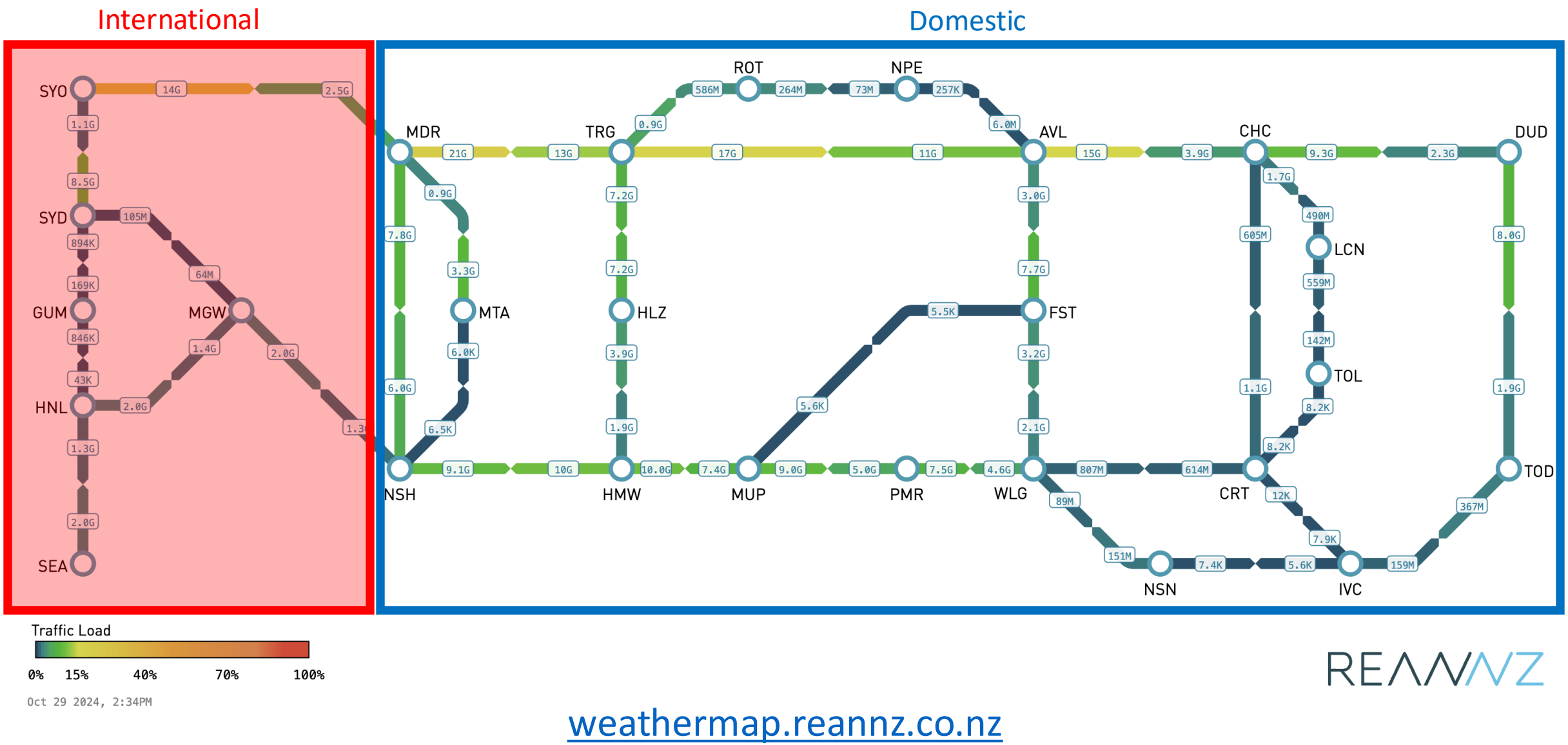

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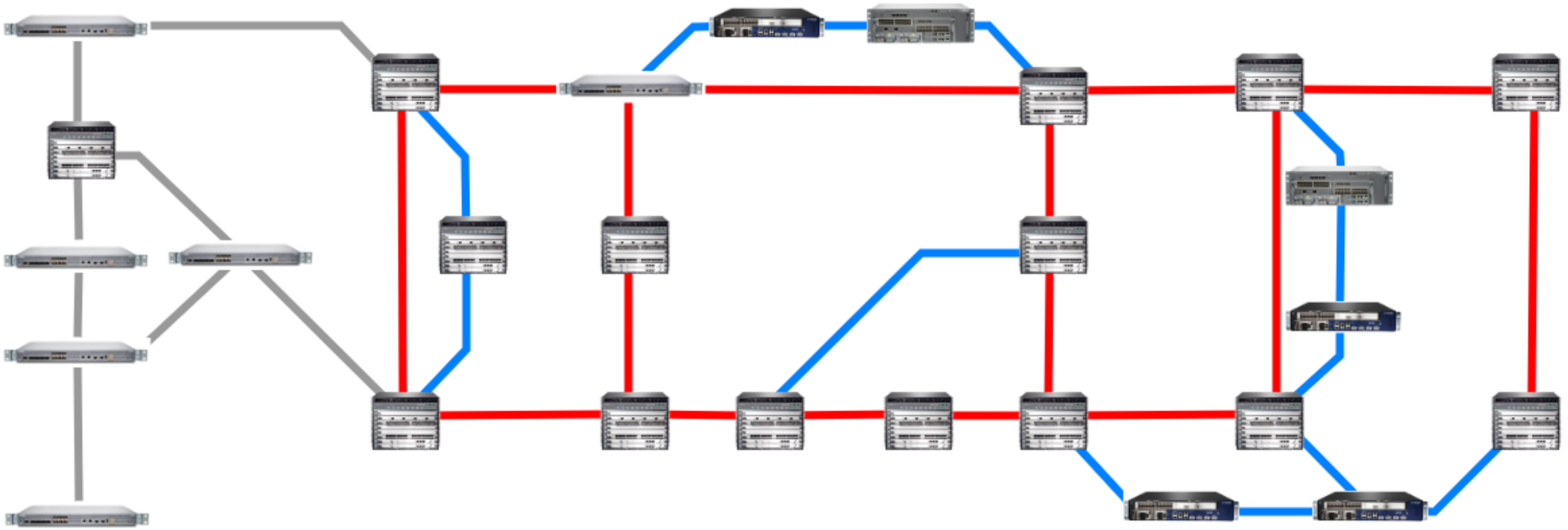
weathermap.reannz.co.nz

REANNZ Core (2016 -> 2023)



Hardware Procurement – Goals

- Brownfield deployment
- Feature parity
- Reliability
- Bandwidth scalability (growth to 400G)
- Reduce cost per port
- Power efficiency per port
- Future-proof for potential feature requirements
    - HQOS
    - Enhanced in network DDoS mitigation
    - Segment Routing

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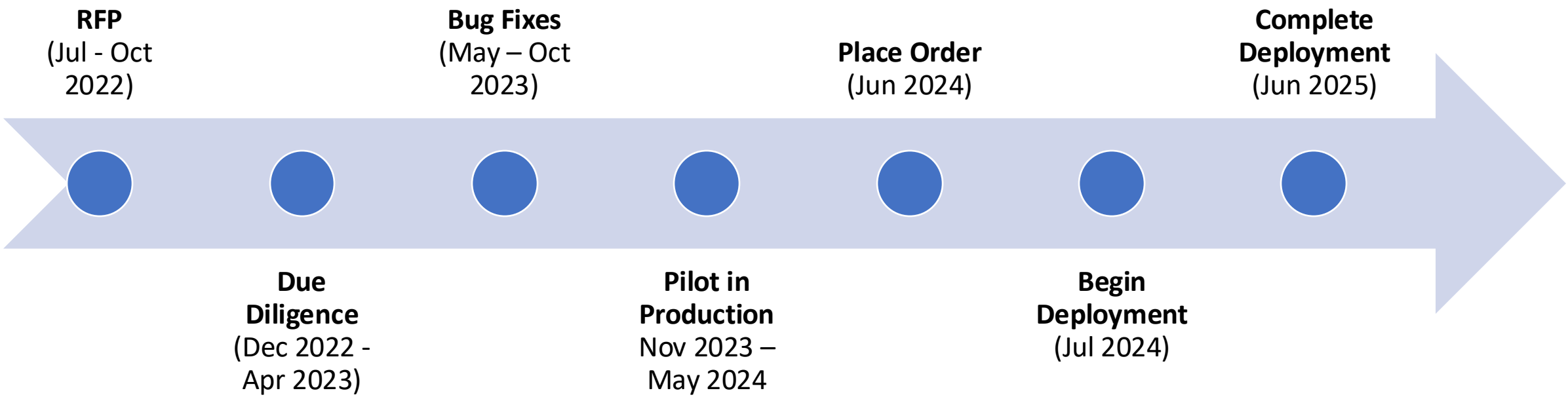
Procurement Timeline



Introducing the Hardware – ACX7024

- 24 x 1G/10G/25G + 4 x 100G in 1RU
- Broadcom Qumran2U (360Gb/s)
- Ideal for:
  - Regional backbone links
  - Terminating small to medium size campuses
  - Datacenters
  - Delivering simple private L2 and L3 services

x 50

Introducing the Hardware – ACX7100-32C

- 32 x 100G + 4 x 400G in 1RU
- Broadcom Jericho2 (3.2Tb/s)
- Line-rate macsec
- Ideal for:
  - Main trunk backbone links
  - Terminating large campuses
  - Simple private L2 and L3 services

x 12

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Introducing the Hardware – MX204

- 16 x 100G or 4 x 400G per LMIC in 2RU
- Juniper Trio 6 (1.6Tb/s per LMIC, up to 4.8Tb/s)
- Ideal for:
  - Large main centre sites
  - Providing Internet services (long-lined via an L2 circuit)
  - Terminating Internet exchanges and external peerings
  - Terminating UFB aggregation handovers

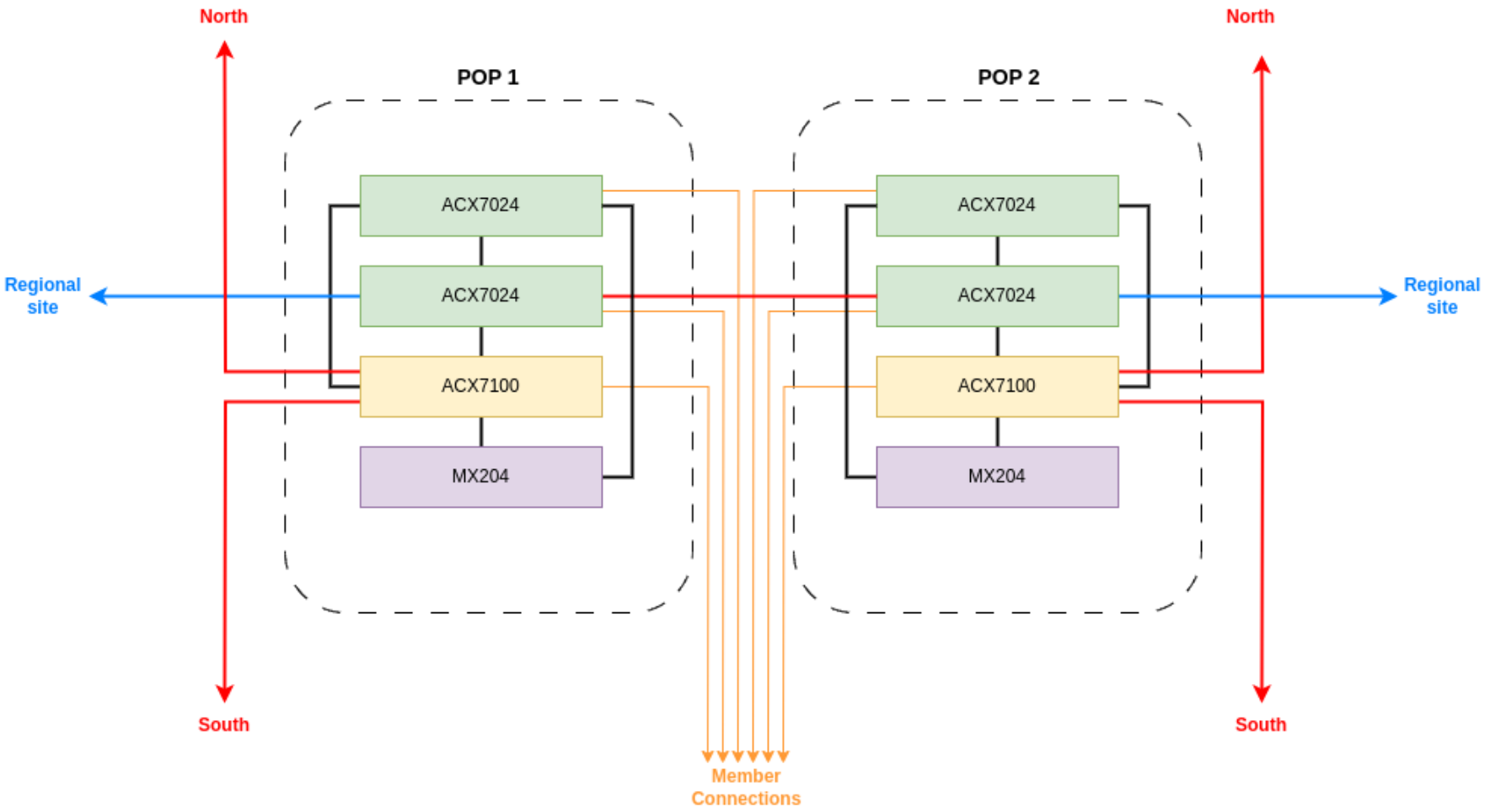
x 3

Introducing the Hardware – MX204

- 8 x 1G/10G + 4 x 100G in 1RU
- Juniper Trio 3 (400Gb/s)
- Ideal for:
  - Smaller main centre sites
  - Providing Internet services (long-lined via an L2 circuit)
  - Terminating Internet exchanges and external peerings
  - Terminating UFB aggregation handovers

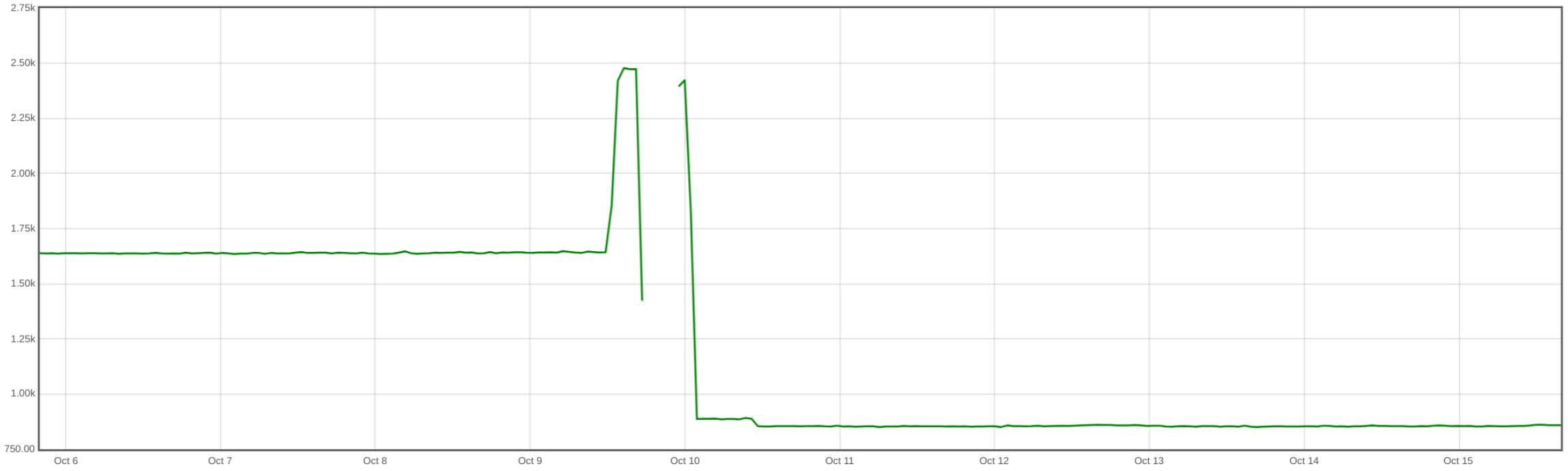
x 12

Typical Region



Power Consumption

- ~40% less power
- Despite 10 x as many 100G ports



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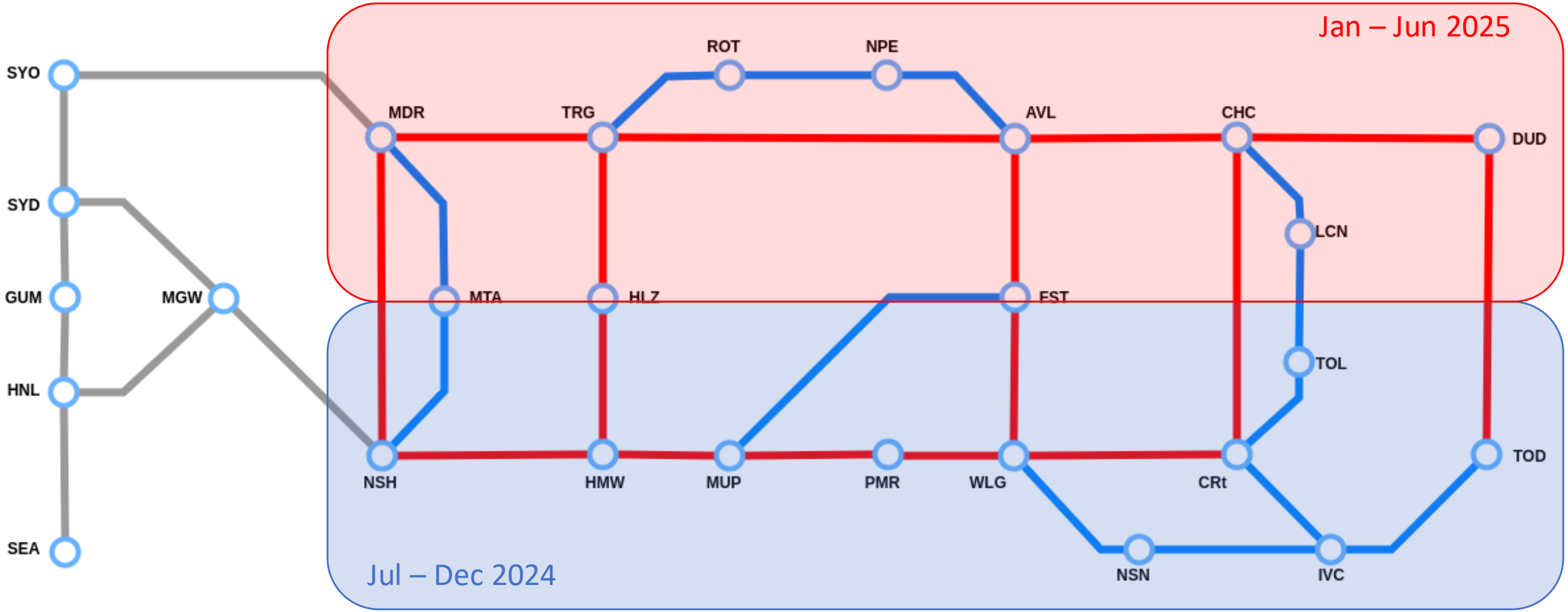
Deployment



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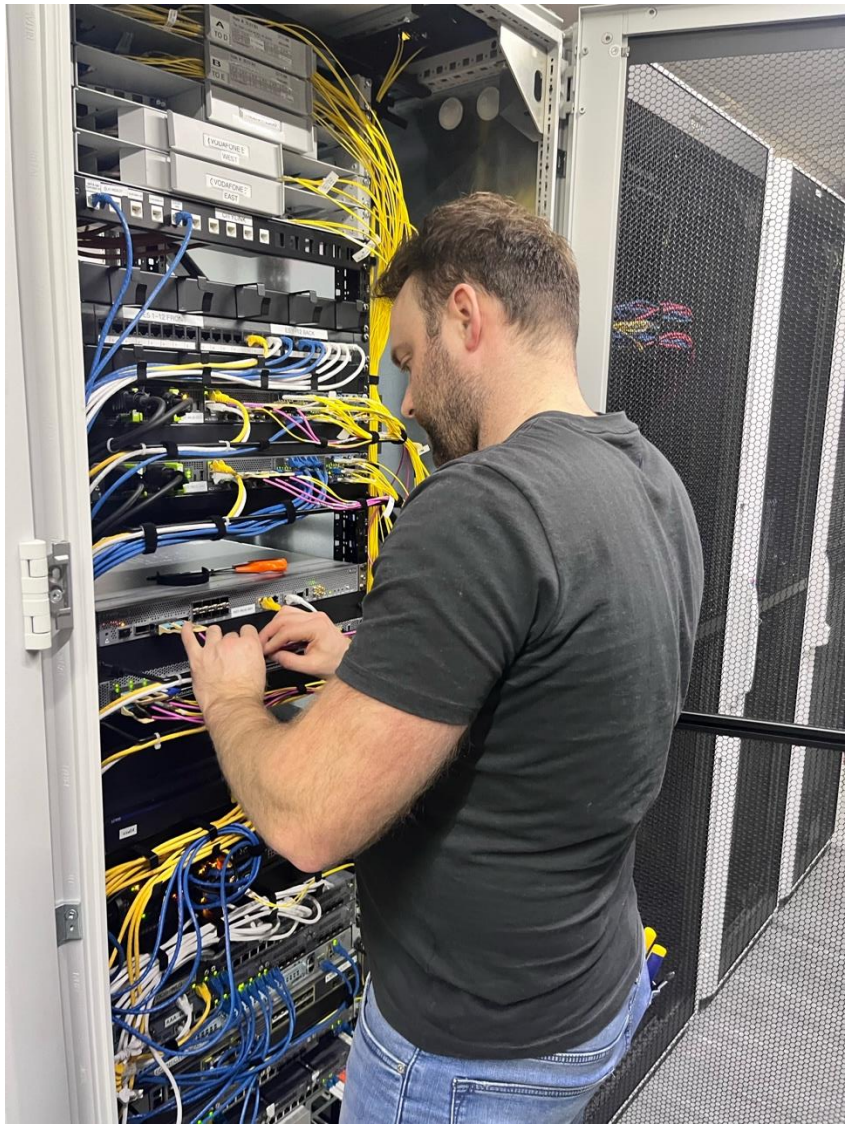
Deployment

- Config ~97% generated, reviewed by 2 engineers
- Backbone links migrated inside business hours ahead of the change
- 1 x engineer on-site, 1 x engineer leading the change remotely
- 3-hour change window (typically 9pm – 11:59pm)
- Migrate 8 – 12 ports per night
- Per port state diffs



Port State Diffs

- State config generated by config migration tooling
- Compares network state pre and post change
  - Interface
  - Unit (VLAN interface)
  - EVPN/VPLS + mac table
  - VRF + route table
  - BGP Handover
  - OSPF Handover

```
- after:
    host: net-hmw-d01
    interface: et-0/0/4
    series: acx
    vlan_id: 3444
    vrf: gns-geo-dc-kpu
  before:
    host: and38
    interface: et-5/1/5
    series: mx
    vlan_id: 3444
    vrf: gns-geo-dc-kpu
  id: '264'
  type: ospf_neighbour
- after:
    host: net-hmw-d01
    interface: et-0/0/4
    series: acx
    vlan_id: 3851
  before:
    host: and38
    interface: et-5/1/5
    series: mx
    vlan_id: 3851
  id: '265'
  type: vlan
- after:
    bgp_neighbour: 210.7.37.218
    host: net-hmw-b01
    series: mx
    vrf: internet-and-nren
  before:
    bgp_neighbour: 210.7.37.218
    host: and38
    series: mx
    vrf: internet-and-nren
  id: '266'
  type: bgp_neighbour
```

Port State Diffs

- Direct engineer's attention to what's important
- Summarise network state where appropriate to make diff more meaningful
- 3k line config change (~100 units) returned a 351 line diff (excluding formatting)

```
================================================================================
Bgp_Handover_State changed from (and38:161.65.54.15) to (net-hmw-d01:161.65.
- routes_received: 293
+ routes_received: 291
- routes_accepted: 293
+ routes_accepted: 291
================================================================================

================================================================================
Vrf_State changed from (and38:gns-geo-dc-kpu) to (net-hmw-d01:gns-geo-dc-kpu
- rt_entry:161.65.52.62/32, next_hop:Remote
- rt_entry:161.65.52.253/32, next_hop:Remote
================================================================================

================================================================================
Vlan_State changed from (and38:et-5/1/5) to (net-hmw-d01:et-0/0/4):
- mtu: 1500
+ mtu: 9192
- push_pop: [ 0x8100.3851 ]
+ push_pop: [ 0x8100.3851 ] In(pop) Out(push 0x8100.3851)
- output_packets: 69
+ output_packets: 58
================================================================================

================================================================================
Vlan_State changed from (and38:et-5/1/5) to (net-hmw-d01:et-0/0/4):
- input_packets: 5
+ input_packets: 3
- output_packets: 2
+ output_packets: 0
- bfd_state: Up
+ bfd_state: Down
```

Future Work – International Hardware Refresh

- Kick off late 2025/early 2026
- MACsec on all links
- Scale beyond 100G
- More ports