AARNet's EN4R Programme

**7th Annual Global LambdaGrid Workshop
18 September 2007**
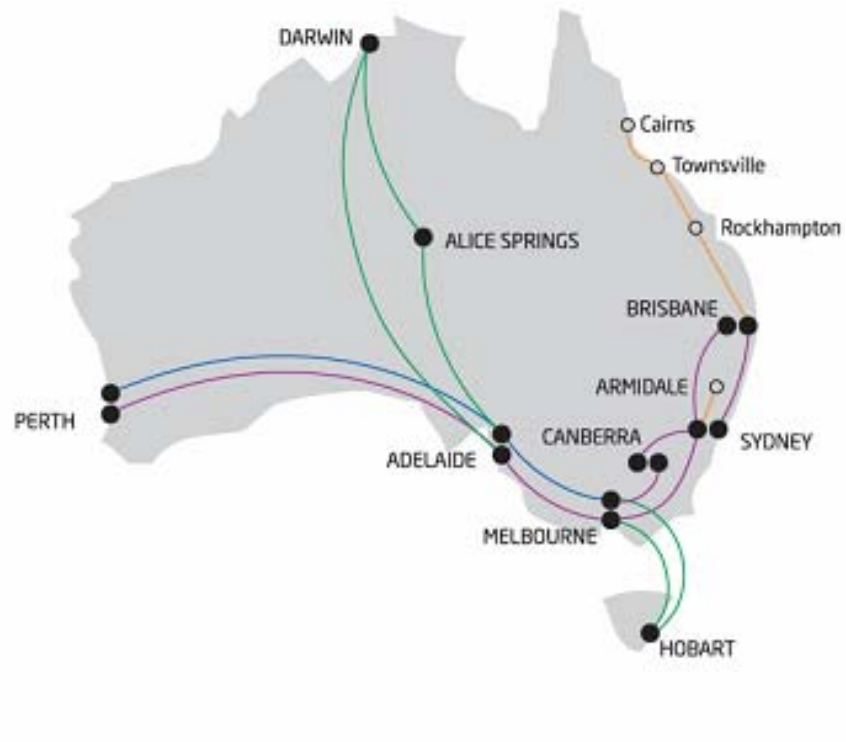

**Alex Reid
Director, eResearch/Middleware**

Overview

- **AARNet3 Network**
- **LightPath Usage**
- **EN4R**
- **AMSeP**
- **Summary**

# AARNet3 Network Extent

AARNet National Network 2006

DARWIN
Cairns
Townsville
Rockhampton
ALICE SPRINGS
BRISBANE
ARMIDALE
PERTH
ADELAIDE
CANBERRA
SYDNEY
MELBOURNE
HOBART

- ● AARNet POP
- ⩽ 155 Mbps
- ⩽ 622 Mbps
- ⩽ 2.5 Gbps
- ⩽ 10 Gbps

AARNet3 Network Extent

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Domestic Optical Network

- **Available across whole network shown**
- **2@10Gb circuits along all paths**
- **1 for general IP traffic**
- **1 for splitting into dedicated 9x1Gb circuits**
- **Must terminate at a PoP**
- **We do this to connect regional sites**
- **63 equipment locations**
- **5,800Km of Nextgen fibre cable.**
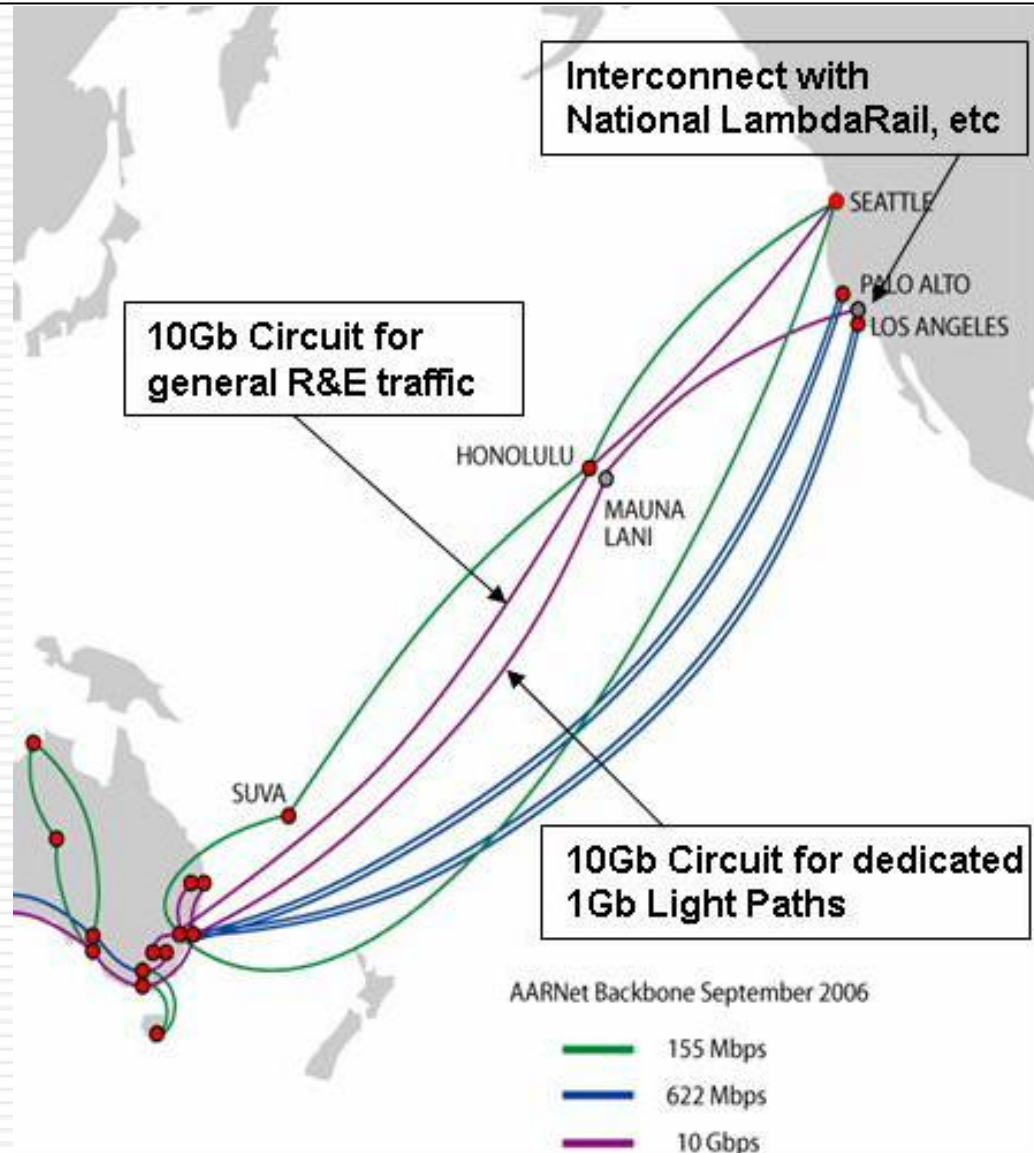- **5 trunk paths.**

Optical POP 🔴

CEV 🔵
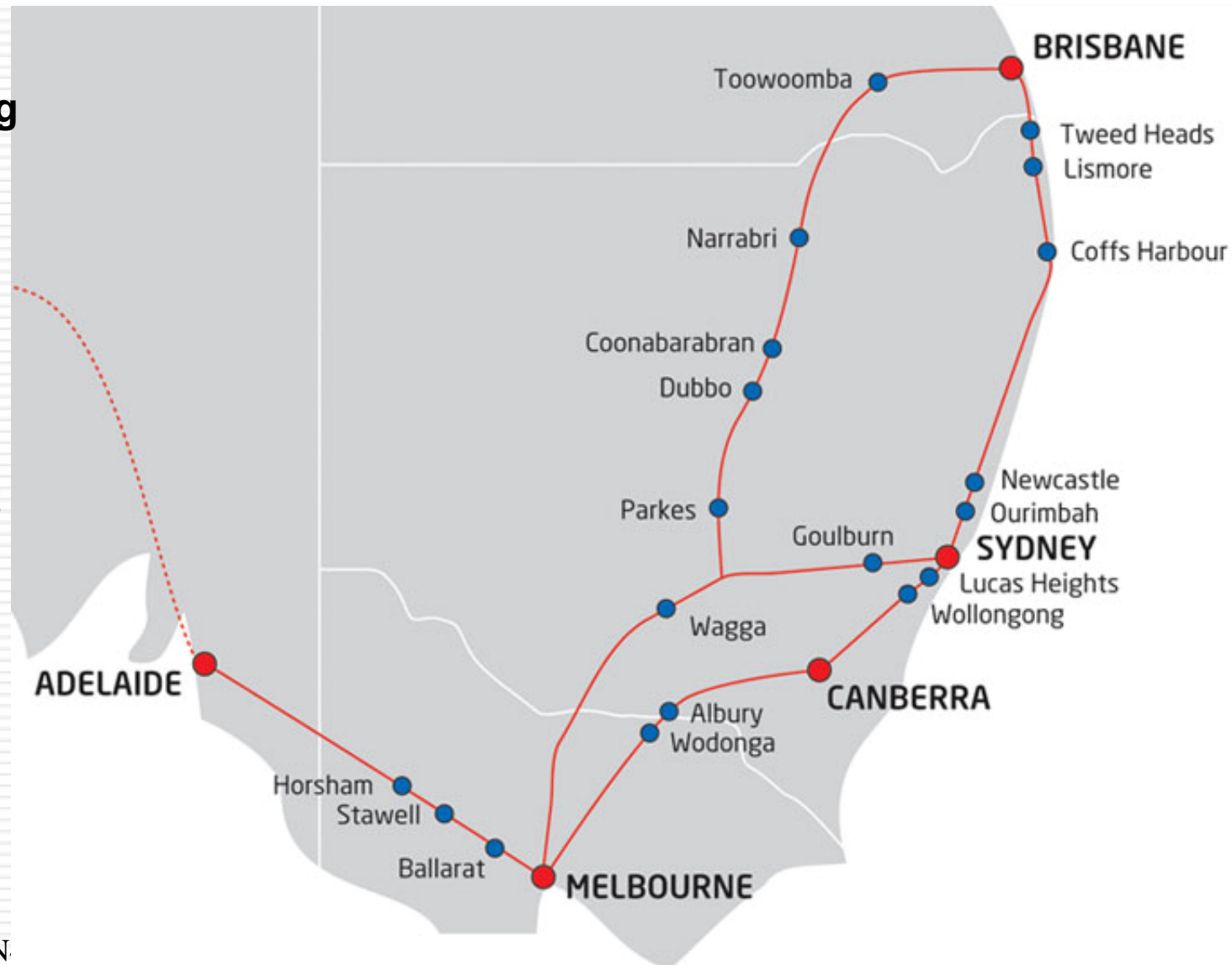
International Optical Network

- **Available across Southern leg of SXTransPORT**
- **Up to 9x1G circuits**
- **Connects to Domestic optical circuits in Sydney**
- **Connects to US National LambdaRail in Los Angeles and thence to other light paths in Canada, UK, Europe**
- **2x1G reserved for GLIF/ EN4R activities**

Interconnect with National LambdaRail, etc

SEATTLE

PALO ALTO

LOS ANGELES

10Gb Circuit for general R&E traffic

HONOLULU

MAUNA LANI

SUVA

10Gb Circuit for dedicated 1Gb Light Paths

AARNet Backbone September 2006

155 Mbps

622 Mbps

10 Gbps

Deployment of LightPaths

- **Regional Network Connections:**
  - **Interconnecting sites belonging to the one organisation (44@ so far)**
- **Light Paths for eResearch:**
  - **Support for "big science" projects (large datasets, dedicated bandwidth requirements)**
- **Experimental Networks for Researchers (EN4R)**
  - **"Try before you buy" service**
- **AARNet3 Multiple Service Platform (AMSeP) proposal**
  - **Dramatically increase flexibility of circuit deployment**

LightPaths to Support eResearch

- **Temporary circuits for special events**
  - ➢ **Huygens Probe eVLBI data transfer from Parkes and Mopra to JIVE in the Netherlands in January 2005**
  - ➢ **Mopra-China-Europe eVLBI demonstration at APAN-24 in Xi'an August 2007**
- **Leading to EXPReS: 20 telescopes worldwide linking to JIVE**
- **Partnership with GLIF – reserved 2 international circuits**
- **CERN's Large Hadron Collider:**
  - ➢ **from Tier1 site in Taiwan to Tier2 in Melbourne;**
  - ➢ **currently 300Mbps sustained 24x7**
  - ➢ **currently accommodated by IP network**
- **Medical applications:**
  - ➢ **Imaging**
  - ➢ **Haptics**
  - ➢ **Video surgical procedures (eg Adelaide to Vietnam)**

EN4R: Experimental Networks for Researchers

EN4R: Experimental Networks for Researchers

- **What?**
  - Dedicated gigabit circuits between two geographically disparate locations
  - Layer 1 – Optical Circuits
- **Why?**
  - Encourage researchers to 'think differently' about transferring data
  - Try Before You Buy
- **Who?**
  - Researchers affiliated with a full AARNet connected institution
- **When?**
  - For short-term (weeks, months) or long-term (up to 1 year)
  - Thereafter: transition to standard service

EN4R: Experimental Networks for Researchers

- **How?**
  - ➢ **By application**
  - ➢ **Assessed by independent Panel**
  - ➢ **No cost (for up to 6 months or more)**
  - ➢ **Thereafter: standard connection fee and annual charge**
- **Promotion:**
  - ➢ **Presentations at conferences from July this year (eg Australasian eResearch Conference)**
  - ➢ **"Plug into" researcher networks**
  - ➢ **Brochure http://www.aarnet.edu.au/library/eN4R.pdf**

EN4R: Experimental Networks for Researchers

- **Research projects needing dedicated circuits:**
  - ➤ **Bandwidth Reservation**
  - ➤ **Dedicated links for research traffic**
  - ➤ **Confidentiality**
  - ➤ **Lowest latency / lowest jitter**
- **Not suitable for all projects:**
  - ➤ **routed IP network goes further**
  - ➤ **More than 2 endpoints**

EN4R: Mechanics

- **Subject to Availability of Gigabit Circuits:**
  - **Internal process to make circuits available**
- **Research Committee to Approve and Rank Proposals:**
  - **IT Directors and Research Peers (Tate, McMeekin, Buchhorn, Moloney, Tzioumis, Francis)**
- **For Research Use:**
  - **traffic must conform to the AARNet AUP**
  - **One end must terminate in an AARNet member institution**
- **Contractually:**
  - **Exchange of letters**
  - **Cancellation without penalty**
- **Any tail costs to be met by proposer**
- **AARNet may lend terminating equipment (eg GBICs, switches)**

EN4R: Programme Charges

Time	Charge*	Notes
0 – 6 months	Free	▪ **No cancellation fee**
6 – 9 months	$8,500	▪ **No cancellation fee**
9 – 12 months	$8,500	▪ **Quarterly payments**
12+ months	$60,000 / $34,000	▪ **Transition to full service** ▪ **Contract requirements**

*** Prices are per circuit per trunk; tail charges not included***

EN4R Potential Projects

- **Grid Computing: Research into computational grids.**
- **Large Hadron Collider data transfer (Tier2 node – 300Mbps 24x7).**
- **GLIF: potential international projects, driven by the GLIF/astronomers' agenda.**
- **EXPReS: Express Production Real-time e-VLBI Service (Parkes, Narrabri, Mopra); 3x256Mbps in Jun-07, 3x512Mbps Oct-07.**
- **APAC network: the APAC Grid implemented with lightpaths.**
- **NZ research collaboration exemplars:**
  - **Grid Computing;**
  - **eVLBI Astronomy;**
  - **Bioinformatics.**
- **HD video trans-Pacific: Demonstrate HD video Brisbane-Chicago using multiple clean 25Mbps 'channels'.**
- **HD video demonstration using SabreNet in South Australia (requires 1.5Gpbs dedicated circuit).**
- **Radio astronomy: Australia Telescope National Facility.**
- **Swinburne University: Establish a link between the Swinburne HPC facility at Glenferrie and the Parkes radiotelescope via the ATNF at Marsfield, Sydney.**
- **ANSTO: access to new OPAL Reactor.**
- **Synchrotron: "virtual" beam lines.**

EN4R: Summary

- **The "upfront" costs of circuits can be expensive**
  - **For research the ROI may be uncertain**
- **This program breaks barriers by:**
  - **Setting a $0 entry point for 6 months**
  - **Leveraging AARNet surplus capacity to assist with tails**
  - **Provide loan equipment**
  - **Minimising contractual requirements**
  - **Providing technical support for Network tuning**
- **Connectivity:**
  - **Domestic - Domestic**
  - **Domestic - International**

AARNet's VPLS Proposal

- **AMSeP: AARNet3 Multiple Service Platform**
- **Based on VPLS over MPLS technology**
- **Layer-2 overlay Ethernet network on current AARNet3 infrastructure.**
- **Across whole Backbone Network (not just where we have "spare" fibres)**
- **High bandwidth point-to-point and point-to-multipoint connections (1 or 10 Gigabit Layer-2 Ethernet).**
- **Firewalls: at the discretion of the institution, connect:**
  - ➤ **direct into the institutional LAN**
  - ➤ **into the institutional Firewall, or**
  - ➤ **outside of institution Firewalls to speed collaboration and avoid complications of local IT policies.**
- **Leverages AARNet support staff and facilities for network operations.**
- **Gigabit Ethernet connectivity for appropriate users of AMSeP on a merits allocation basis.**
- **Integration with the EN4R offering already announced by AARNet.**

AMSeP Configuration

GLIF-2007 - Alex Reid: EN4R et al
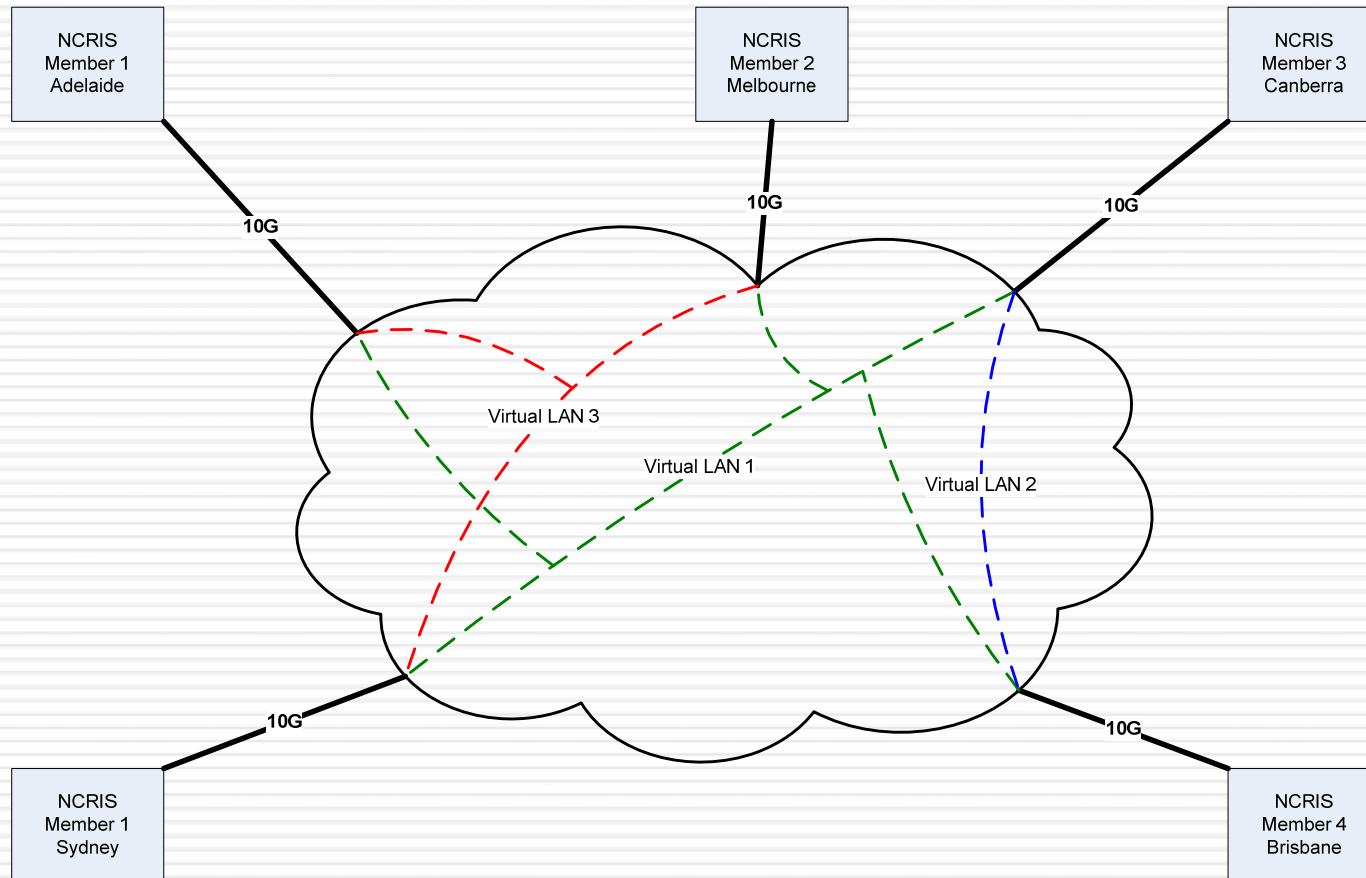
AARNet3 – 21ˢᵗ Century Network

Questions?