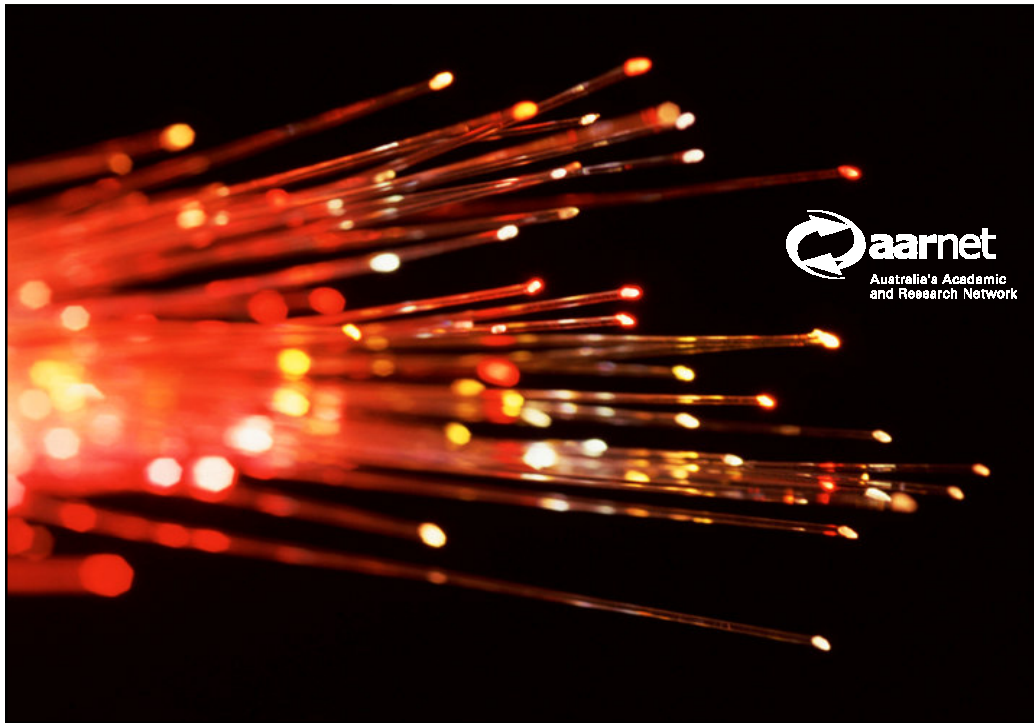




## Agenda

1. The AARNet Strategic Vision
2. The 4 Operating Priorities:
  - (i) Building & Operating Australia's Advanced Network
  - (ii) Delivering a Roadmap for future connectivity
  - (iii) Developing Applications & Services
  - (iv) Reaching our Communities
3. Future challenges for Australia

3

## The AARNet Strategic Vision

1. Reap the benefits of the new infrastructure
2. Continue to develop global research collaborations
3. Embrace new modes of delivery for teaching and learning

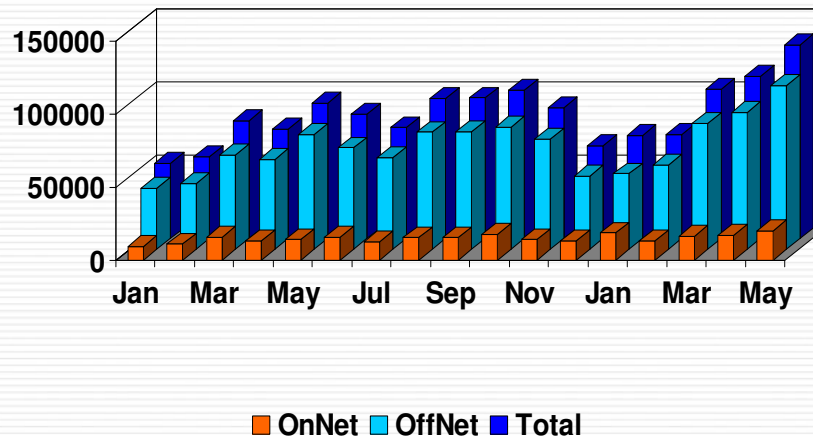
4



|   |                                                                                                                               |
|---|-------------------------------------------------------------------------------------------------------------------------------|
|   |                                                                                                                               |
|   |                                                                                                                               |
|   | Building & Operating an Advanced Network                                                                                      |
|   | <ul style="list-style-type: none"><li>• Traffic growth</li><li>• The new AARNet NOC</li><li>• Measuring Performance</li></ul> |
| 6 |                                                                                                                               |

## AARNet Traffic Growth 2004-2005

37% growth in traffic



7

## The New AARNet NOC

- 24 x 7 'Virtual' NOC
- Call-centre based – customers contact a call-centre service (LinkQ)  
(see <http://www.aarnet.edu.au/contacts/>)
- Call-centre pages an AARNet on-call engineer based on geographic location and time-of-day (AARNet staff in each major capital city)
- Escalation process ensures response within the hour (usually within 10 minutes)
- Remote control, including out-of-band, dial-up access to most equipment
- NOC tools include Nagios, MRTG, NetFlow monitoring
- Emphasis on service monitoring rather than simple 'red icon / green icon' ping tests
- Trouble-ticket systems evaluated – JIRA from Atlassian is front-runner  
(<http://www.atlassian.com/software/jira/>)

8

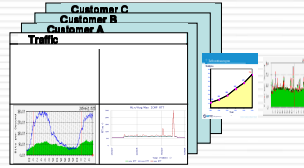
# Measuring Performance



## Current

### Data reporting

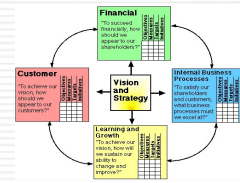
- Large amounts of data tracking traffic at discrete locations
- Little synthesis or summary reporting for targeted performance management and improvement



## End 2005

### Executive Dashboard

- Establish information system (key measures, links to source data)
- Leverage international activities
- Develop software front end and management practices
- Set performance goals linked to overall strategy and specific outcomes
- Systematise measures and criteria for monitoring progress
- Drive performance down to individual projects and members



## Mid-2006

### Balanced Scorecard

- Identify key internal business processes and learning and development opportunities
- Review processes and assess contribution to vision and strategy
- Track all dimensions based on clear objectives, objective measures, stretch targets and improvement initiatives

9

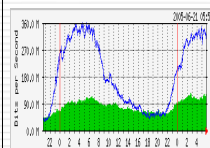
# Key Traffic Measures

Initially, we have focused on four traffic measures

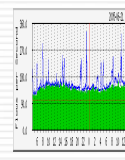
## 1. Flows



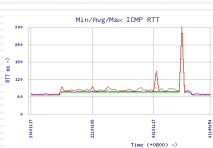
## 3. Capacity Utilisation



## 2. Availability



## 4. Network Performance



10

## Developing Applications and Services

- User Controlled Light Paths
- EduPhone
- ENUM
- Middleware
- AARNet Mirror

11

## User Controlled Light Paths

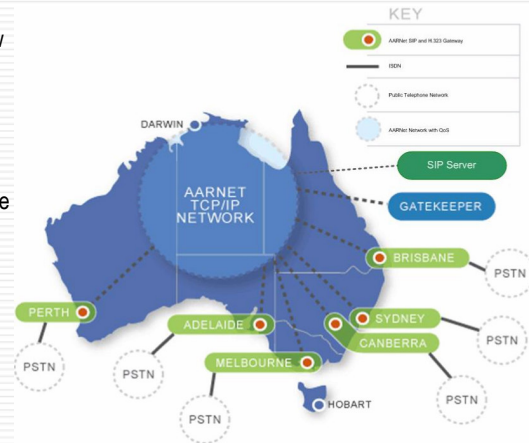
- Routed (packet-switched) networks good for most users
- Some users (scientists needing to access terabytes of data) have special needs
  - massive data transfers
  - use protocols that could impact others, or others impact them
- Best to remove them to their own circuits, to contain them in a way that satisfies their needs without detrimental impact on others (and vice-versa)
- These users best served by setting up an optical path by circuit switching
- Web services used to establish a “User-Controlled Light Path (UCLP)” for the duration of the need by the user – typically a 1Gbps circuit

12

# eduPhone

## The future of the telephone

- AARNet is working with it's Members on a new concept which we have called eduPhone.
- An eduPhone users get a SIP account.
  - This eduPhone SIP account allows you to make and receive Telephone and Video calls, and participate in Instant Messaging
  - It is built on top of the AARNet VoIP and VIDEO backbone.
- eduPhone benefits
  - Uses open standards products
  - Lower costs
  - Collaboration
  - Communication



13

# ENUM

## ENUM does to telephone numbers what the DNS does for Domain Names!

ENUM could have a profound impact on today's Telephone Service

- **What is ENUM?**
  - A proposed IETF standard
  - Enables the DNS to identify available services associated with one E.164 number.
  - ENUM
    - offers a single contact number for a range of services (SIP, email, telephone...)
    - enables VoIP networks to self discover each other.
    - Is available to Individual Users & Organisations.
- **Potential ENUM benefits**
  - An individual number for all your contact details
  - Access to future ENUM applications and services (ENUM phone)
  - Cost free call routing

14

## ENUM - the trial starts TODAY!!!

- **Current status**

- AARNet is a Tier 2 ENUM registrar participating in the national 12 month trial operated by AusRegistry and the former ACA.
- AARNet is working with other the former ACA, AusRegistry and other Tier 2 ENUM Registrars (e.g. Instra) to explore future ENUM applications and services.

- **More information**

- ENUM Service Page - <http://www.enum.aarnet.edu.au>
- Speak to our AARNet staff (Stephen Kingham, Kewin Stoeckigt).
- Join us at the ENUM BOF on Friday at 10am

**Register TODAY for your own ENUM at <http://www.enum.aarnet.edu.au>**

15

## Middleware Strategy

- AARNet's role: to facilitate, coordinate, lead where appropriate – on behalf of the community
- Worked with UQ to develop a bid to ARIIC (May/June)
- Goal is to develop a Middleware Strategy for HE/Research in Australia
- If funded, this will involve:
  - An 18-month project
  - Stocktake of current activity, capability and deficiencies
  - Considerable consultation with all stakeholders
  - Agreement on directions, activities in Australia to build:
    - a middleware infrastructure
    - a development capability to complement international efforts
  - A second Forum/CAMP to ensure full sector involvement
- Continued liaison to ensure compatibility with and participation in international federations

16



## Identity & Access Mgt System (IMS) Survey

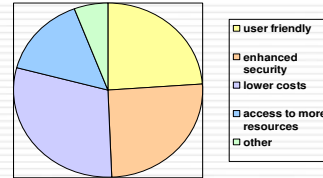
### About the survey

Created by AARNET, MAMS & Middleware Steering Committee, distributed via CAUDIT in June 2005.

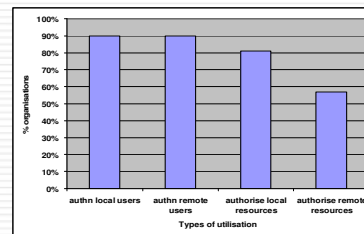
### High level results so far...

80% of organisations who responded have deployed an IMS today, it is being used for

- **Authentication** methods: username/passwords (100%), half also use IP based authentication. One site uses digital certificates.
- The difference in **authorisation** of local versus remote resources may be due to a lack of centralised DRM agreements and/or a central store for content.
- LDAP appears to be the preferred **directory service** with many using in house developments written in either PERL, Visual Basic, JAVA, C++, SQL to process data from student, HR and other databases



Key IMS Drivers



Current IMS utilisation

17

## AARNet's RETAIN

- Research and Education Terabyte Array INfrastructure
- Initial deployment of 20+ Terabytes of storage
- Major upgrade of the AARNet Mirror
- Promoting and assisting in creation of digital repositories by members
- Short term project storage available to research projects
- Longer term DR storage available to member IT departments
- Online software distribution from vendors
- New projects working on national caching and streaming.
- Will complement work in PKI by providing a shared file space for all members

18

## Reaching our Communities

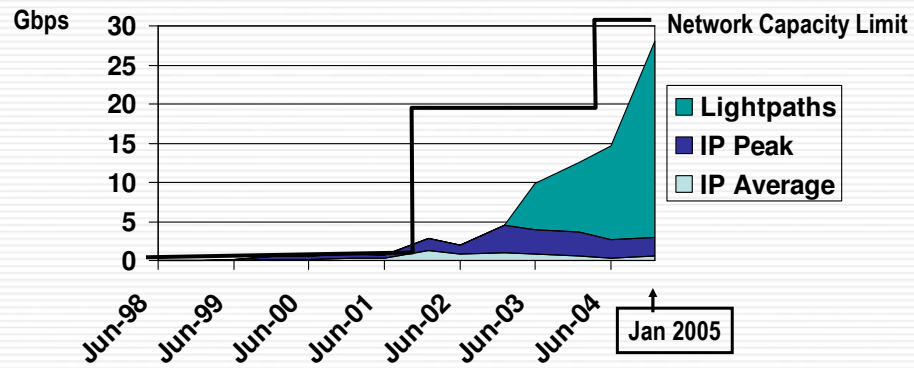
- The Schools Sector
- Square Kilometre Array
- Synchrotron
- Large Hadron Collider

19



The Future  
Challenges for  
Australia

## Capacity Utilisation Challenge



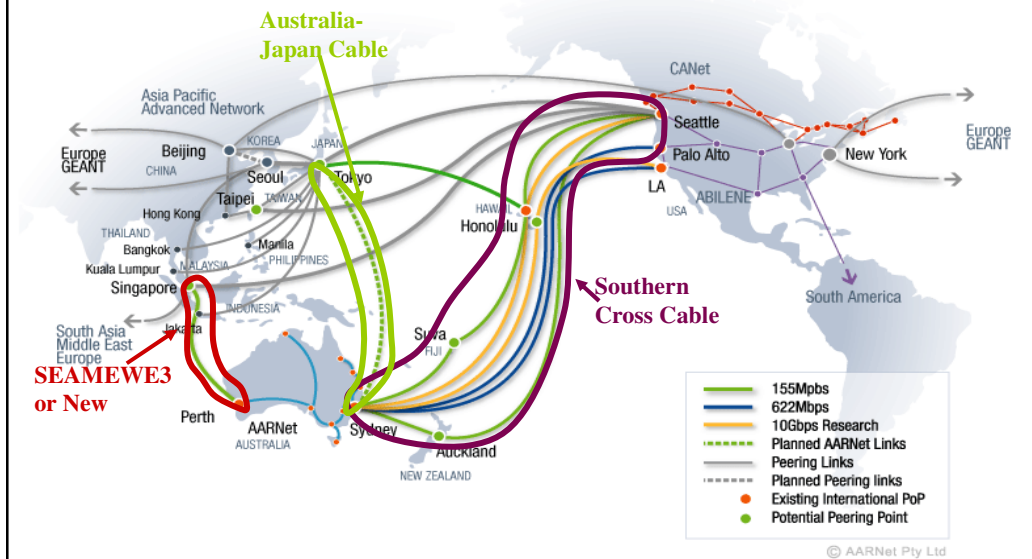
21

## Cost Challenge

- Trans Atlantic capacity for a 10 gig circuit across the Atlantic is US\$18,000 per month (US \$216,000 per annum)
- The price for us across the Pacific is US\$2.5m per month (US \$30 million per annum) !!!!!!!

22

## The Three paths out of Australia



## Connectivity Challenge

- Reaching out to the users
- So far most researchers have to come to the emerging GLIF infrastructure
- Challenge is to bring GLIF to the desk top of the researchers and to their scientific instruments
- This means dark fiber to remote instruments and hybrid networking functionality into the LANs at the campuses

## Middleware Challenge

- How do we glue things together?
- Users need ubiquitous end to end lightpaths connectivity over a multi-domain infrastructure
- Harmonise use of existing protocols
- Invent new protocols
- Create user friendly AAA features

25

## Application Challenge

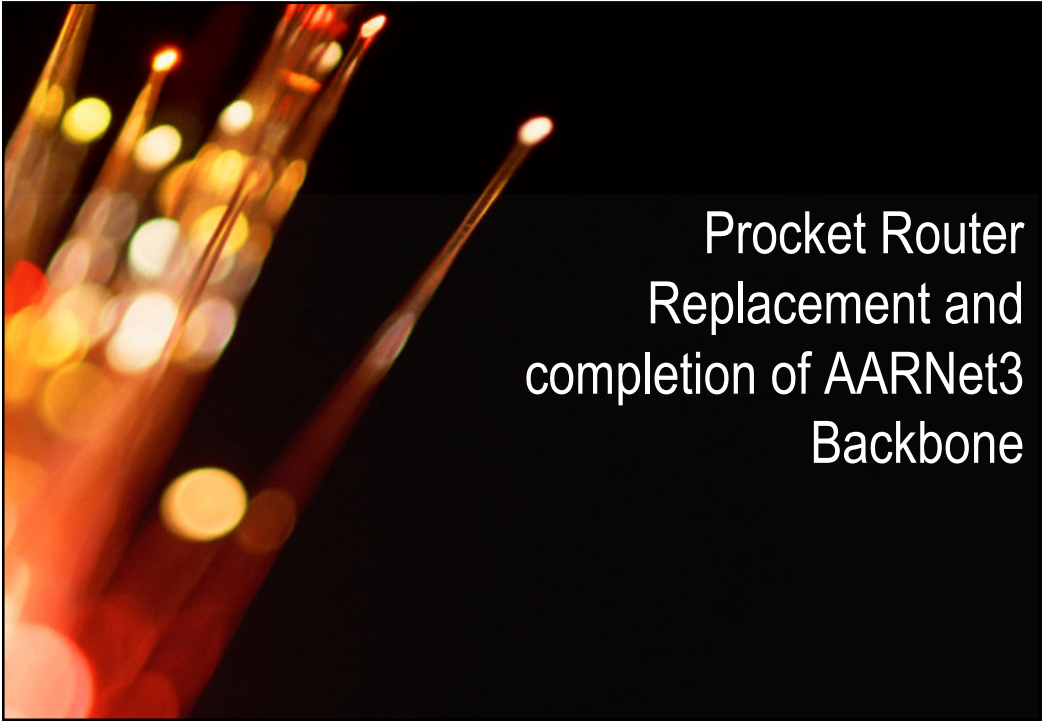
- In the end it's all about applications
- Stimulate the development of applications that explore the new hybrid functionality
- Work closely with the GLIF users on best practices to overcome the connectivity and middleware challenges
- Explain the opportunities to other researchers

26

## AARNet BOF

- Wednesday afternoon at 5:10pm
- Mount Coolum Room
- An opportunity for the members of the various RNO technical committees to discuss AARNet3 issues

27



Procket Router  
Replacement and  
completion of AARNet3  
Backbone

## Overview

- Procket Replacement
- Procket Transition
- Resilience
- Member Edge (Direct Connection)
- Optical (Regional) Network
- Future Road Map

29

## Prockets to be replaced with Juniper M320

- Long and exhaustive selection process
- Widely used in the R&E sector
- Price/performance
- 5 year cost of ownership

Juniper *your* Net™

30

## Juniper M320



- 1/2 Rack high
- 20Gbps per slot
  - 10G interfaces, STM-64c & 10GigE
- Really a T-series that supports “low speed” interfaces
- AC Powered, no special power needed
- Not as dense as a 8812 in interface capacity but more than enough for AARNet and importantly has good Gigabit Ethernet density

31

## Juniper M20



- POP Router in
  - Hobart
  - Darwin
  - Alice Springs
- Supports speeds to STM-16 (2.5G)
- Multiple GigE for customer connections

32



## Juniper M40e



- Replace Cisco 7304 at Palo Alto
- Palo Alto our main transit POP
- Increasing capacity to the POP needs a “bigger” router
- Cisco 12404/PRP-2 to remain in Los Angeles providing diversity of hardware and software

33

## Transition Strategy

- #1 Priority is to minimise impact
  - Always retain an AARNet3 path from one of the GigaPOPs in a city
- Sweep through backbone replacing all Prockets by Q1 2006
- First “replacements” are the holes
  - Amnet, NXG Adelaide, ANU
  - QUT still needs backhaul to NXG in Fortitude Valley

34

## AARNet3 Resilience

- International in place
- National by end Q3
- Diverse backup on order for second Melbourne, Adelaide, Perth path
- Dual unprotected STM-1's on order for Hobart
- Alice Springs & Darwin awaiting ministerial approval

35

## Member Edge Router Update

- Needed to obtain full performance of AARNet3
- Edge router needed to enforce AUP on SXTransPORT, no access without one
- Enhanced network monitoring
- To deploy off-net monitoring from US data centre soon
- 13 sites currently connected

36

## Optical (Regional) Network

- Lighting Nextgen fibre from Brisbane to Adelaide
- Carrier grade multi-gigabit equipment
- Construction of fibre tails to customers
- Progressing cautiously
- Want to get it right!

37

## Future Road Map

- Mitchell Link
  - Lithgow, Bathurst, Orange, Dubbo
- Northern Territory
  - POPs in Alice Springs and Darwin
- Victoria - VERN
  - Optical N/W, fibre tails & Basslink
- Tasmania - TREN
  - Basslink & fibre along gas pipeline
- South Australia - SABREnet
  - SA funding to extend Optical N/W
- Western Australia
  - Mandurah rail corridor fibre
- Queensland
  - Sunshine Coast

38

