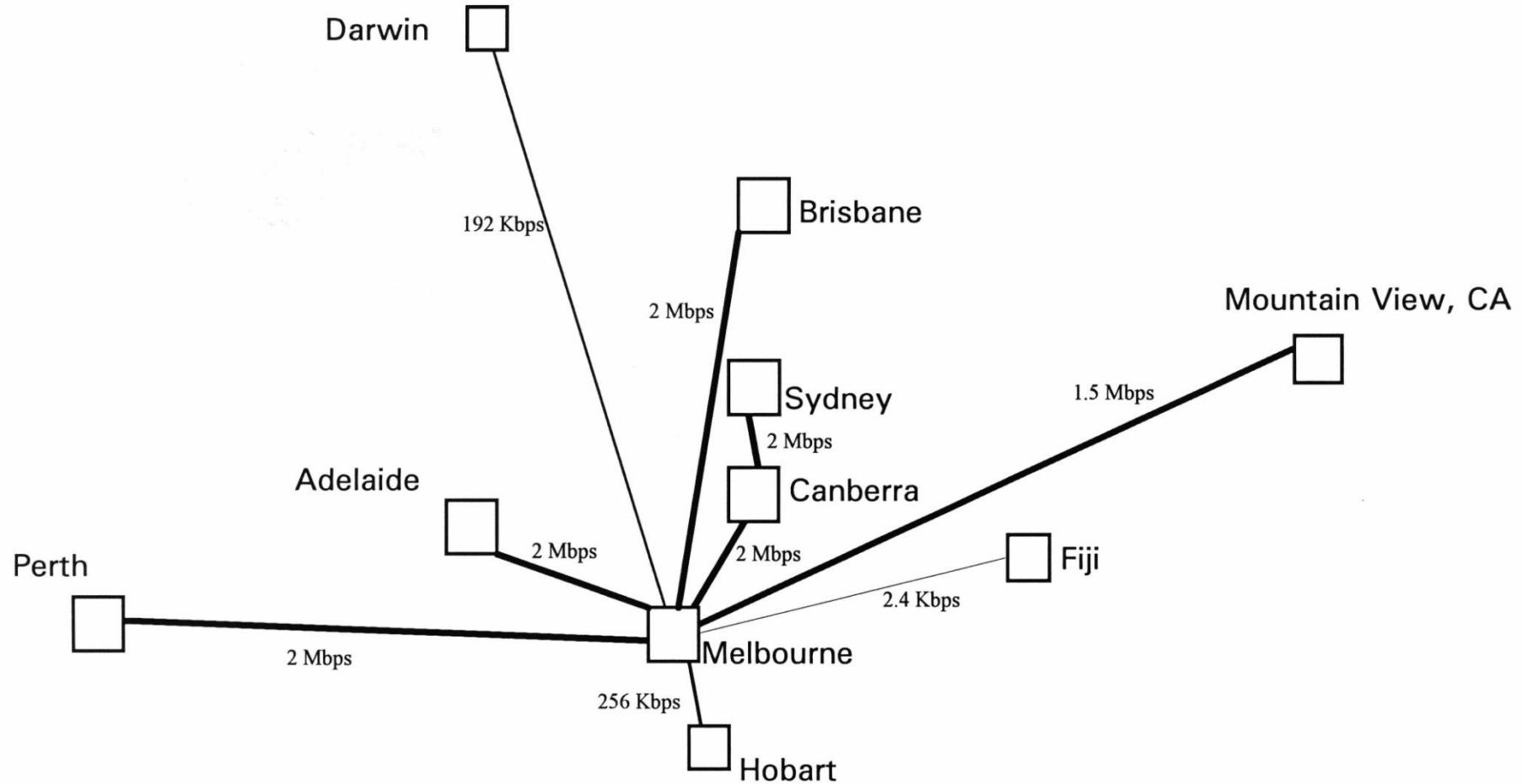


# The Australian Wide-Area SDN Testbed

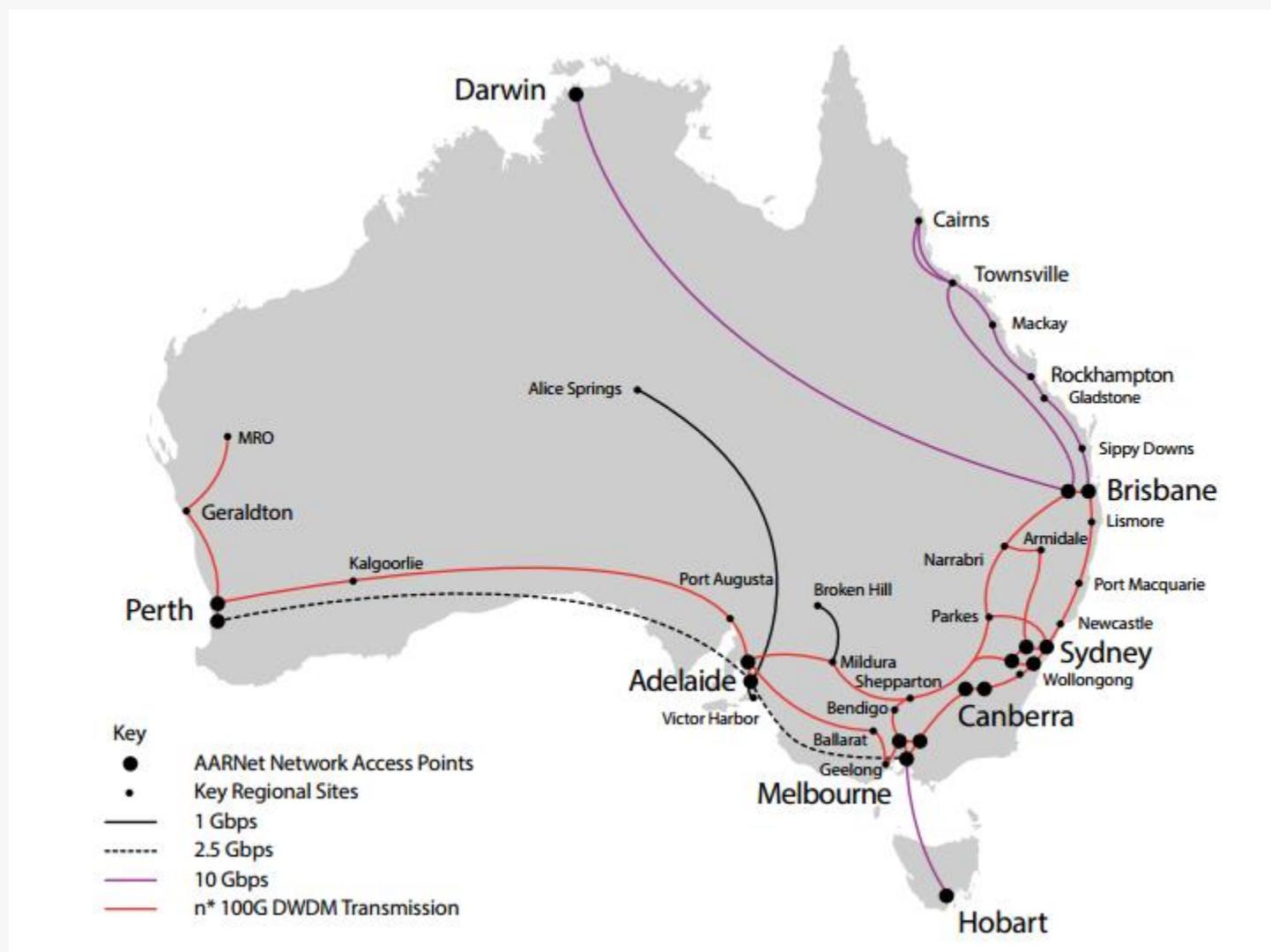
AusNOG, September 2015

David Wilde, AARNet

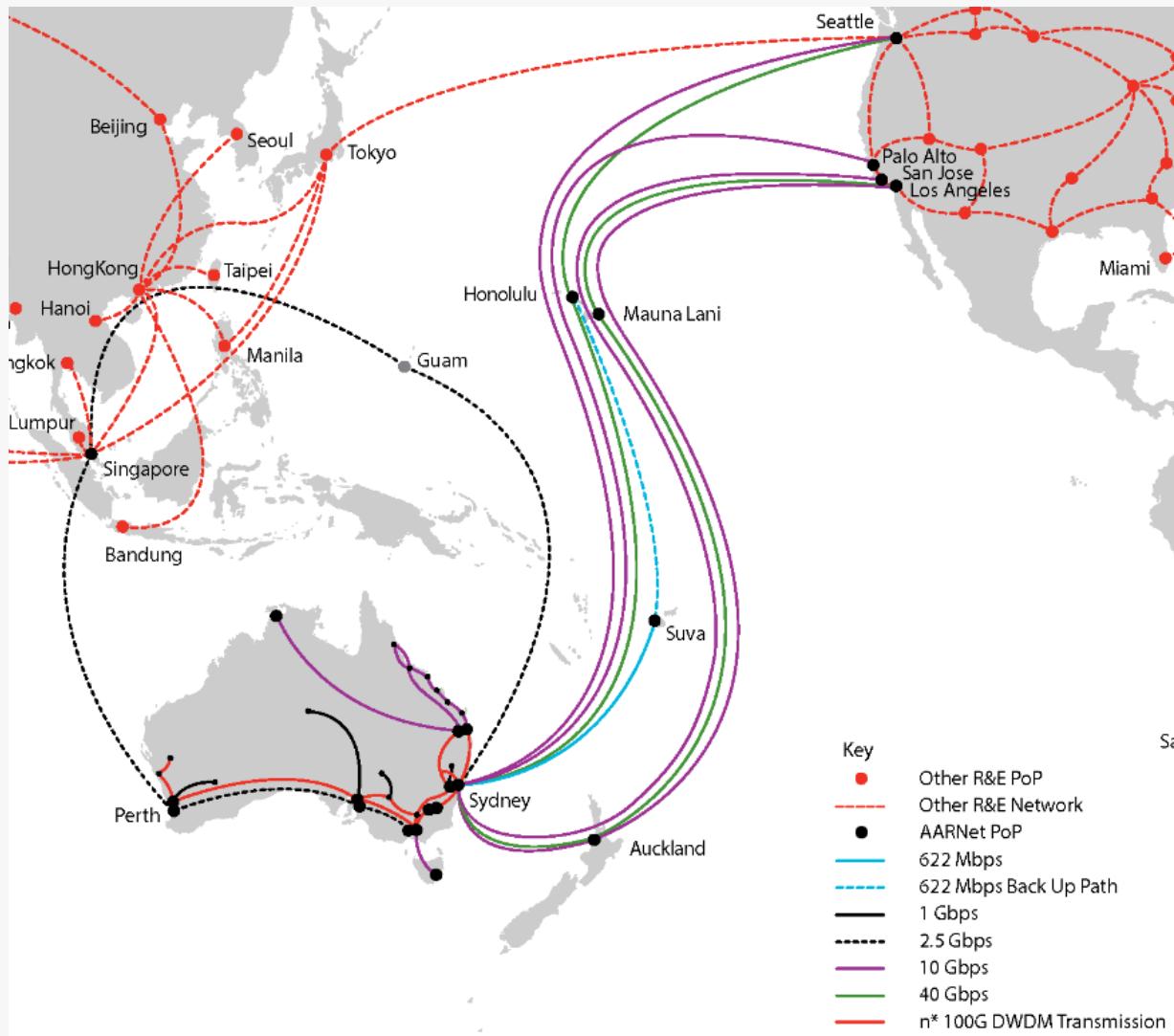
# AARNet network circa 1993



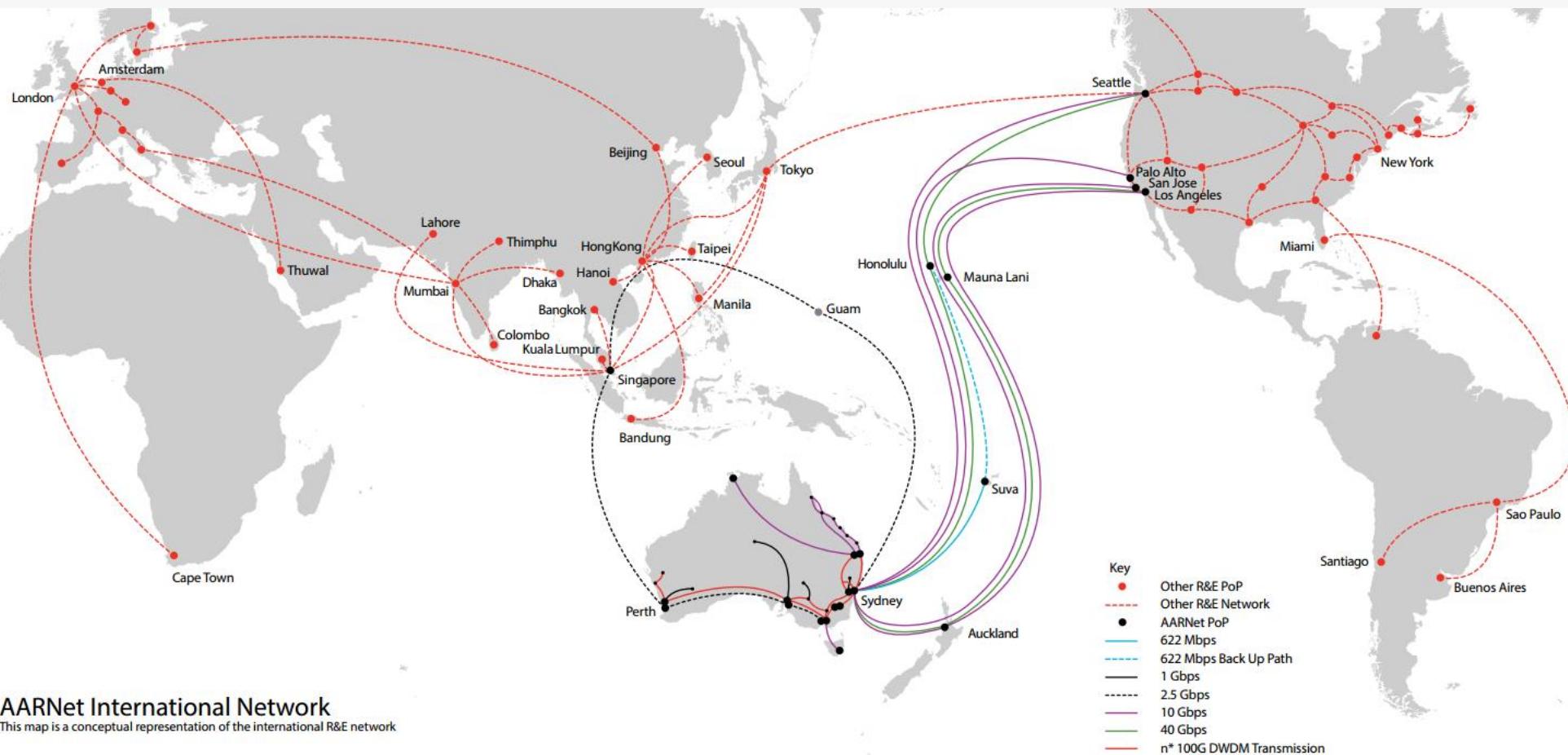
# AARNet: national network 2015



# AARNet: international network



# AARNet: global R&E



# AARNet: known for...



AARNet's Mirror

Australia's research and education network

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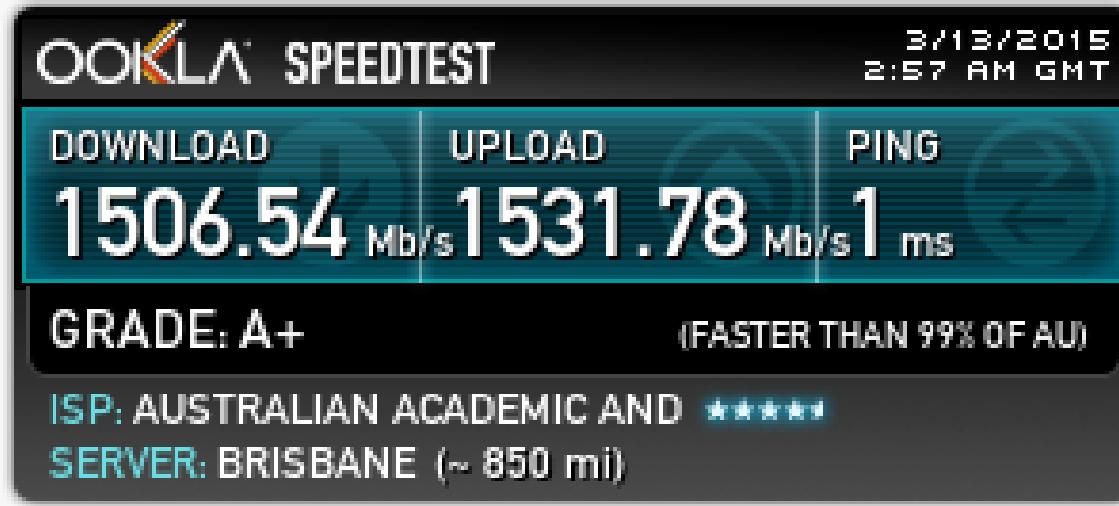
Welcome to the AARNet mirror. We welcome all feedback to [mirror@aarnet.edu.au](mailto:mirror@aarnet.edu.au).

**M o s t P o p u l a r M i r r o r s**

<a href="#">Biomirror</a>	<a href="#">Centos</a>	<a href="#">CPAN/Perl</a>	<a href="#">Fedora</a>
<a href="#">FreeBSD</a>	<a href="#">Kali Linux</a>	<a href="#">Kernel.Org</a>	<a href="#">Linux Mint</a>
<a href="#">MacPorts Project</a>	<a href="#">NetBSD</a>	<a href="#">OpenBSD</a>	<a href="#">openSUSE</a>
<a href="#">Sage Mathematics</a>	<a href="#">TED Talks</a>	<a href="#">Ubuntu</a>	<a href="#">VideoLAN</a>

Feedback or queries are welcome to [mirror@aarnet.edu.au](mailto:mirror@aarnet.edu.au)  
[CDN Copyright AARNet Pty Ltd](#)

... and:

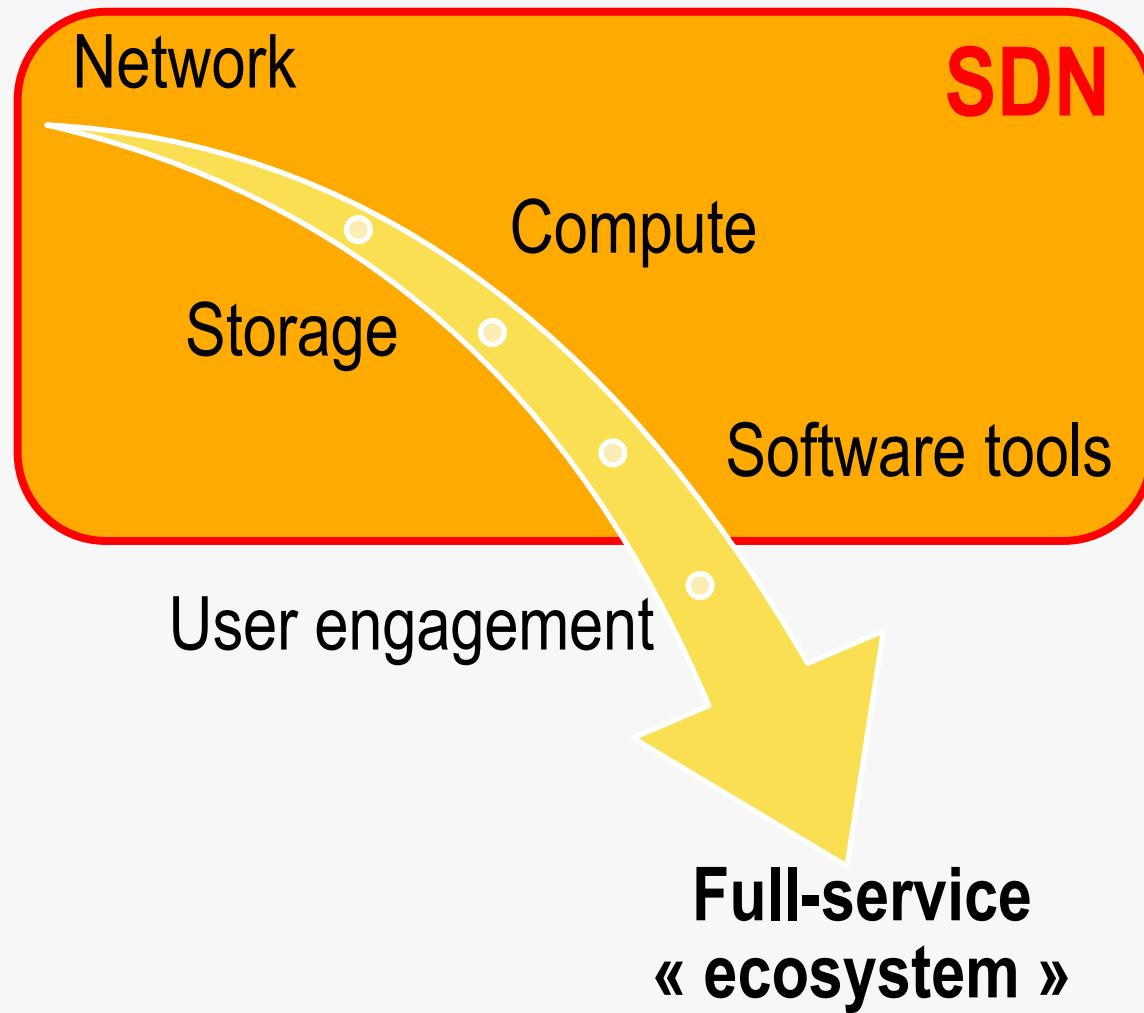


Software Defined Networking

# SDN: WHY?



# SDN as enabler



# SDN potential



Users

Administrators

NFV ... Virtual CPE ... SDN LSR ... capacity management ...  
policy vs CLI ... virtual FW/LB ... intelligent edge

DC/cloud

ISP/telco

Campus/enterprise

Commodity silicon  
Cheap compute + virtualisation

Single view of network  
Integrate compute/storage/network

Lower cost

More features

Australia-wide SDN Testbed



## ENABLING SDN RESEARCH

# Background



Australia's Academic  
and Research Network



**Australian Government**  

---

**Australian Research Council**

**LIEF: Linkage Infrastructure, Equipment and Facilities**

# Participating institutions



Australia's Academic  
and Research Network



THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA



**Australian Government**  

---

**Australian Research Council**



MACQUARIE  
University  
SYDNEY • AUSTRALIA



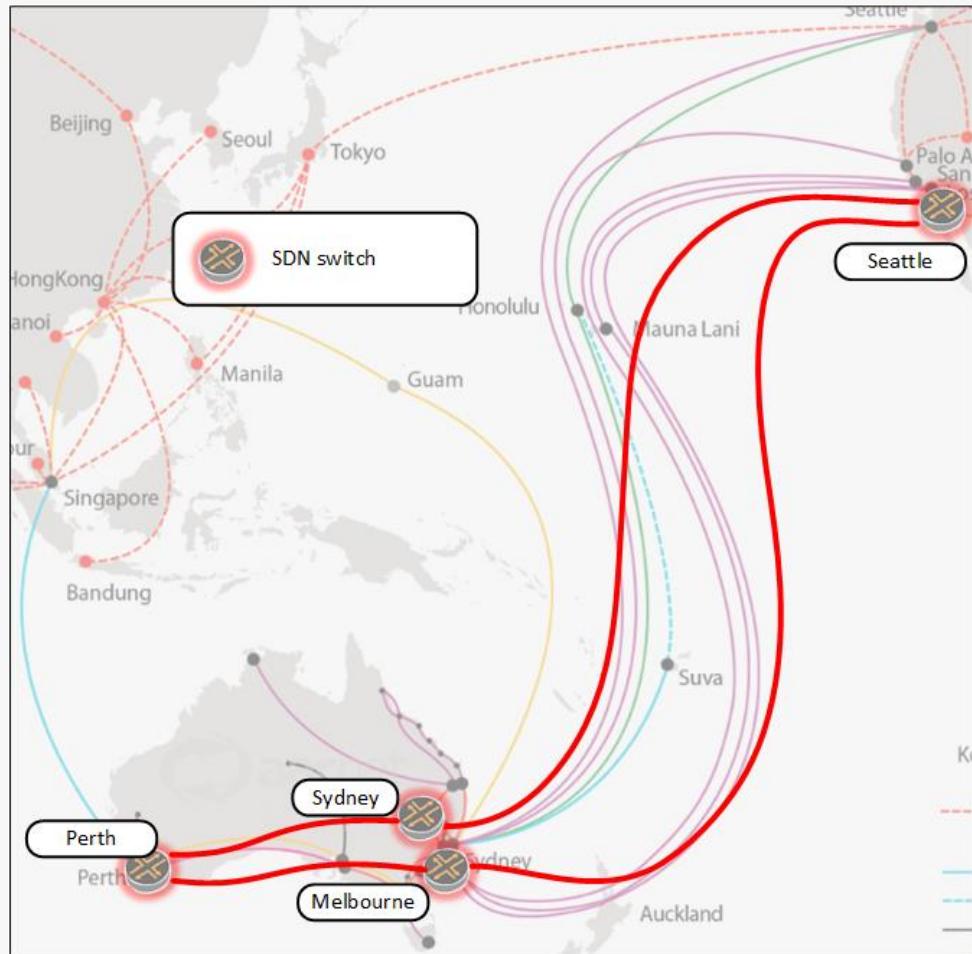
Australian  
National  
University



# Towards an SDN testbed



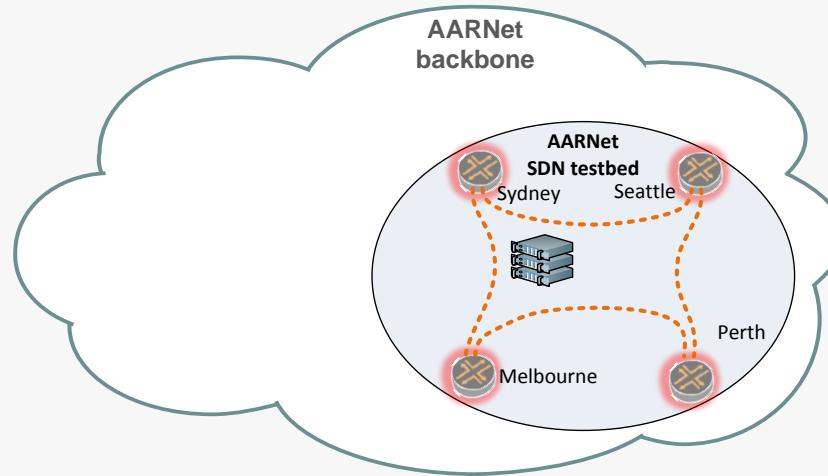
## Step 1: the AARNet SDN testbed



# Towards an SDN testbed



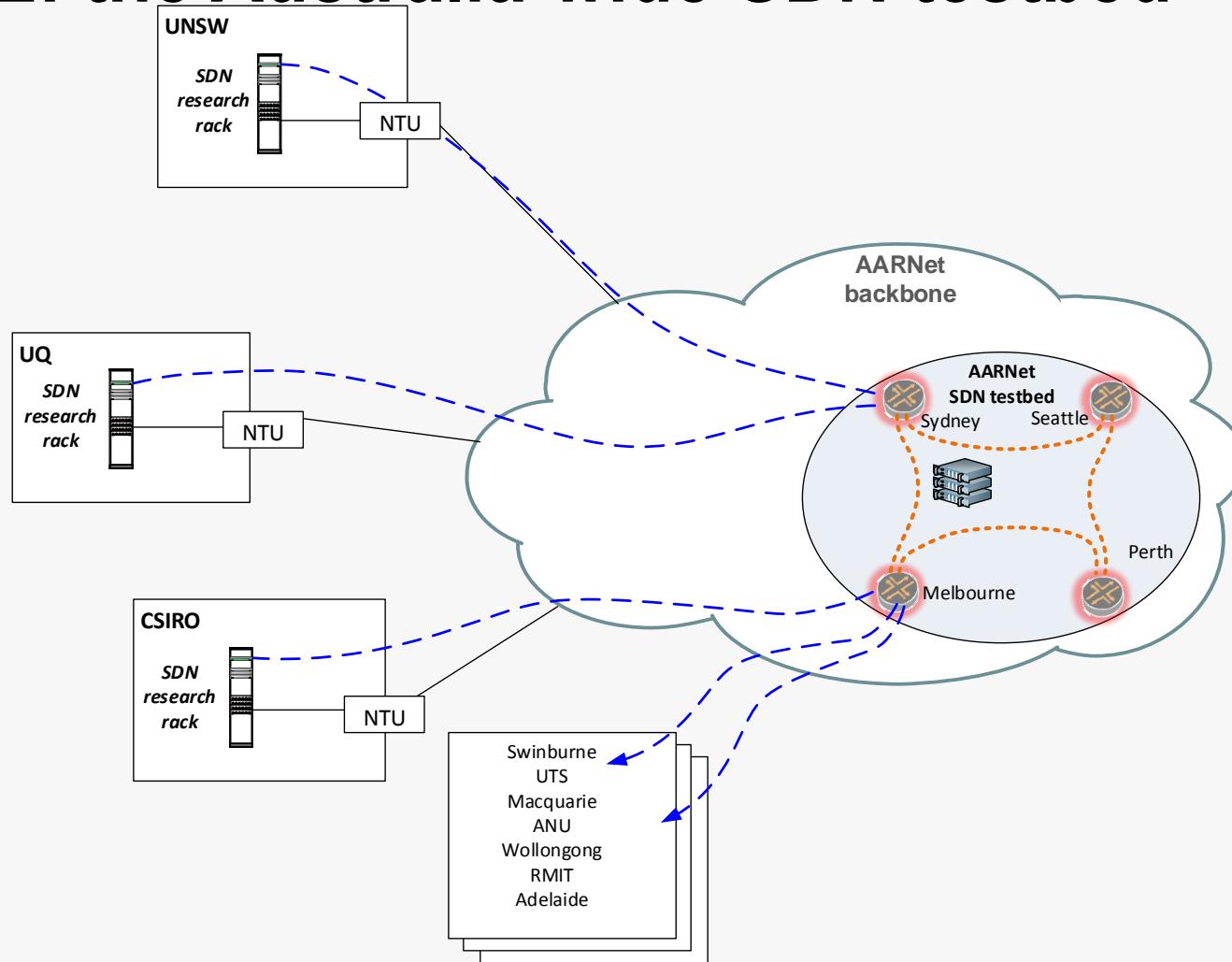
## Step 2: extend...



# Towards an SDN testbed



## Step 2: the Australia-wide SDN testbed

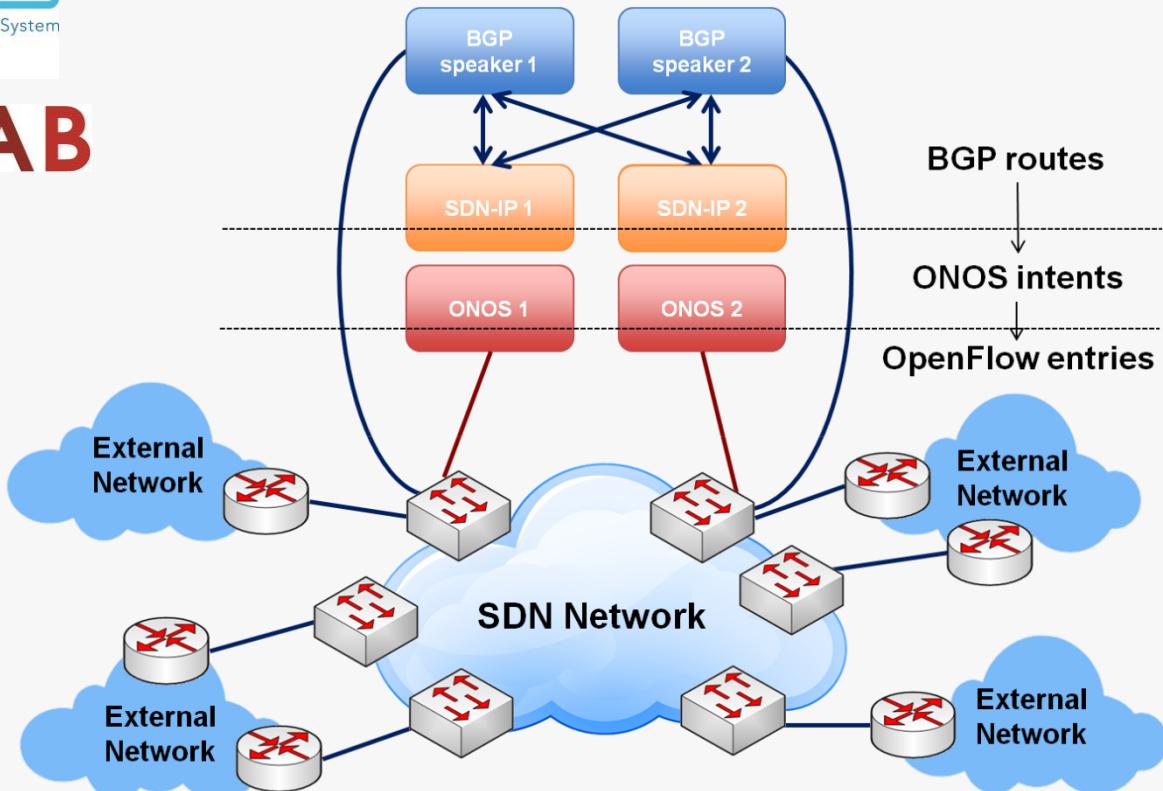


# Towards an SDN testbed



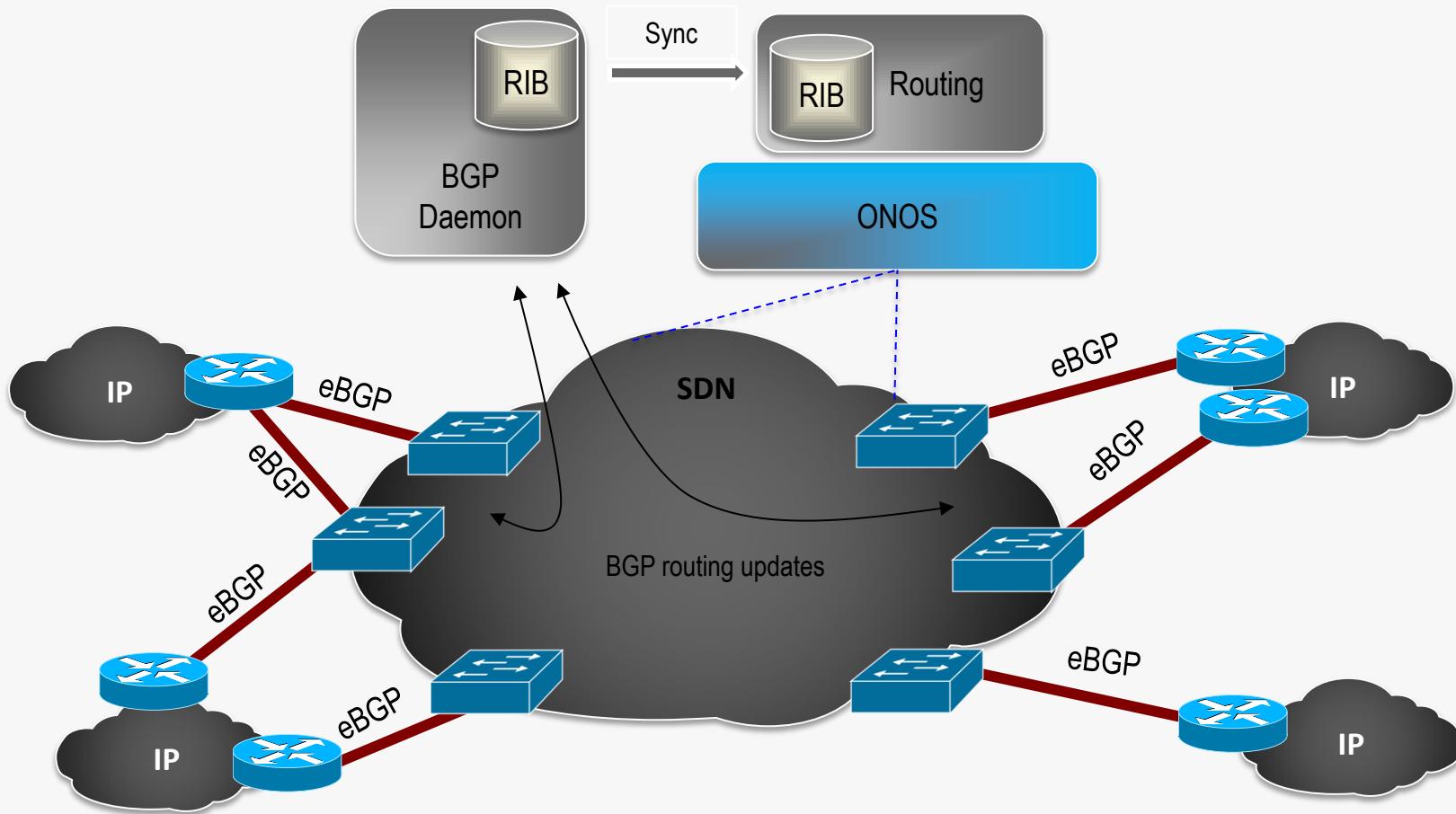
**ON.LAB**

**NoviFlow**  
switching made smarter



*Image: <https://wiki.onosproject.org/display/ONOS/SDN-IP+Architecture>*

# The internals



## Considerations

Entire SDN AS appears as a single big router to external peers



Australia-wide SDN Testbed



## RESEARCH DIRECTIONS

# Research possibilities

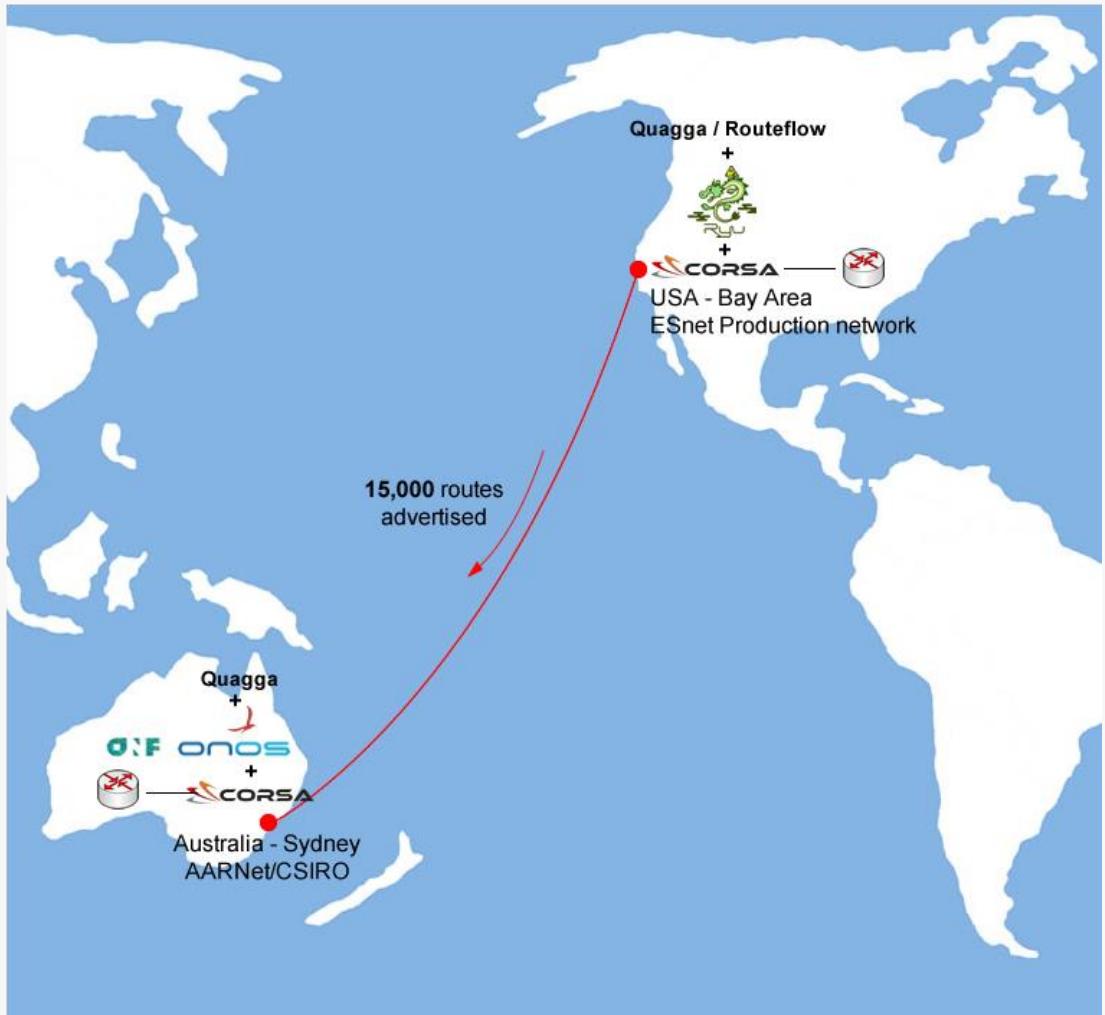


## « Esnet Coalition Partners Announce Global Breakthrough for Software-Defined Networking”

- **ONOS Atrium**
- **Corsa DP64x0 switches**
- **15,000 BGP routes**

[http://www.theregister.co.uk/2015/05/12/international\\_sdn\\_demo\\_just\\_the\\_start\\_for\\_aarnet/](http://www.theregister.co.uk/2015/05/12/international_sdn_demo_just_the_start_for_aarnet/)

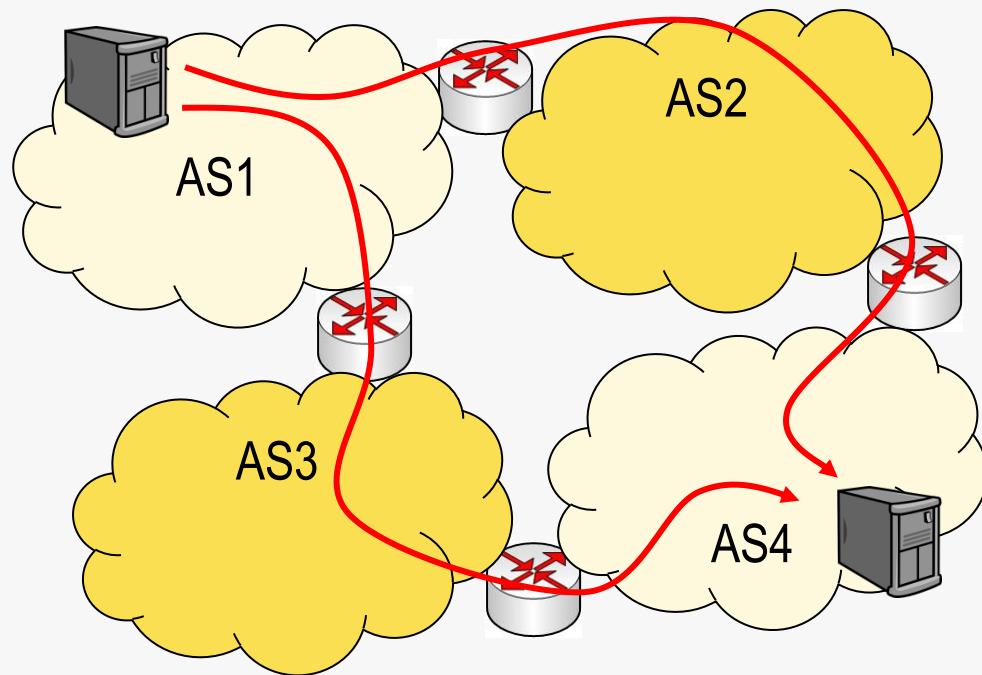
<http://news.aarnet.edu.au/coalition-announces-global-breakthrough-for-software-defined-networking/>



# Research possibilities



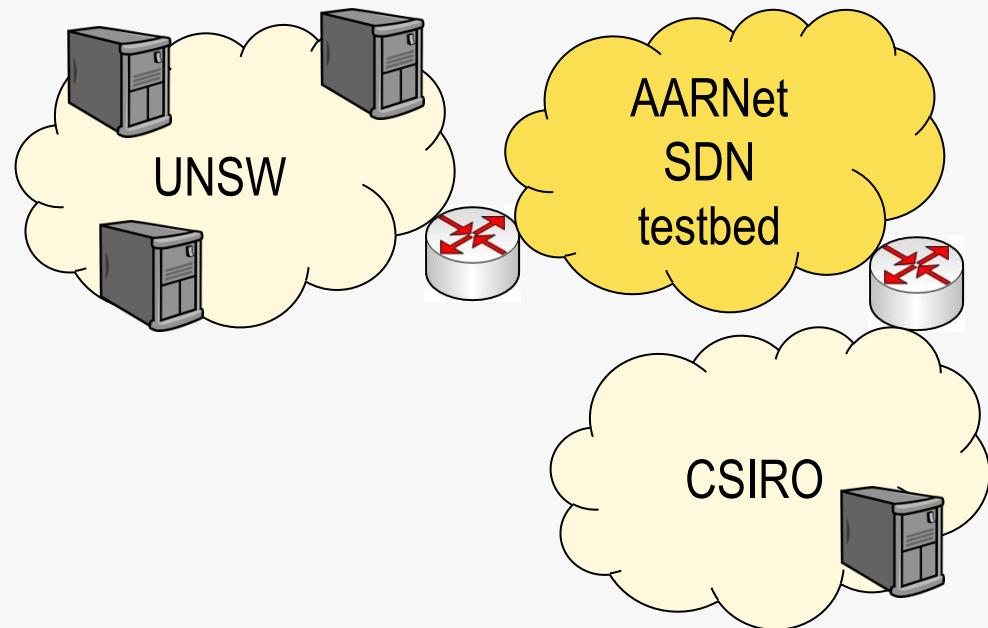
## SDN + IXP + end-to-end service guarantees



# Research possibilities



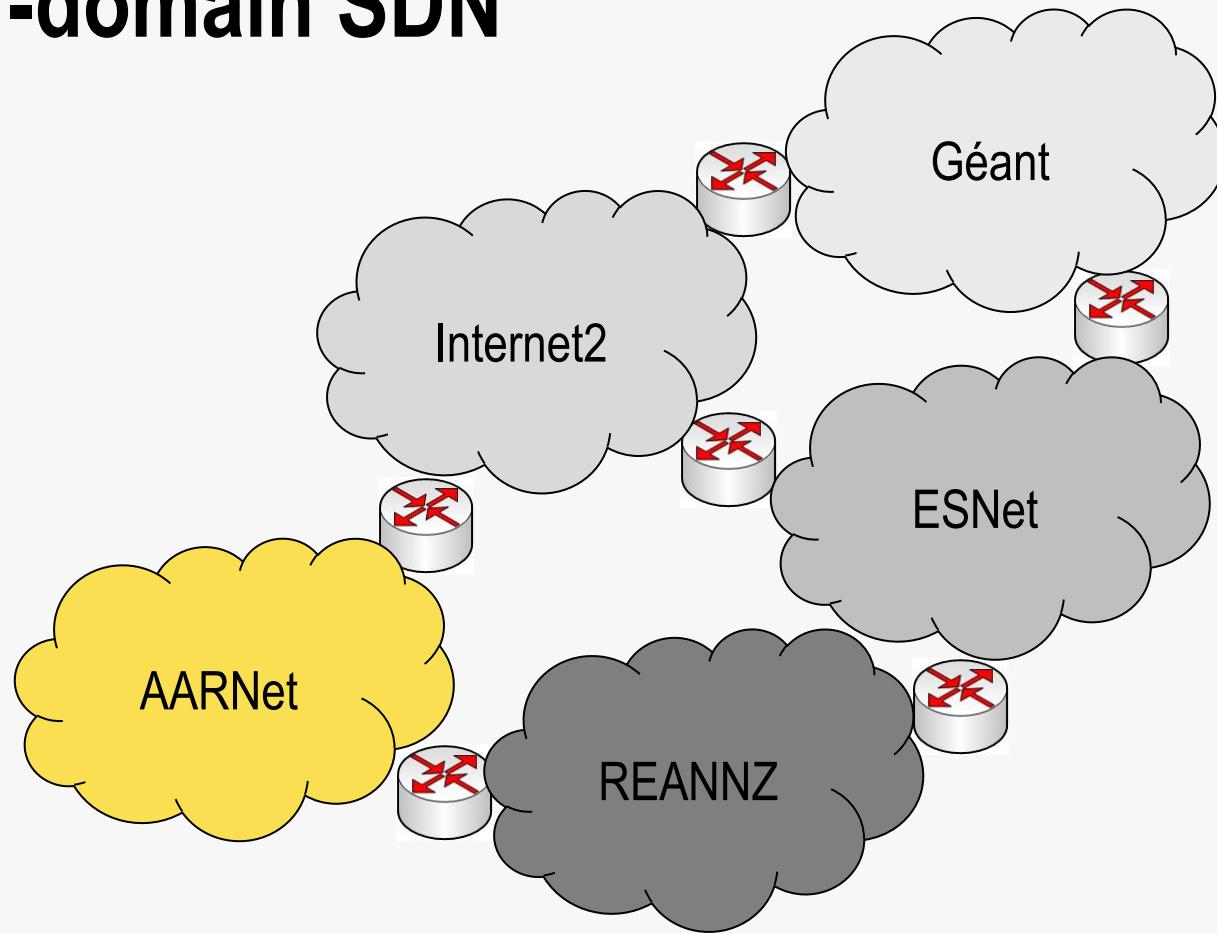
## Intra- vs inter-domain SDN



# Research possibilities



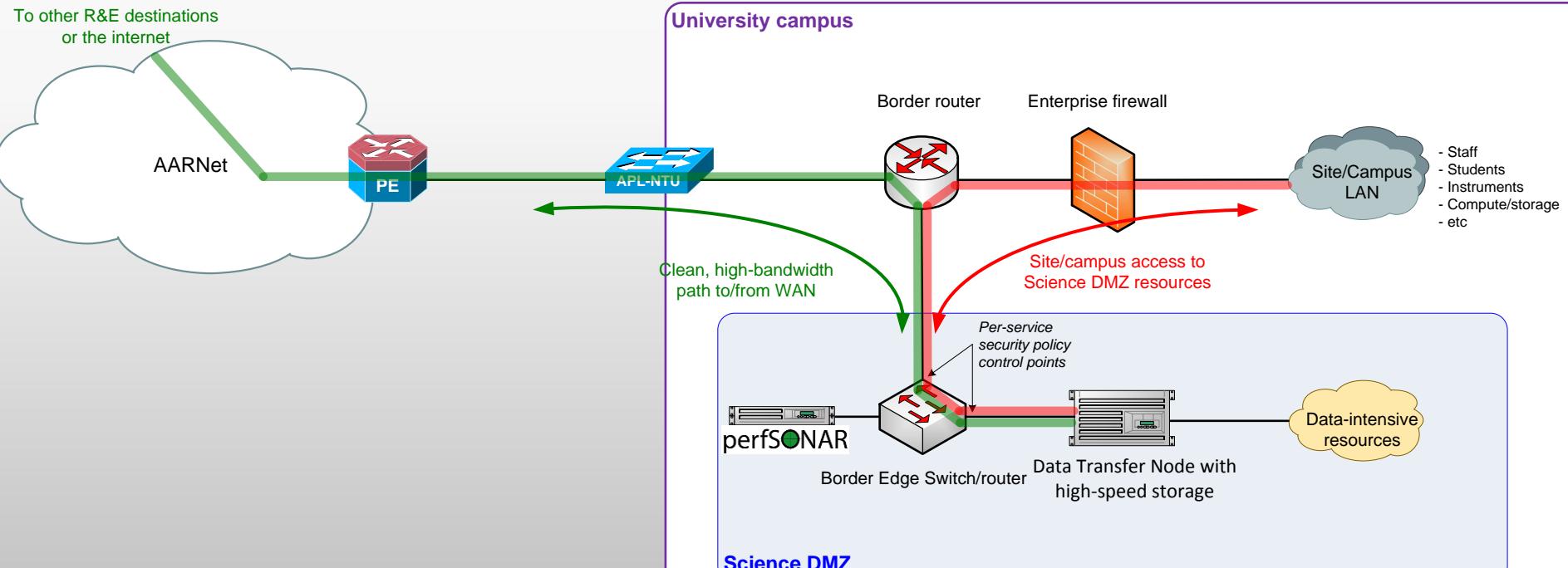
## Inter-domain SDN



# Research possibilities



## « Science DMZ » + security



# Looking forward



- Connect more researchers
- Encourage collaborations
- Run interesting tests
- Add complexity...



**Collectively build understanding  
of the SDN ecosystem**

The background of the slide features a dark, abstract design. At the bottom, there is a dense field of glowing orange and yellow spheres of varying sizes, resembling a microscopic view of cells or data points. Above this, several bright, glowing orange lines radiate upwards from the left side, creating a sense of depth and light. The overall aesthetic is modern and scientific.

David Wilde

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