

GrangeNet II

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QuestNet
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→ GrangeNet II

- Background
- Genesis
- Architecture
- Services
- Status
- Summary



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→ Background

- Funded by DCITA - The Advanced Networks Program (ANP)
- GrangeNet is a non-entity joint venture partnership of



- The consortium received \$14M in 2002 and \$4M in 2005 from the Australian Government under the Advanced Networks Program of the Building IT Strengths (BITS) initiative.
- GrangeNet will run until December 2006



→ Background

“Throwing technology at a community doesn’t work. You need people to understand what it will do for them and then they need to change their behavior.”

- GrangeNet works with many communities in ICT, the arts, sciences, humanities, education and engineering.
- GrangeNet facilitates collaboration between communities (layers 1 through 8)

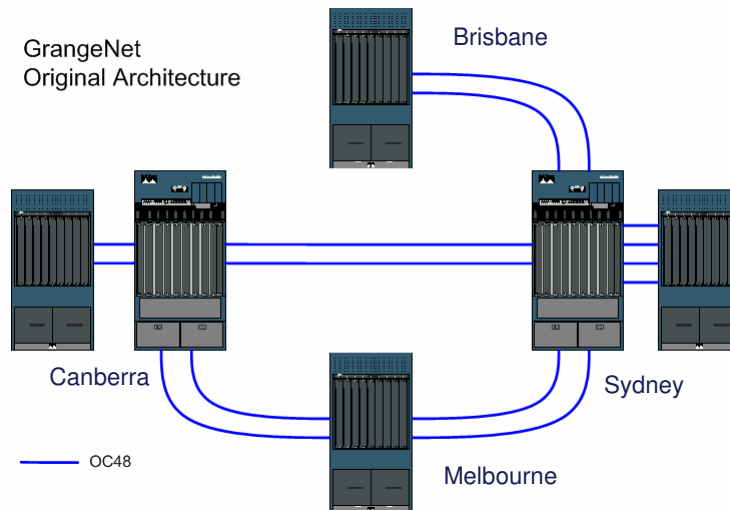


→ Background - Hardware

- In 2002:
 - GrangeNet was a very capable network
 - Designed using available components
- In 2005:
 - Limited
 - Superseded supervisor (MSFC2)
 - IPV6 processed in software
 - OSM modules reached End of Software Engineering
 - Limited Gigabit Ports



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→ Genesis

- GrangeNet funded for further 2 years (until 2006)
- Limitations of Change:
 - Committed to OC48 backbone links
 - Budgetary constraints
- Environment changes:
 - OC192 cheaper than OC48
 - Gigabit WAN becoming Ubiquitous



→ Genesis

What is possible?

... brainstormed ideas with Cisco engineers ...

... the result



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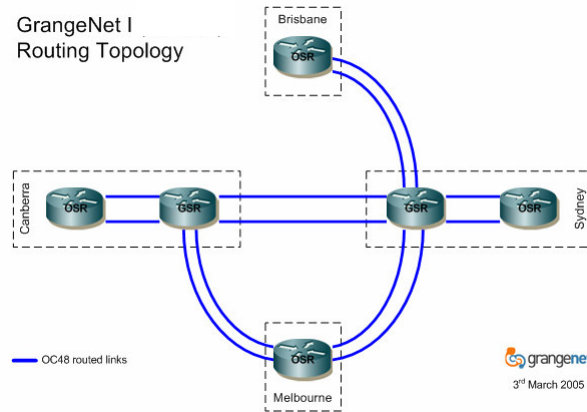
→ Architecture

- A network based on the latest generation of hardware and software
- Capable of:
 - Layer 1 – Light Paths
 - Layer 2 – VLANs
 - Layer 3 – Routing
- Carrying:
 - IPV4 Unicast and Multicast
 - IPV6 Unicast and Multicast



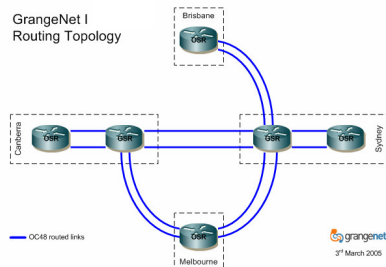
→ GrangeNet II – Topology (L2 / L3)

GrangeNet I
Routing Topology

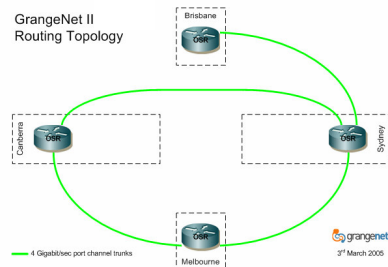


→ GrangeNet II – Topology (L2 / L3)

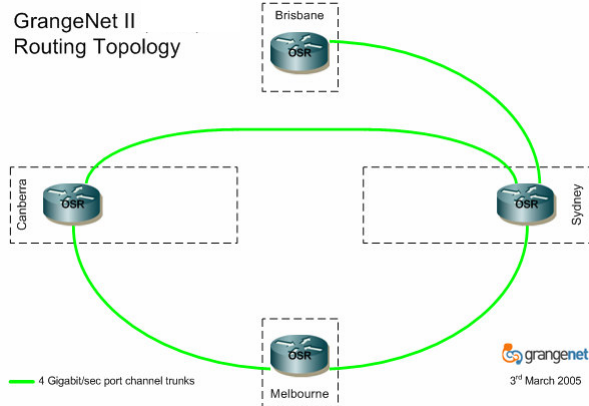
GrangeNet I
Routing Topology



GrangeNet II
Routing Topology



→ GrangeNet II – Topology (L2 / L3)



→ Routers

- Originally:
 - Cisco OSR 7609
 - Cisco 12410
- Now:
 - Cisco 7609
- Benefits:
 - Versatility
 - Performance
 - Latency / Jitter
 - Expansion to 10 Gigabit

→ Hardware – Cisco 7609

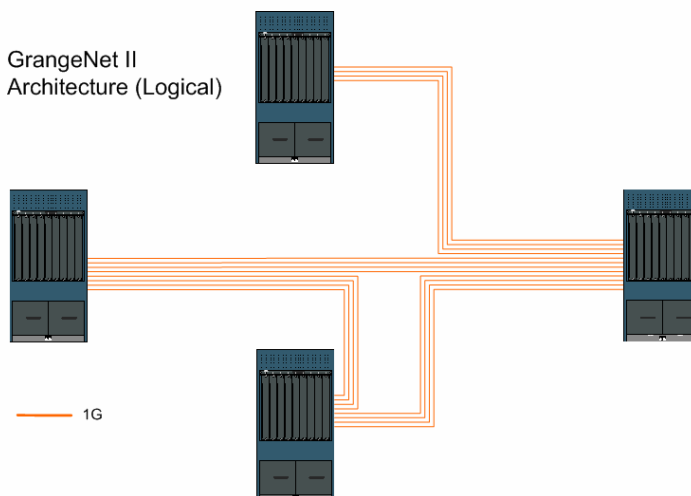


- 720 Gbps switching capacity (40 Gbps / slot)
- 1GB of DRAM
- [Sup720-3BXL](#)
- IPv4 routing to 400Mpps; and IPv6 to 200Mpps
- Routes 1,000,000 (IPv4); 500,000 (IPv6)
- MPLS in hardware
- L2 bridging up to 400Mpps
- All line cards are fabric enabled with 3BXL distributed forwarding cards (except FlexWan)



→ Architecture

GrangeNet II
Architecture (Logical)



→ Physical Layer

- Hardware:
 - Cisco ONS 15454E
- Capability:
 - Time Division Multiplexing
 - OC48
 - Gigabit
 - Expandable to 10 Gigabit
 - Carrier Class Reliability



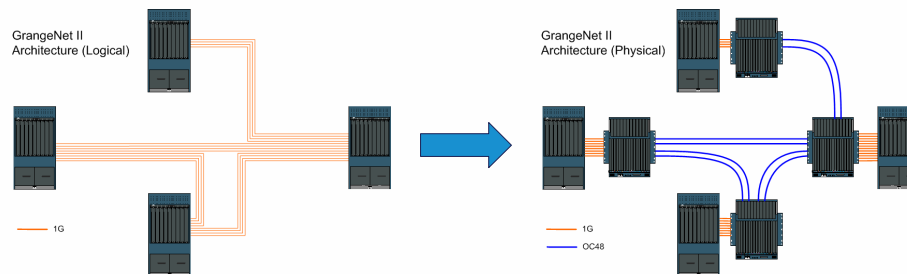
→ Physical Layer



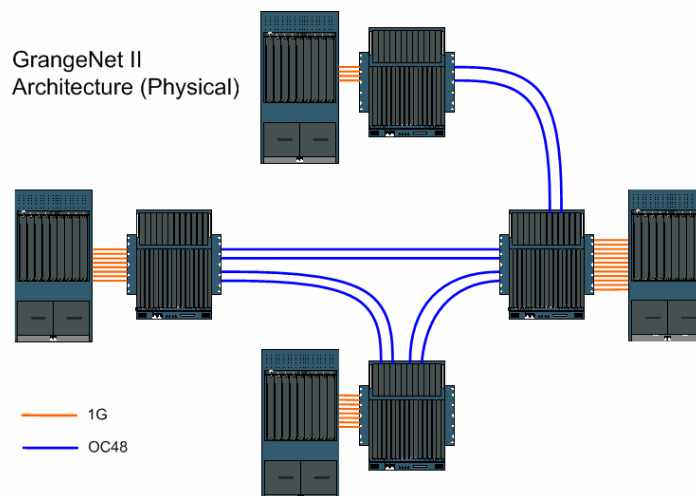
Some assembly required



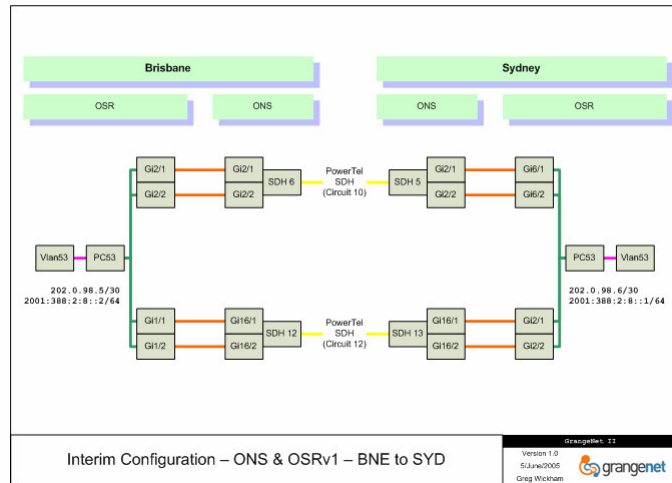
→ Architecture



→ Architecture



→ Architecture (BNE – SYD)



→ Architecture

- The 15454Es are used to Time Division Multiplex multiple Gigabit Circuits onto an OC48
- Gigabit circuits between 7609s are port channelled
- Port channel groups between routers are 802.1q trunks

→ Hardware Summary

- Layer 3 and Layer 2
 - Cisco 7609
 - 3BXL Supervisor
 - 3BXL DFC
 - 67xx series line cards
- Layer 1
 - ONS 16454E
 - OC48 backbone
 - Gigabit Interconnects



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→ GrangeNet II Services

- With the implementation of GrangeNet II more services can be offered than just the traditional **R&E** (routed protocols)
- GrangeNet II supports three levels of service that are aligned with the lowest three layers of the *OSI Reference Model*.
- The service offerings are:
 - **GrangeNet R&E** - Layer 3 (Network Layer)
 - **GrangeNet LAN** - Layer 2 (Data link layer)
 - **GrangeNet Lightpath** - Layer 1 (Physical Layer)



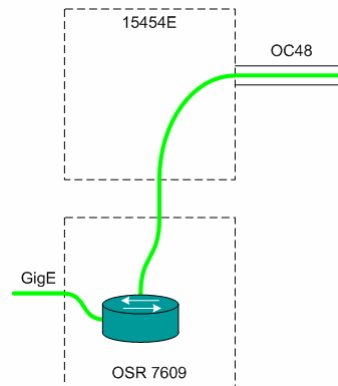
→ GrangeNet R&E

- **GrangeNet R&E** is the traditional **layer 3** service that permits members to peer with both local and international Research and Education members.
- IPv4
 - Unicast
 - Multicast
- IPv6
 - Unicast
 - Multicast (**August 2005**)



→ GrangeNet R&E

- Member BGP Peers with GrangeNet Router
- Australian and International R&E
- This is the primary service provided since inception

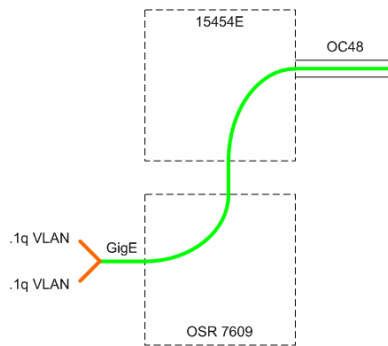


→ GrangeNet LAN

- An extension to the current offering of **MPLS** is **GrangeNet LAN** - a **Layer 2** service. This is a similar offering to **GrangeNet Lightpath** however the members traffic is carried across the **GrangeNet** backbone links in dedicated Vlans.
- There are currently no capacity or quantity constraints on the **LAN** service offering. A client can request many **LAN** services and have these combined with a **R&E** service onto the same physical **GrangeNet** connection.



→ GrangeNet LAN

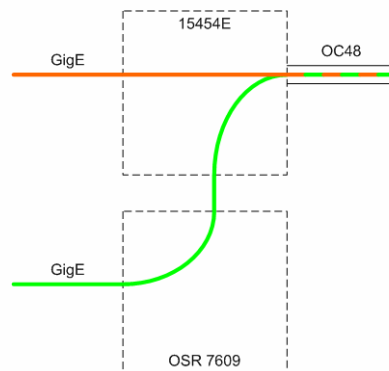


- 802.1q is used by member to select path
- Uses the existing connection
- GrangeNet is a **big** 'switch'
- Multidrop – A Vlan can be extended to any POP



→ GrangeNet Lightpath

- Require dedicated dark fibre to member (or CWDM)
- Gig E circuits are removed from the inter capital trunks
- Layer 1 throughout the network – completely transparent



→ GrangeNet Lightpath

- **GrangeNet Lightpath** is a **Layer 1** clear channel service that transports data between member endpoints. Available in either a 1Gbit/sec or 50 - 200 Mbit/sec variant it provides members with piece of mind that their data will not be visible to any other member on the network.
- The implementation of the **Lightpath** service is at a TDM (Time Division Multiplexing) level direct into the **GrangeNet** DWDM backbone. Data carried in this service does not travel through any of the **GrangeNet** routers.



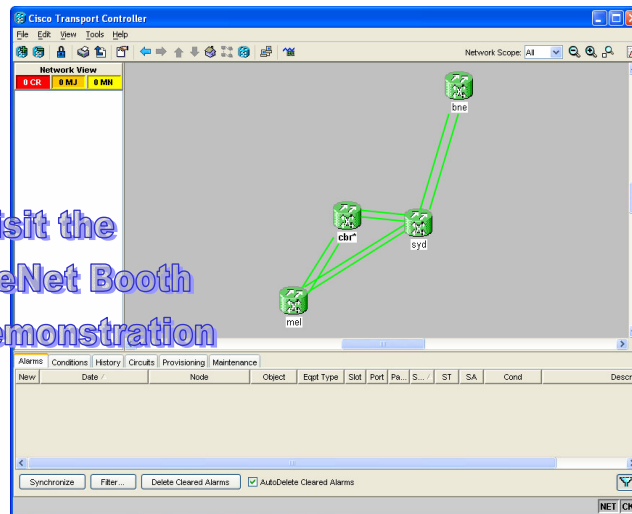
→ Using a Light Path

- **Provisioning:**
 - Currently a manual process
 - Uses Cisco Transport Controller
 - Takes minutes
 - Future UCLP (From CaNARIE)
- **Connectivity:**
 - User needs a connection to two GrangeNet POPs



→ Light Path

Visit the
GrangeNet Booth
for a Demonstration



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→ Status

- GMC Approval of upgrade 16th Feb 2005
 - From 7th May
 - Preparation of racks for Cisco 7609
 - Installation of ONS 15454E
 - 8th June
 - ONS enabled
 - From 30th June
 - Upgrade of 7609 (replace chassis)
 - GSRs Decommissioned
 - Canberra 30th June
 - Sydney 4th July



→ Status

As of 4th July GrangeNet II operational



→ Status

- Issue summary:
 - MPLS can't go through a Vlan (MSFC2)
 - Resolved – Migrated all CeNTIE services to Vlans
 - Minor BGP changes
 - `soft reconfiguration inbound` required on BGP peerings through ATM
 - Errors on Supervisor Gigabit ports
 - Migration to Cisco 7609



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→ Summary

- GrangeNet II
 - Provides greater ability to connect research groups
 - Less jitter / further reductions in latency
 - Operational now...
- More information:
<http://www.grangenet.net/networkoperations/grangenetII>
- Updates posted to:
gn-tech-1@grangenet.net



→ Questions?

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<http://noc.grangenet.net>

