Cisco Infrastructure Powers IPv6 Research Network

Australia's GrangeNet research network promotes next-generation Internet applications on a Cisco network infrastructure.

EXECUTIVE SUMMARY

GrangeNet

- Government Research Network
- Australia

BUSINESS CHALLENGE

- Deploy applications taking advantage of IPv6
- Make IP telephony, unicast, multicast, and other mobile and peer-to-peer applications possible and more efficient among member research universities in Australia
- Offer connectivity to networks in Asia, Europe, and the Americas

NETWORK SOLUTION

- Optical transport platform offers high bandwidth at Layer 1 and 2
- Gigabit Ethernet at Layer 3 supports IPv4 and IPv6
- Built-in router software delivers the full range of features necessary to deploy IPv6 applications

BUSINESS RESULTS

- GrangeNet benefits research institutions in Australia with greatly expanded features that enable researchers to use peer-to-peer network connections at gigabit speeds to gather, compile, and interpret data
- IPv6 applications at GrangeNet also make possible cooperative work with similar research networks and institutions throughout the world

BUSINESS CHALLENGE

The Grid and Next-Generation Network (GrangeNet) is a government-funded, high-performance research network with points of presence (POPs) in Brisbane, Sydney, Canberra, and Melbourne, Australia. GrangeNet is Australia's first native Internet Protocol version 6 (IPv6) network, and it is making the next-generation network technology available to researchers for a variety of applications through its implementation in Cisco IOS® Software.

GrangeNet is a joint venture of Cisco Systems®, Australia's Academic and Research Network (AARNet), the Australian Partnership for Advanced Computing, the Distributed Systems Technologies Centre, and Australian service provider PowerTel. It was established in 2002 and has provided over AUS$5 million in matching funds to projects developing grid technologies.

The network deploys applications that take advantage of IPv6. The goal is to make IP telephony, unicast, multicast, and many other mobile and peer-to-peer applications possible and more efficient among member research universities in Australia. The network also needs to interact with installations in Asia, Europe, and the Americas where IPv6 is now required for network application compatibility. Work on a 10-Gbps native IPv6 network began in March 2002 with special funding from the Department of Communications, Information Technology and the Arts (DCITA), and the network went live seven months later.

NETWORK SOLUTION

All GrangeNet POPs are dual-stack (IPv4 and IPv6) enabled. The network offers a unicast IPv6 connection; IPv6 multicast is also available.

The GrangeNet Network Operations Center in Canberra operates and maintains the core infrastructure and facilitates the connection of clients. The network core contains Cisco® ONS 15801 dense wavelength-division multiplexing (DWDM) optical transport platforms. Layer 1 optical connectivity at 2.5-Gbps speeds is provided using the Cisco ONS 15454 SONET Multiservice Provisioning Platform (MSPP), Layer 2 switched Ethernet is furnished with Cisco 7609 Routers with Supervisor 720 Engines at the network edge, and Layer 3 IPv4 and IPv6 is supported with Gigabit Ethernet cards in Cisco 7600 Series Routers. At the major POPs, GrangeNet uses links to the AARNet Southern Cross Cable Network (SCCN) for connectivity to other research networks in Asia, Europe, and the Americas.

Videoconferencing dominates researchers' use of IPv6. "The researchers are doing a lot of multicast for videoconferences and bulk file transfers from instruments that are connected to the network, such as electron microscopes," says Greg Wickham, GrangeNet's network

operation manager. “You can create peer-to-peer relationships using IPv4 and IPv6 routing at Layers 1 through 3, using Lambda for optical equipment at Layer 1 and through Ethernet switching at Layer 2.”

GrangeNet is delivering IPv6-based native unicast services to 14 universities in Australia, where researchers use unicast to develop applications for network-based testing and monitoring of experiments and phenomena. Research spans the social sciences and physical sciences, from linguistics to chemistry.

The network is also offering multicast at Layer 3 using a single route processor. “We anticipate offering IPv6 interdomain basic multicast when Multiprotocol Border Gateway Protocol becomes available on the Cisco 7609 Routers,” says Chris Myers, GrangeNet’s advanced communications services coordinator.

BUSINESS BENEFITS

“We’re seeing a huge push for IPv6, especially for research contacts with China, Japan, and Korea, where IPv4 addresses are expected to run out by 2013,” says Peter Elford, Cisco sales manager in Australia and a member of the GrangeNet board of directors.

With the exponential growth of IP-addressable devices, the IPv4 addressing scheme is giving way to the 128-bit addressing length feature of IPv6, which will enable every single Internet device to have its own unique IP address. Current techniques to make more efficient use of the existing pool of IP addresses—such as Network Address Translation (NAT)—break the model of peer-to-peer applications. NAT, which connects multiple computers to networks using only one IP address, requires modification of packets between endpoints and therefore does not allow for the end-to-end packet integrity required for effective security and for peer-to-peer connections for such applications as IP telephony and IP videoconferencing. IPv6 precludes the need for NAT in unicast and multicast applications and will create greater scale and integrity between peer-to-peer applications.

PRODUCT LIST

Routing and Switching
- Cisco 7609 Router

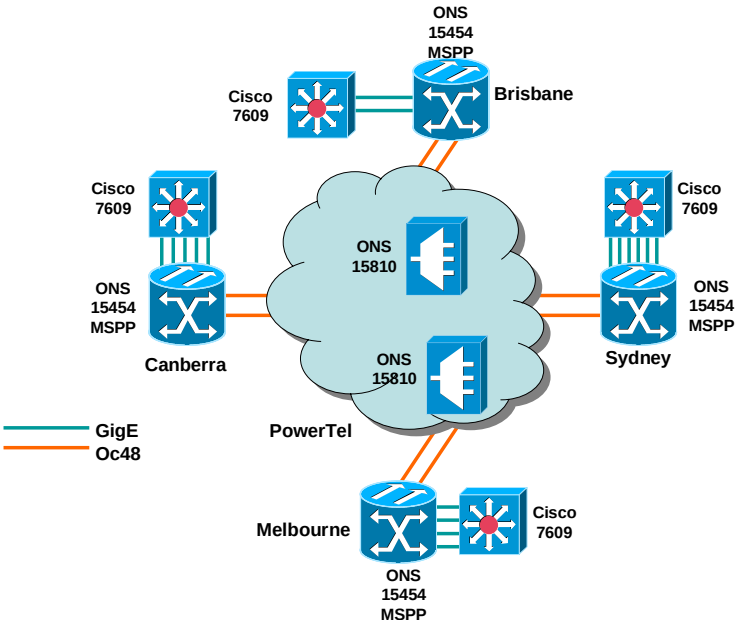
Broadband Cable
- Cisco ONS 15810 DWDM Platform
- Cisco ONS 15454 SONET MSPP

Cisco IOS Software
- IPv6

“Voice-over-IP using Session Initiation Protocol and multicast or broadcast video delivery are big emerging applications,” says Wickham. “We are particularly interested in working with newer networks in Asia, and IPv6 is a key criterion. We want to build applications with longevity. That will increasingly mean that they will run IPv6.”

In the fall of 2005, delegates at the first Australian IPv6 Summit watched the Melbourne Cup horse race, streamed over GrangeNet as a demonstration of IPv6 multicast. “The uses for IPv6-enabled applications like multicast and mobility will touch virtually everyone,” says Charles Smith, a Cisco network consulting engineer who has supported the development of GrangeNet. “We’re already demonstrating its use in sports, particle physics, astronomy, and the list goes on.”

Figure 1. GrangeNet Topology



FOR MORE INFORMATION

To find out more about IPv6 in Cisco IOS Software, visit: http://www.cisco.com/en/US/products/ps6553/products_ios_technology_home.html.

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