Case Study: KanREN Community
Experiences Early IPv6 Adoption

www.internet2.edu/ipv6

The KanREN region has become one of the first segments of the community to see a rapid deployment of the new Internet Protocol, IPv6 with three of its member institutions making aggressive commitments to migrating their campuses to IPv6, and others are poised to follow suit.

With the IP address space quickly depleting under the current Internet Protocol (IPv4), developing methods and timetables for migration will become critically important to higher education institutions, research agencies and their partners.

The Problem

The limitations of IPv4, combined with the ever-growing number of devices connected to the Internet, means the available address space is dwindling. Approximately 87 percent of the IPv4 address space is taken in the U.S., Canada, and the Caribbean (according to the American Registry for Internet Numbers). And that space is depleting quickly.

The rapid growth of the Internet, and the proliferation of connected devices—such as the dramatic rise in the popularity of Internet-capable wireless phones—means that many individuals now need multiple IP addresses.

Techniques used to cope with the shortage of IPv4 addresses, such as temporarily address assignment and network address translation, are reaching their limits and are barriers to the further growth of the Internet.

The Solution

The future of the Internet lies in Internet Protocol version 6 (IPv6), with its ability to use 128-bit addresses instead of the 32-bit addressing of IPv4. This vastly increases the number of addresses available from about 4 billion to approximately 340 trillion trillion trillion.

While many universities are beginning to experiment with IPv6 deployment, the Kansas research and education network, KanREN region—has become one of the first areas of the country to see a rapid uptake in adoption among many of its member institutions.

“By embracing the next generation Internet Protocol now, [Kansas institutions] can better leverage existing phased infrastructure upgrades and software upgrades,” says Cort Buffington, executive director of KanREN. “Also, as educational institutions, it is in their interest to start exposing their students to the new technology now.”

KanREN’s approach has been to provide IPv6 transport within the network, which has meant its own migration to IPv6, and to work individually with interested members. “One thing we emphasize is the phased migration approach,” Buffington says. “We have to accept that IPv6 is a different network layer protocol than IPv4 and decouple ourselves from the IPv4 paradigm.”
KanREN’s commitment to IPv6 leadership has come from a long association with Internet2. KanREN staff attended one of Internet2’s earliest IPv6 workshops, and has been active in development and deployment since.

“The recommendations and work of the Internet2 IPv6 working group, and community in general, come into play,” according to Buffington. “We can forward folks to those resources which help technically and help legitimize the need [for IPv6 migration] with decision-makers.”

The Result
KanREN reports a huge spike in IPv6 initiatives, starting in fall 2008, with several Kansas institutions starting their own IPv6 deployments.

Barton County Community College completed a network migration to IPv6 and a full security policy integration. Ft. Scott Community College completed a full IPv6 dual-stack integration at the main campus and at six remote campuses. Fort Hays State University has implemented IPv6 in their border and network core, and enabled core services such as DNS, email, and Web with IPv6 capabilities. In addition, two institutions, Pittsburg State University and Emporia State University, have completed initial steps related to dual-stack integration.

And KanREN is just a little proud to be the first (and still only) state network member of Internet2 to be “five greens” on the IPv6 working group survey page (www.mrp.net/IPv6_Survey.html), which tests IPv6 status of five representative network services.

“Implementing IPv6 transport within the network has turned out to be the easy part,” Buffington says. “Vendor implementation in operating systems and applications has been the biggest challenge. Our biggest focus is in this area – we know that transport is only as good as the ability of applications to take advantage of it.”

Overall, Buffington believes the simplified addressing and management promised by IPv6 are attractive to institutions, and that many more managers are beginning to see that IPv4 is quickly becoming obsolete, with the dramatic rise in devices requiring IP addresses. But he also believes that colleges and universities have a unique leadership role to play.

“As educational institutions, some feel (and this is a large motivator for KanREN ourselves) that leading the way with new technology is a social responsibility for them. Leadership is important. Change only happens when a few people are bold enough to realize they can make a difference. This is the kind of leadership that Internet2 provides.”

Dale Finkelson, senior network engineer for the University of Nebraska-Lincoln, and co-chair of the Internet2 IPv6 Working Group, said, “The KanREN community’s aggressive efforts in deploying IPv6 Working Group, added, “Through KanREN’s leadership we are able to reaffirm our community's belief in the importance of the end-to-end principle, one of the key bases of the Internet. We applaud their efforts and hope their work helps motivate others to act as well.”