

Carnegie Mellon will test Internet architecture in vehicular network and for online video

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Researchers at Carnegie Mellon University and three other institutions will test a next-generation Internet architecture they've developed in a vehicular network in Pittsburgh and in delivering online video on a national scale.

These deployments of the eXpressive Internet Architecture (XIA) are made possible by a two-year, \$5 million award from the National Science Foundation's Directorate for Computer and Information Science and Engineering (CISE). It is one of three new awards announced by the NSF that will allow research groups funded through NSF's Future Internet Architectures (FIA) program to extend the research they started in 2010 and move their architectures from the design stage to piloted deployments.

XIA includes features that enable the [network](#) to directly access content where it is most accessible, not necessarily on a host website, and includes intrinsic security features that can assure users that the websites they access and documents they download are legitimate.

Peter Steenkiste, professor of computer science and electrical and computer engineering at Carnegie Mellon and XIA's principal investigator, said plans are underway to deploy XIA in a network in and around the CMU campus, or possibly piggybacking atop Downtown Pittsburgh's free Wi-Fi network, that would enable vehicles to share

information about road and traffic conditions and to enable occupants to access the Internet.

Vehicles can use wireless communications channels called dedicated short-range communications, or DSRC, that are similar to Wi-Fi. Creating DSRC networks is challenging, however, because cars and trucks quickly pass from one DSRC access point to the next. XIA enables computer users to directly access content wherever it might be on the network, rather than always accessing a host website, so it should enable vehicles to obtain needed information from neighboring access points.

The researchers also will test a XIA network's ability to eliminate bottlenecks in the transmission of video, which now accounts for a majority of Internet traffic and is slated to grow and strain the network further. The details of this deployment have yet to be worked out, Steenkiste said, but probably will involve nodes spread across the United States. Loss of even a few data packets in a high-definition video stream is readily apparent, he noted, so this will be a critical test of XIA's reliability.

"These deployments will leverage, and enable us to deepen, our work on secure network operations, including providing a highly available infrastructure and secure authentication mechanisms," Steenkiste said. "They will enable us to build and test a robust XIA network and establish best practices for using our architecture, including support for mobility and enhanced cybersecurity."

Simply finding a way to evaluate network architectures will be part of the research effort, Steenkiste said, noting no widely accepted benchmarks yet exist. "It's not like the network is simply faster—it's more abstract than that," he explained. Security and reliability are some of the properties that must be evaluated.

The XIA Project team includes researchers from both CMU's School of Computer Science and its College of Engineering, as well as collaborators at the University of Wisconsin-Madison, Duke University and Boston University.

Just as XIA is designed to allow users to seek out content wherever it is most accessible, it also is designed to evolve with the Internet, so that it will enable future users to accommodate communications with entities that no one has dreamed of yet, Steenkiste said. It also is designed so that it can be deployed piecemeal, so that the entire Internet need not be transformed before people can start seeing XIA's benefits.

"These projects are just the beginning of what it would take to create a full-scale Future Internet," Keith Marzullo, director for NSF's Computer and Network Systems Division said of the FIA projects, "but the ultimate goal is the design and deployment of a network that serves all the needs of society."

Provided by Carnegie Mellon University

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