The Computerworld Honors Program

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Final Copy of Case Study

Status:
Laureate

Year:
2013

Organization Name:
Internet2 (and its members)

Organization URL:
www.Internet2.edu

Project Name:
The nation's fastest, coast-to-coast research and education network

Please select the category in which you are submitting your entry:
Innovation

Please provide an overview of the nominated project. Describe the problem it was intended to solve, the technology or approach used, how it was innovative and any technical or other challenges that had to be overcome for successful implementation and adoption. (In 300 words or less.)

The nation's first 100G open, national-scale, software-defined network (SDN) built to support advanced services and cloud applications is now available to spur new waves of innovation in education, research and industry. Internet2, operator of the nation's fastest, coast-to-coast research and education network, announced in October that their new optical network and their new 100G SDN network is operational for member institutions. The new capabilities now available on the Internet2 Network include: An upgraded Advanced Layer 3 Service, that will provide extraordinary broadband capabilities for science, medicine and education not only to the higher education community, but also to hundreds of thousands of community anchor institutions through partnerships

with regional networks and Internet2's United States Unified Community Anchor Network project. A nationwide 100Gbps SDN layer 2 "distributed open exchange" offering both production services like the Layer-2 Open Science, Scholarship and Service Exchange built in partnership with Indiana University and support of new network innovations through open access to nationwide SDN "slices" that allow direct Openflow software defined networking support. Over 8.8 Tbps of optical network capacity through 88, 100 Gbps-waves that are delivered in a unique partnership, between Internet2 and the Department of Energy's Energy Sciences Network (ESnet) that will share this capacity and operations of the infrastructure to advance national programs. The network also helps to deliver cloud services and to keep pace with the exponential growth in Big Data science being driven by the nation's collaborative researchers in labs and universities. Our new technologies enable transformational new solutions for education delivery and provide better-yielding solutions for 200,000 community anchor institutions and for university business functions, helping institutions remain competitive nationally and globally. More details at can be read and viewed at http://www.internet2.edu/network.

When was this project implemented or last updated? (Please specify month and year.) Has it incorporated new technologies and/or other innovations since its initial deployment? (In 300 words or less.)

With our partners, we completed the optical portion of the network built atop the 15,700 miles of newly acquired dark fiber in October 2012. This is fully in production and providing wavelength, SDN Layer 2 and advanced Layer 3 services today.

Is implementation of the project complete? If no, please describe the project's phases and which phase the project is now in. (In 300 words or less.)

The majority of the network implementation began in July 2010. The optical network and the first phases of the Advanced Layer 2 network and the upgraded advanced Layer 3 services were completed on time in the fourth quarter of 2012. The last segment of the network is scheduled to be completed, between Chicago and Seattle on the northern tier, by July 2013.

Please provide at least one example of how the technology project has benefited a specific individual or organization. Feel free to include personal quotes from individuals who have directly benefited from the work. (In 300 words or less.)

Whole new markets, like the Internet economy, have come from Research and Education and have greatly benefited and driven our economy. R&E sets the

groundwork for the next stages of Internet development and enables future economies. For example, Internet2's new network is benefiting the state of Ohio. Ohio, led by the Ohio Board of Regents and the Ohio Academic Resources Network (OARnet), increased the speed of its former bandwidth of 10 Gigabits per second (Gbps) to an impressive 100 Gbps. It connects to Internet2's international 100 Gbps network backbone at data hubs in Cleveland and Cincinnati. On December 11, 2012, Governor John Kasich showcased how the technology will create and enhance academic partnerships with businesses statewide. Read the Governor's announcement, at http://bit.ly/100Gnetwork. "Connecting to Internet2's Innovation Platform will greatly advance research and job growth across Ohio's higher education, medical research, manufacturing, and technology networking corridors," said Pankaj Shah, executive director of OARnet. "Across the nation sectors such as health care, agriculture, and engineering in conjunction with research and economic development efforts produce enormous volumes of data. By connecting to Internet2's 100 Gigabit per second platform, Ohio's and the other organizations' ability to analyze this data and collaborate globally increases exponentially." These almost unfathomable speeds will benefit Ohio. At 100 Gbps: Daily transfer data equivalent to 80 million file cabinets filled with text Ohio's 1.8 million enrolled K-12 students could download an e-book simultaneously in over 2 minutes 300,000 X-rays be transmitted in 1 minute 8.5 million electronic medical records can be transmitted in 1 minute Smartphone data can be sent 50,000 time faster than current average speeds Visit https://oar.net/press/media/100gbps for more details.

Would this project be considered an innovation, a best practice or other notable advancement that could be adopted by or tailored for other organizations and uses? If yes, please describe that here. (In 300 words or less.)

This project is an innovation advancing the Internet. The new network includes advanced technologies offered as an Innovation Platform to develop a new generation of applications and deliver new, more efficient, better-yielding services for scientific R&E, including http://www.internet2.edu/netplus. This unique new environment may yield as-yet-unimagined solutions that accelerate collaborative scientific research and transform university business services, strengthening the nation's position as a global R&E leader for decades. The Internet2 Innovation Platform includes: abundant bandwidth; fewer bottlenecks; and a new class of control to unlock a whole new dimension of R&E solutions. Abundant bandwidth Extraordinary increases in network capacity and speed, delivered across a 100 gigabit Ethernet (GE) national backbone, with substantial "headroom" capacity for innovation and programs to drive massive bandwidth as close to end users as possible. Fewer bottlenecks Pioneering concepts like the Science DMZ, http://fasterdata.es.net/science-dmz, provide a blueprint for architecting local networks to support big research data. Using this model, campuses experience

levels of improved application performance without sacrificing security, allowing them to fully leverage their investments in 100GE connectivity. New class of control: Entirely new dimensions of network and application integration through software-defined networking, allow previously untouchable, inflexible networks to be programmed and optimized for particular applications. The nation's ability to compete and collaborate in the world of "big data" and globally distributed science demands a dramatic increase in our broadband performance. For example, a single human genome sequence file can easily be 1 terabyte when factoring in multiple reads--required for reliable results and analysis data. At 100 Gbps, it takes only 80 seconds to download this file! U.S. researchers of today and tomorrow depend on our networks' ability to handle big data at big speed.

If there are any other details that the judges should know about this project, please note them here. (In 300 words or less.)

Innovation takes place when ideas are liberated to create practical, far-reaching solutions. The Internet2 community is laying a foundation for entirely new ideas: equipping the brightest people in the world with the most advanced technology in the world. The commercial Internet we know today was shaped by the vision and work of the people and organizations in the Internet2 community, collaborating within research and education environments that removed the barriers to discovery. Our members continue to develop and leverage advanced technologies that accelerate discoveries and improve the way the world works. Internet2 has an exceptional community of U.S. and international leaders in research, academia, industry and government who collaborate via innovative technologies. Through mutual agreements with similar organizations around the world, Internet2 is establishing ties that will help ensure the continued global interoperability of advanced networking, and enable collaboration between U.S. researchers, faculty, students and their overseas counterparts. Internet2 comprises approximately: 220 U.S. universities, 60 leading corporations, 70 government agencies, 38 regional and state education networks, 65 national R&E networking partners representing over 100 countries. We want to remove barriers to innovation. If Universities constrained network bandwidth for students, innovations like Google search or Facebook likely wouldn't exist. The Internet2 community is responsible for many of the great Internet technology innovations including the Internet itself. As a member institution, the R&E community makes each institution much greater that it could be alone. Our community extends beyond creating economies of scale; we scale to create economies. We accelerate research discovery, advance national and global education, and improve the delivery of public services. Our community touches nearly every major innovation that defines our modern digital lives, and we continue to define "what's next." See http://bit.ly/Internet2Network for more details.