Project Outcomes Report – NSF Award# 1440646

Project Title: CC*IIE Networking Infrastructure: Accelerating Science, Translational Research, and Collaboration at the University of Pittsburgh through the Implementation of Network Upgrades.

Recipient Organization: University of Pittsburgh

Project/Grant Period: 09/01/2014 – 08/31/15

PI: Brian Stengel

This project upgraded portions of the University of Pittsburgh's campus network with increased capacity and functionality to support scientific research using high performance computing, big-data resources at campus/regional/national sites and intra/inter-institutional collaborations in data-driven science. The project provides the necessary foundation from which further network enhancements can be developed to meet the rapidly expanding needs of collaborative and multi-disciplinary data-driven research and further enables the University's participation in activities involving data access, collaborative research, real-time analysis, and science education.

The project established a ScienceDMZ network at Pitt distinct from the general-purpose campus network, engineered specifically to support data-intensive science. The Science DMZ provides a network-architecture approach optimized for high-performance scientific applications and the transfer of large research data sets over high-speed wide area networks. It supports big data movement by improving security, cost-effectiveness, and handling of large scientific data sets. ScienceDMZ works by "carving out a small part of the campus network" to provide friction-free, high-performance networking in an environment separate from the business or enterprise systems that constitute the great majority of the campus local area network (LAN). This separate environment provides a relatively small space optimized for the wide area data-movement needs of systems whose effectiveness depends on high-speed flows of big data. It also gives researchers greater networking capacity to work with colleagues at other campuses, institutions, or national labs.

The ScienceDMZ will benefit current and future projects including: Increasing access to and improving analyses of particle physics generated by the Large Hadron Collider; accessing large genomic datasets stored on publically available repositories; connecting communities of scientists to large-scale datasets from simulation and modeling conducted at supercomputing facilities; developing a secure repository of de-identified TCGA data at the University of Pittsburgh linked to enterprise clinical data at UPMC. Scientists will use this resource for the purposes of understanding the molecular basis of cancer and to develop new methods for improving cancer care.

The project has enabled these goals by upgrading key campus networking connections and implementing new tools for data movement. The campus connection to the 3Rox GigaPoP (providing access to the major research and education network backbones, the Pittsburgh Supercomputing Center, and XSEDE resources) was upgraded to 100Gb/s. The campus to data center connection was upgraded to 100Gb/s.   New equipment and

software were used to build an enterprise data-transfer node (DTN) connected to the ScienceDMZ and cluster resources at the data center.   Additionally, an extension of the ScienceDMZ was delivered to a campus building to connect a DTN attached to a local cluster.

Improving researchers' ability to exploit capacity and knowledge brings broader impacts within and beyond the immediate subject areas.   New network capacity to HPC resources will spur new collaborations and educational activities for undergraduate research, teaching, training, and sharing of data with a larger community of researchers. New modes of research collaboration can be developed to further Pitt's contributions to the "grand challenges" facing society.