



Description of OmniPoP for Proposals

Summary

The OmniPoP is a collaborative effort between 12 of the member universities of the Big Ten Academic Alliance. Together, these institutions have pooled their efforts to create a high performance shared infrastructure based in the Chicago area. This infrastructure was designed to complement and augment the shared fiber infrastructure that the Big Ten Academic Alliance members had previously purchased.

The OmniPoP operates a high capacity switching infrastructure that supports 10 gigabit and 100 gigabit connections to its member institutions and equivalent high capacity links to national research and education networks such as Internet2, ESnet, and Starlight. This allows OmniPoP connections to be leveraged to provide services to large data flows in support of multi-institutional cooperative research efforts. Efforts supported today include interconnections between the Large Hadron Collider (LHC) Tier 2 efforts at the member institutions and the Midwest Openflow Crossroads Initiative (MOXI) project which links several midwest regional networks to the GENI backbone.

OmniPoP Infrastructure and Peerings

The Omnipop infrastructure consists of a redundant pair of 100 gigabit capable switches. These switches operate from geographically diverse co-location facilities within the Chicago metropolitan areas. These facilities also serve as Points of Presence (PoPs) for other major networks such as Internet2, ESnet (Department of Energy's Energy Sciences Network), and Starlight (the international peering exchange), enabling seamless cross connections to the major national and international research and education networks that support much of the academic research community. An additional benefit to these facilities is that they offer the opportunity for Big Ten Academic Alliance members to co-locate additional network related equipment in support of their own projects independent of the OmniPoP core infrastructure.

The switches support 10 gigabit and 100 gigabit connections for member and affiliate institutions. To date, seven 100 gigabit connections:

- University of Michigan
- University of Chicago
- University of Wisconsin (2)
- Indiana University/Purdue University (shared)
- University of Iowa
- University of Illinois – Urbana Champaign/ScienceDMZ/NCSA

and eighteen 10 gigabit connections:

- Wiscnet (Affiliate member) (2)
- University of Illinois – ICCN (2)

- University of Chicago
- Michigan State University
- University of Illinois – NCSA
- University of Michigan (3)
- University of Minnesota (2)
- University of Iowa (2)
- Northwestern University (2)
- Indiana University
- Ohio State University

have been established to OmniPoP members from these switches. Each institutional member receives a pair of 10 gigabit ports and access to a 100 gigabit port as part of their membership allotment. Additional connections may be leased by members and affiliated as needed. In addition to serving the member institutions, these connections also support access to the affiliated statewide or regional networks and Sponsored Educational Group Participants (SEGPs). The additional networks served by OmniPoP include:

- BOREAS-Net - The Broadband Optical Research, Education and Science Network is a collaboration of four major research institutions in the upper Midwestern United States: Iowa State University, the University of Iowa, the University of Minnesota, and the University of Wisconsin-Madison.
- ICCN - The InterCampus Communications Network of the University of Illinois is a broadband network that serves its three campuses in Urbana, Chicago and Springfield.
- I-Light and Indiana GigaPoP - I-Light is the State of Indiana's optical network for higher education. The Indiana GigaPoP manages I-Light.
- MiLR and Merit Network - Michigan LambdaRail is a high speed, fiber data network built by the three public research universities in Michigan: University of Michigan, Michigan State University, and Wayne State University and operated by Merit Network, the research and education network for the state of Michigan.
- Northern Lights GigaPoP - is an advanced regional networking initiative for research and education operated by the University of Minnesota.
- OARnet - OARnet is the broadband network and services organization for the state of Ohio. It serves research, education and public service institutions including universities, colleges, K-12, hospitals, public broadcasting, and state and local government.
- WiscNet - Wisconsin's Research and Education Network is a broadband network based in Madison that serves most of the colleges and universities in Wisconsin as well as most K12 school districts, library systems, the State of Wisconsin, many local and municipal governments, hospitals and non-profit affiliated organizations. (Affiliate Member)

The OmniPoP has also established peerings to several regional and national networks in support of its members. These peerings include:

- Internet2 (2 X 100 Gbps) connecting to both the Advanced Layer 2 Services (AL2S) backbone and the Commercial Peering Service (CPS). The AL2S backbone provides general transit for Internet2 research connections and the opportunity to create custom connections between member

institutions. The CPS service provides access to additional commodity Internet drainage for Internet2 members.

- ESnet – Energy Sciences Network (2 X 100 Gbps) a high-speed network connecting thousands of Department of Energy scientists, collaborators and their big science instruments (e.g., Large Hadron Collider) worldwide.
- MREN/StarLight – (100 Gbps) The Metropolitan Research and Education Network is a high-performance, broadband network in Chicago, IL. Starlight, based in Chicago, is the preeminent international connection point for high-performance research and education activity in the central United States.
- Wiscnet Regional Peering Service (8 X 10Gbps) – A regional peering service operated by the Wiscnet affiliate that provides peering opportunities with commercial providers at several Chicago area exchange points.
- Reciprocal back-up of primary (10 Gbps) Chicago Internet2 connections through Great Plains Network (Kansas City): A collaborative partnership between OmniPoP and GPN provides OmniPoP members the opportunity to back-up their primary Internet2 connections and serves as a no-cost insurance policy against unforeseen Chicago network disruptions.

Big Ten Academic Alliance institutions utilize the OmniPoP infrastructure to support a variety of research, academic, and administrative needs at their individual campuses. Member institutions leverage the OmniPoP to facilitate their participation in national research efforts such as using the OmniPoP infrastructure as a backbone to transport data flows between Large Hadron Collider (LHC) Tier 2 sites. Projects such as the Midwest Openflow Crossroads Initiative (MOXI) also utilize the OmniPoP as part of their effort to connect midwest regional networks to the GENI backbone.

Operational support for the OmniPoP is provided by a contract with the Global Research Network Operations Center (GRNOC) of Indiana University. This arrangement provides outstanding technical management of OmniPoP insuring 24x7 network support and strong network management and operation expertise. The GRNOC also helps manage the Big Ten Academic Alliance fiber assets in the Chicago area which ties the OmniPoP locations together and provides access to several other major fiber exchange points in the Chicago metropolitan area.

About the Big Ten Academic Alliance:

Headquartered in the Midwest, the Big Ten Academic Alliance which includes the fourteen member universities of the Big Ten Conference, is the largest university consortium of its kind in the nation. Particularly relevant to this proposal is the strength of the Big Ten Academic Alliance as an experienced consortium. For over 50 years, the regionally connected, world-class research institutions in the Big Ten Academic Alliance have advanced their academic missions, generated unique opportunities for students and faculty, and served the common good by sharing expertise, leveraging campus resources, and collaborating on innovative programs. The Big Ten Academic Alliance enjoys a sizeable market share of the US academic enterprise, within its halls representing ~500,000 students and 19,000+ faculty. Big Ten Academic Alliance institutions are among the best equipped and most research active in the nation, engaging in \$10 billion in research in 2014.

Big Ten Academic Alliance Governance:

The Big Ten Academic Alliance, as a whole, is governed by an Executive Board, the Provosts of the member universities, who lead, guide, and fund the activities of the enterprise. Under the overall

guidance of the Provosts, many Big Ten Academic Alliance stakeholder groups convene and carry out collaborative programs on a regular basis and typically fall into one of three categories:

Executive Leadership: These groups include senior leaders at Big Ten Academic Alliance member universities who govern and/or make investments in Big Ten Academic Alliance activities, e.g., Chief Information Officers, Vice Chancellors for Research, and Deans.

Program Management/Task Forces: These groups are typically convened by an executive leadership group to accomplish a particular analysis or to manage a Big Ten Academic Alliance project or program.

Peer Groups: These groups are typically self-organizing peers from member universities who get together (virtually and/or face-to-face) to share ideas and best practices.

Management of the OmniPoP is overseen by the OmniPoP Executive Board comprised of the Chief Information Officers (CIOs) of the Big Ten Academic Alliance member institutions. Routine technical operations are coordinated by a Technical Advisory Committee, which is comprised of two representatives from each member institution.