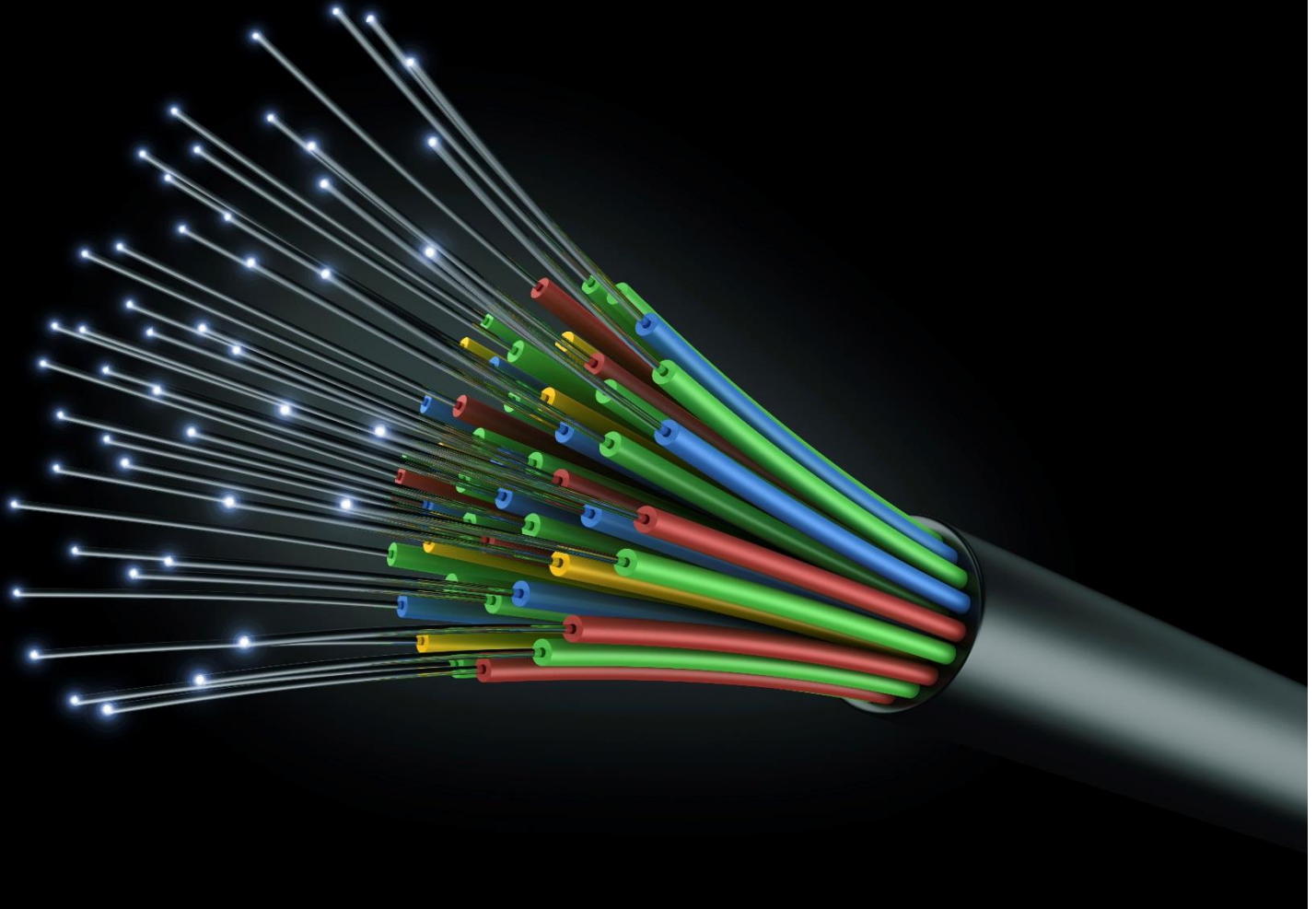# CIC OmniPoP Program Evaluation (2011-2015)
Better. Together.

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Approved by OmniPoP TAC: November 13, 2015
Approved by CIC CIOs: December 2, 2015

C·I·C COMMITTEE ON INSTITUTIONAL COOPERATION
www.cic.net

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Executive Summary

The CIC OmniPoP is a collection of fiber optics, network devices, and colocation facilities utilized by the 15 CIC institutions. This collection of resources provides high-speed connectivity to the membership both directly and via several external network and service providers. The joint 20-year purchase of fiber optic cable in downtown Chicago in 2004 by the participating CIC Chief Information Officers (CIOs) was a primary driver to create OmniPoP in 2006 for the purpose of sharing network equipment and services in Chicago. OmniPoP and its related Regional Optical Networks (RONs) owned by CIC member universities have become the primary infrastructure upon which many CIC members connect to local, national, and international networks.

In its first few years of existence (2006-2010), OmniPoP's focus was on deployment of the shared network, getting all members connected (both physically and logically) and establishing high-need services (Internet2 research and education transit, Commodity Peering Service, leasing additional ports). In the following years (2011-2015) the shared network has expanded to a second Chicago location to provide additional and redundant access for its members. Network devices have been upgraded twice in order to support the demand for 100Gbps networking and services. The OmniPoP now boasts (18) 100Gbps connections to several members as well as Internet2, ESNet, and Starlight/MREN in addition to the several 10Gbps connections.

With the network expansion and upgrades, OmniPoP's strategic priorities are shifting to include developing collaborative services, exploring advanced technologies, and preparing for the next increment in high-speed research connectivity. Specifically, the strategic priorities of OmniPoP from FY2016-2020 are to:

1. Promote use and improve visibility to our partners and users.
2. Continue to explore strategic partnerships and opportunities.
3. Protect existing fiber assets.
4. Develop mitigation strategy for DDOS and other cyber attacks.
5. Monitor and evaluate technologies that may impact future infrastructure.

In OmniPoP's second five years of existence, each CIC member school has invested $85,000/year on average and saved approximately $489,000/year.

Part I: Overview

OmniPoP is a collaborative network infrastructure operating shared resources for the mutual benefit of the participating CIC institutions. The infrastructure includes member owned fiber cabling throughout downtown Chicago which connects to a shared switching infrastructure located at a pair of redundant locations in the Chicago metropolitan area. This shared resource knits together the members' own regional optical networks and provides shared connectivity to national and international network infrastructure. OmniPoP capabilities include 2x100Gbps connectivity to the national Internet2 research backbone, as well as direct 100Gbps connections to other higher education and research peers such as ESNet which reduce costs and network congestion for academic and research faculty at the member institutions.

The design of OmniPoP provides multiple access points and built-in redundancy that helps limit network downtime due to unforeseen fiber optic cable damage or equipment failure. OmniPoP provides services to faculty and researchers that allow them to share bandwidth-intensive applications (such as high-definition video) and massive research datasets between regional, national, and global collaborators. In addition, OmniPoP provides access to common good services such as the WiscNet peering service and TeliaSonera Internet peering service.

Background: The name "OmniPoP" was coined at its inception in 2006 and was defined to mean "a gigaPoP of gigaPoPs" were PoP stands for "point of presence" of networking equipment. As such, OmniPoP was envisioned as:

- A place where members can place and/or share their networking equipment.
- A place to develop a rich mesh of various services and peerings between members as well as external entities.
- A framework to provide common and elective services to the members.

Members: All CIC CIO universities are OmniPoP members, except for Maryland, Nebraska, and Rutgers (geographical distance from Chicago currently makes membership unattractive to these three). All OmniPoP members are assessed an annual fee for base services, set by TAC and approved by the member CIOs. Members may also choose to participate in elective services, for which they are assessed separately.

Affiliates: OmniPoP affiliates are those institutions or organizations that procure services from or otherwise do business with (e.g., network peering) the OmniPoP, but do not become OmniPoP members. Affiliate status must be approved by the OmniPoP Executive Board.

Drivers of the Formation of OmniPoP:

- CIC collaboratively-owned fiber rings in downtown Chicago pre-paid for 20-years
- Need for Internet2 connectivity and National LambdaRail (NLR) connectivity in Chicago
- Need for member-controlled collocation space in Chicago
- Opportunity for direct (layer 2) peering with CIC members via Campus and Regional Optical Networks (RONs) including BOREASnet (Iowa, UMN and UW-Mad), MiLR (UMich and MSU), I-Light (IU and PU), Oarnet (includes OSU), Wiscnet (UW-Mad) and ICCN (UIUC and UIC).
- A central need for 24/7/365 production support and NOC services

OmniPoP Governance and Oversight: A Memoranda of Agreement (see Appendix A) signed by the CIC and its participating universities describes the governance and oversight of OmniPoP. OmniPoP oversight and governance is provided by 3 entities including:

- OmniPoP Executive Board: The OmniPoP Executive Board (EB) consists of the CIOs from the CIC universities that participate as full members of the OmniPoP. The EB sets the strategic vision, reviews and approves policies and finances, and approve technical service and architectural proposals.
- Technical Advisory Council (TAC): Up to 2 reps from each member school plus the OmniPoP operator (currently Indiana's Global Research Network Operations Center/GRNOC) and CIC-HQ prepare annual budget, strategic technical plan, recommend changes to service and architecture, approve routine purchases and service contracts.
- Tactical Technical Team: Up to 6 TAC members who work with the OmniPoP operator and the CIC-HQ on day-to-day technical coordination of operational issues.

Mission: Maximize advanced internetworking opportunities to enable our individual and collective missions.

Vision: To create and maintain reliable, high-performance regional, national and international connectivity for our institutions.

Values:

Non-technical Values:
- Trust and mutual respect among partners
- Maintain respect and influence locally, regionally and nationally
- Pragmatic, Midwestern values ("get it done") applied to national networking
- Economy of scale
- Communication, collaboration, cooperation, consensus
- More gain from working together than independently
- Voluntary participation

Technical Values:
- Transparency
- Simplicity of design
- Scalable
- Production-oriented
- Using best common practices when appropriate
- Bleeding edge moderated with calculated risk

OmniPoP Technical Architecture:

- Two co-owned high-performance, full-featured switches with routing capability are located at two diverse facilities in downtown Chicago plus all fiber has presence in both facilities. (By terminating fiber in OmniPoP facilities, OmniPoP avoids costly monthly fiber cross connect fees.)
- Each member receives a 1GE and 10GE line-rate port on each network switch with options to purchase additional ports. Each member also receives one 100GE line-rate port on the switch of their choice with the option to purchase additional ports.
- Direct peering established between all member CIC universities campus networks or Regional Optical Networks (RONs)
- 2 X 100GE connectivity (including Commodity Peering Service) to Internet2.
- Other direct peering with ESNet (Large Hadron Collider), and Big Ten Network.

OmniPoP Base Services for Members:

- OmniPoP members receive a "birthright" 1GE and 10GE port on each of the two OmniPoP switch/routers and one 100GE on the switch of their choice.
- OmniPoP members have the opportunity to connect to all the OmniPoP negotiated peering arrangements.
- OmniPoP members may purchase elective services as structured by the TAC.

OmniPoP Elective Services for Members:

- OmniPoP members have the opportunity to connect to 2 X 100GE connectivity from Internet2, assessed per a cost-share model developed by TAC and approved by the CIOs.
- OmniPoP members have the option of utilizing the WiscNet peering service, which provides traffic exchange to a number of Internet content providers present in the Chicago area. Members taking advantage of this service are assessed via the same cost-share model as used for the Internet2 connectivity service.
- Commodity Internet drainage is an elective service via an agreement with Internet provider TeliaSonera. As with other elective services, a cost-share model is used to assess the members using this service.
- OmniPoP members may purchase additional 1GE, 10GE, and 100GE ports on the switches for cost-recovery prices as determined by the TAC.
- OmniPoP members may also utilize space in the OmniPoP facility to co-locate their own equipment and are assessed a charge proportional to their power and space utilizations in the suite.

OmniPoP Services for Affiliates:

- OmniPoP currently has four affiliate members. These are Maryland, Nebraska, Rutgers, and WiscNet. The TAC has established an Affiliate annual fee that provides affiliates with the opportunity to establish peerings with mutually agreeable OmniPoP peers, and to purchase the same elective services offered to members.

Part II: Strategic Priorities and Accomplishments FY2011-2015

The OmniPoP TAC met on June 8-9, 2010 in Chicago to revise OmniPoP's strategic priorities. The following seven priorities were identified and later approved by the OmniPoP Executive Board. A summary of the activities and accomplishments related to the seven strategic priorities from FY11 to FY15 are listed below:

Priority #1:   Facilitate improved interactions with ourselves, our partners and users.

- OmniPoP TAC and TTT members worked to integrate OmniPoP services into the general network infrastructure at their institutions and promote the added flexibility that OmniPoP offered when working to solve specific problems for researchers and other institutional members that require high speed network interconnections.
- The OmniPoP TAC has worked to develop a general standardized summary of OmniPoP features and strengths that can be added to relevant grant proposals at the member institutions. A preliminary version was offered for some short lead time proposals during 2015 and a team is reviewing the currently updating the draft of this version for more general circulation.
- Outside of regularly scheduled OmniPoP conference calls and face to face meetings that keep the OmniPoP operations working as a cohesive unit, the OmniPoP EC has reached out to Big Ten Networks to facilitate better communication and understanding of what BTN needs from us and vice versa.
- The OmniPoP also facilitated learning opportunities among members such as the overview that Rutgers gave on their DDOS event.

Priority #2:   Identify and engage with potential strategic opportunities.

- OmniPoP has worked to ensure that its services keep pace with technological changes in the national and international networking area. Upgrades have been made across the board to incorporate 100g technology and the OmniPoP now supports connections to Internet2, ESNet and individual member institutions at this speed.
- With the addition of the University of Nebraska to the CIC, the OmniPoP developed a reciprocal agreement with their primary connector (GPN) that provides a path for their institution to access OmniPoP resources but also allows the two networks to offer each other backup access to Internet2 resources in case of a localized equipment failure.
- OmniPoP has also expanded its ability to help member institutions to contain costs by reducing the amount of commodity Internet that they need to purchase. In addition to supporting connectivity to the existing Internet2 TR/CPS Internet peering service, the OmniPoP has two more optional services to help their members manage their internet traffic. These are the Wisconsin Regional Internet Peering Service (WRIPS) and a direct peering with bulk commodity Internet provider TeliaSonera.

Priority #3:   Protect existing fiber assets.

- The OmniPoP TAC worked with Level3 to identify and complete the private cross connect infrastructure at the 600 West Chicago Level3 facility. In many cases, this allows member institutions to create fiber cross connects and avoid paying significant monthly service fees to Level3. The OmniPoP staff also worked with Level3 and GRNOC (the OmniPoP operator) to create a detailed inventory of fiber assets and connections that is now maintained for OmniPoP by GRNOC.
- The OmniPoP TAC has held some preliminary discussions with Level3 and Zayo to scope out the locations and costs of fiber assets that may be available to us in the FY2024 time frame when our current fiber asset IRUs expire. The TAC has also worked to develop a more extensive list of providers that may have fiber assets of interest to the OmniPoP in that time frame.
- The OmniPoP TAC has also explored the alternative of building our own fiber infrastructure in the metropolitan Chicago area as an alternative to acquiring a new set of fiber IRUs. The OmniPoP TAC intends to continue to explore this option and will make a recommendation on a buy vs. build decision around 2019, so that sufficient time remains to fully complete either option.

Priority #4:   Identify and deploy strategic new technologies.

The OmniPoP TTT deployed a second switch (Juniper model MX960) at the 600 West Chicago Level3 facility. This allowed for redundant services to be offered between this switch and the original OmniPoP switch previously deployed at the 710 North Lakeshore (MREN/Starlight) facility.

- The rapid adoption of 100g optical technologies during this five-year period led the OmniPoP to upgrade to a new generation of switches at both facilities. A pair of Juniper MX2010 switches were deployed to facilitate member and service upgrades as previously described to 100g speeds.
- Connectivity to both the Internet2 and ESNet networks were upgraded to take advantage of the new 100g technologies. In addition, the increased load presented by OmniPoP members led the OmniPoP to add a second connection to Internet2 into their AL2S network. With the retirement of Internet2 AL3S services, the original port was also moved into the AL2S network so that Internet2 dynamic circuit services are now available on both OmniPoP switches

Priority #5:   Develop strategic partnerships.

- OmniPoP's relationship with the Great Plains Network (GPN) provides backup access to Internet2 to members of both networks.
- In order to support our athletic departments' initiative in creating the Big Ten Network (BTN), we have engaged with the BTN technical staff to create a direct interconnect in support of athletic content and have also worked to upgrade this connection to 10g speeds as traffic necessitated and are working to develop an additional redundant connection.
- The further expansion of the CIC to include institutions in the East-Coast region has renewed our interest in creating strategic partnerships with network gigapops in that area. We are working to develop these relationships and improve the ability of the OmniPoP to offer relevant services to member institutions in this region.

Priority #6:   Develop strategies for expanding of services and infrastructure.

- The addition of the second OmniPoP switch at 600 West Chicago and the expansion of OmniPoP to its own equipment suite at this location has allowed OmniPoP to offer co-location space to its members. Several institutions have taken advantage of this new service and have located significant equipment in the OmniPoP space at the Level3 facility there.
- As previously mentioned, the OmniPoP has worked to help members contain their Internet costs with the addition of access to the WRIPS peering service and the TeliaSonera commercial Internet service. These are both optional services and the costs for offering these services are fully funded by an additional fee paid for by the participating members

Priority #7:   Develop technology cycle plan for next generation infrastructure deployment.

- The rapid development and availability of 100g services encouraged us to overhaul our switching infrastructure. We replaced the original Force10 switch which was at end of life with a Juniper 2010 switch. We did an early replacement on the second switch, a Juniper MX960 with a similar Juniper MX2010 switch. This allowed us to offer completely redundant services and affordable denser 100g services at both locations and provides us a platform that we anticipate will give us a path to 400g or higher level services in the future.

Part III: Evaluation Survey Summaries

Surveys were sent to the CIC Chief Information Officers and the OmniPoP Technical Advisory Committee (TAC). The surveys asked each university to articulate OmniPoP's value to their campus, opportunities to further OmniPoP's value, and a five-year technology outlook for OmniPoP.

Value of OmniPoP

The value of OmniPoP to the member universities was expressed in four emergent themes: cost savings, redundancy, enhanced opportunities/services, and technical expertise.

- Peerings with other CIC institutions and WiscNet (an OmniPoP affiliate) reduce traffic on "pay for Mbps" commodity links providing significant cost savings and increased bandwidth to members.
- The OmniPoP connection to the Big Ten Network saves members the time and expense of individually connecting a fiber circuit to BTN at the 600 W. Chicago Ave, Chicago, IL location.
- Having a geographically diverse infrastructure reduces both the number and length of network outages for members and provides back-up paths to Internet2 and ESNet
- OmniPoP has enabled multiple collaborations in the research domain-- ESNet, MOXI, LHC, and the award of an NSF CC-NIE networking upgrade on one member campus.
- The TAC continues to serve as a valuable collaborative resource—staff on member campuses have broader access to knowledge and expertise in high bandwidth networking which makes it easier for individual campuses to stay on the forefront of technology.
- The combined voice of CIC OmniPoP has been particularly helpful when dealing with research network partners such as Internet2.

Opportunities to further leverage OmniPoP's value

Survey respondents noted that CIC OmniPoP should be careful not to duplicate Internet2 NET+ services. The following were identified as opportunities to further leverage the value that OmniPoP brings to the CIC universities.

- Caching/CDN, VPN, Load Balancing
- DDoS Mitigation
- Data scrubbing services
- Collective hardware/software purchasing and shared virtual hosting services
- Specialized network applications between other CIC members when appropriate
- More diversity in connections and connections to geographic areas outside of Chicago
- Expand BTN video transport to revenue-generating events

- CIC member access to virtual routers on OmniPoP MX 2010 infrastructure
- Improved collaboration tools for TAC/GRNOC to facilitate better information exchange between members—IRC, Slack, or other.
- Collaborative development and maintenance of tools for network management and monitoring, data analytics for grant-funded research activities, end-to-end traffic characterization and trending, and shared network forensics

Five Year Technology Outlook for OmniPoP

In considering the five-year technology outlook for OmniPoP, survey respondents emphasize that consideration of any future opportunities should not be at the expense of the current operation of the network or currently available services.

- Consider eastern presence (OmniPoP East) to support Penn State, Rutgers, and Maryland — direct OmniPoP offering or via agreements with network collaborations such as KINBER
- New fiber IRUs to sustain presence in Chicago
- Layer 3 services
- SDN in support of research and large data flows either via additional virtualize network circuits or a new network architecture. Add appropriate connectivity via the Internet2 AL2S, Starlight, or other research connectivity partners.
- 400 Gb/1 Tb connectivity
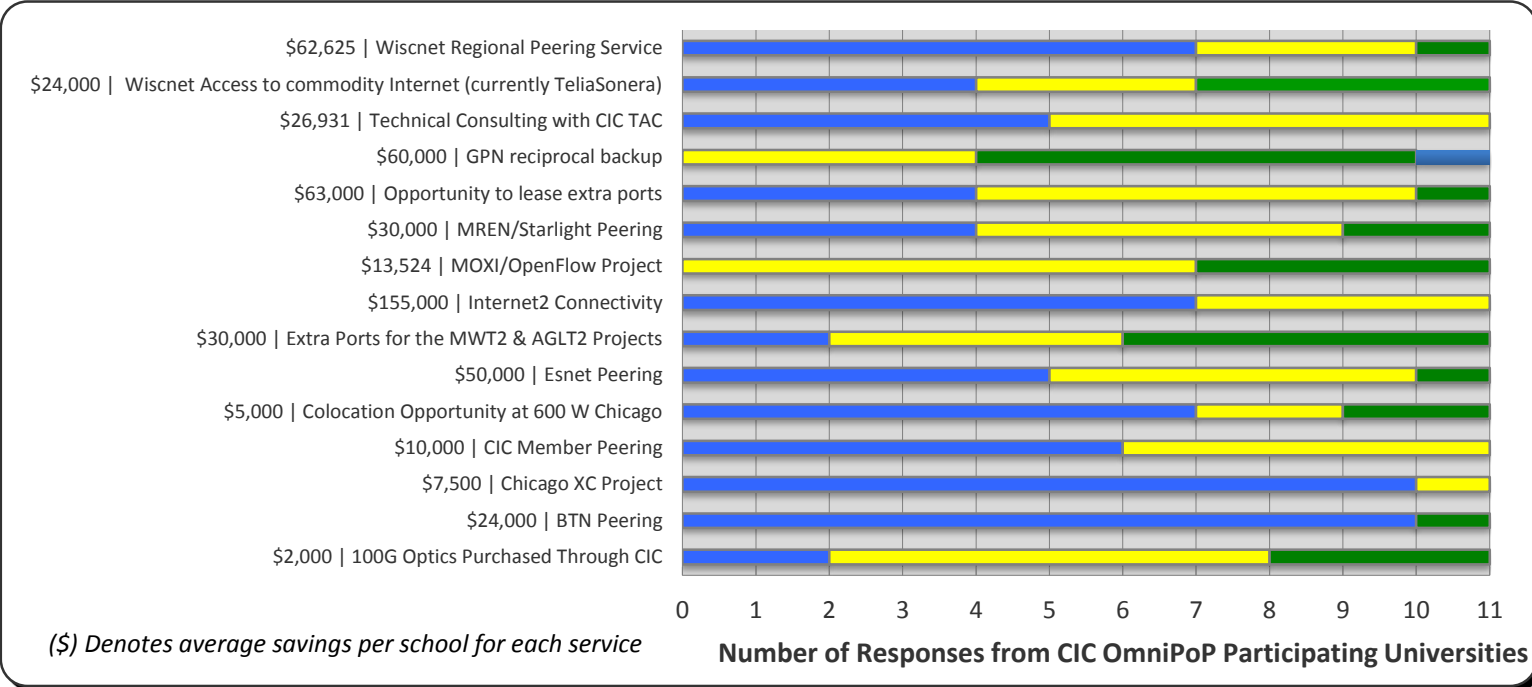
Part IV: Cost and Average Savings FY2010-2015

Fiscal Year	Membership Fee per School	Total Elective Services	Average Investment per School	Average Savings per School
2010-11	$25,000	$525,000	$74,257	$385,397
2011-12	$30,000	$575,000[1]	83,944	$483,921
2012-13	$35,000	$745,000	$89,545	$491,021
2013-14	$40,000	$866,443[2]	$83,690	$551,080
2014-15	$45,000[3]	$863,807[4]	$94,091	$533,580

Footnotes:
[1] Addition of WiscNet Regional Peering Service to elective services.
[2] Addition of Colocation Service to elective services.
[3] Building reserves for 20-year fiber IRU renewal/purchase.
[4] Addition of TeliaSonera commodity Internet to elective services.

OmniPoP Value to CIC Members FY14-15

Service	
$62,625 | Wiscnet Regional Peering Service	
$24,000 | Wiscnet Access to commodity Internet (currently TeliaSonera)	
$26,931 | Technical Consulting with CIC TAC	
$60,000 | GPN reciprocal backup	
$63,000 | Opportunity to lease extra ports	
$30,000 | MREN/Starlight Peering	
$13,524 | MOXI/OpenFlow Project	
$155,000 | Internet2 Connectivity	
$30,000 | Extra Ports for the MWT2 & AGLT2 Projects	
$50,000 | Esnet Peering	
$5,000 | Colocation Opportunity at 600 W Chicago	
$10,000 | CIC Member Peering	
$7,500 | Chicago XC Project	
$24,000 | BTN Peering	
$2,000 | 100G Optics Purchased Through CIC	

($) Denotes average savings per school for each service

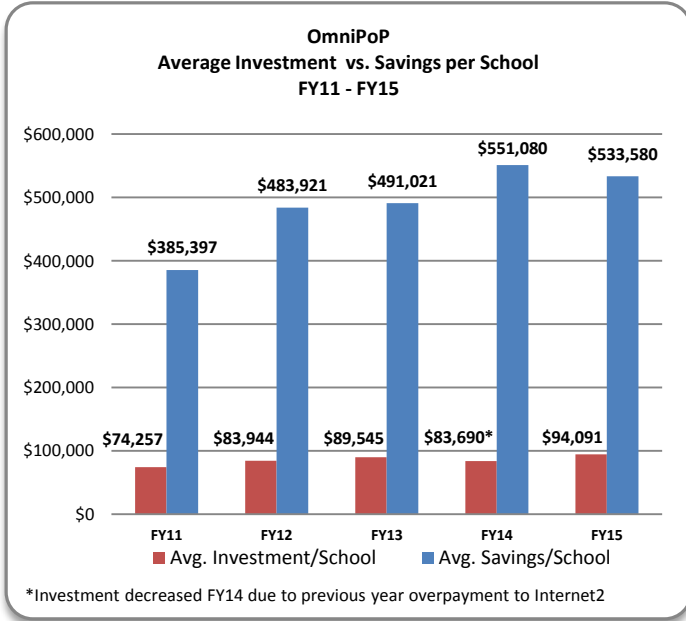**Number of Responses from CIC OmniPoP Participating Universities**

Rating Scale:

- **Essential Service:** Would need to be replaced or otherwise secured if not for OmniPoP

- **Value-added Service**: Adds value, redundancy, capacity, etc. and/or may reduce overall campus networking costs; However, if not for OmniPoP, this service may not be replaced unless very cost-effective or otherwise attractive alternative was available.

- **Currently Unneeded Service:** This service is not being used by some members because it is not yet needed.

- **Could find more affordable option:** Essential or Value-added service that could be found more affordably than OmniPoP if service needed to be replaced.

"OmniPoP provides a lot of value and makes service acquisition much easier and more affordable. We greatly appreciate all the effort and thoughtfulness that goes into the operation and the spirit of collaboration."
-CIC OmniPoP TAC Member

"[Our] connection to the CIC OmniPop service provides us with high speed access to regional, national, and global network resources that would be extremely expensive should we have to pursue direct connections on our own. The CIC Colocation space at 600W Chicago Ave will provide us with a resilient point of presence in downtown Chicago. Purchasing colocation services from an outside vendor would likely have been cost prohibitive."
-CIC OmniPoP TAC Member

"...OmniPoP is in the center of all of [our] collaborations. It facilitates the technical interconnections, cost sharing, and people networking necessary for us to accomplish much more than we could alone. Without OmniPoP, [we] would have to co-locate [our] own equipment in Chicago..."
-CIC OmniPoP TAC Member

"The OmniPoP resources continue to be a highly valued asset, critical in maintaining cost-effective connections to regional and national networks."
-CIC OmniPoP TAC Member

OmniPoP
Average Investment vs. Savings per School
FY11 - FY15

*Investment decreased FY14 due to previous year overpayment to Internet2

"The CIC OmniPoP provides the organizational, technical, & physical underpinnings for our primary connectivity to the world. We'd be hard-pressed to get similar functionality outside of the OmniPoP."
-CIC OmniPoP TAC Member

"CIC OmniPoP provides us with peering options that would be difficult to build and sustain on our own. It also gives us opportunities to build a robust network infrastructure to provide highly available services to our customers. Through CIC OmniPoP collaboration we are able to facilitate high speed research networking, such as connectivity to partner US-ATLAS Midwest Tier 2 institutions. We are in the process of taking advantage of the colocation opportunity at 600 W Chicago and 100 Gbps ports to provide world-class networking to the high performance computing resources that our campus has to offer. Access to Internet2 CPS and WiscNet RPS services have been a cost-effective way for us to meet the rising Internet traffic demands of our students, faculty, and staff."
-CIC OmniPoP TAC Member

"The CIC fiber and location at 600 W.Chicago was essential in allowing us to build a diverse pathway out of our campus at a very reasonable cost. WRIPS and backup Internet2 connectivity are an important part of our diverse connectivity planning in terms of minimizing noticeable impact in the event of failure."
-CIC OmniPoP TAC Member

Part V: Summary of Strategic Priorities FY2016-20

The OmniPoP TAC met on May 4, 2015 in Chicago to revise OmniPoP's strategic priorities. The following five priorities (in no particular order of importance) were identified by the TAC.

Priority #1: **Promote use and improve visibility to our partners and users.**
The primary goal is to support our users and their research efforts. To this end, the immediate short-term goal is to create descriptive language that can be used in grant proposals to describe our facilities and assets. Secondary goals include continued outreach to our campus research communities and other CIC collaborative activities.

Priority #2: **Continue to explore strategic partnerships and opportunities.**
Continue to develop a comprehensive strategy to extend services to CIC members who do not require or have an opportunity to acquire a Chicago presence, especially for members on the East -Coast. This may include reaching out to other regional aggregation points, such as MAX to determine if there are mutually beneficial opportunities for collaboration in support of these institutions. Similar to the direct connections to ESNet that we have established, we should continue to look for other interconnection opportunities that will help support and improve opportunities for our researchers and other campus community members.

Priority #3: **Protect existing fiber assets.**
Continue to explore the alternatives to build or lease fiber assets to replace the fiber optic IRUs that expire in 2024. To date, we have had initial discussions with two of the larger Chicago area fiber suppliers. Over the next five years, we need to continue these discussions and arrive at a decision on the lease vs. build question. Negotiations should be started with vendors for acquisition of a new fiber footprint as well as sufficient co-location space in the Chicago area to support the necessary OmniPoP networking equipment.

Priority #4: **Develop mitigation strategy for DDOS and other cyber attacks.**
Work with other strategic partners, such as Internet2, to determine if there is an infrastructure answer that may help mitigate denial of service cyber-attacks against our member institutions. Evaluate optional or on demand services that may be available to put into operating should such an attack occur against one of our member institutions.

Priority #5: **Monitor and evaluate technologies that may impact future infrastructure.**
Continue to investigate and evaluate new technologies that may change the underlying technology or potential scope of our shared infrastructure. This includes, but is not limited to, new software technologies such as Openflow, SDN, and ONOS as well as new signaling technologies with the potential to carry bandwidths at speeds of 400 gigabits or 1 terabit and beyond.

Part VI: Conclusion

The OmniPoP continues to evolve and improve itself to provide network-related services to its member institutions.

Most importantly, the OmniPoP continues to support and track the fiber assets that the CIC institutions acquired and has started to make plans for the next generation of metropolitan Chicago fiber connectivity when the current fiber IRUs expire in 2024. In the next five years, we will need to make a recommendation on whether we should continue with the existing model and acquire replacement IRUs for the fiber we need or whether it would be more prudent to invest in the creation of our own fiber infrastructure.

The network switching infrastructure that OmniPoP created has expanded to become a significant component in our members' wide area networking infrastructure. The OmniPoP switching gear now includes a pair of fully redundant network switches at geographically diverse locations. The equipment has been upgraded to include support for the 100Gbps large scale data connections that today's researchers require. This allows for enhanced collaboration between faculty at our member institutions and also enables connectivity to other non-CIC partners. The collaborative nature of OmniPoP has allowed us to provide these services at a significant cost savings as compared to each individual institution acquiring its own infrastructure.

As OmniPoP continues to evolve, it has added common services to further benefit the participants. In addition to the research oriented high capacity connections to Internet2 and ESNet, the OmniPoP now provides direct connectivity to the Big Ten Network for the transmission of athletics-related streams as well as access to the WiscNet Peering Service and Internet commodity services from TeliaSonera to help reduce the members' Internet drainage costs.

OmniPoP's assets and services continue to serve as indemnification against any shortcomings that may arise with the national networks. OmniPoP is considered a major regional "RON of RONs" and with such a unique stature, it has extended its influence in the greater national and international networking community.

As we move into the next five years, OmniPoP will continue to keep its focus on identifying and deploying new technical innovations and services. OmniPoP will strive to provide an evolving valuable resource to aid its member universities' faculty, students and staff. In addition, the OmniPoP will continue to explore service opportunities that align itself better with the geographic dispersion and challenges that the growth of the CIC membership provides. As we have said before, OmniPoP will continue it contribution towards positioning the CIC as the easiest place in the nation to collaborate, share research and digital resources, and greatly accelerate collaborative innovation to the academic benefit of students, faculty and the member universities at-large.

Appendix A

MEMORANDUM OF AGREEMENT ON COLLABORATIVE PRINCIPLES

FOR CIC OmniPoP SERVICES ("Agreement")

The <name of institution> wishes to join the CIC OmniPoP ("OmniPoP") , a collaborative effort of the Committee on Institutional Cooperation ("CIC") to serve the participants' networking needs by creating a framework for a network infrastructure to promote regional network connectivity and shared services. It is envisioned that a primary vendor will operate the OmniPoP under a MASTER SERVICE AGREEMENT and will be referred as the OMNIPOP OPERATOR. The <name of institution> will join the CIC OmniPoP as an NEW OMNIPOP PARTNER.

1. **(Effective Date)** This Agreement will become effective upon execution. This Agreement will continue until terminated as provided in Paragraph 14 below.

2. **(Define OmniPoP Services)** OMNIPOP SERVICES generally include connectivity services, operational "hands and eyes", and network infrastructure. The description of OMNIPOP SERVICES may change from time to time pursuant to the governance process described in Paragraph 13. OMNIPOP SERVICES include both COMMON and INDIVIDUAL SERVICES.[1]

3. **(Role of CIC)** The CIC, will acquire and hold the OmniPoP service agreements, including the MASTER SERVICE AGREEMENT with the OMNIPOP OPERATOR, and any COMMON ASSETS (e.g., physical property, licenses, leases or co-location agreements), on behalf of and for the benefit of the OMNIPOP PARTNERS. Further, the CIC will purchase and hold insurance for OmniPoP assets at OmniPoP expense. CIC will administer the service agreements and COMMON ASSETS as provided herein, including designating a contract representative and a technical representative to work with each vendor. The contract representative will be responsible for maintaining the records related to the service agreements. The initial contract representative will be Elizabeth Stovall, Associate Director for Technology Collaboration, CIC, and the initial technical representative will be Jeff Schwab, Network Engineer, Purdue University.

4. **(No Marginal Cost to CIC; Self-contained Arrangement)** The OMNIPOP PARTNERS and OMNIPOP AFFILIATES, as defined in Paragraphs 8 and 11, together will reimburse the CIC for their proportionate or allocated share of costs relating to the service agreements and COMMON ASSETS as defined elsewhere in this AGREEMENT. There will be no marginal cost burden due to the OMNIPOP SERVICES for the CIC or its non-participating CIC member universities. All expenses of the OMNIPOP SERVICES throughout the life of the collaboration will be paid by the OMNIPOP PARTNERS and AFFILIATES.

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[1] In the context of the MASTER SERVICE AGREEMENT, OMNIPOP SERVICES are referred to as "Projects".

5. **(Common Services)** COMMON SERVICES are those OMNIPOP SERVICES and related expenses (e.g., legal expenses) procured collectively and used in common by all OMNIPOP PARTNERS.[2] COMMON SERVICES will be administered by CIC according to the following cost principles:

   a. Each OMNIPOP PARTNER will pay an equal share of the total initial acquisition, ownership, and ongoing common expenses for COMMON SERVICES for which fixed initial or annual pricing applies.

   b. Each OMNIPOP PARTNER will pay its own direct expenses for COMMON SERVICES for which variable pricing applies.

   c. Each OMNIPOP PARTNER will pay its own direct expenses for connections to the demarcation points OF COMMON SERVICES.

   d. Any additional future common fixed expenses of the COMMON SERVICES (for example, equipment refreshes), will likewise be charged in equal amounts to each OMNIPOP PARTNER.

6. **(Individual Services)** INDIVIDUAL SERVICES are those OMNIPOP SERVICES and related equipment and other expenses procured individually by one or more, but not all of, the OMNIPOP PARTNERS.[3] INDIVIDUAL SERVICES will be administered by CIC according to the following cost principles:

   a. Each OMNIPOP PARTNER invoking INDIVIDUAL SERVICES will be responsible for its own direct expenses for the INDIVIDUAL SERVICES it uses, and of any equipment or other expenses related to the INDIVIDUAL SERVICES so used. When certain INDIVIDUAL SERVICES are shared by a subset of OMNIPOP PARTNERS, those OMNIPOP PARTNERS involved in the sharing arrangement may agree how to share the related expenses in a separate agreement between those OMNIPOP PARTNERS and CIC.

   b. Each OMNIPOP PARTNER will pay its own direct expenses for connections to the demarcation points of INDIVIDUAL SERVICES.

   c. INDIVIDUAL SERVICES will at no time and in no way interfere with COMMON SERVICES, divert the OMNIPOP OPERATOR's attention from serving COMMON SERVICES, or adversely affect the cost of COMMON SERVICES. Similarly, INDIVIDUAL SERVICES will at no time and in no way interfere with or violate the terms of COMMON ASSETS.

7. **(Common Asset Ownership)** Certain COMMON ASSETS (e.g., physical property, licenses, leases or co-location agreements) may be required from time to time to support various operating needs or objectives of the OMNIPOP PARTNERS. The University of Illinois will acquire and

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[2] In the context of the MASTER SERVICE AGREEMENT, COMMON SERVICES are referred to as "Common Projects".

[3] In the context of the MASTER SERVICE AGREEMENT, INDIVIDUAL SERVICES are referred to as "Individual Projects".

hold title to THESE COMMON ASSETS as described in Paragraph 3. The OMNIPOP PARTNERS will each assume an equal share of the total expenses of COMMON ASSETS.

8. **(New Participants)** If an institution is interested in joining the CIC OmniPoP collaboration as a NEW OMNIPOP PARTNER:

   a. The institution is directed to approach the CIC headquarters and indicate its interest in participating. The CIC headquarters will then promptly notify the existing OMNIPOP PARTNERS of this interest.

   b. A NEW OMNIPOP PARTNER will be permitted to join the existing OMNIPOP PARTNERS with the consent of two-thirds of the existing OMNIPOP EXECUTIVE BOARD (EB) as described in Paragraph 13.

   c. If a NEW OMNIPOP PARTNER joins and is added to the existing OMNIPOP PARTNERS, that NEW OMNIPOP PARTNER will buy in to OmniPoP membership by providing to CIC an amount of money equal to that NEW OMNIPOP PARTNER's equal share of the total expenses of COMMON ASSETS calculated using the new number of OMNIPOP PARTNERS. The existing OMNIPOP PARTNERS may decide either to have CIC rebate the amounts collected from the NEW OMNIPOP PARTNER to the existing OMNIPOP PARTNERS in equal amounts, or may elect to have CIC retain such amounts and apply them as credits to existing OMNIPOP PARTNERS' future expenses for COMMON SERVICES.

   d. The NEW OMNIPOP PARTNER also shall pay CIC for the amount of its proportional share of any COMMON SERVICES expenses, prorated for the remaining portion of the then-current annual term of the OmniPoP services agreements with the service vendor(s). OMNIPOP PARTNERS may decide either to have CIC rebate the amounts collected from the new OMNIPOP PARTNER to the existing OMNIPOP PARTNER in equal amounts, or may elect to have CIC retain such amounts and apply them as credits to existing OMNIPOP PARTNERS' future expenses for COMMON SERVICES.

9. **(Assessment of OmniPoP)** Annually the EB, as defined in paragraph 13, will assess the effectiveness of the OmniPoP to ensure that it continues to meet the PARTNERS' networking needs and goals. At the same time the EB will also determine if the collaboration should continue as a CIC initiative. For example, if there are NEW OMNIPOP PARTNERS admitted from organizations other than CIC member universities, then the collaboration will need to be changed so that it is no longer affiliated with the CIC. The collaboration could be changed or the oversight and fiscal responsibility might be provided by one of the OMNIPOP PARTNER organizations.

10. **(Termination of Participation)** An OMNIPOP PARTNER may terminate its participation in the collaboration at any time, but the withdrawing OMNIPOP PARTNER will pay in full any amounts owed to the CIC OmniPoP collaborative, including any unpaid balance of any acquired Common Assets, the withdrawing OMNIPOP PARTNER's share of COMMON SERVICES expenses through the end of the then-current annual term of the OmniPoP MASTER SERVICES AGREEMENT with the OMNIPOP OPERATOR and any other service agreements for

COMMON SERVICES with other vendors. The withdrawing OMNIPOP PARTNER will forfeit any and all of its interests in COMMON ASSETS or their value.

11. **(OmniPoP Affiliates)** OMNIPOP AFFILIATES are those institutions or organizations that procure services from or otherwise do business with (e.g., network peering) the OmniPoP from time to time, but do not become OMNIPOP PARTNERS.

    a. Procurement of OmniPoP services or a business relationship by OMNIPOP AFFILIATES may only occur with the concurrence of and under terms established by the EB, described in Paragraph 13.

    b. Subject to the approval of the EB, OMNIPOP AFFILIATES generally may procure INDIVIDUAL SERVICES under the same terms as OMNIPOP PARTNERS as described in Paragraph 6.

    c. OMNIPOP AFFILIATES may participate in, by utilization of, COMMON SERVICES with the concurrence of and under terms and conditions established by the EB, described in Paragraph 13.

    d. INDIVIDUAL SERVICES or participation in COMMON SERVICES by OMNIPOP AFFILIATES will be subject to the terms of this Agreement, including termination of this Agreement.

    e. The relationship between the CIC OmniPoP collaboration and any OMNIPOP AFFILIATE will be described in a written contract between the CIC OmniPoP collaboration and the OMNIPOP AFFILIATE.

12. **(Transit Service and Third-party Access)** All OMNIPOP PARTNERS and AFFILIATES agree to abide by such policies and procedures as may be established from time to time by the EB, described in Paragraph 13. Such policies and procedures will be intended to ensure that the operation of the OmniPoP is in compliance with all applicable laws and regulations, with the terms of any relevant IRU(s) for fibers the OmniPoP may be using to provide its services, with the Acceptable Use Policies of any providers the OmniPoP may be using or to which it is connected, and with any other technical requirements the EB may deem appropriate to assure the orderly and efficient operation of the OmniPoP. Each OMNIPOP PARTNER and OMNIPOP AFFILIATE shall be responsible for complying with all applicable laws, regulations, IRU terms, and provider and EB policies in connection with its use of the OMNIPOP. The EB reserves the right to regulate attachments and use of OMNIPOP connections and services, and to take any actions necessary to correct noncompliance with applicable laws, regulations, IRU terms or provider and EB policies. The EB may delegate the necessary regulating actions to the OMNIPOP OPERATOR.

Should an OMNIPOP PARTNER or AFFILIATE desire to use the OmniPoP to provide services to other organizations (e.g., if the OMNIPOP PARTNER is a GigaPoP), the OMNIPOP PARTNER or AFFILIATE agrees to provide the Executive Committee in advance with a description of its operation including the services it provides, the types of other organizations to which such services are provided, and any Acceptable Use Policies it uses for its own operation. The OMNIPOP PARTNER or AFFILIATE agrees to immediately notify the Executive Committee

should any of this information change so the Committee can be assured that the OMNIPOP PARTNER or AFFILIATE is always using the OmniPoP services in accordance with the EB's policies and procedures.

13. **(OmniPoP Governance)** The CIC OmniPoP collaboration will be governed as follows:

    a. An EB will be constituted of two types of representatives. One type of representatives will be from FOUNDING PARTNER institutions with each institution having one representative. The other type of representatives will be from all PARTNER institutions with each institution having one representative. Initially the membership of the EB will be all of the FOUNDING PARTNER institutions. The EB may, by two-thirds vote, change its overall size from time to time to address governance efficiency, but the total number of FOUNDING PARTNER representatives on the EB will always be at least half of the total number of EB representatives.

    b. The EB will be responsible for:

        i. Overseeing all aspects of the OmniPoP;

        ii. Approving an annual budget;

        iii. Determining OmniPoP policy;

        iv. Determining the definition of COMMON SERVICES and the means and terms of their procurement and management;

        v. Determining whether and how to procure COMMON ASSETS and their disposition;

        vi. Approving NEW OMNIPOP PARTNERS and AFFILIATES;

        vii. Deciding whether to undertake network peering relationships;

        viii. Enacting amendments to this Agreement as stipulated in Paragraph 15;

        ix. Assessing the effectiveness of the OmniPoP and determining if it should continue as a CIC collaboration as stipulated in Paragraph 9;

        x. Acting to terminate the CIC OmniPoP collaboration as a whole and this Agreement as stipulated in Paragraph 14;

        xi. Approving all equipment purchases and service contracts valued at $29,500 or more.

    c. All actions taken by the EB must be approved by at least two-thirds of the OMNIPOP PARTNER representatives, except as set forth in Section 14.

    d. The EB will convene at least once every calendar year, and may convene more frequently as needed. The EB may convene in person, by telephone or by electronic means.

e. There will be an OMNIPOP TECHNICAL ADVISORY COUNCIL (TAC) composed of i) not more than two representatives from each OMNIPOP PARTNER, as identified and appointed by their respective EB representatives, ii) representatives of the OMNIPOP OPERATOR as identified and appointed by the OMNIPOP OPERATOR, and a representative of the CIC office, as identified and appointed by the CIC. In addition each AFFILIATE may appoint not more than two non-voting representatives to the TAC.   The TAC will convene as needed to provide technical advice and recommendations to the EB, and recommend to the EB technical strategic directions and an annual budget for operations. The TAC may convene in person, by telephone or by electronic means.

f. The TAC will be responsible for:

i. Preparing or updating an annual OmniPoP strategic technical plan to recommend to the EB;

ii. Preparing an annual OmniPoP budget to recommend to the EB;

iii. Proposing new or modified COMMON and INDIVIDUAL OMNIPOP SERVICES to recommend to the EB;

iv. Approving all equipment purchases and service contracts less than $29,500. Equipment purchases and service contracts valued at $29,500 or more must be approved by the EB;

v. All decisions made by the TAC will be approved by simple majority;

vi. The TAC may appoint a subset of up to six members to serve as a TACTICAL TECHNICAL TEAM to work with the OMNIPOP OPERATOR and the CIC office on a day-to-day basis to provide technical coordination between the OMNIPOP PARTNERS and AFFILIATES and OmniPoP service vendor(s), adjust the OmniPoP operational procedures to meet the needs of the OMNIPOP PARTNERS and AFFILIATES, and provide a third level escalation group to assist the OmniPoP service vendor(s).

14. **(Termination)** The CIC OmniPoP collaboration as a whole and this Agreement will terminate when all remaining OMNIPOP PARTNERS and the CIC agree mutually to terminate the arrangement. Assets will be sold and profits placed in a CIC account to be redistributed to OMNIPOP PARTNERS as determined by the EB.

15. This Agreement may be amended at any time by a two-thirds vote of the OMNIPOP PARTNERS provided that such amendment is consistent with the obligations of the OMNIPOP PARTNERS under the service agreements with the OMNIPOP OPERATOR and any other OMNIPOP vendor(s).

16. This Agreement is not intended, and shall not be deemed, to create a partnership or otherwise authorize joint action for any purpose except as specified herein. No party shall act as agent or representative of any other party except as authorized in accordance with this Agreement.

Agreed to:

By: _____   _____

Name, Chief Information Officer   Date

_____   _____

Name, University Signature Authority   Title

_____

CIC OmniPoP Member University

_____   _____

Barbara McFadden Allen, CIC Executive Director   Date