About the Great Plains Network

Great Plains Network

September, 2013

GPN

ADVANCING RESEARCH   CREATING SOLUTIONS

This Presentation

- GPN History & Current Status
- How GPN Delivers Value to Campus Members
- How GPN Delivers Advanced Networking
- How GPN Fosters Collaboration & Innovation
- How GPN Advances Regional Cyberinfrastructure

1. GPN History & Current Status

GPN Background
Major Milestones
Framework
Organization
Strategic Plan & Directions

GPN Background

- Founded by researchers and for researchers
- Initially funded by the National Science Foundation
- One of the largest aggregators for Internet2
- While the topology of the GPN physical network has changed over time, the GPN membership has grown because of a *shared commitment* to maintain an organization that sustains a collaborative and interdisciplinary focus among the membership.
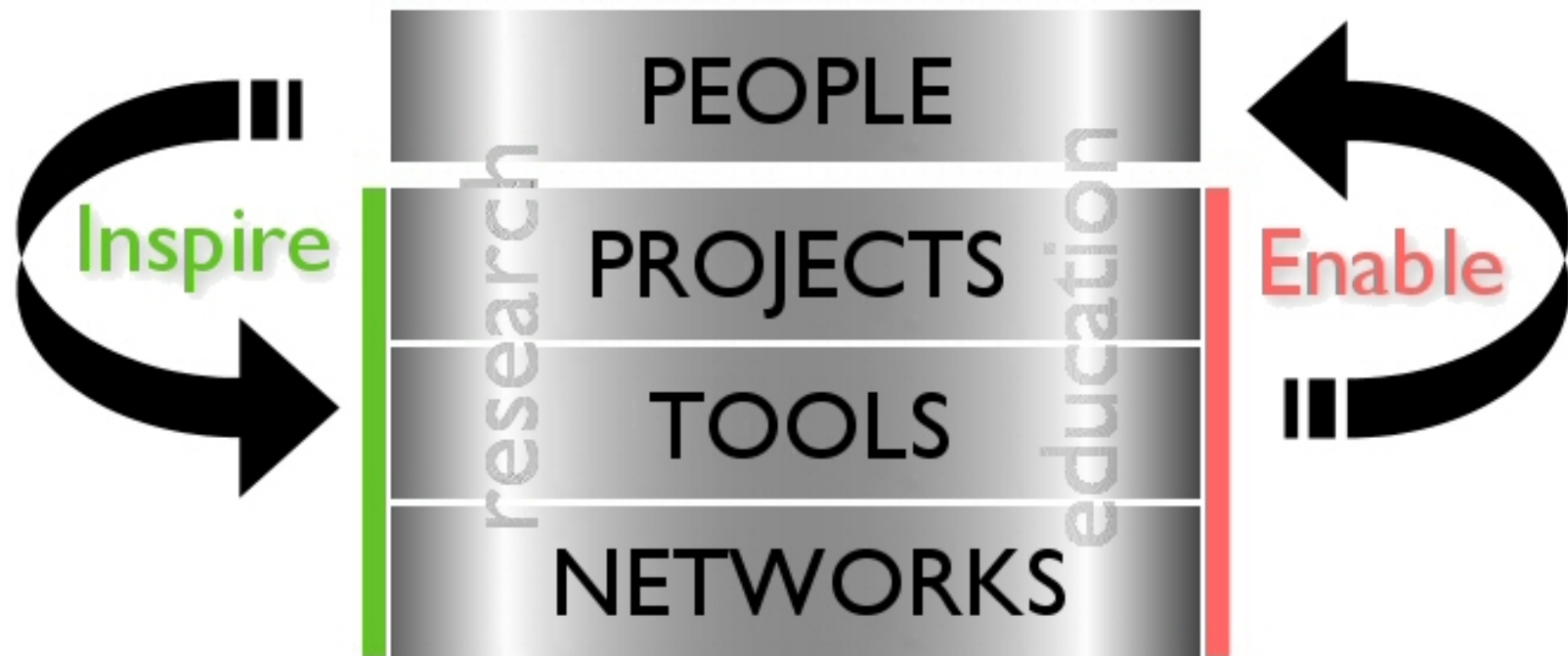
GPN Major Milestones

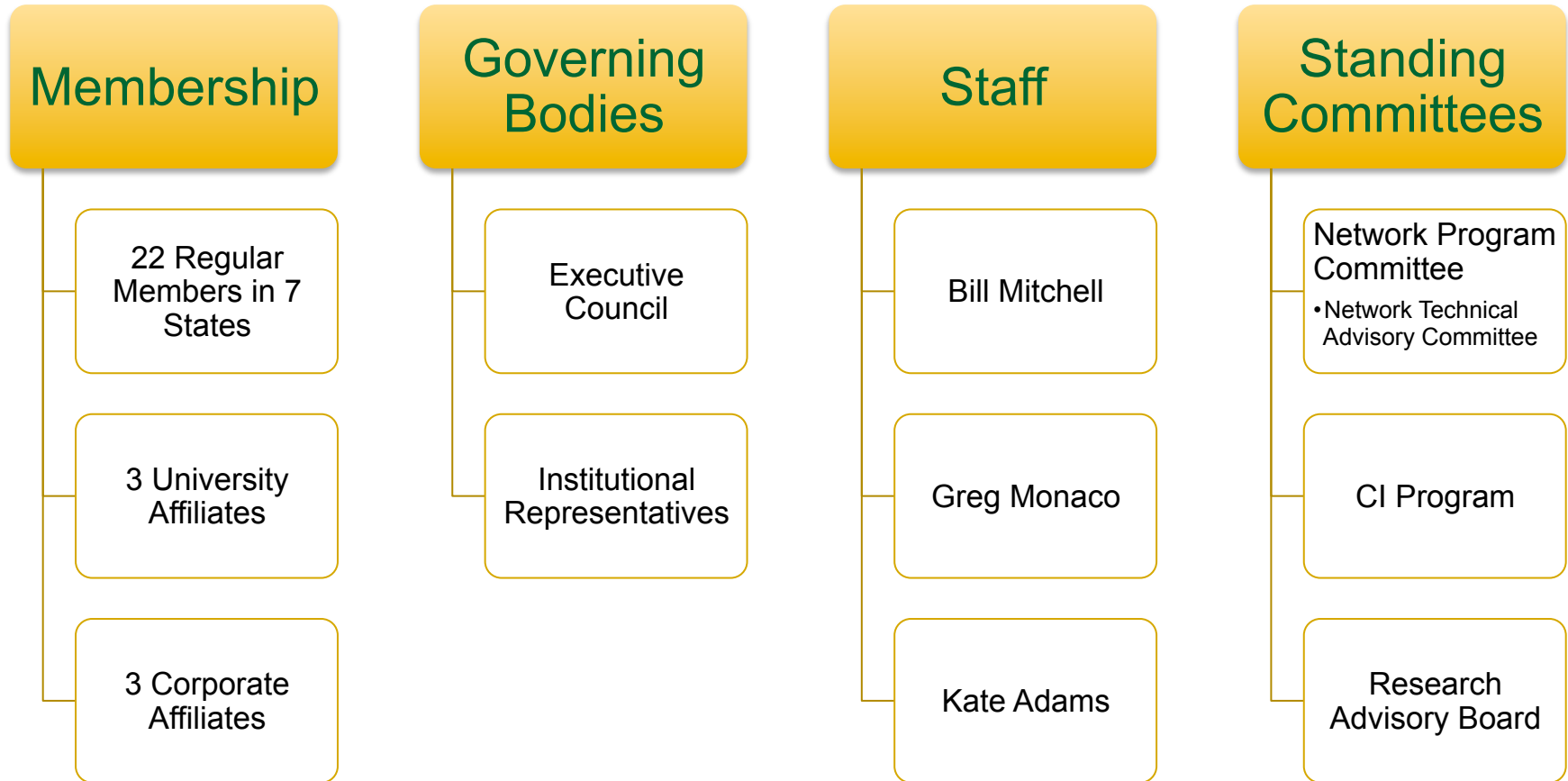| Year	GPN	National Events
1996	Organizational Meeting	President's Next Generation Internet Initiative
1997	NSF Award to Create GPN	Internet2 Formed
1998	GPN Connects to Internet2 at 155 Mbps	Abilene Network Created
1999	First GPN Applications Meeting	
2004	NSF Middleware Subaward to GPN	
2005	First GPN Annual Meeting	
2006	GPN Connection upgraded to 1Gbps	
2008	GPN Connection upgraded to 10Gbps, GENI Award, Cyberinfrastructure Summit	
2012	IMLS Data Management Planning Award	
2013	GPN Connection upgraded to 2 x 100Gbps	

Why a Consortium?

- Success with MidNet (NSFnet partnership)
- Huge geographic area with excellent institutions
  - More spread out than either coast
- Strength in numbers
  - Gives us a voice we would not otherwise have
- Leverage existing regional relationships on behalf of the community
- Importance of sustainability

GPN Framework

GPN At a Glance

Membership
- 22 Regular Members in 7 States
- 3 University Affiliates
- 3 Corporate Affiliates

Governing Bodies
- Executive Council
- Institutional Representatives

Staff
- Bill Mitchell
- Greg Monaco
- Kate Adams

Standing Committees
- Network Program Committee
  - Network Technical Advisory Committee
- CI Program
- Research Advisory Board

GPN Governance: Executive Council

- 1 representative per state containing a GPN Regular Member

  - Arkansas: David Merrifield, ARE-ON
  - Kansas: Bob Lim, University of Kansas
  - Missouri: Gary K. Allen, D.V.M., Ph.D. , University of Missouri
  - Nebraska: Michael Ruhrdanz, University of Nebraska
  - Oklahoma: James Deaton, OneNet
  - South Dakota: Claude Garelik (Chair), South Dakota Board of Regents

GPN Regular Members

- Arkansas
  - Arkansas State University
  - University of Arkansas
  - University of Arkansas at Little Rock
  - University of Arkansas for Medical Sciences
- Kansas
  - Kansas State University
  - University of Kansas
  - Wichita State University
- Missouri
  - Missouri University of Science and Technology
  - University of Missouri - Columbia
  - University of Missouri - Kansas City
  - University of Missouri - St. Louis

- Nebraska
  - University of Nebraska – Lincoln
- Oklahoma
  - Oklahoma State University
  - University of Oklahoma
  - University of Oklahoma Health Sciences Center
  - University of Tulsa
- South Dakota
  - Black Hills State University
  - Dakota State University
  - Northern State University
  - South Dakota School of Mines & Technology
  - South Dakota State University
  - University of South Dakota

GPN Affiliate Members

- **University Affiliates**
  - Iowa State University
  - University of Minnesota
  - WiscNet, Wisconsin's Research & Education Network

- **Corporate Affiliates**
  - Adva Optical
  - Ciena
  - Fujitsu

GPN Strategic Partners

- **State Networks**
  - ARE-ON
  - KanREN
  - MOREnet
  - Network Nebraska
  - OneNet
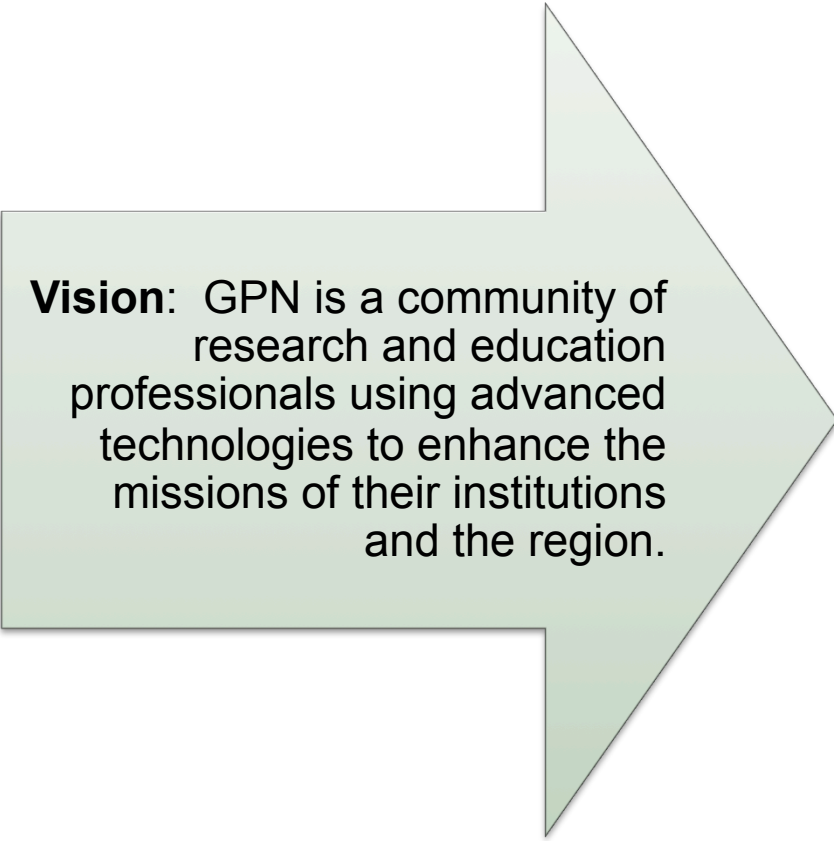 - REED (SD)
- **Organizations**
  - Greater Western Library Association (GWLA)
  - Internet2
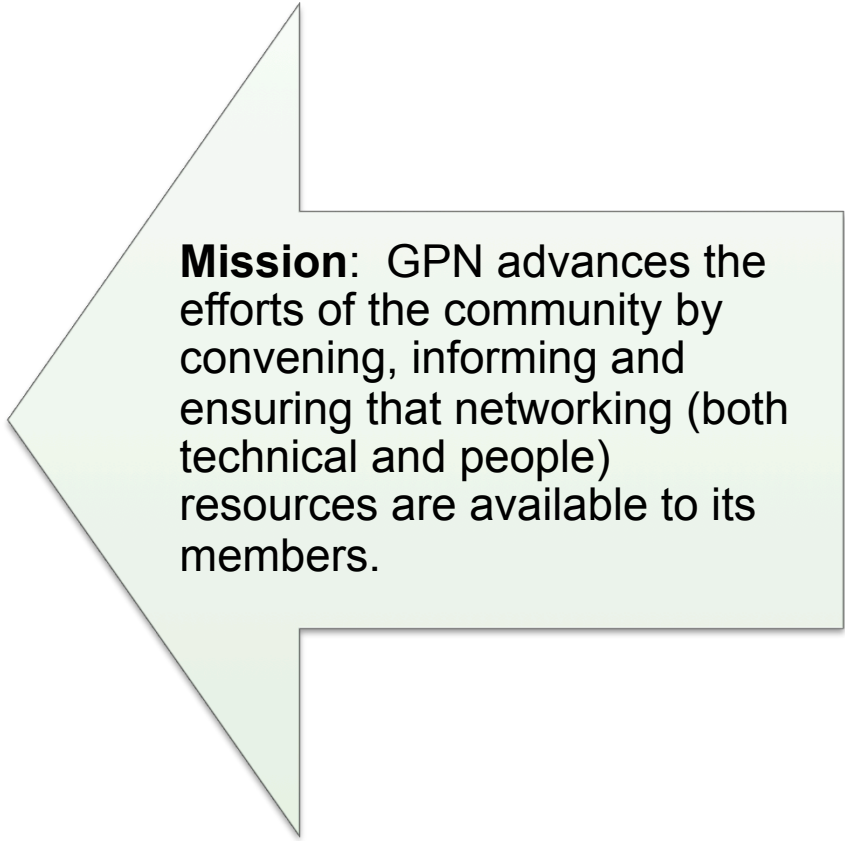 - MCBIOS
  - Quilt

- **High Performance Computing (HPC) Centers**
  - Arkansas HPC Center (UAF)
  - Institute for Computational Research in S&E (KSU)
  - Holland Computing Center (UNL)
  - UM Bioinformatics Consortium
  - OSCER (OU)
  - OSU HPC Center
  - SDSU HPC Center
  - Tandy Supercomputing Center at the Oklahoma Innovation Institute
  - WSU HPC Center

GPN Strategic Plan

Vision: GPN is a community of research and education professionals using advanced technologies to enhance the missions of their institutions and the region.

Mission: GPN advances the efforts of the community by convening, informing and ensuring that networking (both technical and people) resources are available to its members.

GPN Strategic Directions

1. Advance the spirit of community
   - communication,
   - professional development
   - partnerships with other organizations.

2. Provide leadership in advanced networking… regionally & nationally…on behalf of the membership.

3. … build a regional community of practice in the application and use of CI…to enhance the competitiveness of the region.

2. How GPN Delivers Value to Campus Members

GPN Working on Behalf of Campus Members

GPN at the Nexus

GPN Meetings

Benefits to Individual Campuses

GPN at the Nexus

You & Your Campus

National & Regional Organizations

State Networks

GPN

Non-GPN Campuses

National Partnerships

Other GPN Members

Regional Partnerships

GPN Working On Behalf of Members

- Facilitate multi-institution collaborations
- Form Partnerships on Behalf of GPN Memberships
  - MCBIOS – MidSouth Bioinformatics Consortium
  - GWLA – Greater Western Library Alliance
  - GLOBUS – University of Chicago/Argonne
  - XSEDE Campus Champion Program
- Communicate Latest Developments
  - Website, Weekly News by Kate Adams

GPN Working on Behalf of Members

- **Annual Conference**
  - Unique combination of research, library and IT/network attendees
  - Plenary session speakers from I2, NSF, NIH
  - Numbers
- **GPN Professional Development Program**
- **GPN Summits: CI, Big Data**
- **Teleconferences for Communities of Interest**
- **CIO Roundtable**
- **Internet2 Meeting with GPN Members**

Bringing It All Together
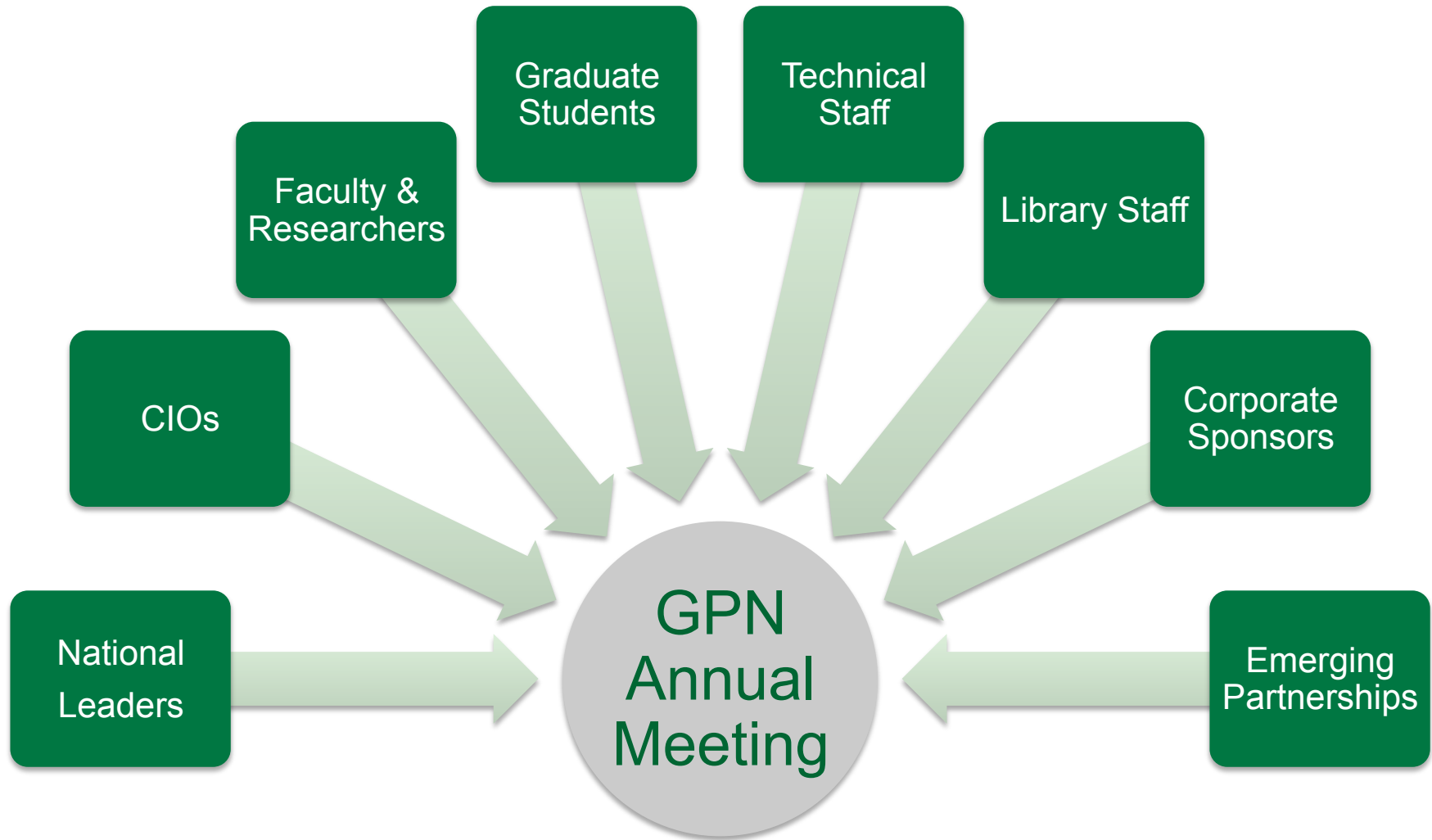
3. How GPN Delivers Advanced Networking

Networking Milestones
How It Looks, Today
Philosophy
Priorities

GPN Networking Milestones

Year	GPN Network	National Events
1996	Organizational Meeting	President's Next Generation Internet Initiative
1997	NSF Award to Create GPN	Internet2 Formed
1998	GPN Connects to Internet2 at 155 M	Abilene Network Created
2003		National LambdaRail Formed
2006	GPN Connection - 1G	
2007		I2 DCN/ION Service Begins
2008	GPN Connection - 10G	
2010	GPN Connection - 2 x 10G	
2012	GPN Equipment Upgrade	Internet2 Launches 100G Network
2013	GPN Connection - 2 x 100G	

GPN Network

GPN Network map showing Great Plains Network members and connectors across North Dakota, South Dakota, Minnesota, Wisconsin, Nebraska, Iowa, Kansas, Missouri, Oklahoma, and Arkansas.

Legend:
- ● GPN Member
- ■ Affiliate GPN Member
- △ State GPN Connector
- ◉ GPN PoP
- — Great Plains Network

Labeled locations: Northern St Univ, Black Hills St Univ, SD School of Mines & Technology, South Dakota St Univ, Dakota St Univ, REED, Univ of South Dakota, Univ of Minnesota, WiscNet, Iowa St Univ, Univ of Nebraska Lincoln, Kansas St Univ, KanREN, GPN, Univ of Missouri Columbia, Univ of Kansas, Univ of Missouri Kansas City, MOREnet, Univ of Missouri St. Louis, Wichita St Univ, Missouri Univ of Science & Technology, Univ of Tulsa, OneNet, OSU Tulsa, ARE-ON, Univ of Arkansas, Arkansas St Univ, Oklahoma St Univ, Univ of Oklahoma Health Sciences Center, Univ of Oklahoma, Univ of Arkansas Little Rock, Univ of Arkansas Medical Sciences

Inset: Internet2 Network

7/29/

Bandwidth Delivered to GPN Members

Cartography by Christopher Buechner

8/1/2013

GPN — ADVANCING RESEARCH CREATING SOLUTIONS

South Dakota
Minnesota
Wisconsin
Nebraska
Iowa
Chicago

10 Gig
WiscNet Peering

20 Gig
ESnet
100 Gig
Internet2

Kansas City
Kansas
Missouri

10 Gig
WiscNet Peering

30 Gig
KC to Tulsa

Internet2
100 Gig
Tulsa
Oklahoma

-Locations-
- ⬤ Chicago Peering Node
- ⊙ GPN PoP

-Bandwidth Delivered (gbps)-
— 10 Gig
— 20 Gig
— 30 Gig
— 100 Gig
▭ Member States

Internet2 Network Infrastructure

IP router node (Layer 3 services)
Advanced Layer 2 Service (Layer 2 services)
Optical add/drop facility (Layer 1 services)

Internet2 Network *by the numbers*
17 Juniper MX960 routers in support of Advanced Layer 3 IP and Peering Network
21 Brocade and Juniper switches in support of Advanced Layer 2 Service Network
49 custom colocation facilities
250+ amplification racks
15,717 miles of newly acquired dark fiber
8.8 Tbps of optical capacity
100 Gbps of hybrid Layer 2 and Layer 3 capacity
300+ Ciena ActiveFlex 6500 network elements
2,400 miles partnered capacity with Zayo Communications
        in support of the Northern Tier region

24

GPN Network 'Philosophy'

- *Quick to Respond*
  - GPN should be ready to implement new services as they become available, balancing current investments to be 'ready', while not buying earlier than needed.

- *Value-based decisions*
  - Decisions should be based on delivering value to our membership, with a solid cost/benefit analysis.

- *Example of this philosophy in action*
  - Purchased core network replacement equipment with 100g capable gear. Allows us to rapidly deploy 100g connections when requested.

GPN Network Program Priorities

- Full deployment of 100 Gig Connections to I2

- Develop & implement long-term solution for space/power at KC PoP

- Implement Netflix servers in KC & Tulsa

- Revisit OmniPoP Backup Agreement WRT100g

- Cost/benefit analysis for creating a GPN PoP in the Midwest Internet Hub and Collocation Facility (1102 Grand, KCMO)
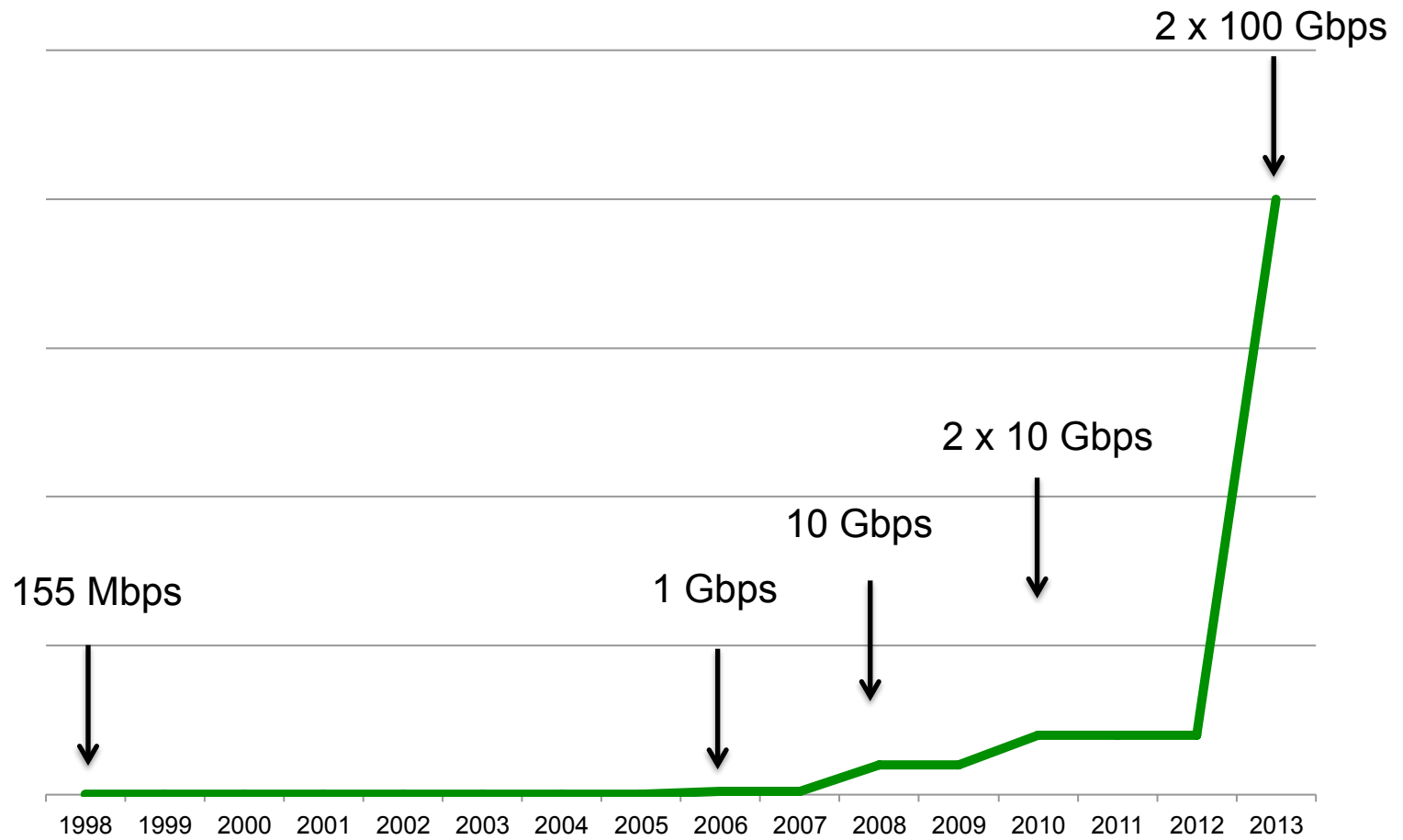
Network Facilities

- **Kansas City PoP at 1100 Walnut (Level 3)**
  - Co-located in I2 Suite
  - NLR access
  - GPN NOC operated by MOREnet
    - 24x7x365 monitoring & management
- **Tulsa PoP at 18 W Archer (Level 3)**
  - Co-located in NLR Suite
  - GPN Tulsa NOC operated by OneNet
    - 24x7x365 monitoring & management
- **State-based connection strategy**
  - Individual institutions can connect as an Affiliate Member
- **Each GPN Connector gets 2 x 10g and 1 x 1g Port**
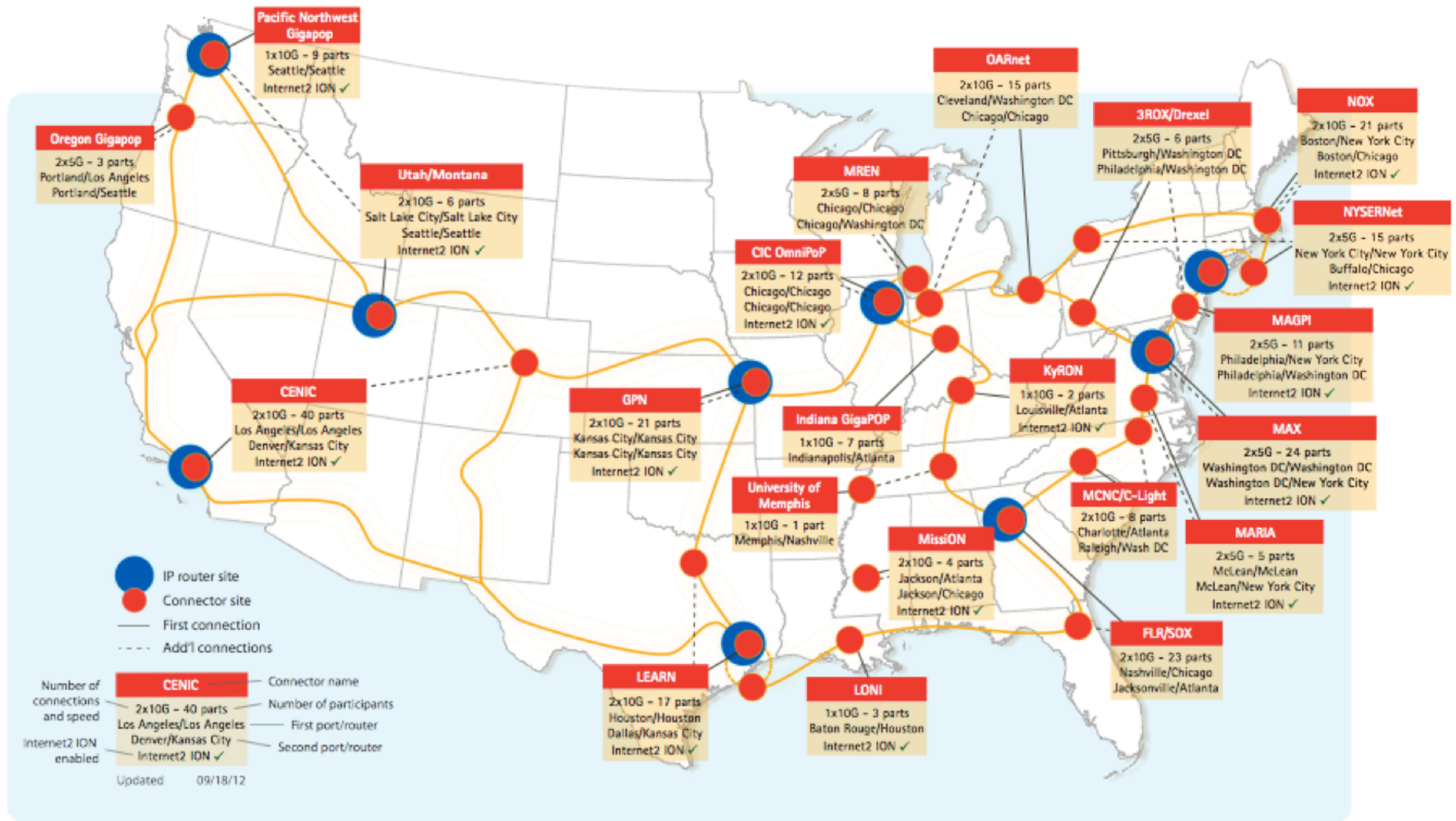 - Additional ports available at a fee

Network Services

- **2 x 100g bandwidth to I2**
  - Shared Service for Research and Education Traffic
  - Dedicated Bandwidth Reservation Service
    - Dedicated optical paths between end-points up to 10 Gig
  - CPS – Commodity Peering Service
- **WiscNet Commodity Peering Service**
- **ESnet 2x10g Peering Connection**
- **GpENI – *Great Plains Environment for Network Innovation***
- **GPN Peering Exchange – Keeps Member Traffic 'Local'**
- **Access to I1 providers**

GPN Bandwidth to Internet2

2 x 100 Gbps

2 x 10 Gbps

10 Gbps

155 Mbps

1 Gbps

1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013

Internet2 Connectors

30

Internet2 Sponsored Education Group Participants Program - SEGP

- Allows expanded access to the Internet2 Network for state and regional education networks

- There are thirty-nine state K20 networks participating.

- 6 GPN states participate

4. How GPN Fosters Regional Collaboration & Innovation

Timeline
Funded Research
Cyberinfrastructure
Meetings
How GPN Connects You

GPN Timeline

Year	GPN	National Events
1999	First Scientific Applications Meeting	
2000	Research collaboration emphasized	
2003	GPN Administration moved from KU to MU	
2004	NSF Middleware Award	
2005	First GPN Annual Meeting	
2006	Sun Microsystems Award	
2007	First Affiliate Members join, partnership with MCBIOS	NSF GENI Project Office Awarded
2008	GENI Award, CI Summit	
2009	Bridges Collaborative Workshop	
2011	Data Management working group formed, partnership with GWLA	Data Management as national issue
2012	IMLS Award	

GPN Collaborative Work

Tools (Cyber-infrastructure)

People (Communities of Interest)

Facilitation
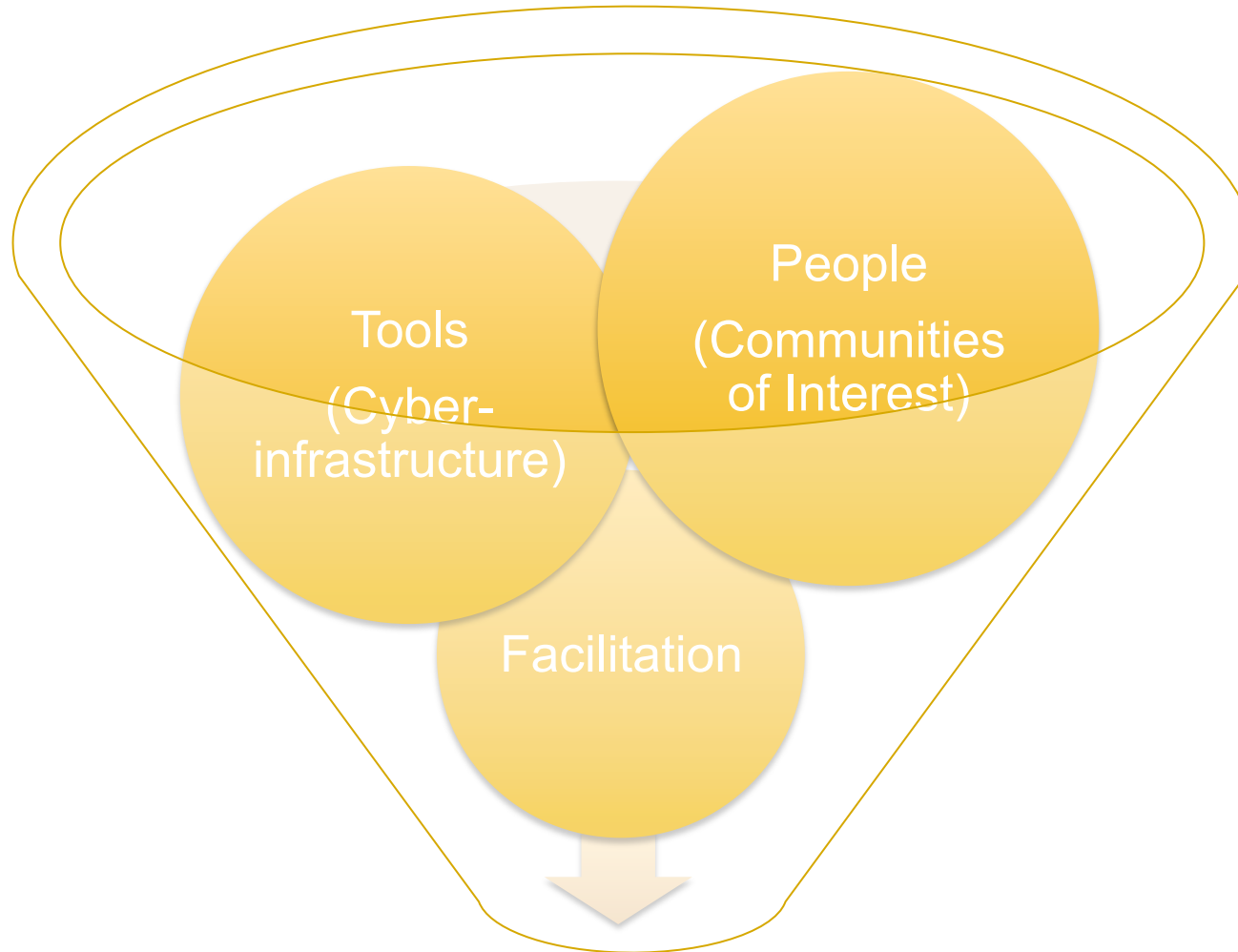
Successful Regional Collaborations

GPN Communities of Interest Since 2004 (Funding Source)

- Network Infrastructure
- Mediated Learning
- Water Resource Management
- Bioinformatics
- Collaborative Middleware (EDUCAUSE – NSF subaward & MIDnet)
- Grid Computing (Sun Microsystems)
- Human Language Technology (NSF)
- Networking Research – GENI (NSF)
- Cyber-physical Systems (NSF)
- K20 Interactive Distance Learning
- Data Management for Research Projects (IMLS)

GPN & K20 Interactive Distance Learning

2006 – 2007   formed an interest group among Internet2 Sponsored Education Group Participants in the Region

2007

Visit to an Ice-Age Cave on November 7

2008

Emergency Preparedness: Lessons from Greensburg, Kansas March 11

Chinese Autumn Festival September 17

2009

Brown v Board of Education Interactive Distance Learning Event February, 2009

National Park Service Panel December, 2009

2010 First Annual National Park Service IDL Events

Homestead National Monument, Beatrice, NE Monday, April 19

Brown vs. Board of Board of Education, Topeka, KS April 20th

Knife River Indian Villages, Stanton, ND April 21

Minuteman Missile, Wall, SD April 22, 2010

5. How GPN Advances Regional Cyberinfrastructure

CI Expertise in the Region

GPN CI Program

Successes

Ongoing Support

CI Expertise in the Region

- **Networking**
  - State Networks
  - Network Researchers
- **High Performance Computing Centers**
  - AHPCC: Arkansas High Performance Computing Center (UA-F)
  - ICRES: Institute for Computational Research in Science & Engineering (KSU)
  - Holland Computing Center (UNL)
  - UMBC: University of Missouri Bioinformatics Consortium
  - OSCER: University of Oklahoma Supercomputing Center for Education & Research
  - Oklahoma State University High Performance Computing Center
  - South Dakota State High Performance Computing Center
  - Tandy Supercomputing Center at the Oklahoma Innovation Institute
  - University of South Dakota High Performance Computing Center
  - HiPeCC: Wichita State University High Performance Computing Center
- **Content Areas**
  - genomics,
  - life sciences,
  - library science
- **The challenge is to harness it in support of the entire region**

GPN Cyberinfrastructure Program

- To deliver high value services to GPN Membership
  - 2 Members per State, one per Affiliate Member
  - Rick McMullen, University of Arkansas, Chair
- Working Groups
  - Computing Infrastructure & Services (Dan Andresen, Kansas State University, Chair)
  - Data Storage (Gordon Springer, University of Missouri, Chair)
  - Education, Outreach & Training (Jeff Pummill, University of Arkansas, Chair)
  - Networking Research (Deep Medhi, University of Missouri, Kansas City)

GPN CI Program

- **Priorities for Regional CI Support**
  - ❑ Computation
  - ❑ Data storage services
  - ❑ Networking services
  - ❑ Education and training
  - ❑ Collaboration
  - ❑ Communication
  - ❑ Help
  - ❑ Expertise and resource referral

CI Program Successes

- **GPN Dropoff**
  - Service to permit transfer of files too large to email
- **Professional Development Program**
  - Eight to ten speakers on timely CI topics
- **Shared Storage for Research Projects**
  - Can be allocated to and managed by a researcher (PI). That researcher can administer the allocation among colleagues
- **SC13 Booth**

CI Program Successes (cont.)

- ❑ InCommon Participation
- ❑ Federated Identity Management for GPN Members
- ❑ Membership in Identity Ecosystem Steering Group

The End

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- Greg Monaco, greg@greatplains.net
- Kate Adams, kate@greatplains.net