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1.0 R&D IN SUPPORT OF SCHOLARSHIP

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R & D in networking

Drivers –

- Support experimental network research
- Support proliferating requests for private networks (*escaping the curse of Metcalfe's Law)*
  - More-or-less permanent, for VOs
  - Ephemeral - even transient - for experiments
- Support the increasingly global needs of the Internet2 community – research *and* education
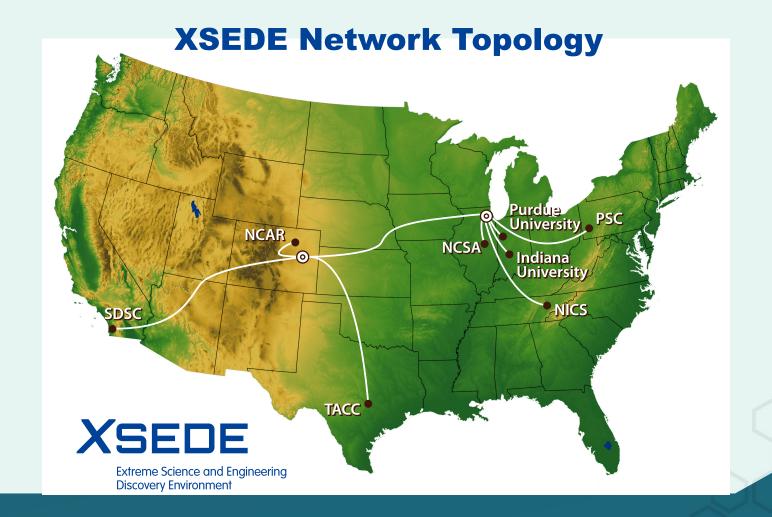
INTERNET
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VO private nets

- GENI
- XSEDE
- PRAGMA

Coming soon –

- Chameleon
- Cloudlab

INTERNET2

XSEDE Network Topology
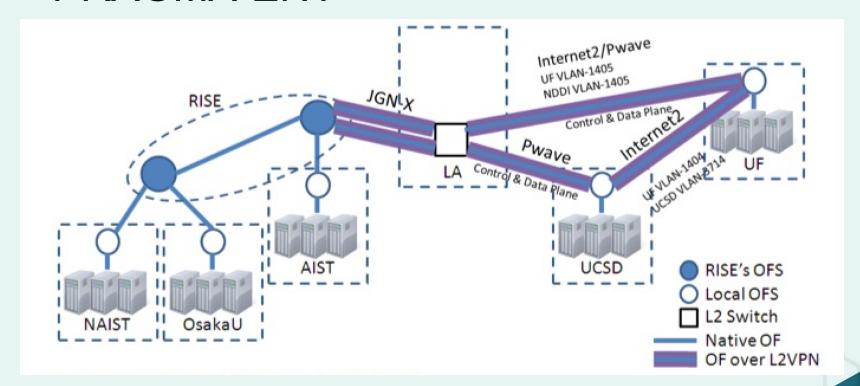
PRAGMA-ENT

R & D in networking

- Content-delivery and NDN
- SDN – OpenFlow
- NFV
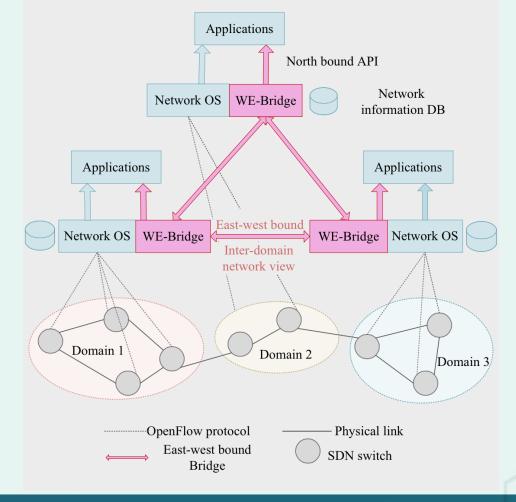- SDX and the maturation of GLIF
- FTWs / CrossConnects joint with ESnet

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R & D in networking

- perfSONAR – hardening and development
  – Merger of MDM and PS forks
  – Joint project with ESnet and Indiana
  – perfSONAR at AWS – ESnet, NCBI, Internet2
- Interdomain OpenFlow
  – AutoVFlow
  – GENI stitching
  – BGP
  – WEBridge
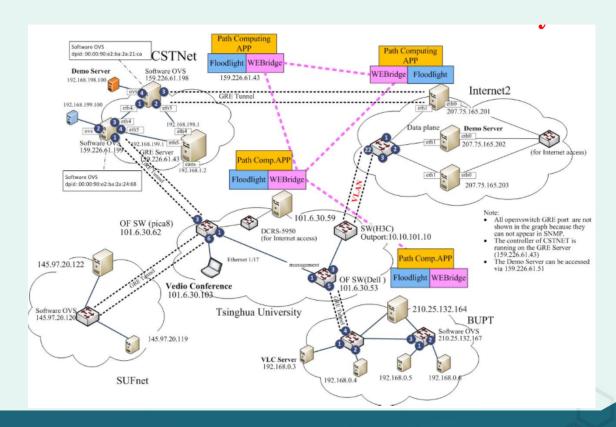 – …

WE-Bridge

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CANS 2014 demo

2.0 BROADENING THE REMIT

Our beat is the Global R&E *Cyberfabric*

- "Broadening the Reach" – cyberinfrastructure for non-research-intensive schools, including schools in EPSCoR states
  - NIH AREA, NSF RUI & CAREER, CC*IIE
  - The long tail of science
- Support for research in the life sciences
  - LSRPAG
  - ICTBioMed
- Increased attention to HPRC
  - HPRCPAG
- RDA – "Data-driven innovation requires a foundation of infrastructure to support the sharing, access, use, re-use, analysis, and stewardship of digital data."

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ICTBioMed

- Research cloud for biomedicine
- Common software (OpenStack, Galaxy, perfSONAR)

C-DAC	Pune	IN
ACTREC	Navi Mumbai	IN
PSNC	Poznan	PL
Chalmers University	Gothenburg	SE
OHSL	Rockville, MD	US
University of Notre Dame	South Bend, IN	US
Duke University (pending)	Durham, NC	US
Arizona State University (pending)	Phoenix, AZ	US

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3.0 A NEW INITIATIVE

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From NSF award abstracts, 1997:

"NSF, through this program, will provide access for researchers to high performance computing systems, with associated highly trained staff and researchers necessary to develop and optimize their use."

"NPACI will integrate computational science and engineering education activities into the infrastructure, building on successful education and outreach efforts within the partnership."

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From the Atkins Report*, 2003:

"A new interdisciplinary work force – The need for a new workforce - a new flavor of mixed science and technology professional – is emerging. These individuals have expertise in a particular domain science area, as well as considerable expertise in computer science and mathematics. Also needed in this interdisciplinary mix are professionals who are trained to understand and address the human factors dimensions of working across disciplines, cultures, and institutions using technology-mediated collaboration tools**."**

* *Revolutionizing Science and Engineering Through Cyberinfrastructure:* Report of the National Science Foundation Blue-Ribbon Advisory Panel on Cyberinfrastructure, January 2003

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We aim to make

"Cyberpractitioner"

a profession.

VSEs

- **Purpose**: Elevate the productivity of the US scientific research enterprise

- **Vision**: Scholars have comprehensive support for compute- and/or data-intensive research, that surpasses in level and accessibility that available today

- **Strategy**: Develop and make available across the domain disciplines a professional cadre of highly skilled cyber-infrastructure practitioner-consultants

- **Execution**: Design, build, and execute a national program to develop the profession as a credentialed academic discipline

Characteristics of the profession

- Legitimized via "credentialing"

- Underlying advancement model

- Incorporated in academic and non-academic HR structures

- Compensation standards

- Incorporated into academic institutional governance

Skills/competencies for the profession

- Applied mathematics – analysis, statistics, numerical methods, …
- Computational skills - programming/scripting, algorithm design, modeling and simulation, workflows / science gateways
- Systems architecture
- Systems operations – networks, computing, storage, …
- Analytics and emerging 4th Paradigm methodology
- Communication and people skills – speaking, listening, writing
- "T-shaped skillset" – i.e., deep understanding in at least one domain discipline

Core Values

- Promote diversity
- Professional integrity
- Long range view
- Life-long learning
- Sharing of knowledge and skills
- Dynamic and flexible

Program/Project Characteristics

- Academic program
- Certification/validation services
- Internships and residency program(s)
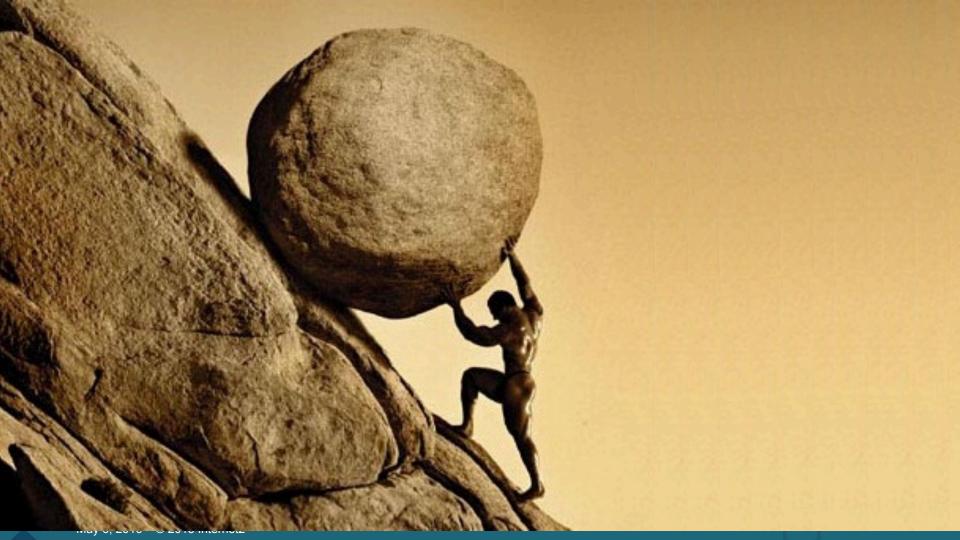- Journal(s)
- Professional society
- Meetings

Contacts

Contributors:
- OSG
- CASC
- Internet2 HPRC PAG
- XSEDE
- NITRD
- ACI-REF
- National Labs
- Internet2 member schools

Supporters and Sponsors:
- NAS / NAE / IOM
- OSTP/PITAC
- Professional societies – SIAM, ASEE, ACM, IEEE, CRA/CRAW, …
- NITRD
- Federal science agencies – NSF, NIH, DOE, DOD, DOT, AG, NIST,…
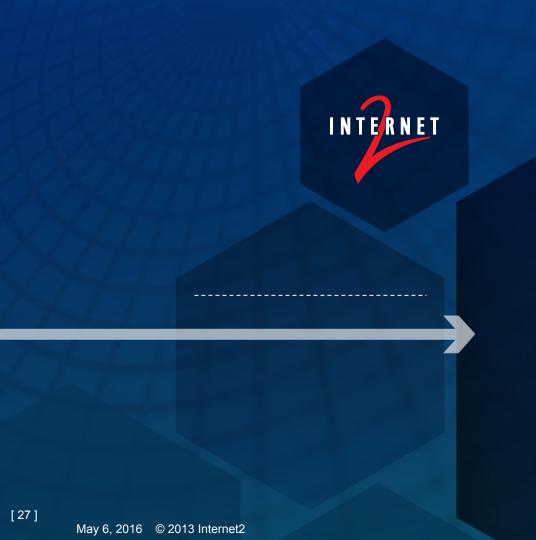- Private industry labs

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What's Internet2's Role?

- Market maker for Internet2's services
- Manage the certification/validation service
  - cf. AAMC
- Meeting management
- Incubate the professional society
- Operate the internship and residency program

Thank you

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