The BRIDGES Project-
Building a Global Cyber-Infrastructure
Canvas Supporting Networked Applications Experimentation and Evolution

Introduction and Overview of the Project
What is “BRIDGES”?

• “Binding Research Infrastructures for the Deployment of Global Experimental Science”
• Funded by the US National Science Foundation (NSF)
  • $2.5M USD, 3 years
• Part of the Int’l Research Network Connections Program (IRNC) Testbeds program

• BRIDGES goal is to make customized deterministic cyber-infrastructure resources available to applications globally
  • Predictable, deterministic performance – anywhere/everywhere
  • Agile and customizable to meet changing usage or application requirements
  • Globally scalable and globally secure architecture
BRIDGES—Binding Research Infrastructures for the Deployment of Global Experimental Science

EU Research Anchor Tenants
Fed4FIRE (15+ testbeds)
EU EMPOWER
PlanetLab-EU
OneLab
SLICES
GEANT Testbeds Service
DFN-GVS, CESNET-GVS

US Research Anchor Tenants
FABRIC
COSMOS
Chameleon
CloudLab
Internet2
StarLight

New York City
100 Gbps Eth/OTN circuits
Washington
100 Gbps Eth/OTN circuits
Amsterdam

EU PoP
BRIDGES PoP
BRIDGES PoP
BRIDGES PoP

Prod.
OXP
Res
Res
Res

OTN Switch
L2 QoS+BE Switch

Prod.
OXP
Res
Res
Res

OTN Switch
L2 QoS+BE Switch

East wave 100 Gbps
South wave 100 Gbps
West wave 100 Gbps
North wave 100 Gbps
Key BRIDGES Concepts

- Network research and global applications require a very flexible, agile, and deterministic cyber-infrastructure environment in order to innovate, evaluate, and evolve.
- Cyber-infrastructure is going virtual and software processes are critical to managing these CI resources. But automation and orchestration of CI, and the integration of different CI elements is dependent upon a common model for defining and manipulating these virtual resources.
- BRIDGES supports the notion that networks and applications can be dynamically constructed from virtual CI resources – IFF those CI resources are defined and implemented rigorously, and a common grammar exists for manipulating such resources via software driven processes.
- In order to develop dynamic *global* applications and application specific service environments, a generic virtualization model is needed, and a facility that can fully implement that virtualized resource model is required.
- BRIDGES provides the infrastructure and the virtualization layer software to do this.
BRIDGES Virtual Network Architecture

Application specific networked environments

Global science environment “Beta”
Lab B

Global science application “Alpha”

A customized WAN infrastructure consisting of a broad range of dynamically allocated resources that are controlled by the client using SDN principles
Timeline. BRIDGES is a 3 yr Project.

• Year 1  Oct 2020 – Sep 2021
  • Build out Washington and Paris nodes and Trans-Atlantic wave
  • Deploy GVS software
  • First connectors Q2/Q3 2021. (tbd: I2, GEANT, COSMOS, FABRIC, GTS, Grid5000, EUWireless,...)

• Year 2.  Oct 2021 – Sep 2022
  • Build out Amsterdam and New York pops and terrestrial optical links
  • Deploy second 100 Gbps wave. NYC-AMS
  • More connectors
  • More Key software features

• Year 3  Oct 2022 – Sep 2023
  • Software focus – new features
  • Follow on challenges
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• Web site under construction – tba very soon.