ProtoGENI Control Framework

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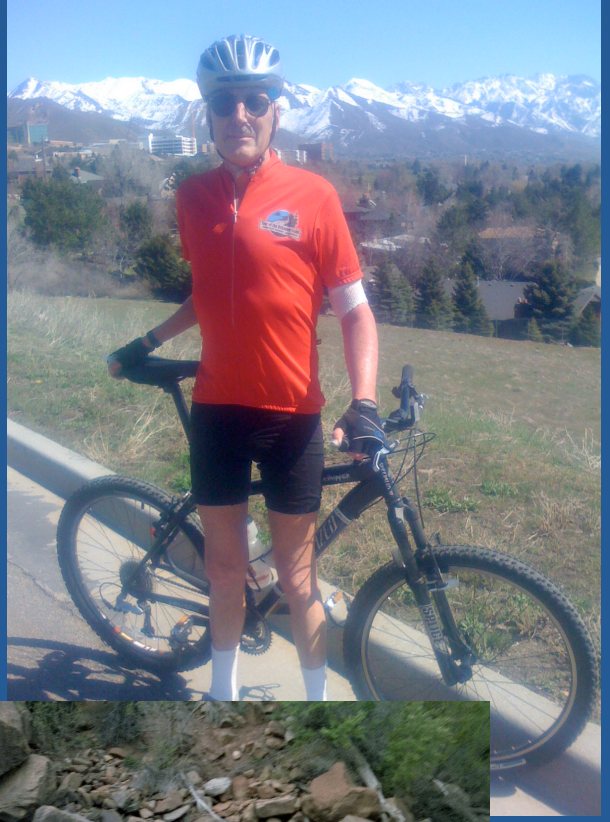
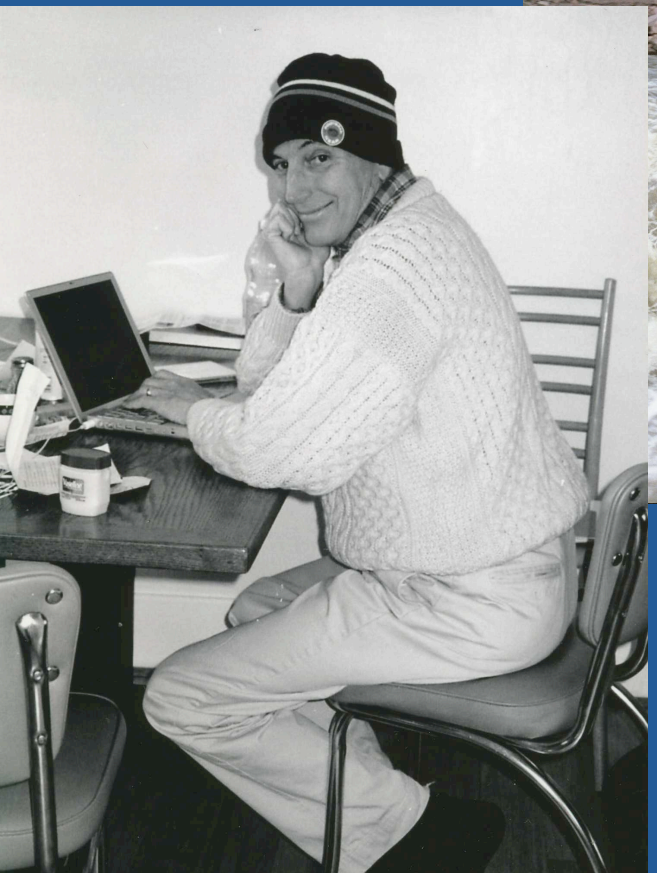
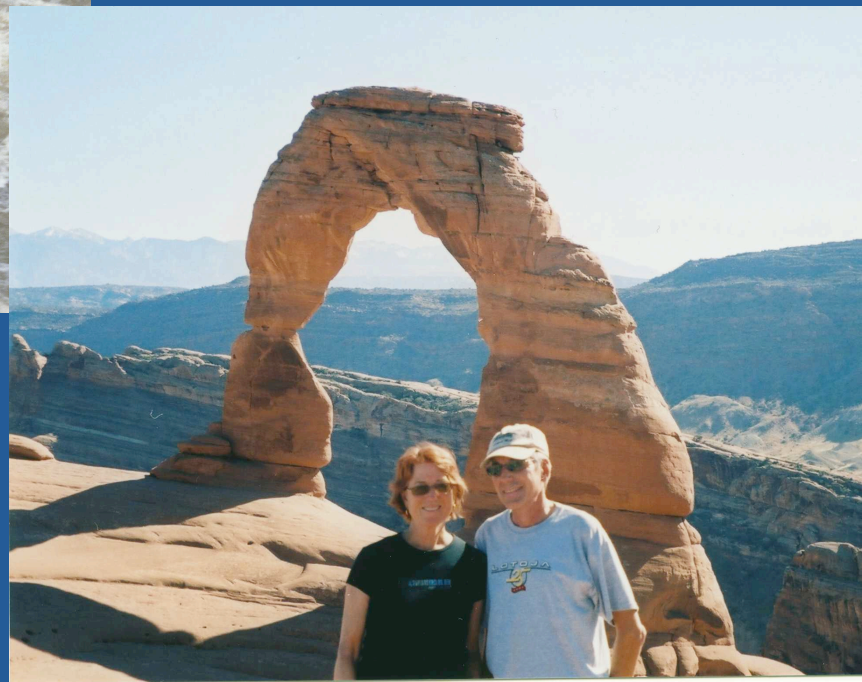
University of Utah

GENI-FIRE Workshop
Madrid, España
08 December 2008



Jay Lepreau
1952-2008





Core themes

- Control Framework
- National Backbone
- Diverse Components
- Integrated Projects

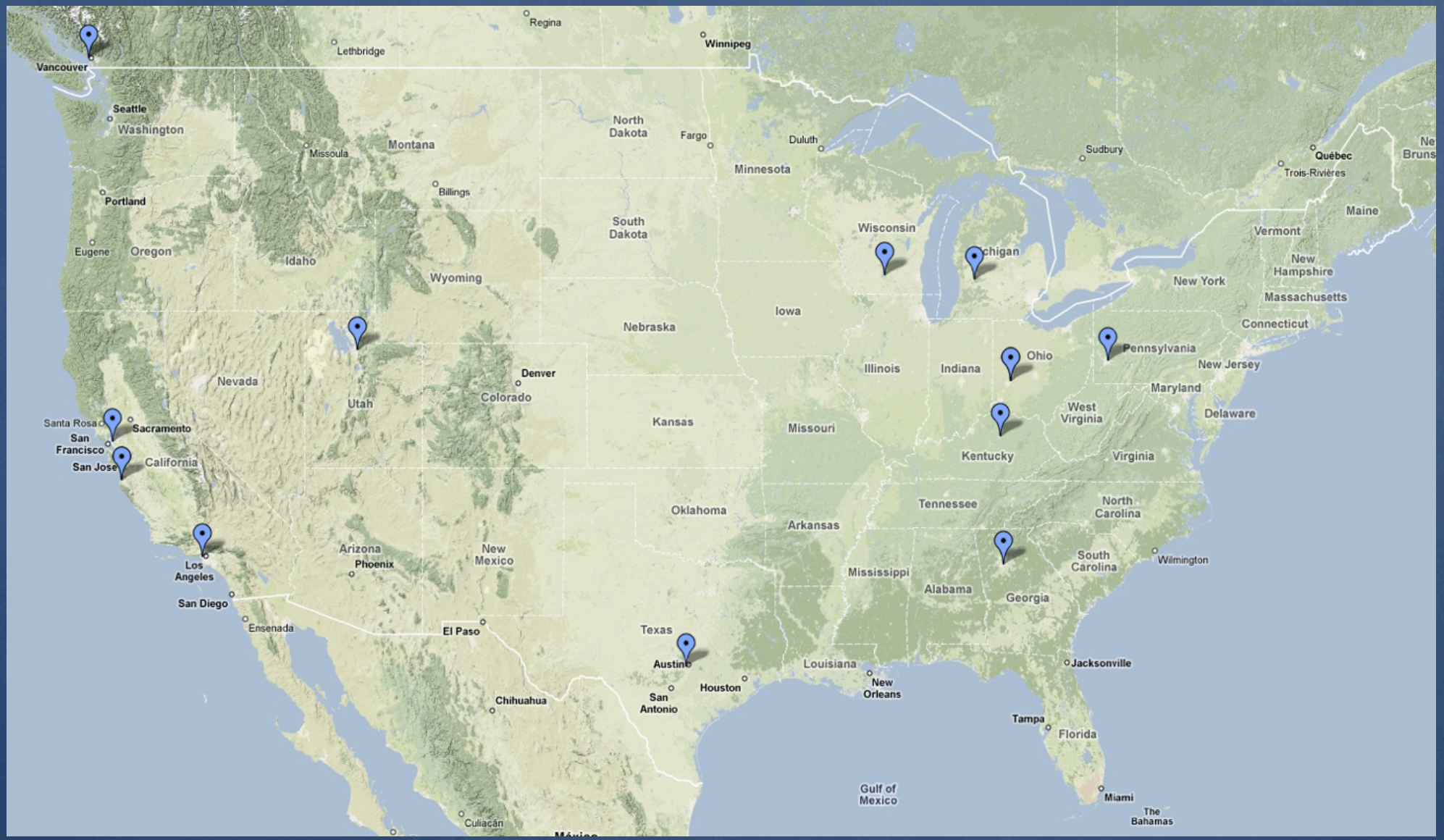
Control Framework

Control Framework Pieces

- Clearinghouse
- Security Model
- Aggregate Component Manager(s)
- Operations & Management
- Data Structures and Wire Formats

Building on...

- Emulab:
  - Component / link management
  - Resource allocation
  - User management
- PlanetLab and VINI: PC slicing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Billings
Portland
Eugene
Oregon
Idaho
South Dakota
Wisconsin
Michigan
Vermont
Maine
New Hampshire
New York
Massachusetts
Connecticut
Wyoming
Iowa
Nebraska
Pennsylvania
New Jersey
Maryland
Delaware
Ohio
Illinois
Indiana
Denver
Colorado
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San Francisco
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South Carolina
Wilmington
Mississippi
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Georgia
Austin
Houston
San Antonio
Louisiana
New Orleans
Jacksonville
Chihuahua
Tampa
Florida
Gulf of Mexico
Miami
The Bahamas
Culiacán


Canada
Hudson Bay
United States
México
Gulf of Mexico
North Atlantic Ocean
Pacific
Sweden
Norge
Norway
Россия
Russia
United Kingdom
Ireland
Polska
Poland
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Österreich
Austria
Україна
Ukraine
France
Italia
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España
Spain
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Mongolia
Uzbekistan
Turkmenistan
Iraq
Iran
Afghanistan
Pakistan
China
India
Myanmar (Burma)
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Thailand
Malaysia
Indonesia
Saudi Arabia
Yemen
Morocco
Algeria
Libya
Egypt
Mauritania
Mali
Niger
Chad
Sudan
Nigeria
Ethiopia
Somalia
Kenya
DR Congo
Tanzania
Angola
Zambia
Mozambique
Namibia
Zimbabwe
Botswana
Madagascar
South Africa
South Atlantic Ocean
Indian Ocean
Venezuela
Colombia
Brasil
Brazil
Perú
Bolivia
Paraguay
Chile
Argentina

ProtoGENI Home

New! If you have a ProtoGENI-issued identity, you can try our new flash interface for creating slices and slivers. (standalone version)

ProtoGENI is an NSF-funded prototype implementation and deployment of GENI, led by the Flux research group at the University of Utah.

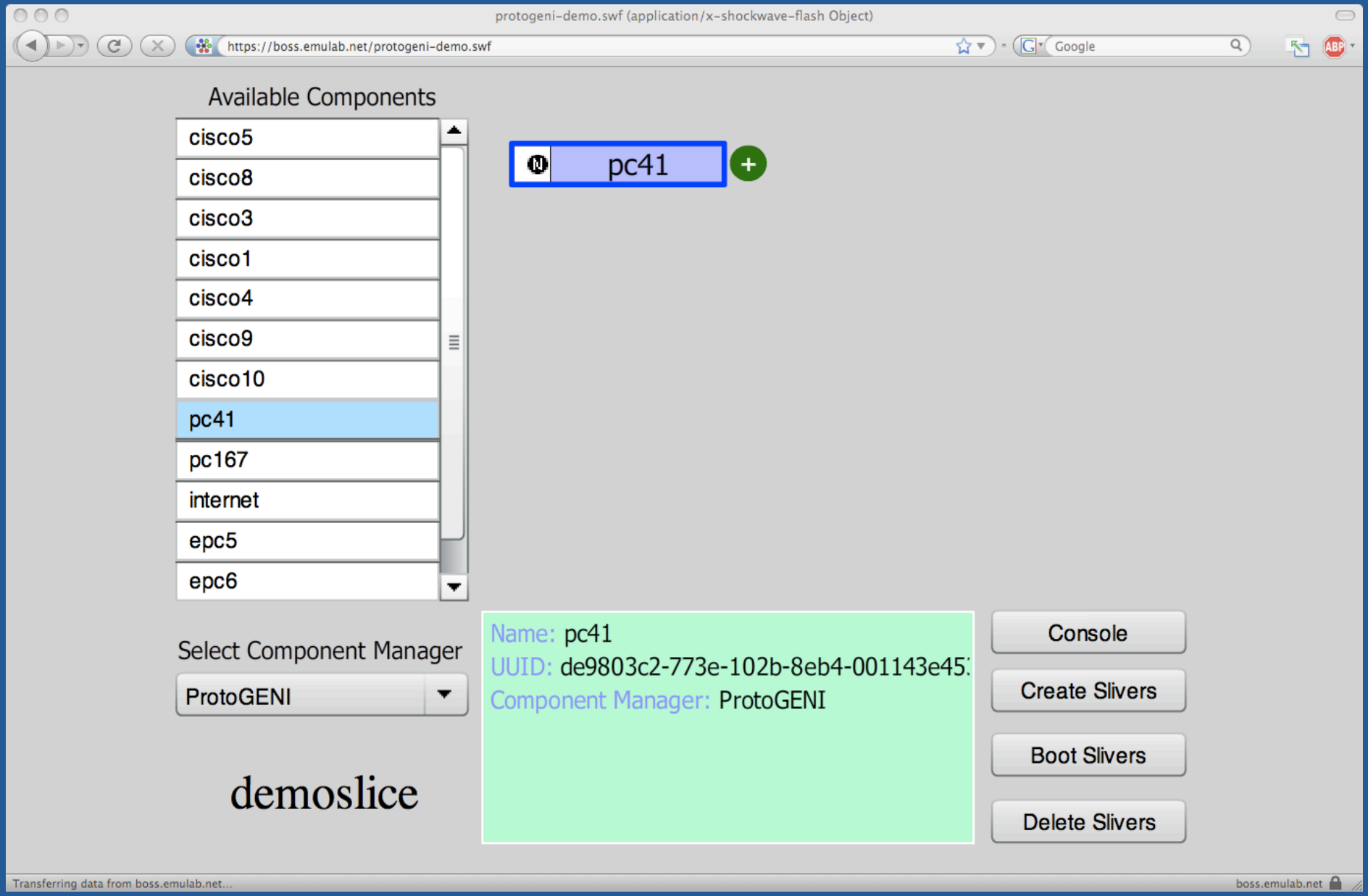
Background and Approach

GENI, the Global Environment for Network Innovations, is a proposed national facility that supports exploration of radical designs for a future global networking infrastructure. It will be a research network/testbed that is geographically distributed, contains diverse devices including wireless, supports many simultaneous experimenters, and allows end-users to use and exploit those experimental protocols.

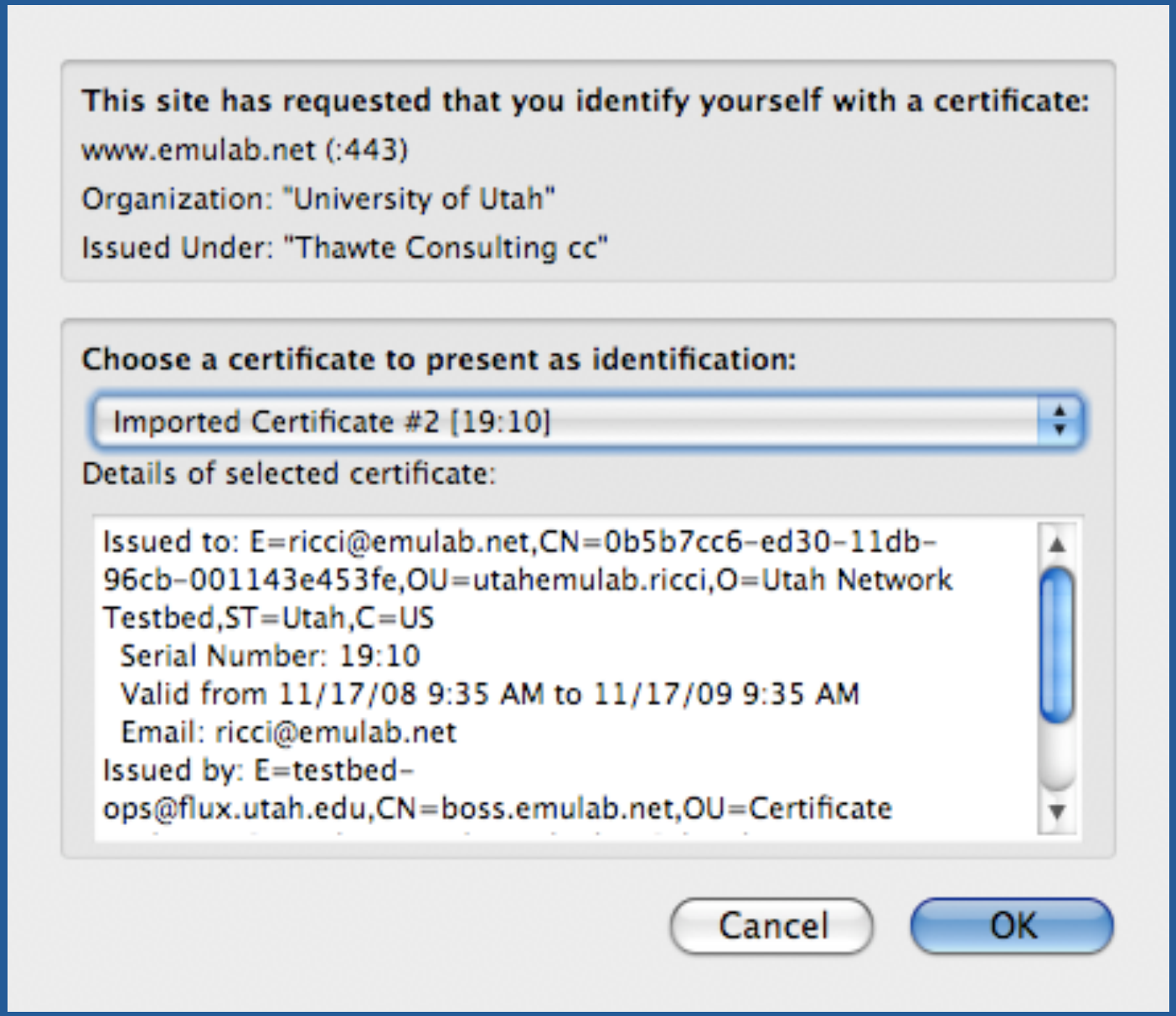
ProtoGENI is a smaller, less fancy, but functional version of both the GENI software and deployed hardware. We are primarily deriving it from our Emulab software, and secondarily leveraging the existing Planetlab software. Both base systems are production code.

- PgeniApproach -- More detail on our overall technical approach to developing ProtoGENI

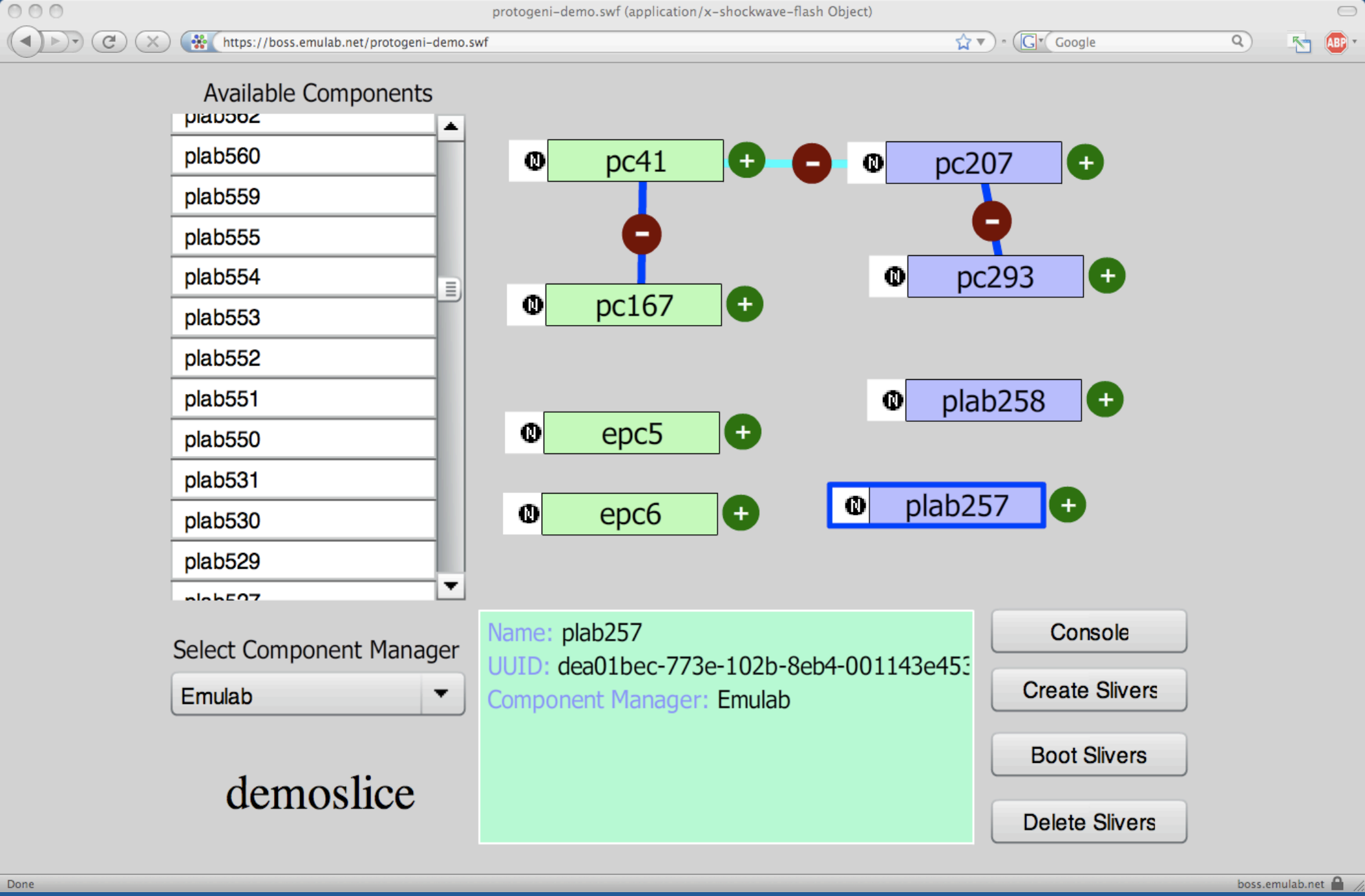
- DesignNotes
- ExistingTechnologyNotes
- MeetingMinutes
- VersionZero
- Publicly Readable Email List
- Emulab Source Snapshots - most ProtoGENI-specific code is in the `protogeni/` directory



Selecting a Component from Component Manager

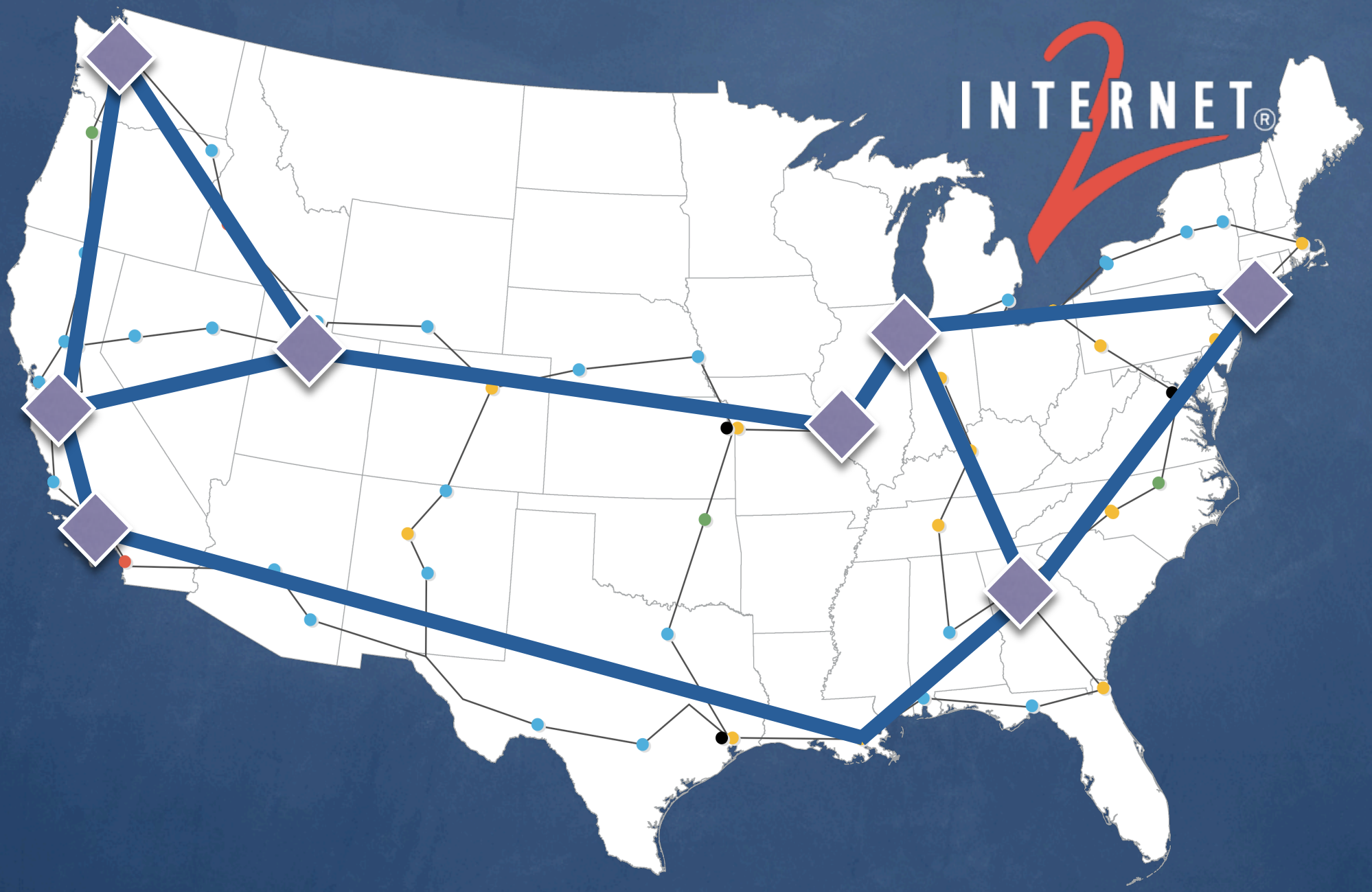


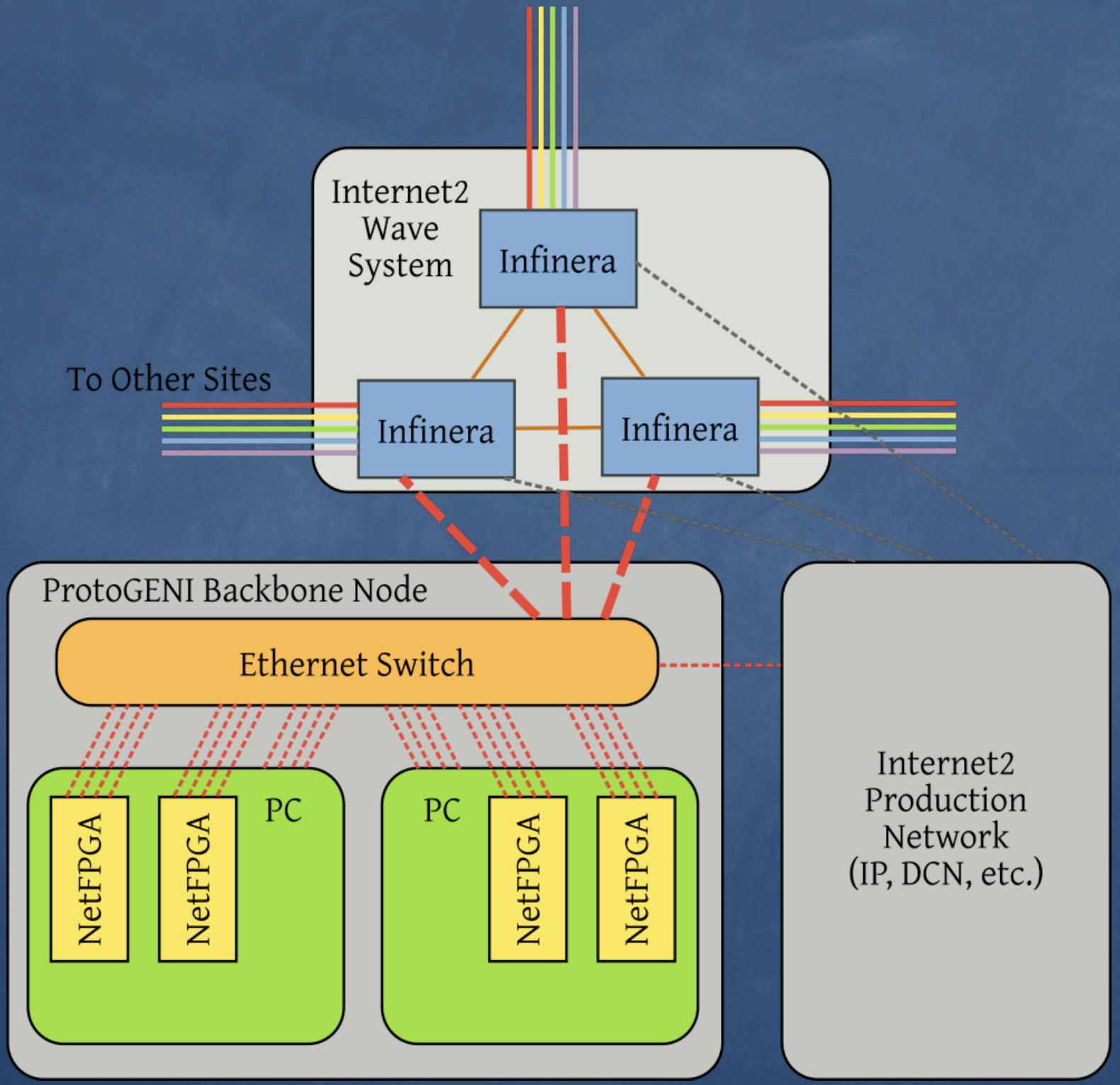
Certificate-based authentication



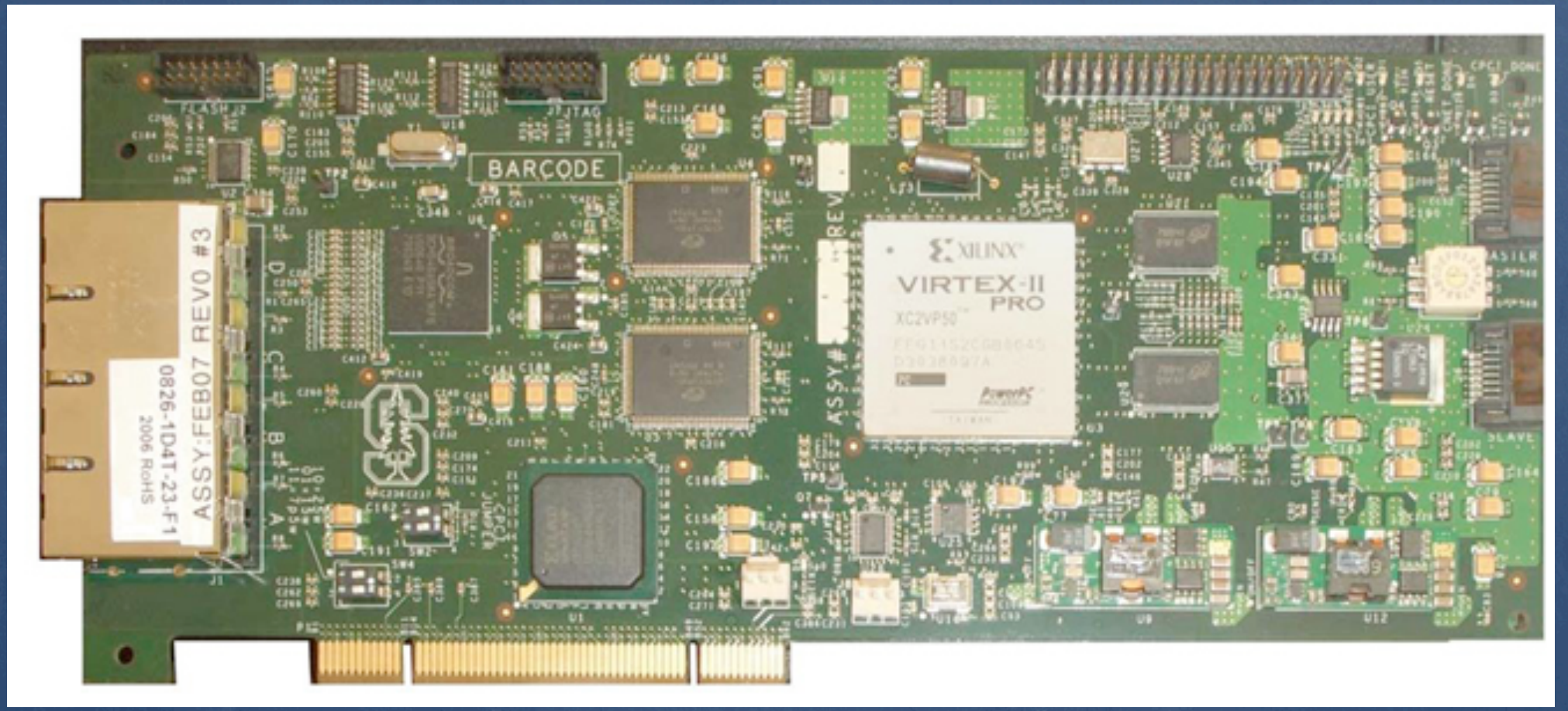
Slice with PlanetLab and Emulab Components

Backbone


INTERNET®

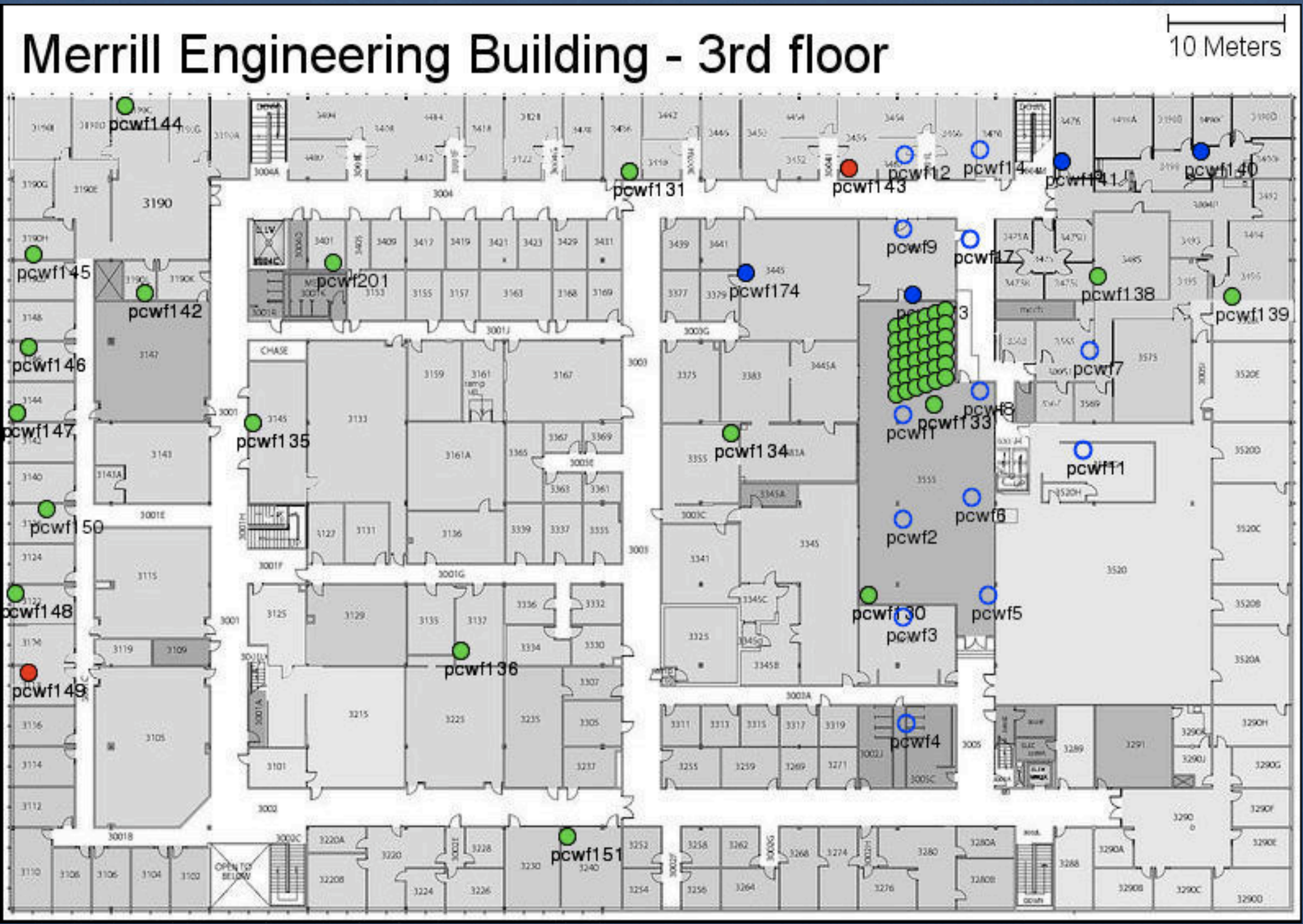

Internet2
Wave
System
Infinera
To Other Sites
Infinera
Infinera
ProtoGENI Backbone Node
Ethernet Switch
NetFPGA
NetFPGA
PC
PC
NetFPGA
NetFPGA
Internet2
Production
Network
(IP, DCN, etc.)

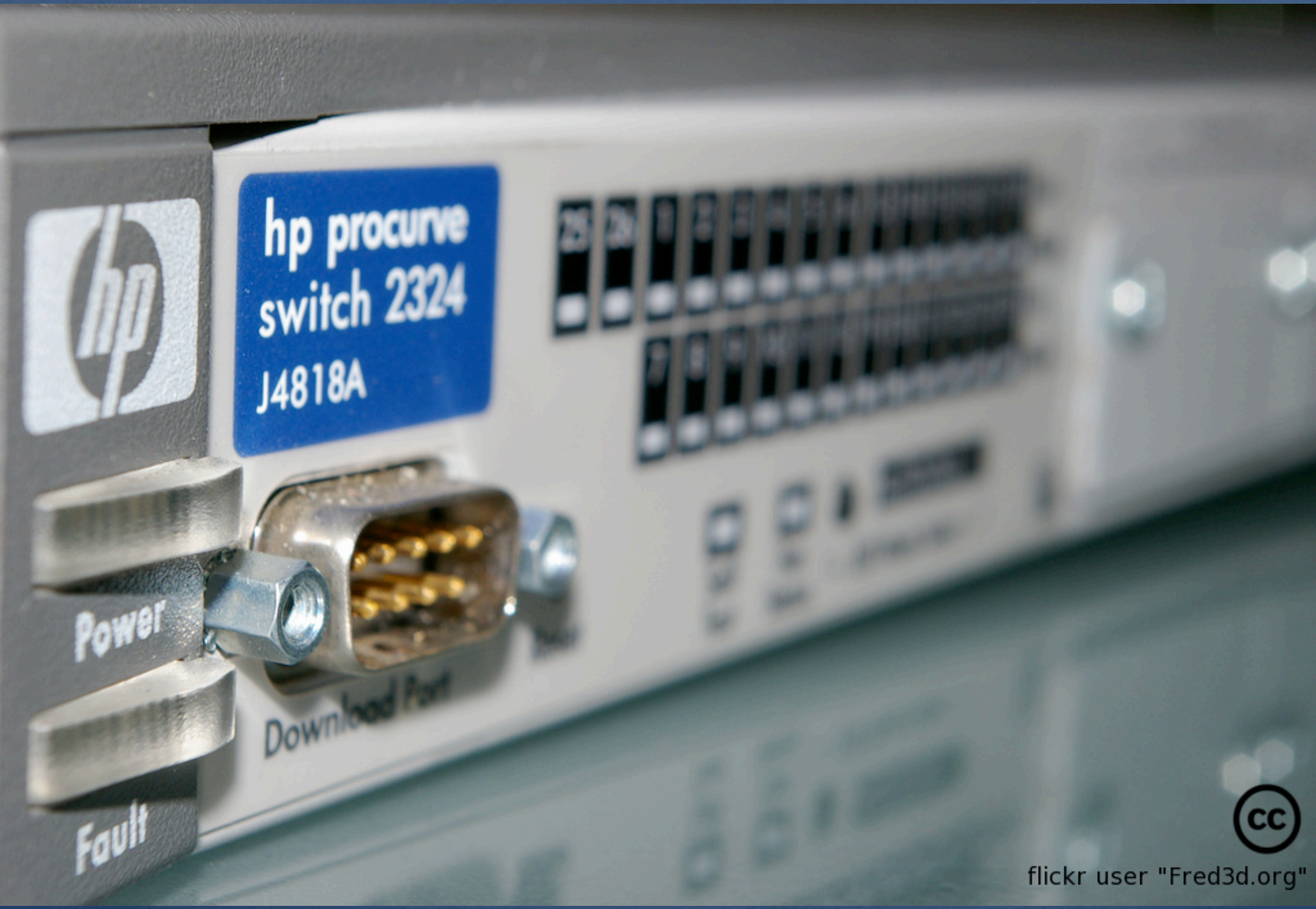
Components


BARCODE
XILINX
VIRTEX-II
PRO
XC2VP50
ASSY:FEB07 REV0 #3
0826-1D4T-23-F1
2006 RoHS

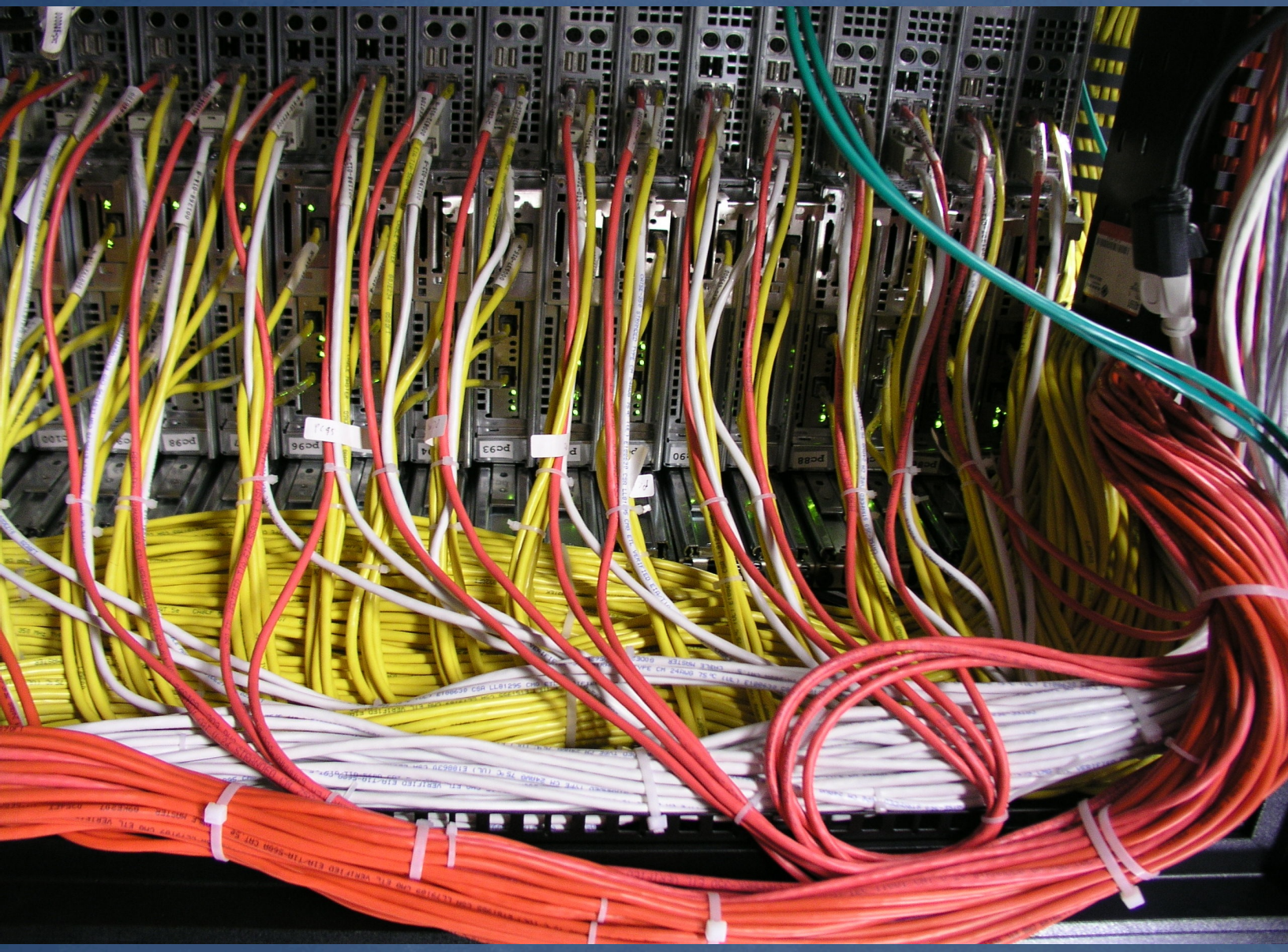

Ettus Research
USRP2
RF1
RF2
REF CLOCK
PPS IN
SD MEMORY
MIMO EXPANSION
GB ETHERNET
A
B
C
D
E
F
POWER 6V DC 3A

Merrill Engineering Building - 3rd floor

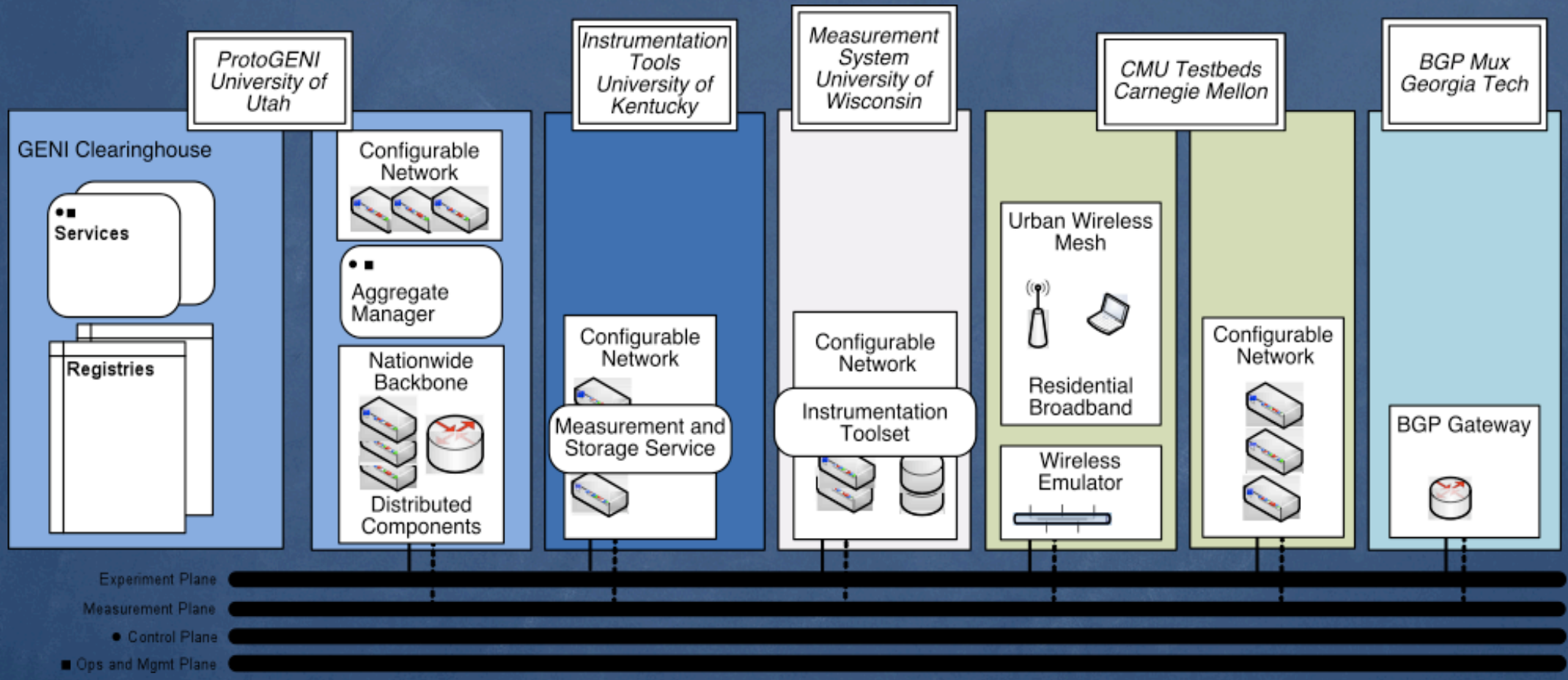




flickr user "Fred3d.org"



Integration


ProtoGENI
University of Utah
Instrumentation Tools
University of Kentucky
Measurement System
University of Wisconsin
CMU Testbeds
Carnegie Mellon
BGP Mux
Georgia Tech
GENI Clearinghouse
Services
Registries
Configurable Network
Aggregate Manager
Nationwide Backbone
Distributed Components
Configurable Network
Measurement and Storage Service
Configurable Network
Instrumentation Toolset
Urban Wireless Mesh
Residential Broadband
Wireless Emulator
Configurable Network
BGP Gateway
Experiment Plane
Measurement Plane
Control Plane
Ops and Mgmt Plane

ProtoGENI Partners

- Internet2: Backbone links and hosting space
- HP: Switches and Programmable Edge Cluster

Cluster Projects

- Instrumentation Tools (Kentucky)
- Measurement System (Wisconsin)
- Virtual Tunnels and BGPMux (Georgia Tech)
- HomeNet and Wireless Emulator (CMU)
- Programmable Edge Node (UMass - Lowell)
- Security Architecture (Sparta)

Opportunities for US/ EU collaboration

- Emulab/ProtoGENI node development
  - Open source software (GPL variant)
  - Ease of joining federation
  - Open software development community
- Transatlantic connectivity

www.protogeni.net