GpENI
Status Update
GEC6 – November 2009

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GpENI
Overview

• GpENI [dʒɛˈpi ni]
  Great Plains Environment for Network Innovation
  – exploiting new fiber infrastructure in KS, MO, and NE
  – significant international footprint under deployment
  – affiliated with GENI Cluster B
GpENI
Project Goals

- Collaborative research infrastructure in Great Plains
- Infrastructure to support future Internet research
  - NSF FIND PoMo
  - EU FIRE ResumeNet
- Flexible infrastructure to support GENI program
- Open environment for network research community
Principal Participants: Universities

- **KU**: The University of Kansas
  - James P.G. Sterbenz (lead PI), Joseph B Evans (co-I), Rick McMullen (co-I), Ronqing Hui, Gary Minden

- **KSU**: Kansas State University
  - Caterina Scoglio (PI), Don Gruenbacher (co-PI), Tricha Anjali

- **UMKC**: University of Missouri – Kansas City
  - Deep Medhi (PI), Baek-Young Choi (co-I), Cory Beard, Khosrow Sohraby, Jim Schonemann

- **UNL**: University of Nebraska – Lincoln
  - Byrav Ramamurthy (PI)
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Principal Participants: Universities

- **IIT: Illinois Institute of Technology**
  - Tricha Anjali
- **Lancaster University (UK)**
  - David Hutchison, Andrew Scott (co-Is),
- **ETH Zürich (Switzerland)**
  - Bernhard Plattner (co-I)
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Participants: Research Networks

- **GPN**: Great Plains Network (consortium)
  - Greg Monaco (PI)
- **KanREN**: Kansas Research and Education Network
  - Cort Buffington (PI)
- **MOREnet**: Missouri Research and Education Network
  - Hank Niederhelm
- **JANET**
- **SWITCH**
- **GÉANT2 / DANTE**
- **NORDUnet**
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Participants: Industry

• Ciena
  – Jeff Verrant (PI), Jim Archuleta (co-I)
• Qwest
GpENI
Node Cluster

- GpENI cluster
  - 5–10 PCs
    - GpENI mgt.
    - L4: PlanetLab
    - L3: prog. routers
- GbE switch
  - arbitrary interconnection
  - VLAN connectivity to GENI
  - SNMP cluster monitoring
- Ciena optical switch
  - L1 GpENI interconnection

Ciena optical switch
   GpENI optical backbone
      to Internet2 and KC SPP
      then to MAX

GbEnet
   PlanetLab
      GENIwrap
         prog. nodes
   ctl. frwk.
      aggr. mgr.
      PLC VINI
      DCN

GpENI
management & control

prog. routers
   VINI,
   XORP,
   click, ...

site specific
   KUAR,
   sensor, ...

ctl. frwk.
   aggr. mgr.
   PLC VINI
   DCN

GENI VLANs

GbEnet

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GpENI
• Midwest backbone (phase 3)
  – multiwavelength optical backbone
  • current or imminent deployment
  – 4 universities in 3 states
  • 1 switch/year with current funding

new nodes

to Smith Ctr. KS (eventual link to CO)

C42 GpENI Ciena CN4200
GpENI Ciena CoreDirector
GpENI node cluster

C42 Gp ENI

KSU – KS
KU – KS

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Physical Topology and Network Infrastructure

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Layer 2 Connectivity (mid phase 1)
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Midwest Expansion

- Regional GpENI partners: 11
  - Principal partners
    - KU, KSU, UMKC, UNL, IIT
  - South Dakota: 3 universities
    - DSU, SDSMT, USD
  - Missouri: UMC
  - GMOC at Indiana University
  - Canada
    - Waterloo
- European GpENI partners
  - 13 nations
  - 23 research institutions
  - ~115 nodes
  - more under discussion
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Asian Expansion

- Asian GpENI partners
  - 3 nations
  - 5 research institutions
  - 25 nodes
  - more under discussion
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Node Cluster Status

• Midwest backbone nodes
  – PlanetLab and VINI operational
  – UNL switch installed; KU switch this year

• International nodes coming up
  – Connectivity to the UK tunneled to and through Lancaster
    • Cambridge and Lancaster nodes up
  – Swiss nodes coming up
    • ETH Zürich and Bern
  – other nodes in various states of procurement and installation
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Systems Software Status

• PlanetLab sub-aggregate (KSU)
  – MyPLC 4.3 with GENIwrapper SFA
  – exploring federation (GpENI aggregate and GENI)
• Programmable router sub-aggregate (UMKC)
  – VINI installed; will be beta for 5.0 to unify with PlanetLab
  – exploring Quagga now, other options later (XORP...)
• Optical switch sub-aggregate (UNL)
  – UNL switch installed; KU next
  – DCN running on Ciena CoreDirector and Netgear Enet
  – coördinating with MAX for interdomain DCN
• Overall management, monitoring, administration (KU)
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User and Application Status

- **Experiment control**
  - Gush running now
- **Code deployment**
  - Raven running now
- **User access**
  - Seattle running now
  - requests for external accounts being entertained
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Critical Next Steps and Issues

• Integration of PlanetLab and VINI sub-aggregates
  – ability to control *topology* of GpENI slices

• Programmable router capabilities
  – ability for slices to install and use arbitrary routing algorithms

• Funding profile insufficient to build infrastructure
  – only partial and slow deployment of Ciena optical switches
  – international node connectivity currently backhauled to KU
End