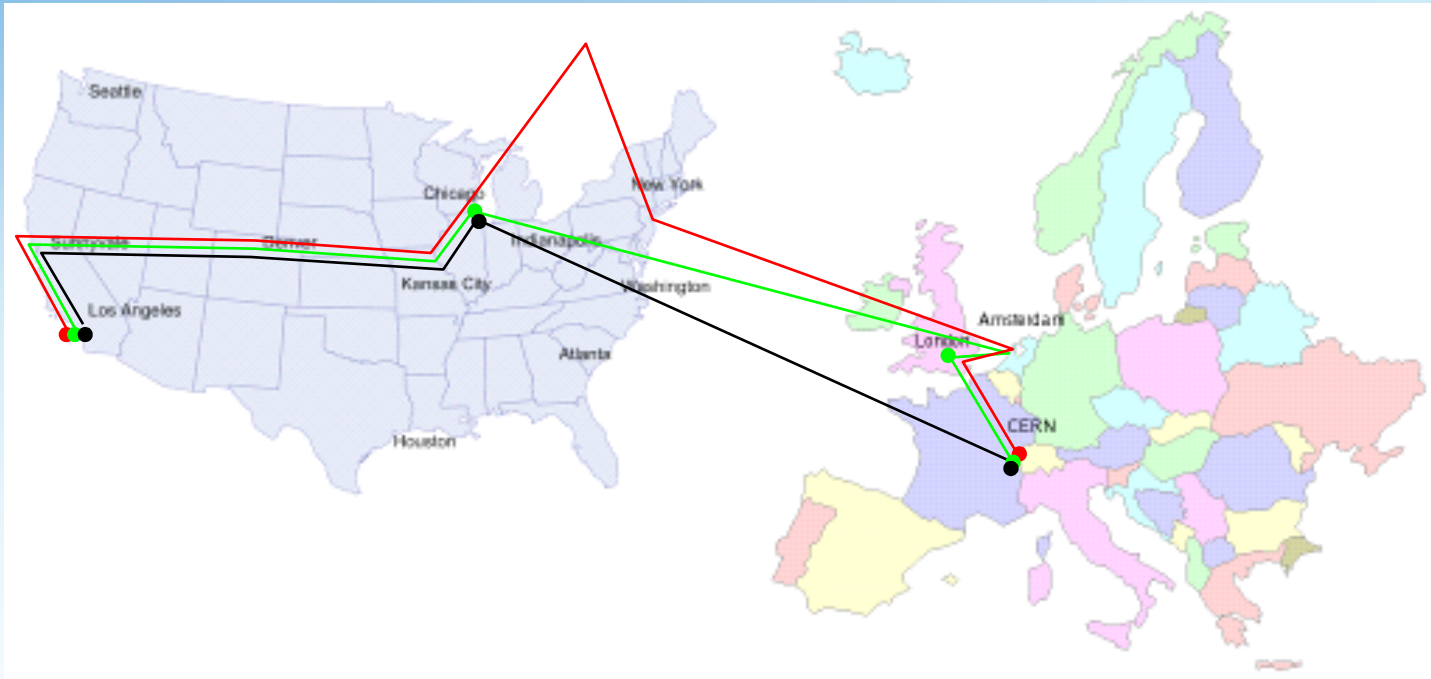




June 10th 2010, Transatlantic Networking for LHC Experiments
Eric Boyd, Internet2 Deputy CTO

**PANEL: EXISTING AND FUTURE
ADVANCED NETWORK SERVICES:
WHAT CAN THEY OFFER TO HEP
EXPERIMENTS?**

GNEW04: All Roads Lead to Geneva



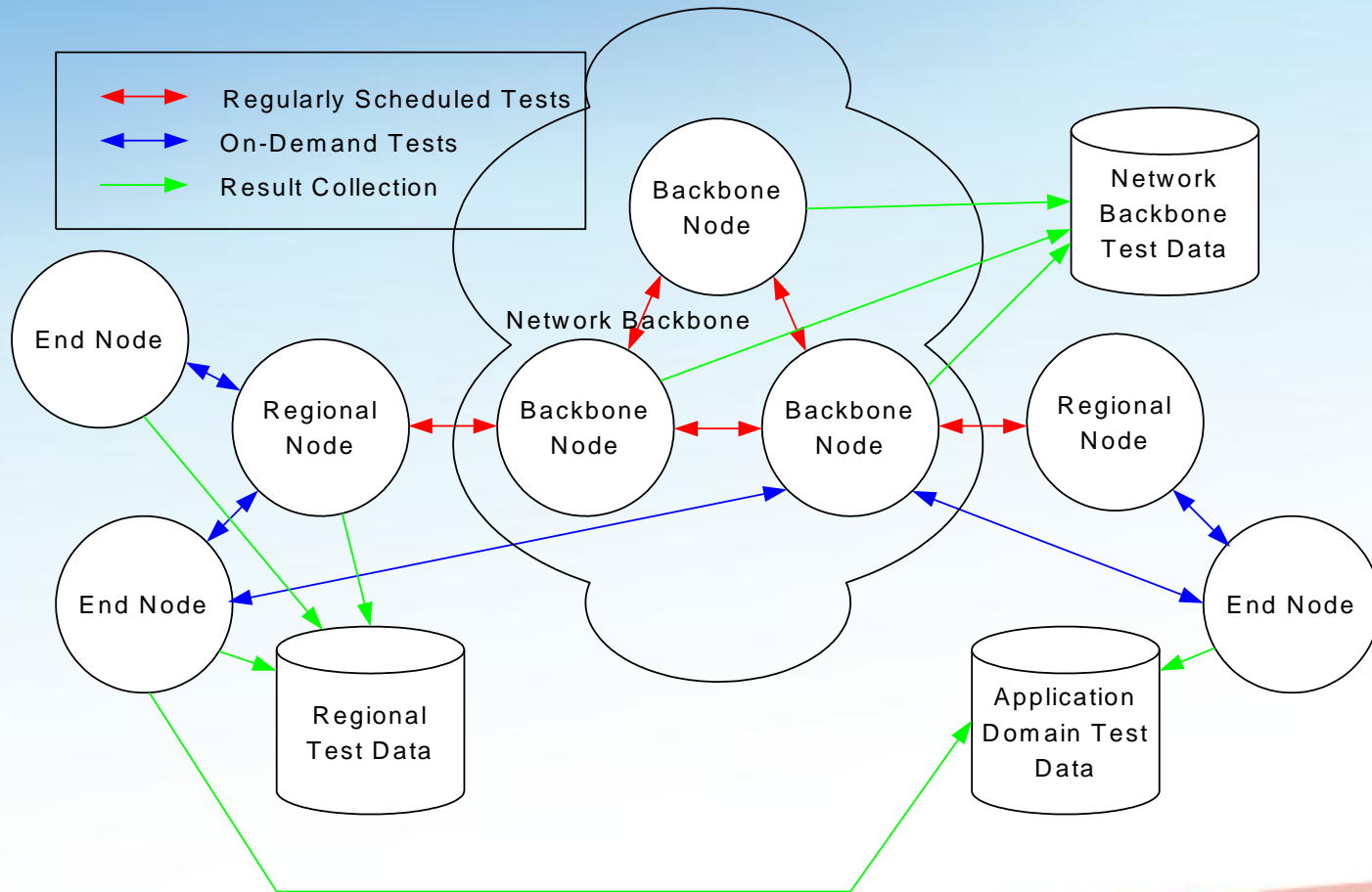
Path 1 — DataTag — Default Route

Path 2 — Eurolink — "Cooked" Alternate Route

Path 3 — Lightpath — "Cooked" Alternate Route

Circles Correspond to OWAMP / BWCTL Measurement Node Pair

GNEW 2004: Sample piPEs Deployment



GNEX 2004: Transatlantic Lightpath Experiment (Rick Summerhill slide)

- Grew out of a meeting in December with CANARIE, GEANT and Internet2
- Decided to setup a basic 1 Gig Lightpath to demonstrate technologies and requirements
 - Followed KIDS, not KISS – that is, keep it difficult stupid! -☺
 - Uses a variety of layer 1, 2, and 3 technologies
 - Crosses administrative domains using different layers
- Goal - examine the problems, and how one might make this dynamic (in some way)!
- Control Plane
 - 8 hours of conference calls
 - Approximately 300 pieces of email

Existing Advanced Network Services (1)

- Distributed, decentralized monitoring middleware
 - Goal:
 - Preserve local autonomy
 - Allow sharing of monitoring data
 - Permit inter-domain active measurement tests
 - Permit multiple implementations
 - Status:
 - perfSONAR works, widely deployed, multiple implementations
 - Other efforts as well

Existing Advanced Network Services (2)

- Distributed, decentralized automatic provisioning of circuits
 - Goal:
 - Preserve local autonomy
 - Permit inter-domain automatic provisioning of circuits
 - Permit multiple implementations
 - Status:
 - IDC works, somewhat widely deployed, multiple implementations
 - Other efforts as well

Existing Advanced Network Services (3)

- Federated trust infrastructures
 - Goal:
 - Preserve local autonomy
 - Enable authentication and authorization with single identity across multiple domains
 - Permit multiple implementations
 - Status:
 - Federated trust works, widely deployed, multiple implementations

Future Advanced Network Services

- Ubiquity
 - Present: Exponential growth (distributed monitoring infrastructures, federated trust infrastructures) or accelerating growth (automatic circuit provisioning services)
 - Future: “Norm” for “well-run” Research and Education Networks
- Integration
 - Present: Monitoring and automatic circuit provisioning underway
 - Future: Monitoring, automatic circuit provisioning, federated trust, storage, compute engines fully integrated
- Network Exploitation Paradigm
 - Present: High BW network users and network operators by necessity are tightly coupled in shaping network evolution (capacity and transport technology)
 - Future: Decouple network transport technology choice and application design
 - Future: Adaptive feedback loop between network and application

What can future advanced network services offer HEP Experiments?

- Ubiquitous, integrated distributed advanced services should enable a new generation of scientific application design
- Availability of advanced services may significantly alter the partitioning and location of compute and storage resources
- Fixed role of sites may become more fluid; no more “Tiers”
- Long-lived experiments may seamlessly float atop an ever-changing mix of underlying network transport technologies



An Overview of Architectural Directions and Advanced Services

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