perfSONAR PS for LHC Tier 2s

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Internet2

perfSONAR Motivation

- Most organizations can do monitoring and diagnostics of their own network
- Networking is becoming an increasingly cross-domain effort
- Monitoring and diagnostics must also become a cross-domain effort

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What is perfSONAR?

- A set of protocols and schemas for implementing a Service-Oriented Architecture (SOA) for sharing and controlling network performance tools
- A community of users and developers
- Multiple sets of interoperable software

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Outline

- Challenge
- perfSONAR PS for Tier 2s
- Tier 1 / Tier 2 Interoperability
- Measurement and Dynamic Circuit Networks

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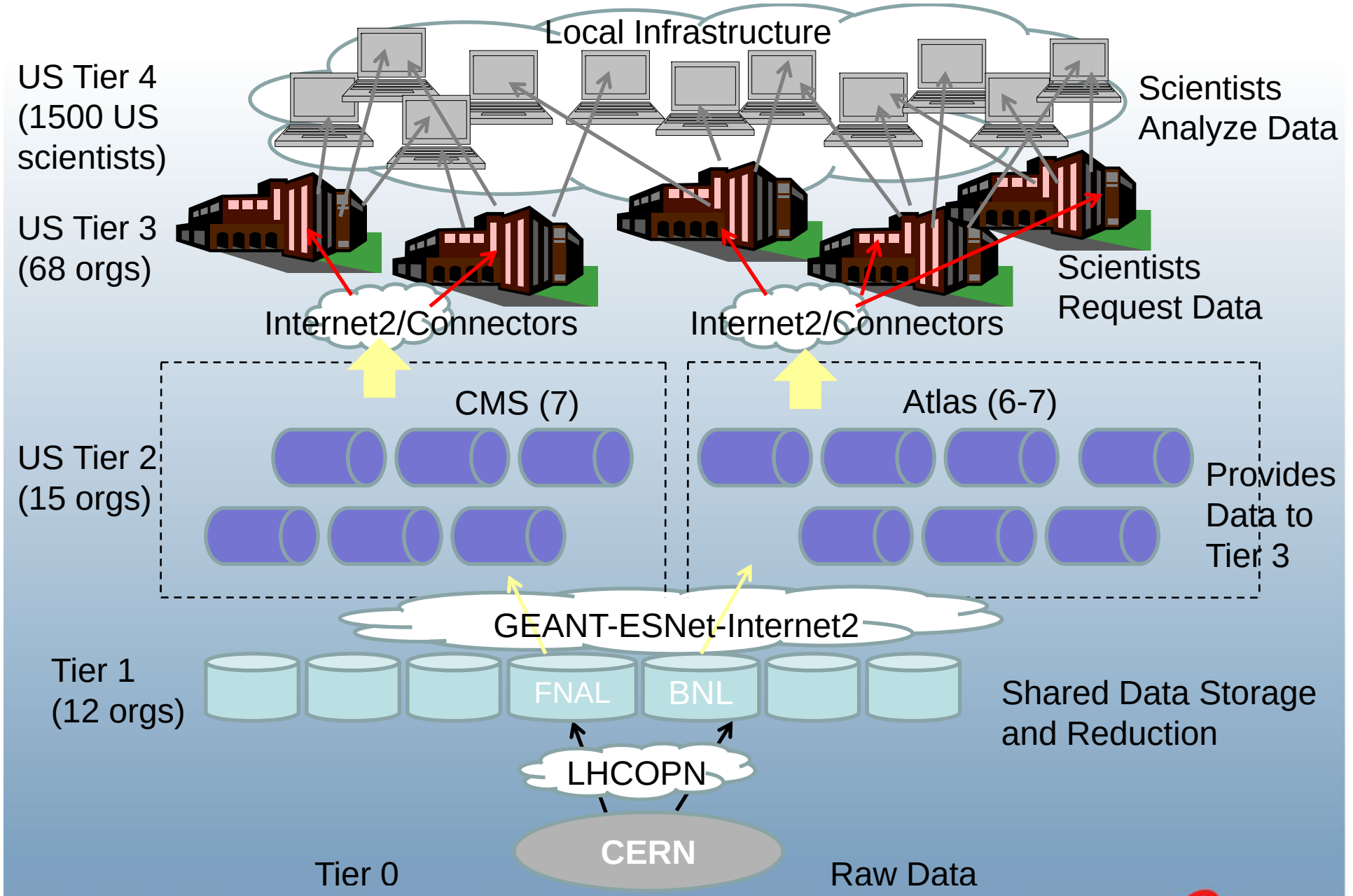
Local Infrastructure
US Tier 4
(1500 US
scientists)
Scientists
Analyze Data
US Tier 3
(68 orgs)
Scientists
Request Data
Internet2/Connectors
Internet2/Connectors
CMS (7)
Atlas (6-7)
US Tier 2
(15 orgs)
Provides
Data to
Tier 3
GEANT-ESNet-Internet2
Tier 1
(12 orgs)
FNAL
BNL
Shared Data Storage
and Reduction
LHCOPN
CERN
Tier 0
Raw Data

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perfSONAR PS Characteristics

- Available to any organization
- Software package, not an appliance
  - Easy to install
  - Easy to configure
- Create separate implementation of perfSONAR standard
  - Use same protocol/standards
  - Proof of interoperability (strengthens the standard)
- Targeted at US Tier-2 Educational Institutions
  - Interoperable with Tier 1 solution(s)

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perfSONAR PS and perfSONAR MDM

- perfSONAR MDM
  - Appliance
  - Centrally-managed
  - Software + Hardware + Functionality Support + Operational Support
  - Targeted at LHC OPN
  - Available March 2008
- perfSONAR PS
  - Software package
  - Federated deployment
  - Software + Functionality Support; assumes local and federated operational support and locally-supplied hardware
  - Targeted at US Tier 2s
  - Available January 2008

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Two Classes of Tier 2s

- We need to meet the needs of both classes of Tier 2s.
  - Some Tier 2s are “measurement targets”
  - Some Tier 2s are ”measurement hubs”
- Measurement Targets
  - Knoppix disk of perfSONAR PS
  - Makes low-level tools available for diagnostics
  - Run a dLS instance to make local services known to the world
    - Interim Solution: Register with a centralized LS at ESnet or Internet2
- Measuremnt Hubs
  - CPAN/scriptable install or Knoppix disk of perfSONAR PS
  - Makes low-level tools available for diagnostics
  - Coordinate a mesh of tests
  - Store test data
  - Run a dLS instance to make local services known to the world
    - Interim Solution: Register with a centralized LS at ESnet or Internet2

perfSONAR PS for Tier 2 Measurement Target

- OWAMPd
- BWCTLd
- Traceroute MP
- NDT MP
- perfSONAR dLS instance

perfSONAR PS for Tier 2 Measurement Hub

- As above, plus:
- perfSONAR-PS dLS
  - Interim solution: centralized LS deployed at ESnet and/or Internet2
- perfSONOBUOY
  - Configure regular active measurement tests
- BWCTL MA
- OWAMP MA
- pS-PS SNMP-MA
  - Includes simple SNMP polling tool available for configuration
- pS-PS Link Status / Circuit Status
  - Supports E2EMON UI

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Tier 2 Requirements of Tier 1s

From the point of view of the Tier 2s …

- Goal: Interoperability with Tier 1s
- Need Tier 1s to support:
  - OWAMPd
    - configured so Tier 2s can interact
  - BWCTLd
    - configured so Tier 2s can interact
  - Traceroute MP
  - NDT MP
  - perfSONAR dLS instance
    - so the above tools can be 'announced‘
- Two solutions … (see scenarios)

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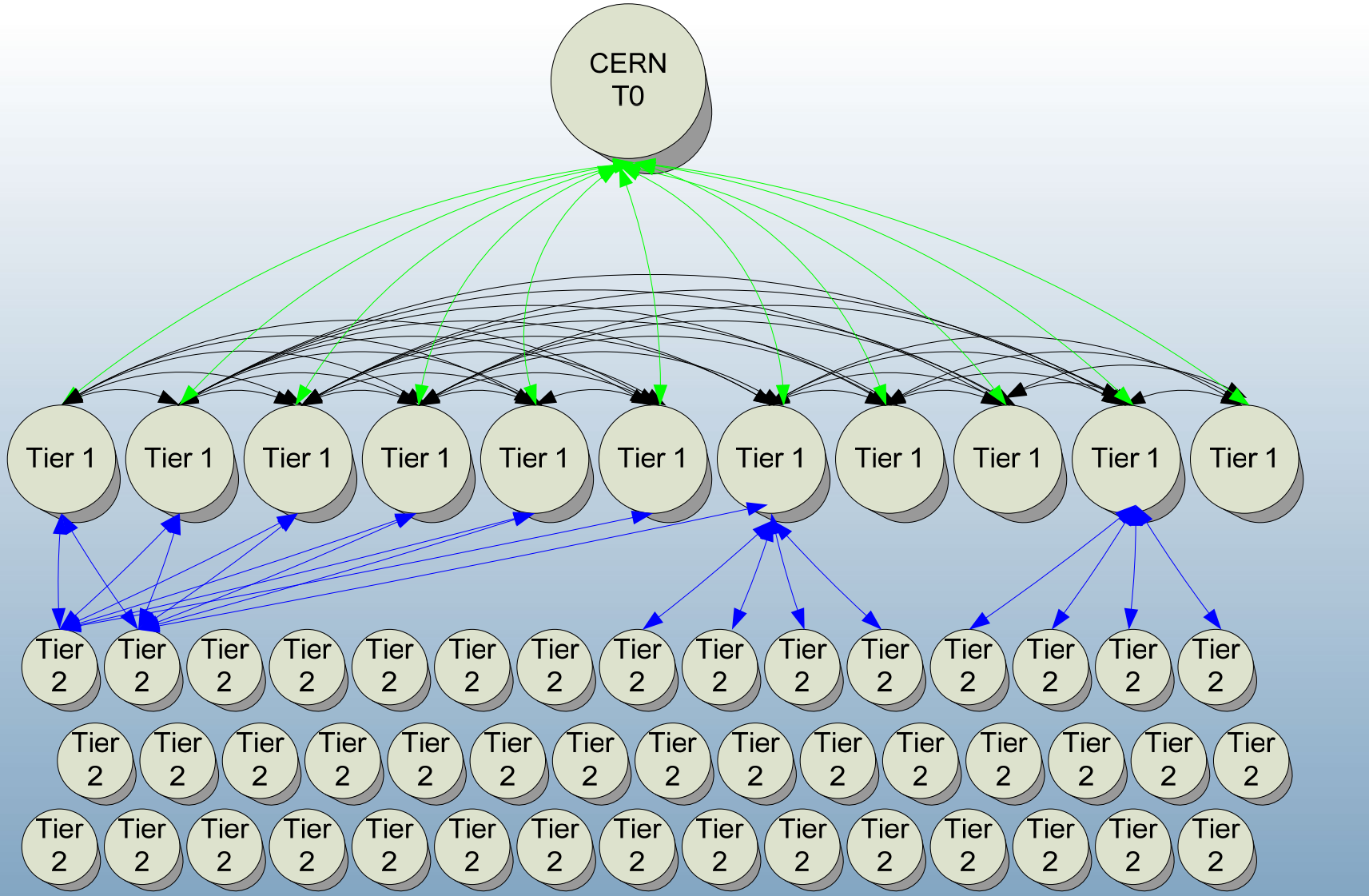
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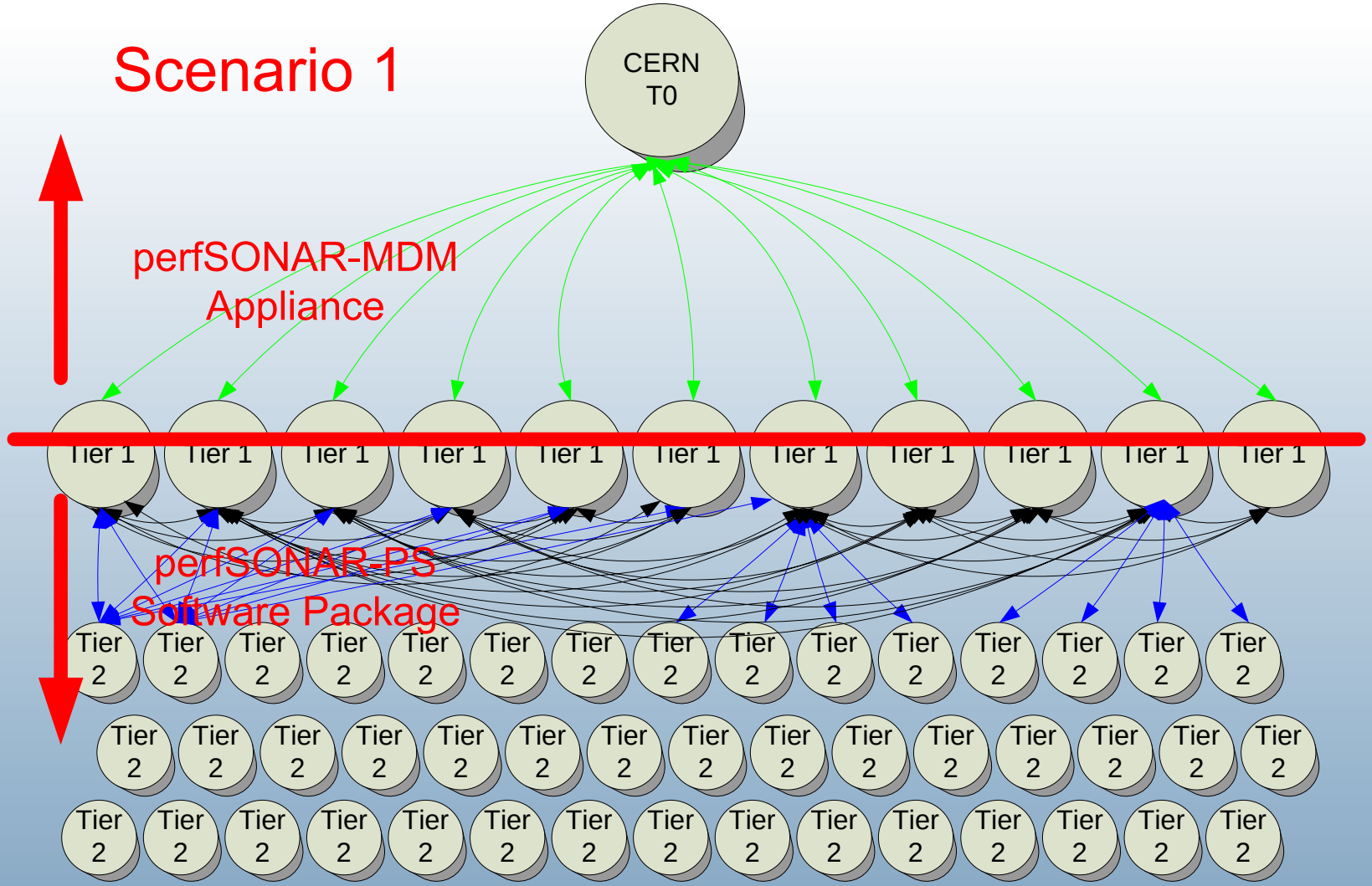
Tier 2

Scenario 1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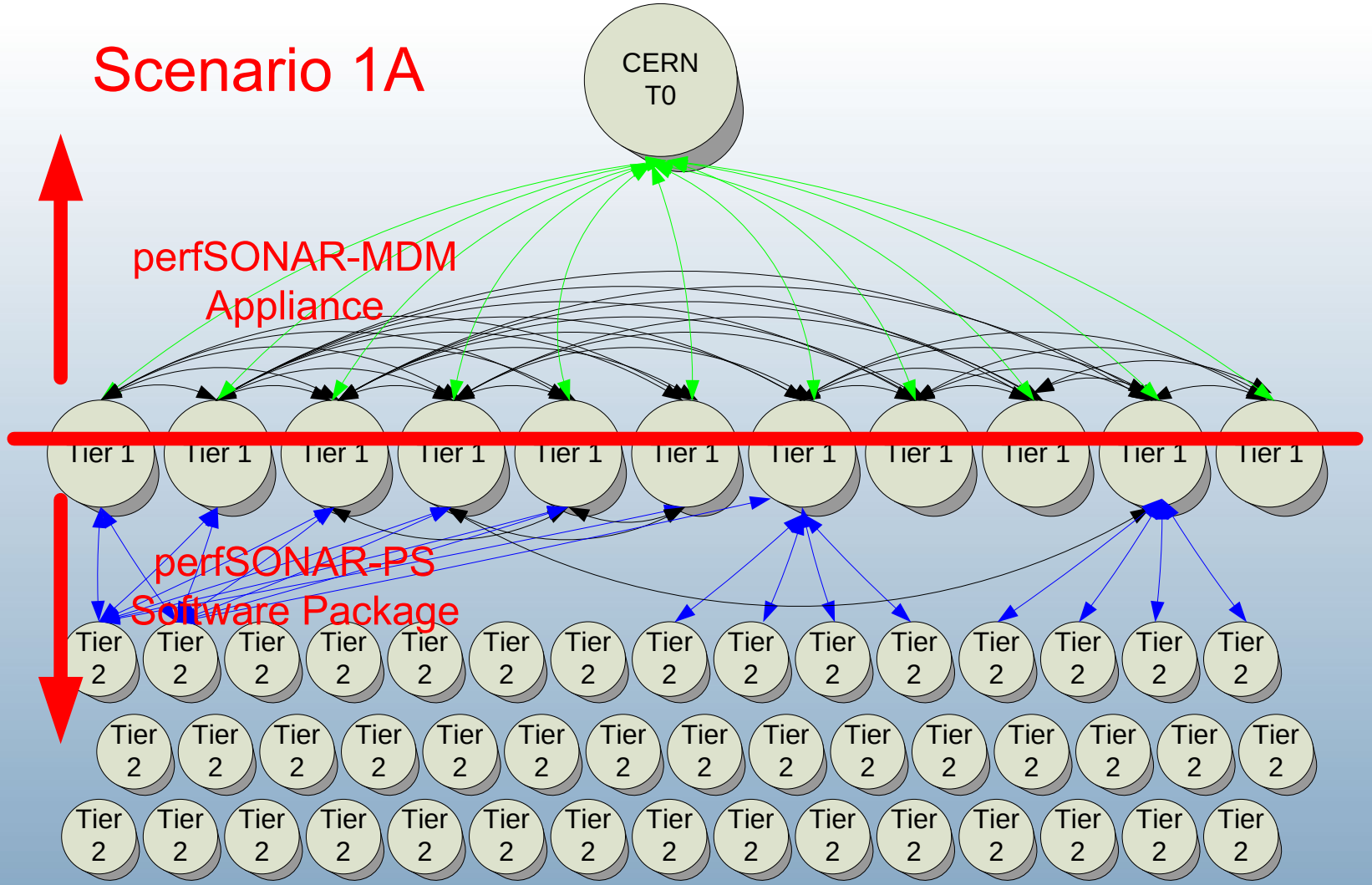
Scenario 1A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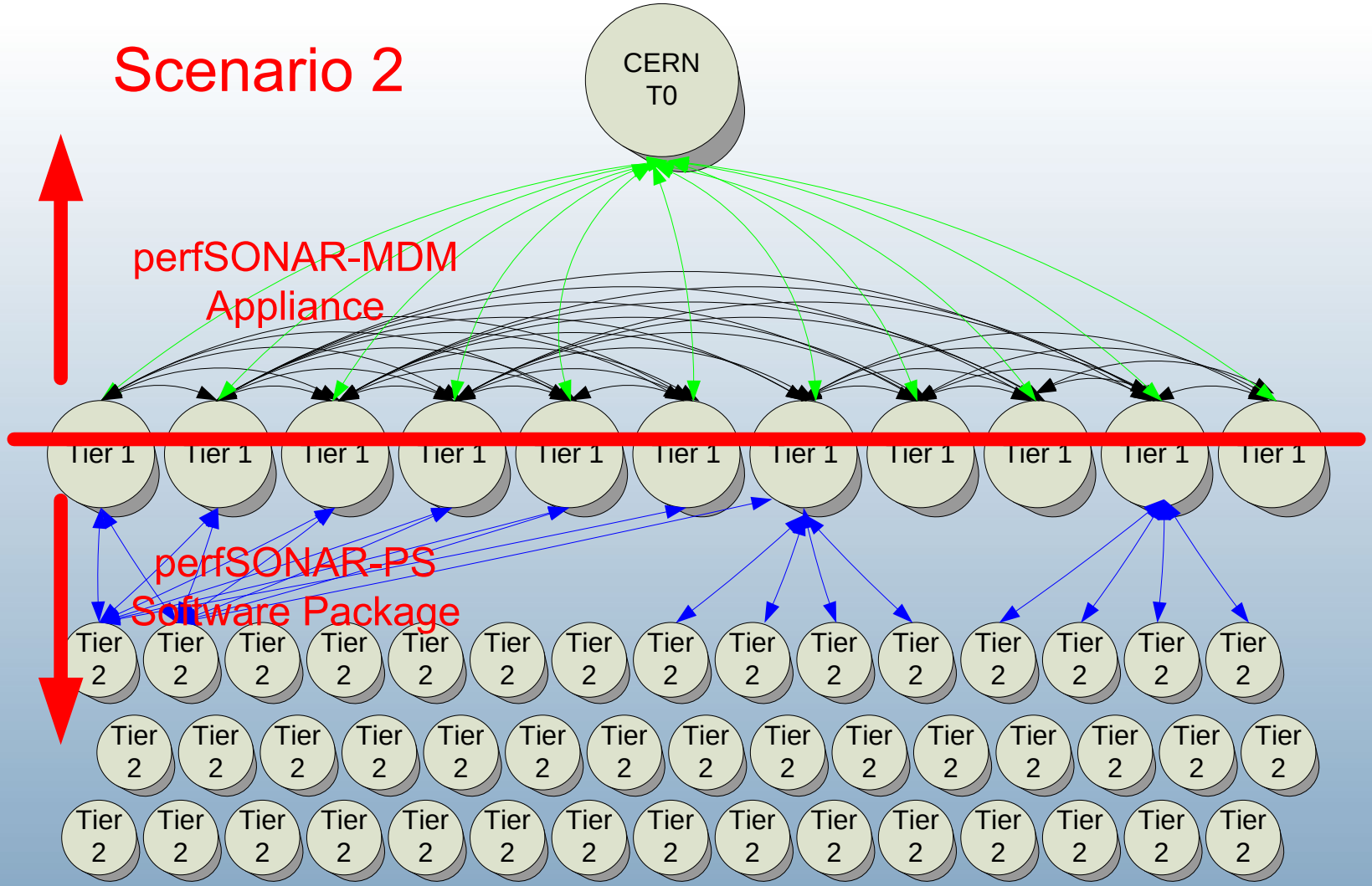
Scenario 2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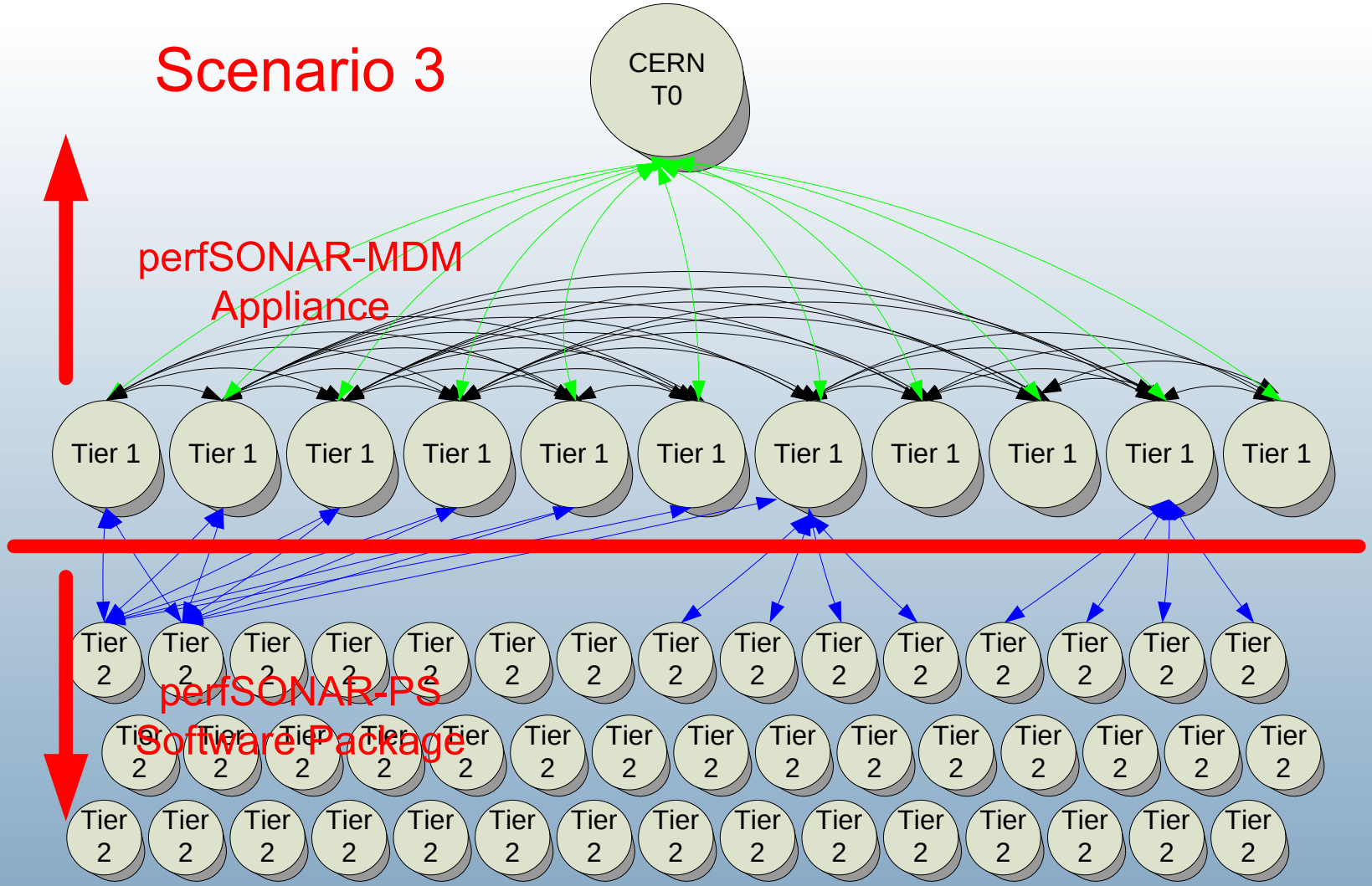
Scenario 3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UPDATE

- After significant discussion, the group agreed to Scenario 2.

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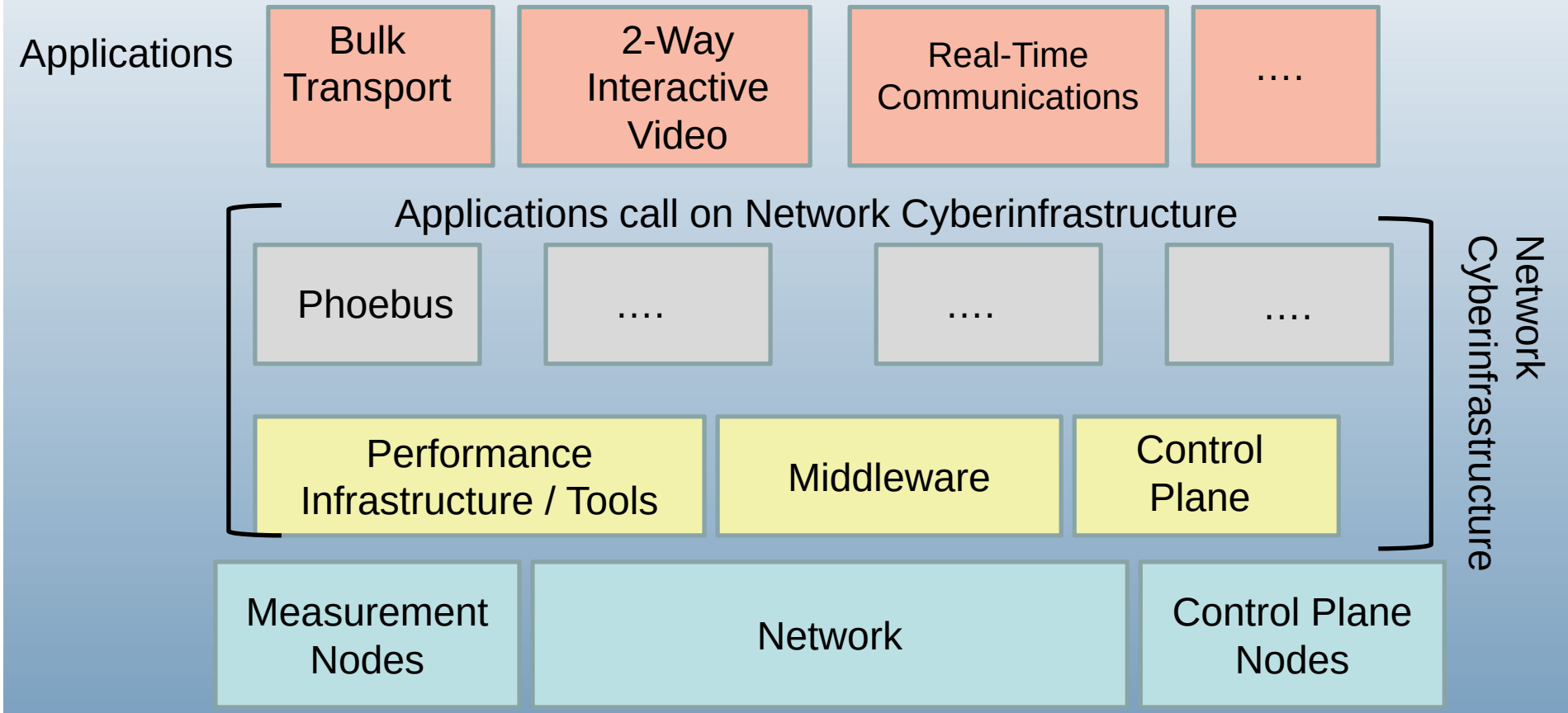
Internet2 Network Cyberinfrastructure Components



DCN Definitions

- DCN is a generic term for a dynamic circuit network
- DCN instances include the Internet2 DCN, ESnet's Science Data Network, etc.
- In partnership with MAX and ISI, Internet2 has developed the DCN Software Suite

DCN Software Suite Under the Hood

- DCN is using Web Service representation and abstractions to facilitate automated provisioning and network virtualization
- Web service control plane architecture has been a collaborative development between Internet2, ESNet, GEANT, Nortel, DRAGON and others
- This architecture includes an XML topology schema which is based on extensions to the OGF Network Measurements Working Group (NMWG) defined XML schemas.
- This is the same set of standards that the PerfSonar technologies utilize.

DCN / perfSONAR Integration (1)

- The main purpose of the control plane is to allow for multi-domain dynamic provisioning and "topology" building, often referred to as network virtualization.
- For the purposes of monitoring and debugging, the control plane will rely on an interaction and exchange of information with the measurement and monitoring plane, i.e. PerfSonar.
- Since PerfSonar and the DCN Control Plane share the same web service underpinnings, exchange of information and network state will be greatly facilitated and should allow for dynamic services to be readily integrated into the multi-domain PerfSonar monitoring, measurement, and debugging architecture.

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DCN / perfSONAR Integration (2)

- A typical exchange of information between the DCN Control Plane and perfSONAR is expected to include web service descriptions of provisioned circuits.
- Follow the NMWG/perfSONAR formats, which will allow for ready mapping to the perfSONAR topology descriptions and integration into the existing monitoring and debugging framework.
- In addition, real time interactions between the measurement/monitoring and control planes are anticipated in direct response to varying levels of debugging.
- For example:
  - The control plane may inform perfSONAR about a routine multidomain dynamically provisioned circuit.
  - Iin response to a external domain query, perfSONAR processes may request additional information from the control plane to assist in a multi-domain debugging or monitoring processes. This additional information might include a specific list of nodes traversed across the local domain, from which perfSONAR processes can correlate to their existing measurement points, or perhaps initiate new measurement and monitoring processes.

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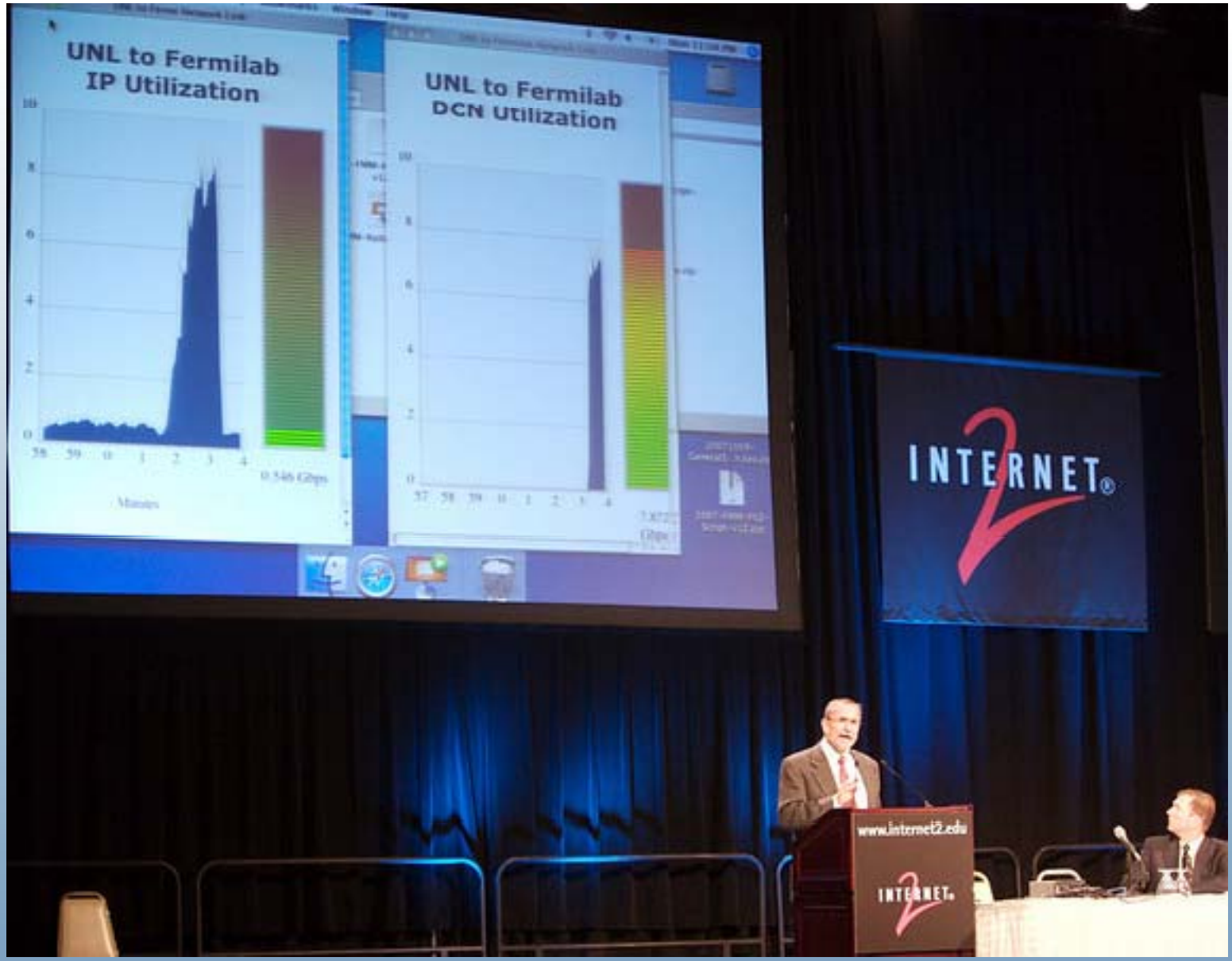
DCN / perfSONAR Integration Status

- The DCN software suite currently has a monitoring system which stores realtime circuit information in a mysql database.
- We hope to have the information available to perfSONAR in the appropriate OGF schema formats sometime in 1st Quarter 2008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DCN Utilization
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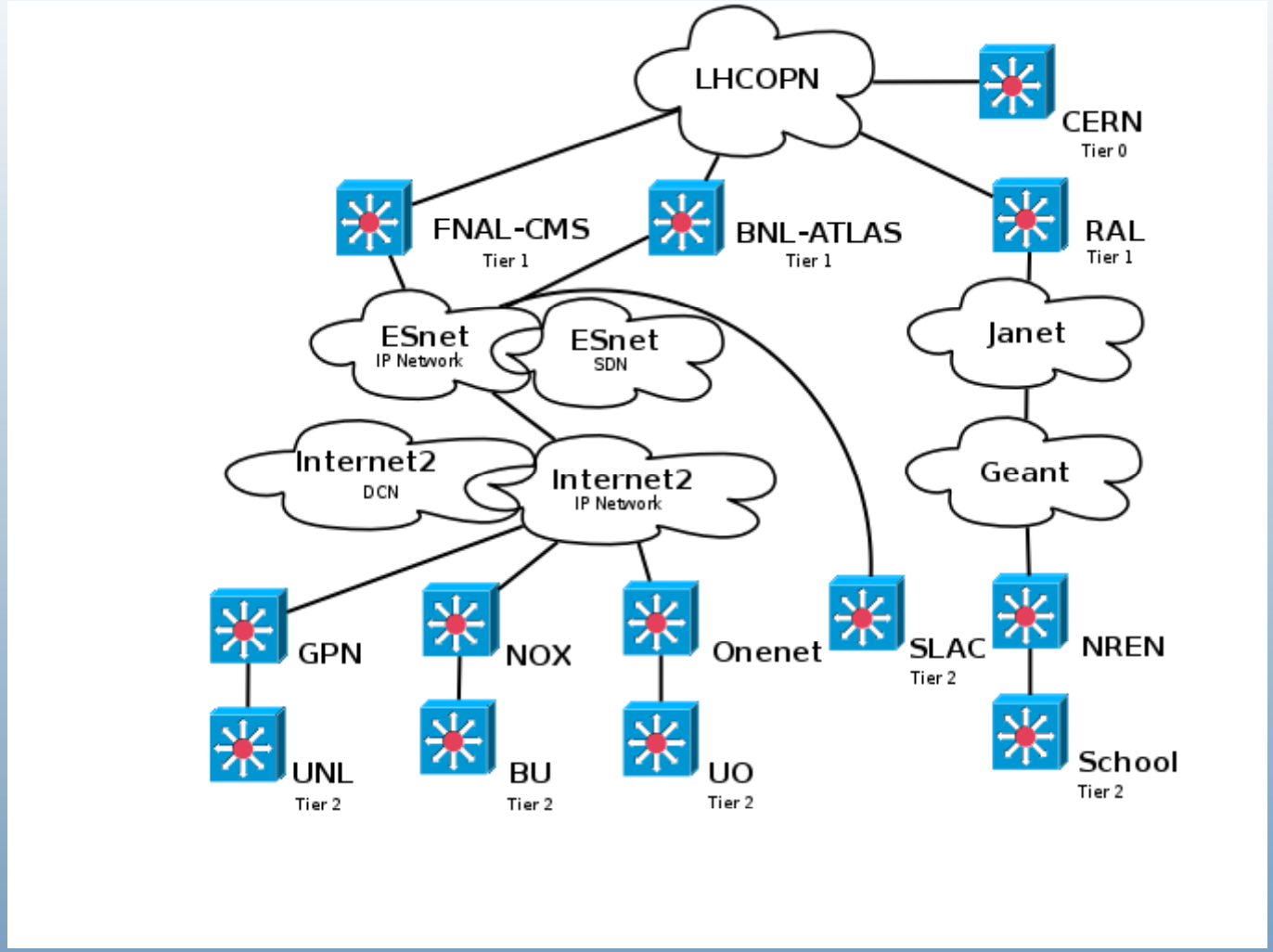
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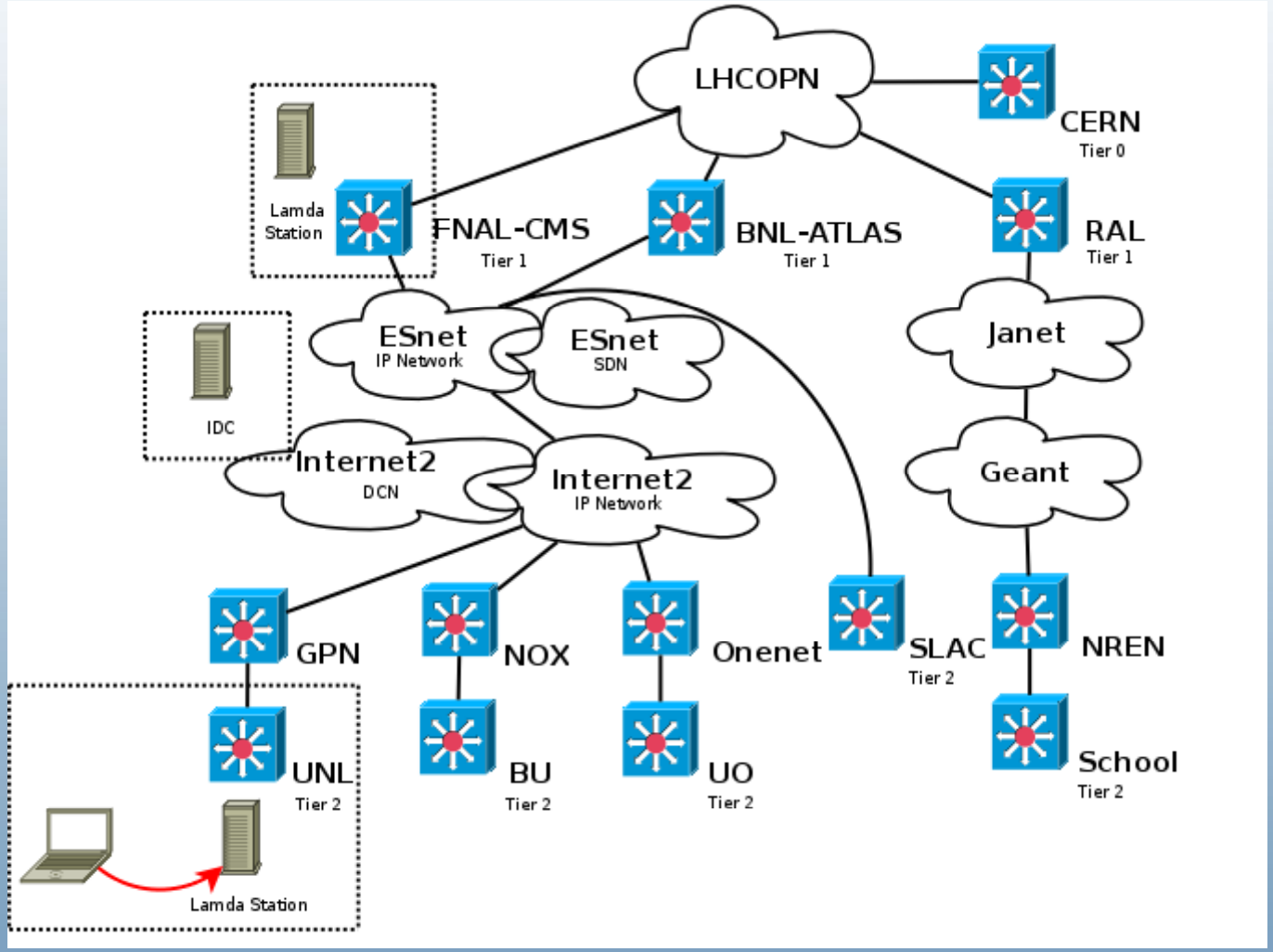
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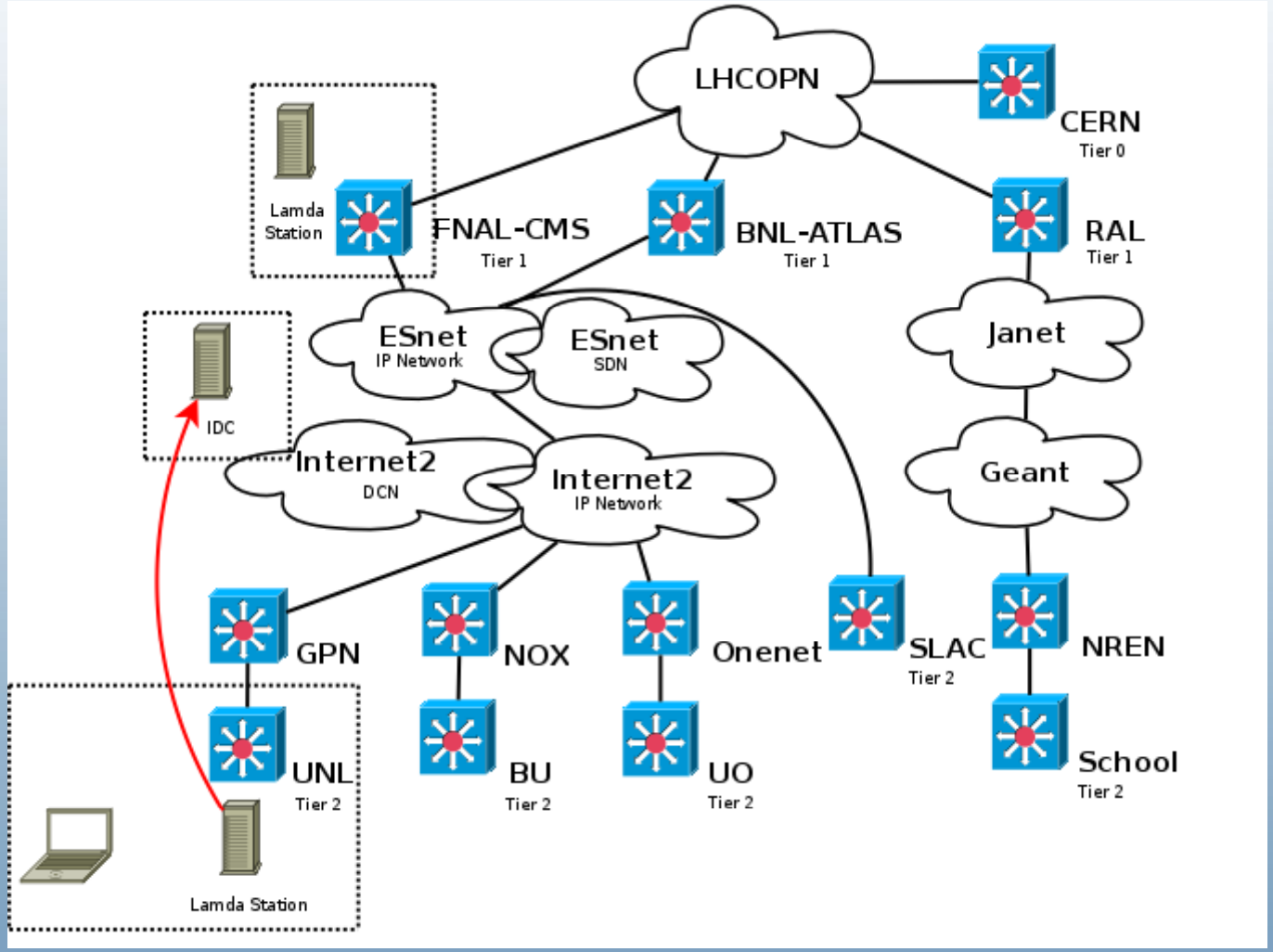
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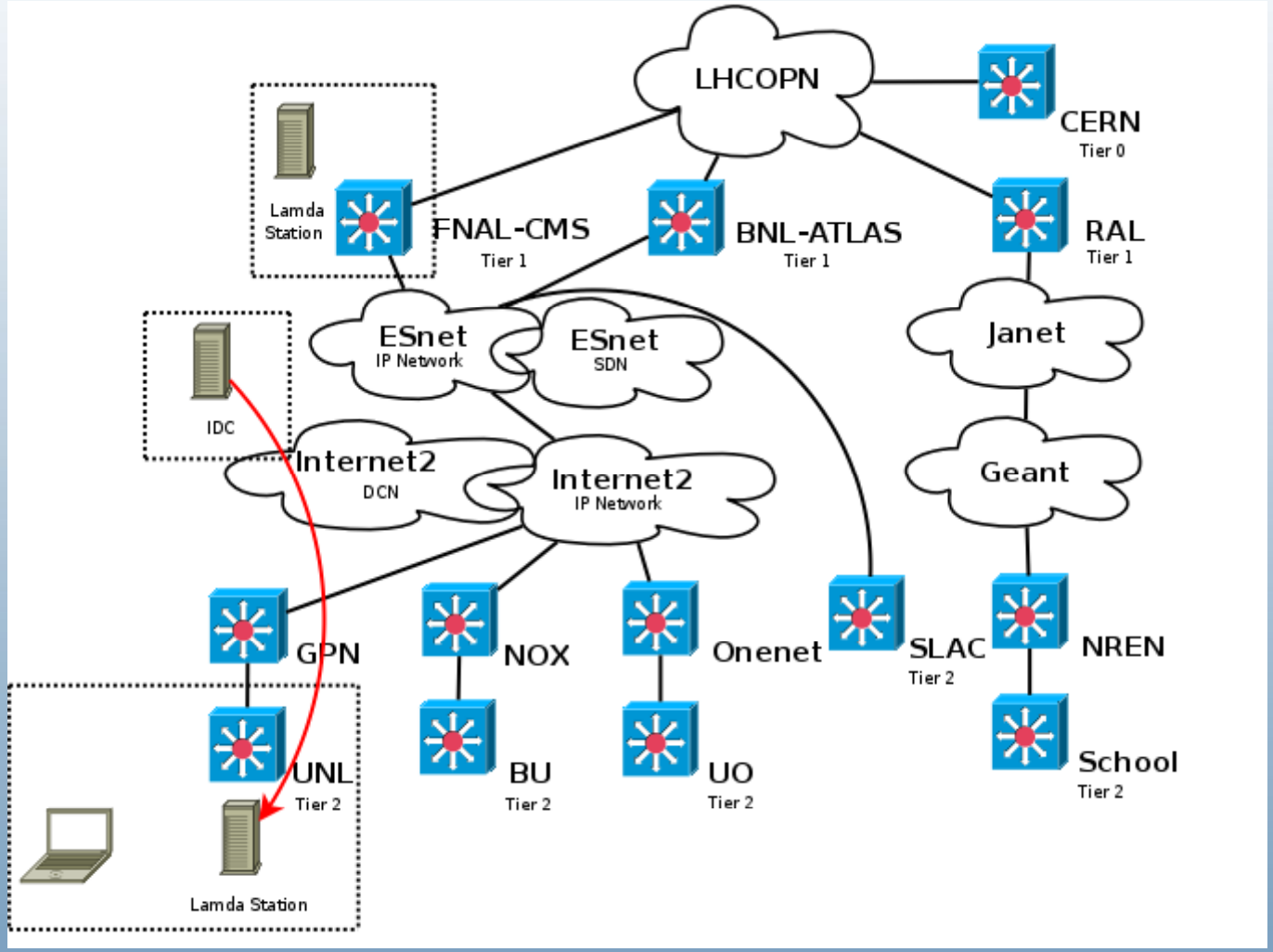
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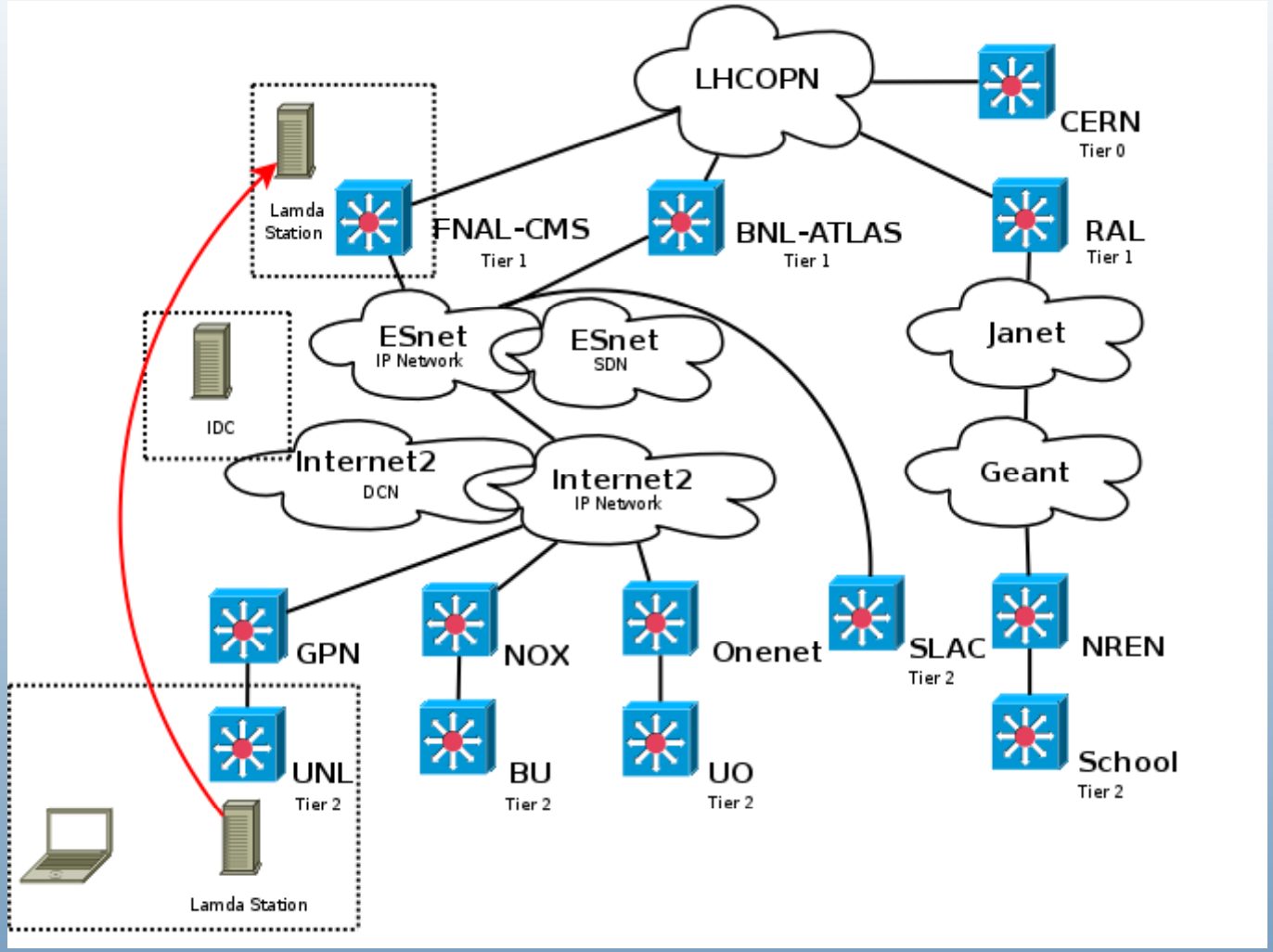
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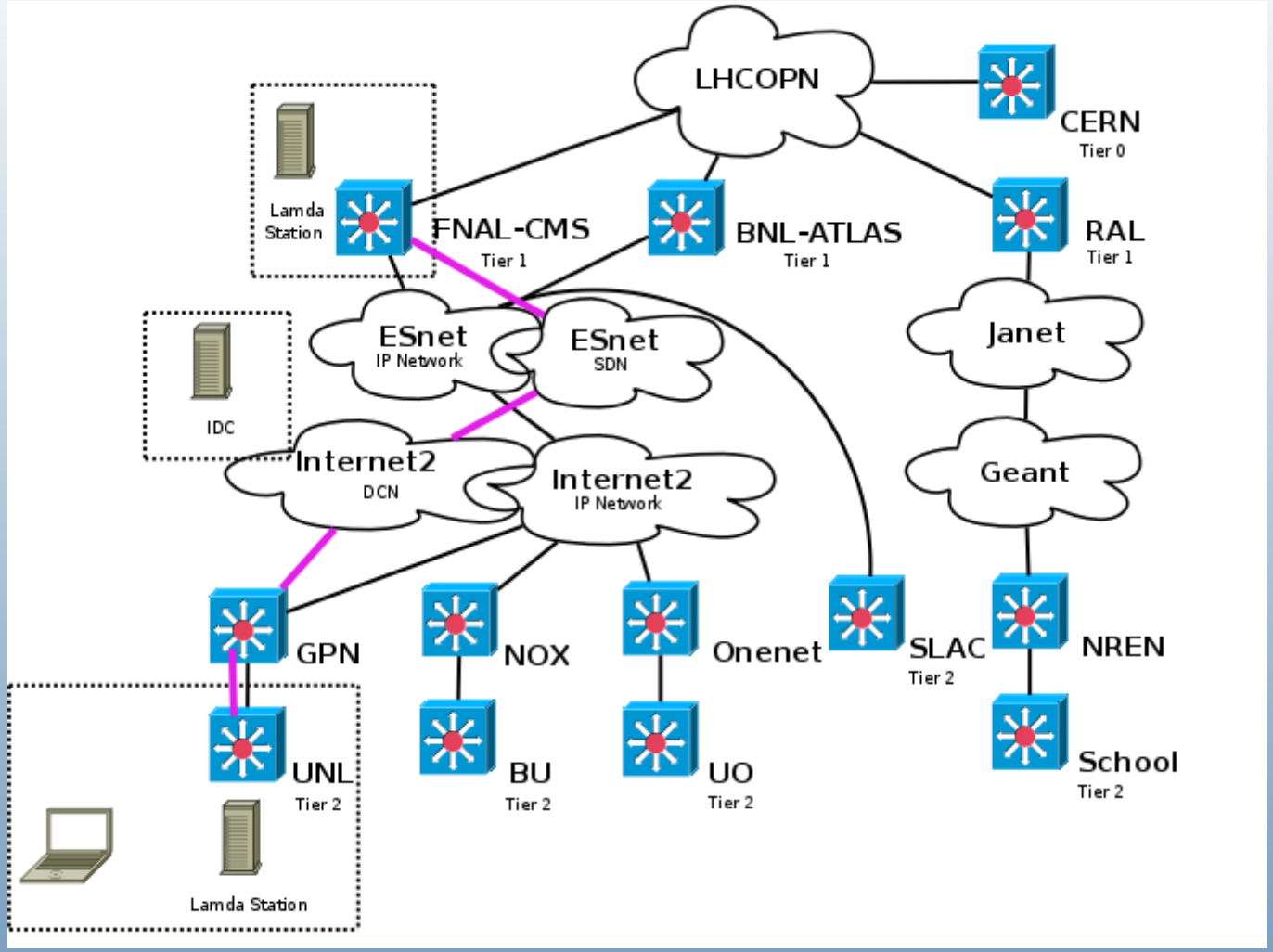
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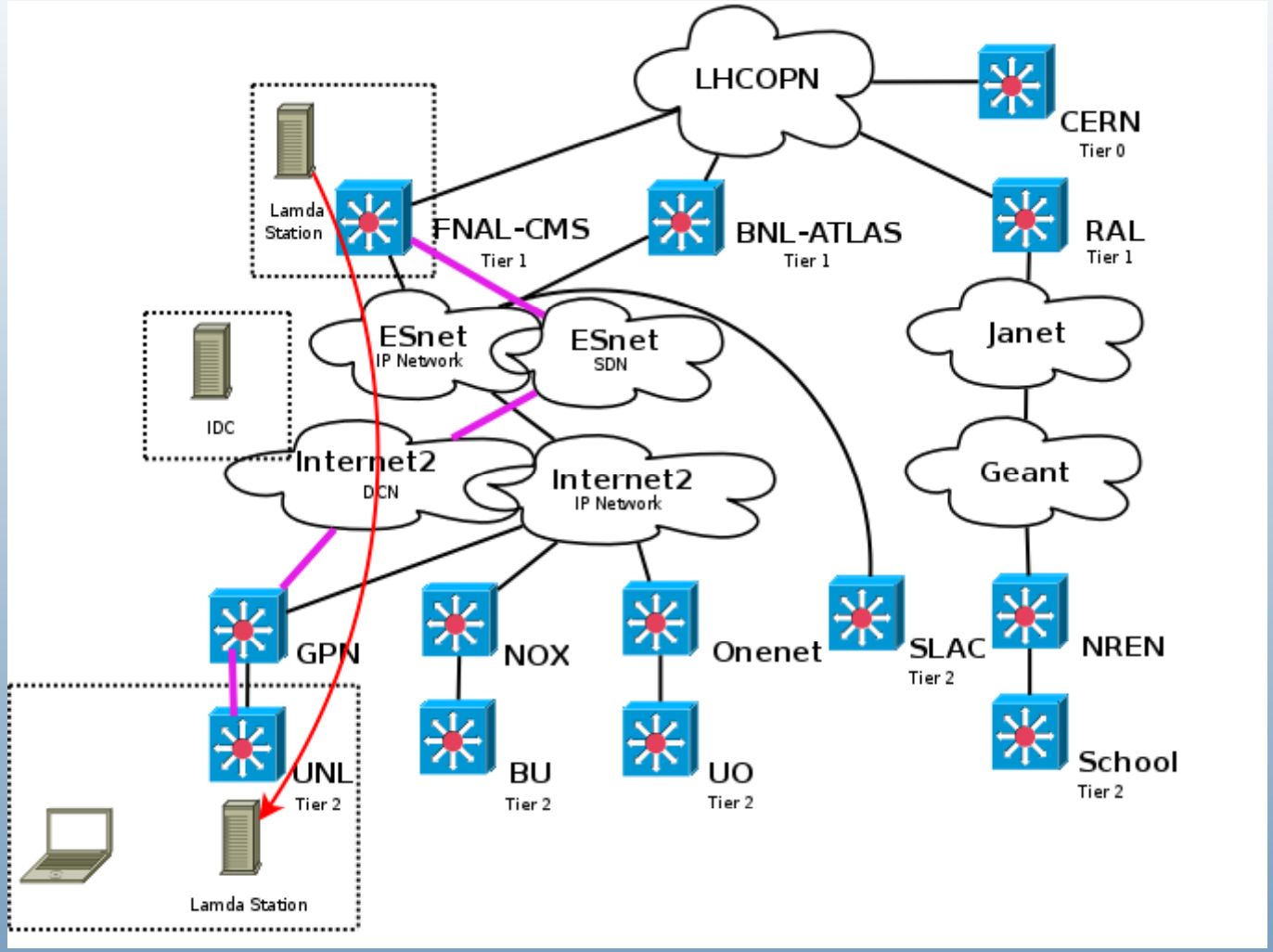
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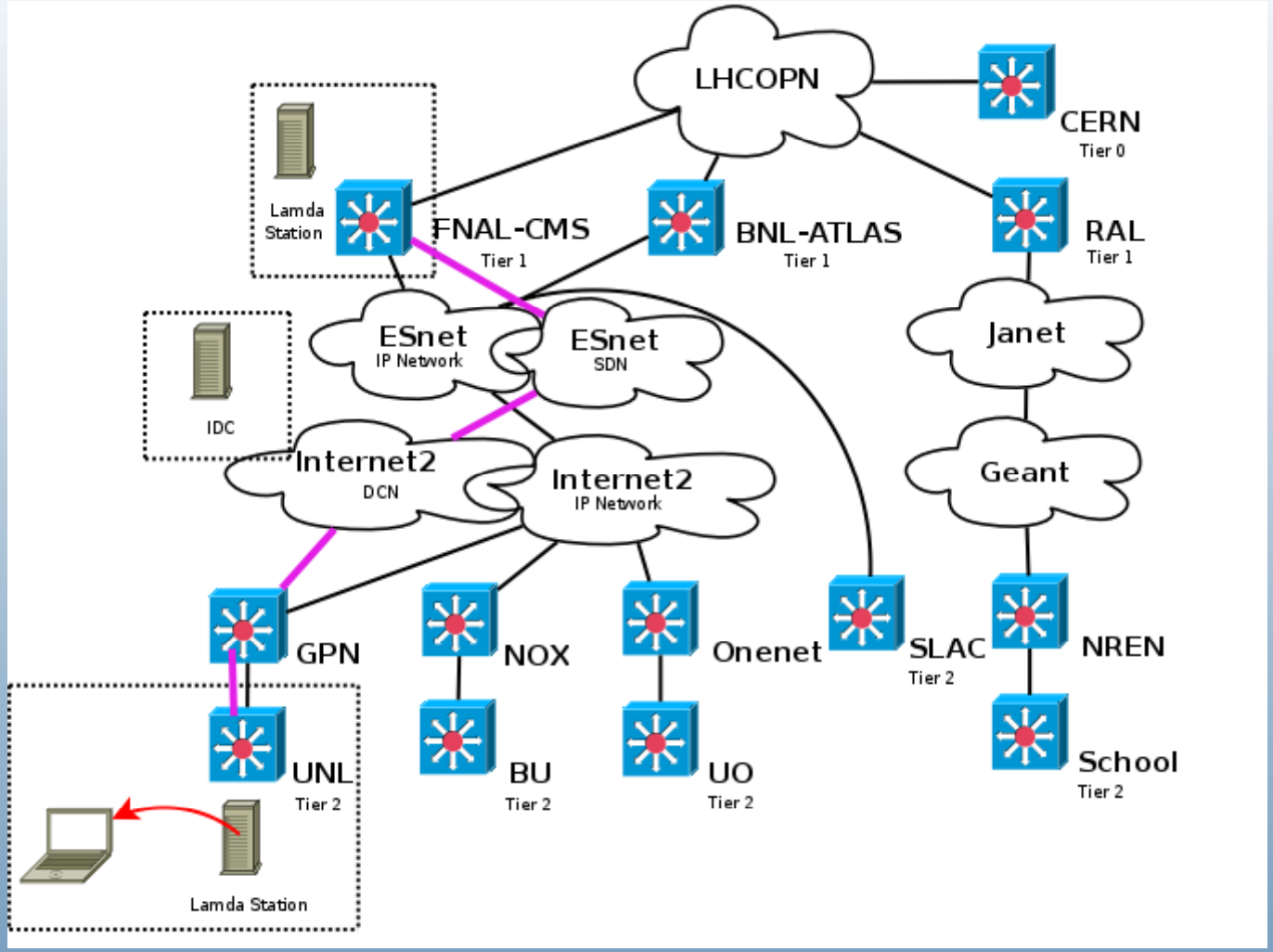
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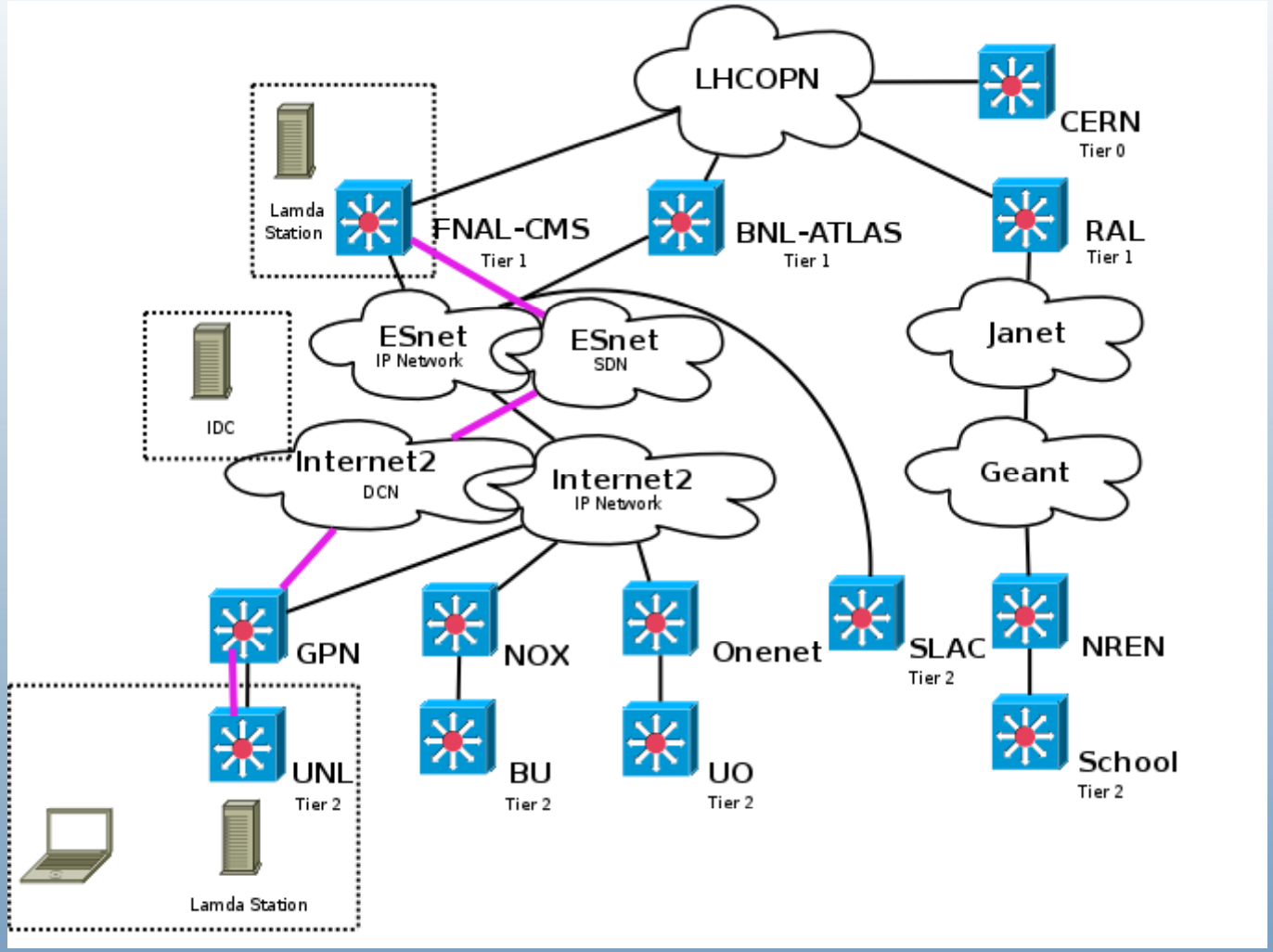
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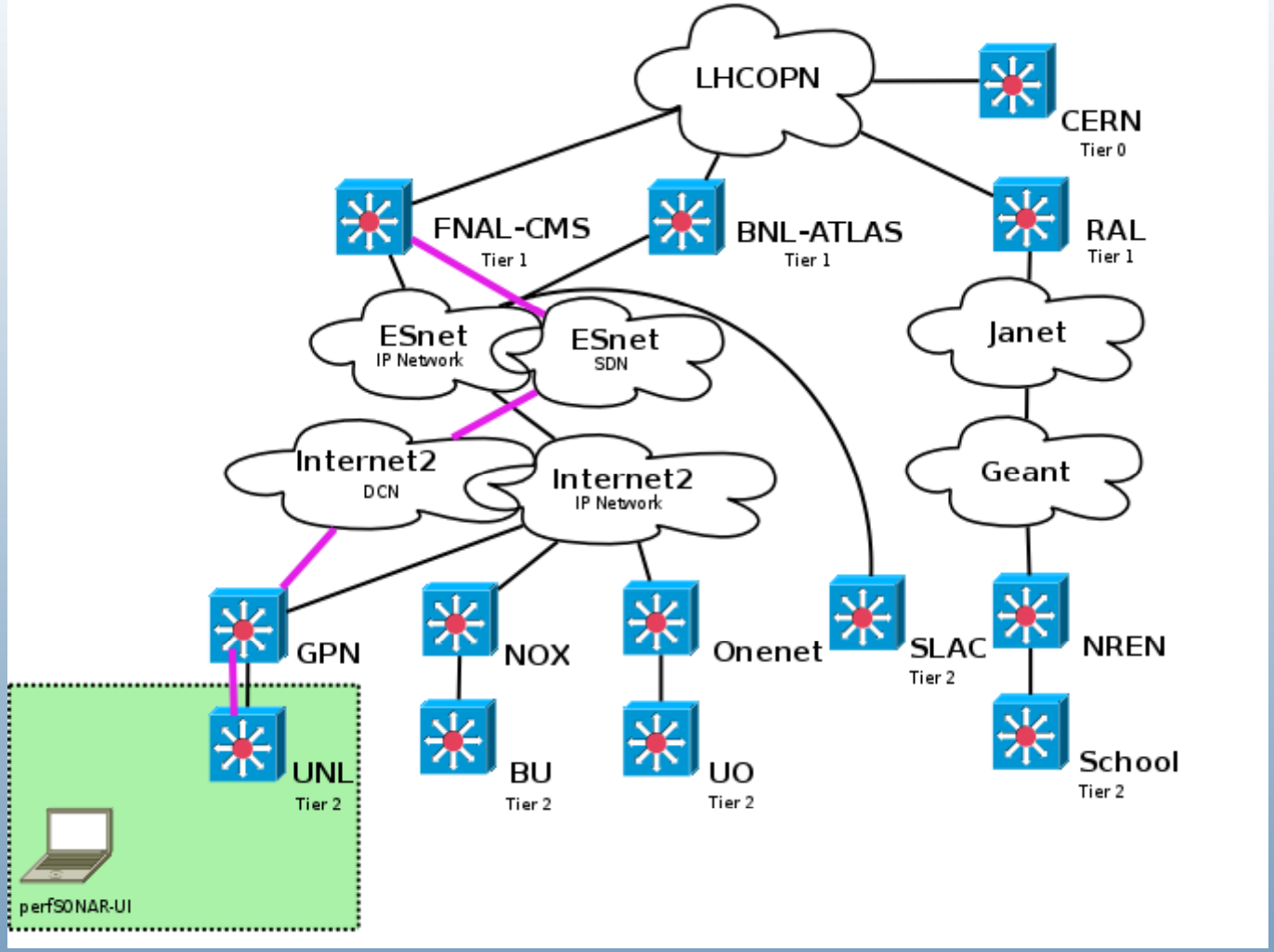
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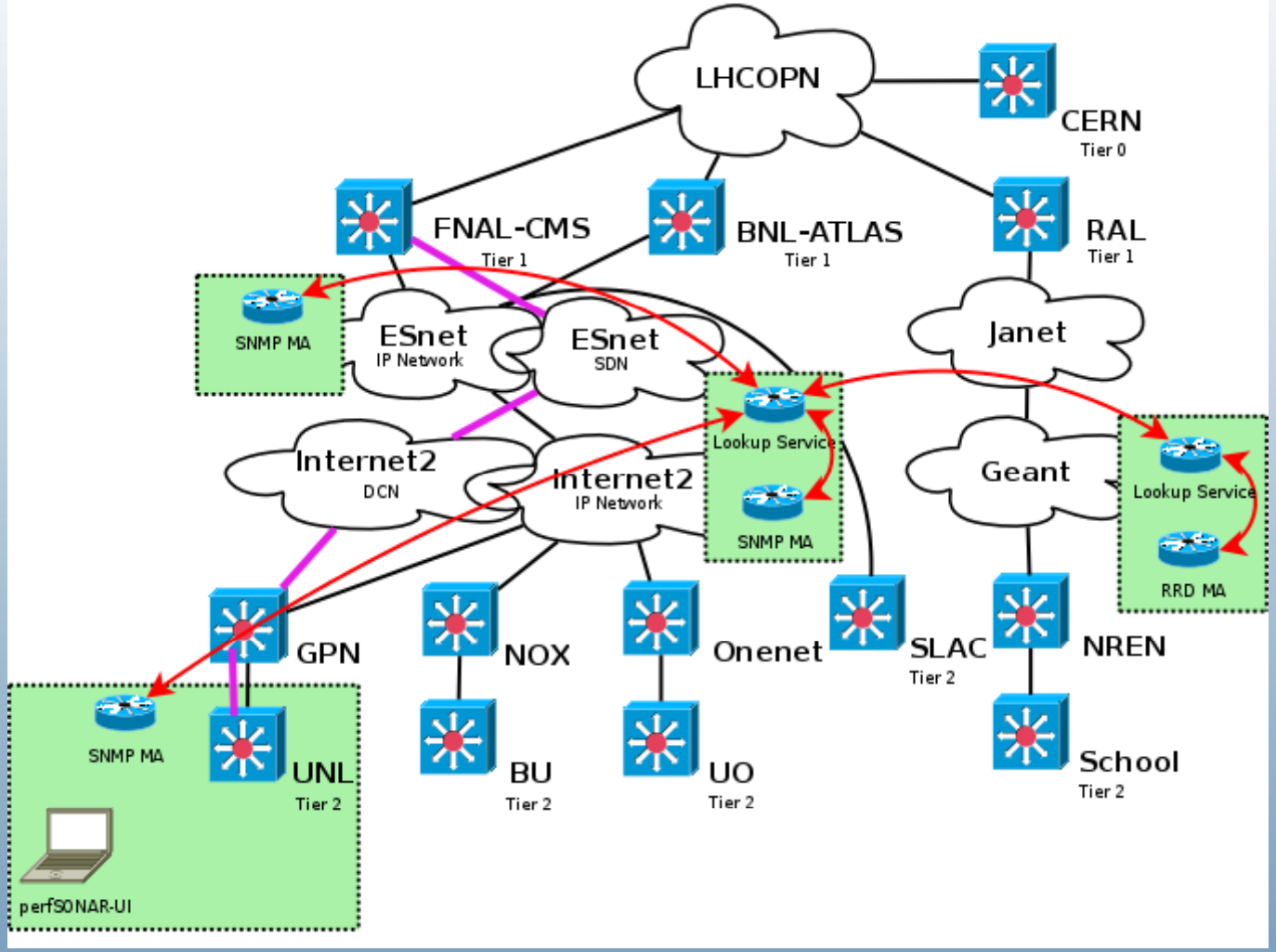
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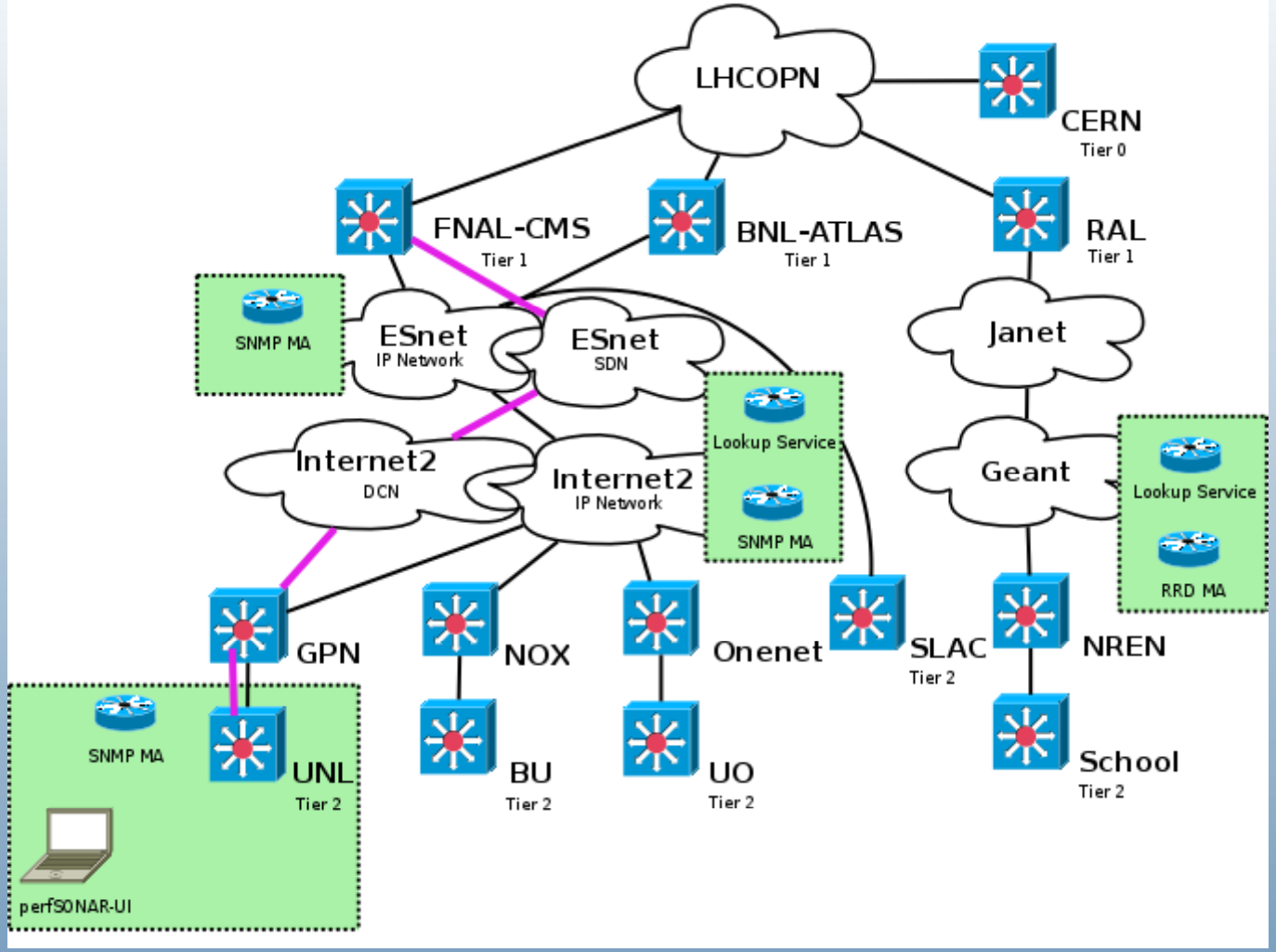
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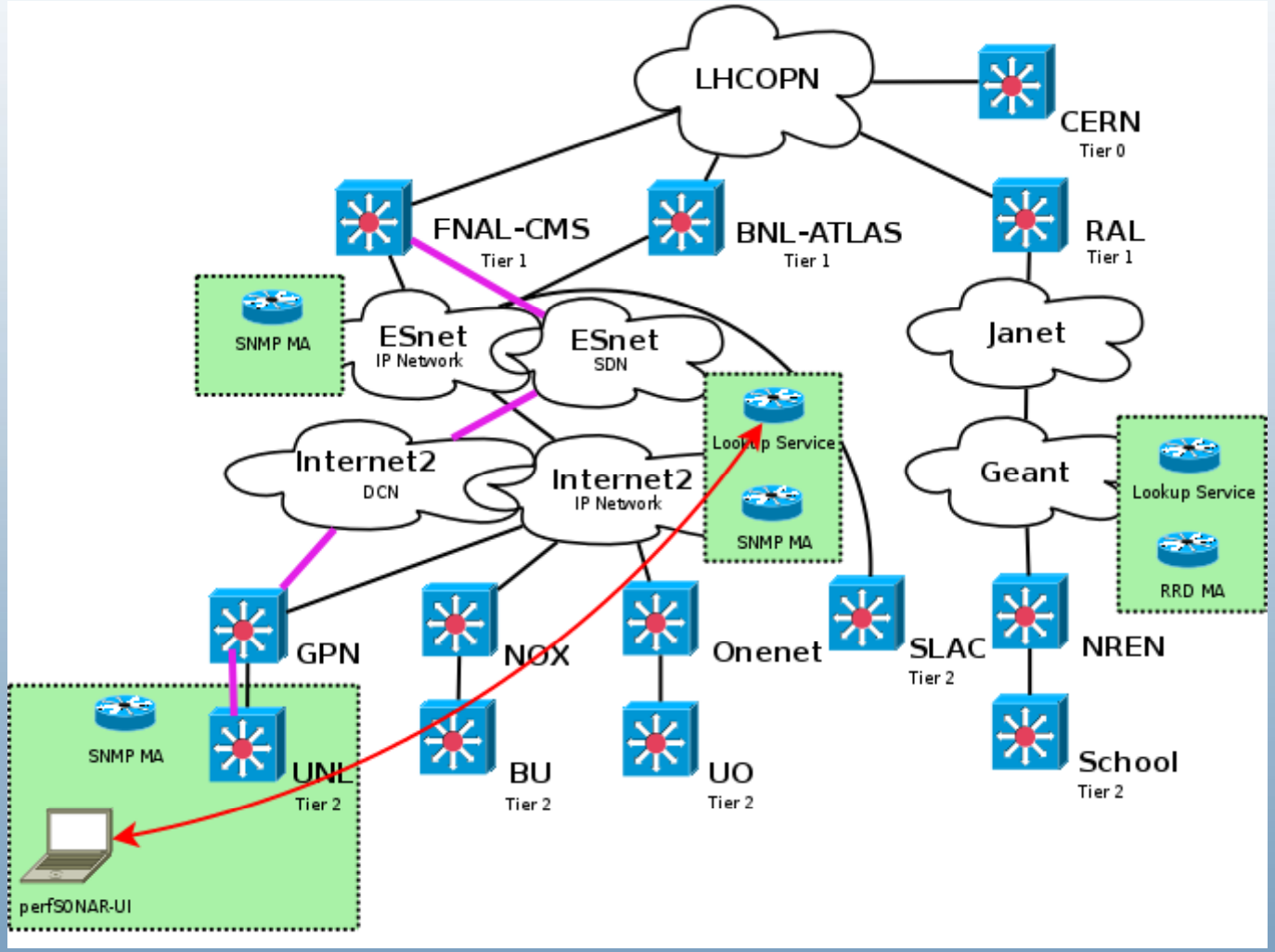
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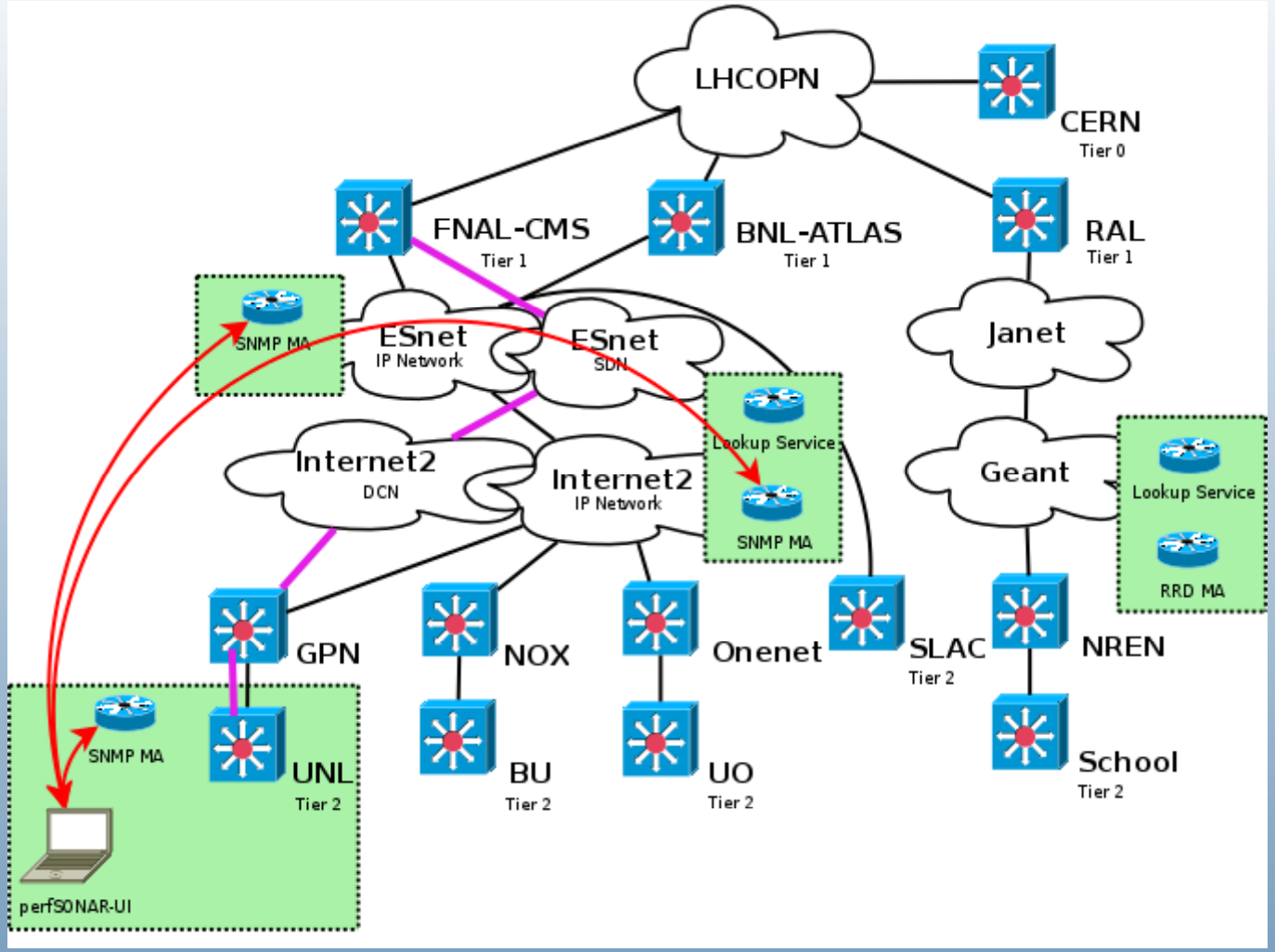
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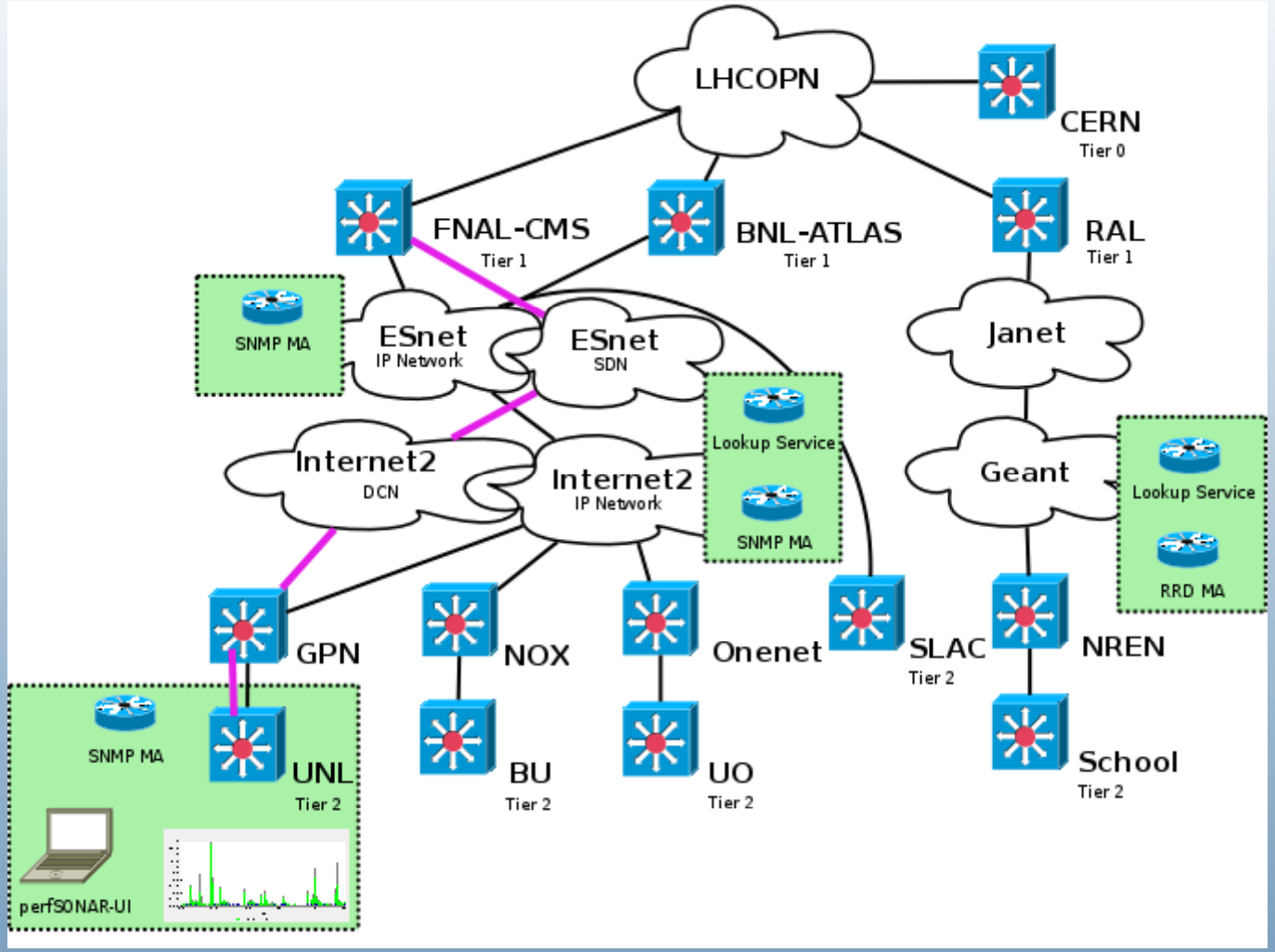
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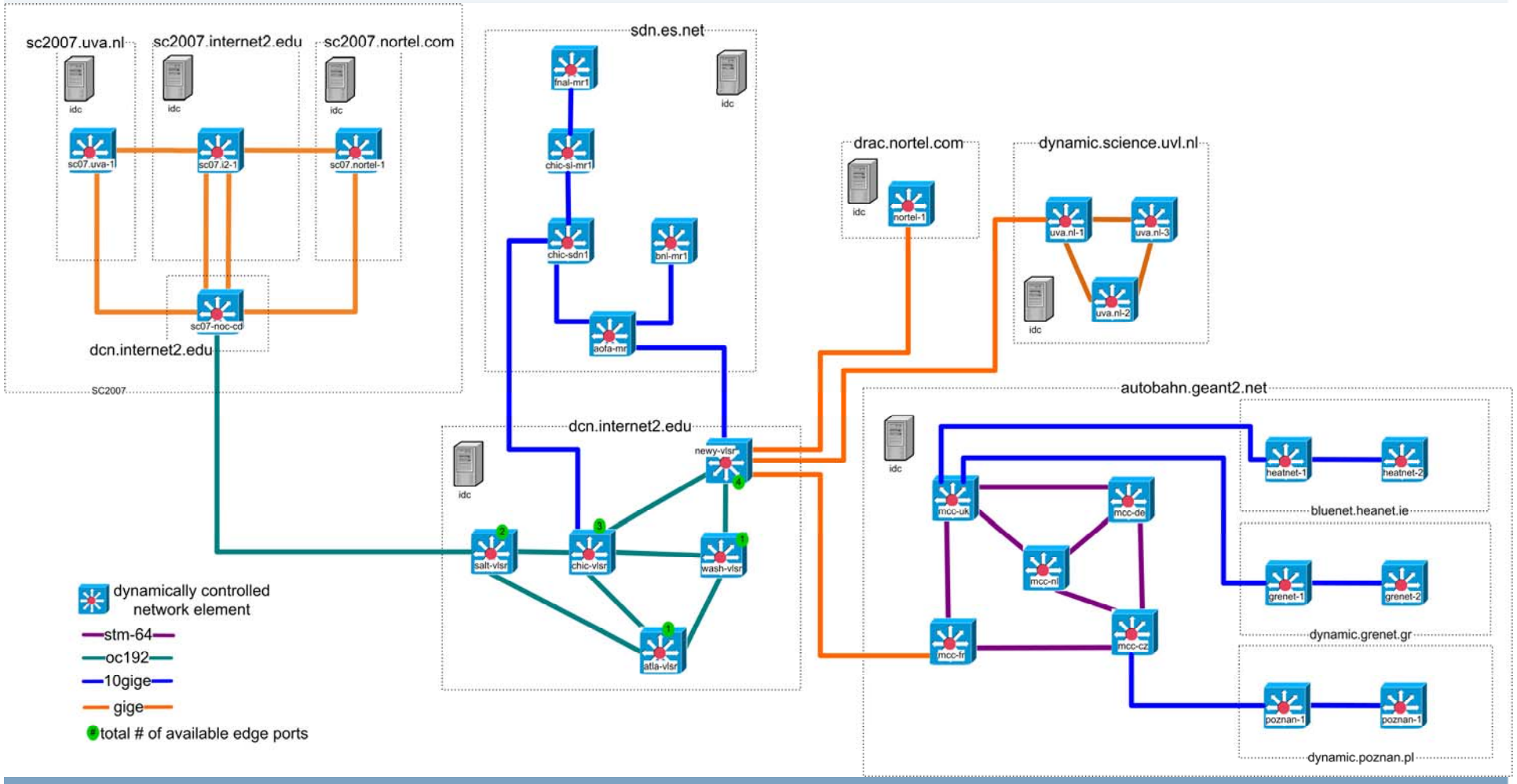
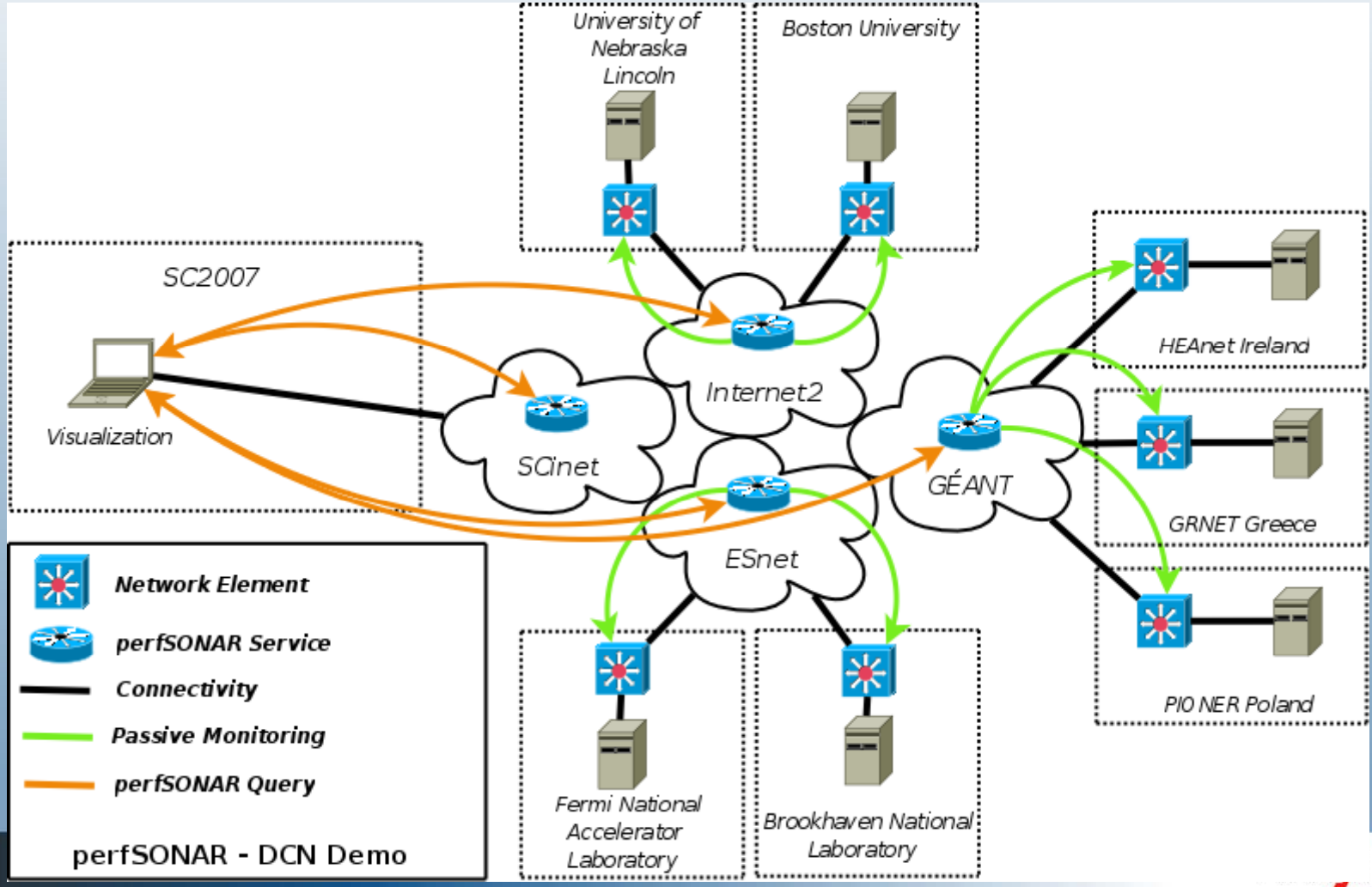
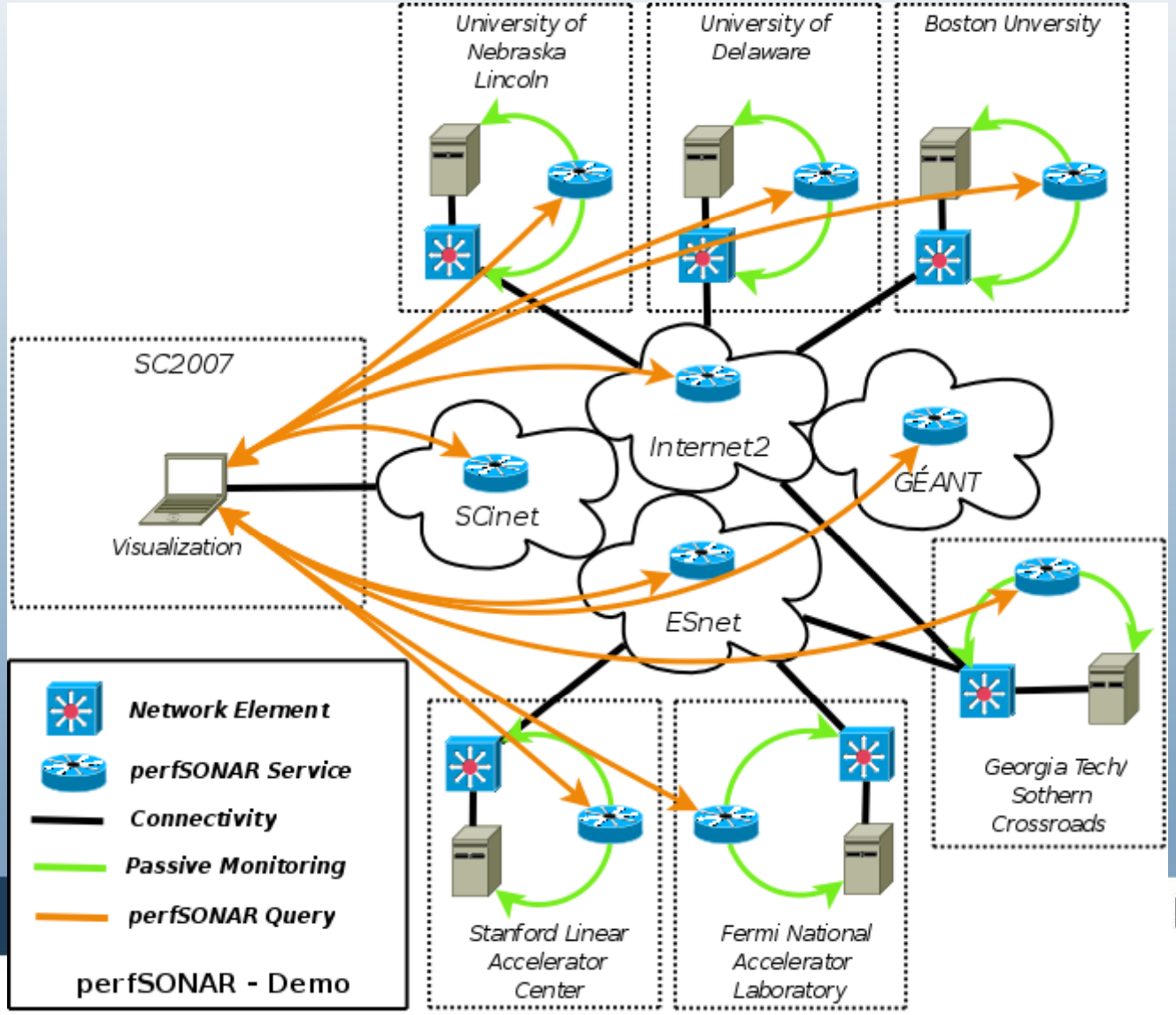
DCN Demos at SC 07



perfSONAR Monitoring of DCN Demos at SC 07



perfSONAR Monitoring at SC 07



#7 GEANT2: Phoebus (DCN) Demo

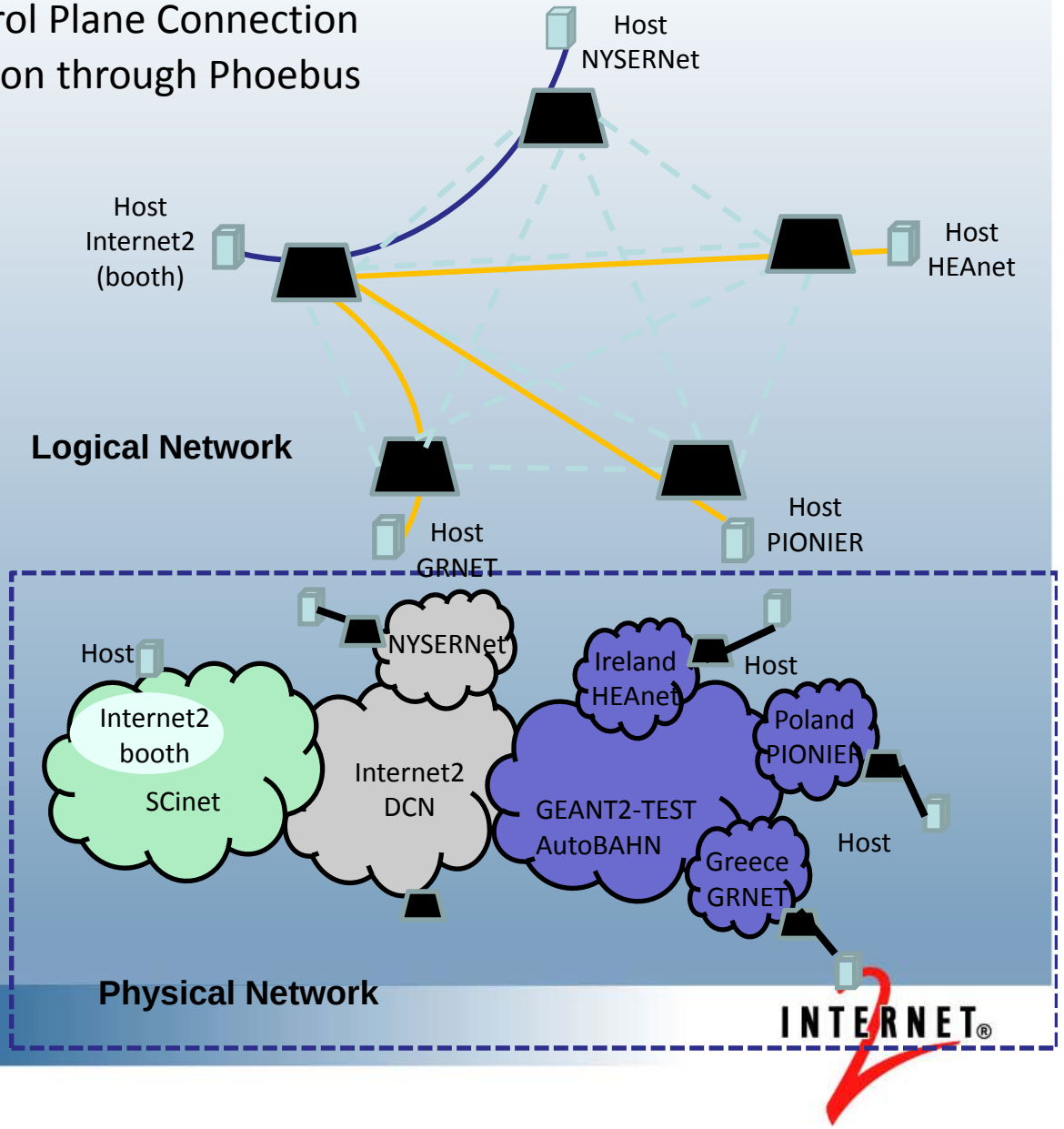
Phoebus Depot

IP Connection

Phoebus initiated Control Plane Connection

Host-to-Host Connection through Phoebus

Phoebus file transfer capability over 1 GigE between the US and HEAnet and the US and PIONIER, where intermediate Phoebus adaptation points leverage DCN capabilities to improve performance over long-haul, low-loss backbone networks.



AutoBAHN: GEANT2's Automated Bandwidth Allocation across Heterogeneous Networks
HEAnet: Ireland's Higher Education Authority Network
GRNET: Greek Research and Technology Network
PIONIER: Polish Optical Internet

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