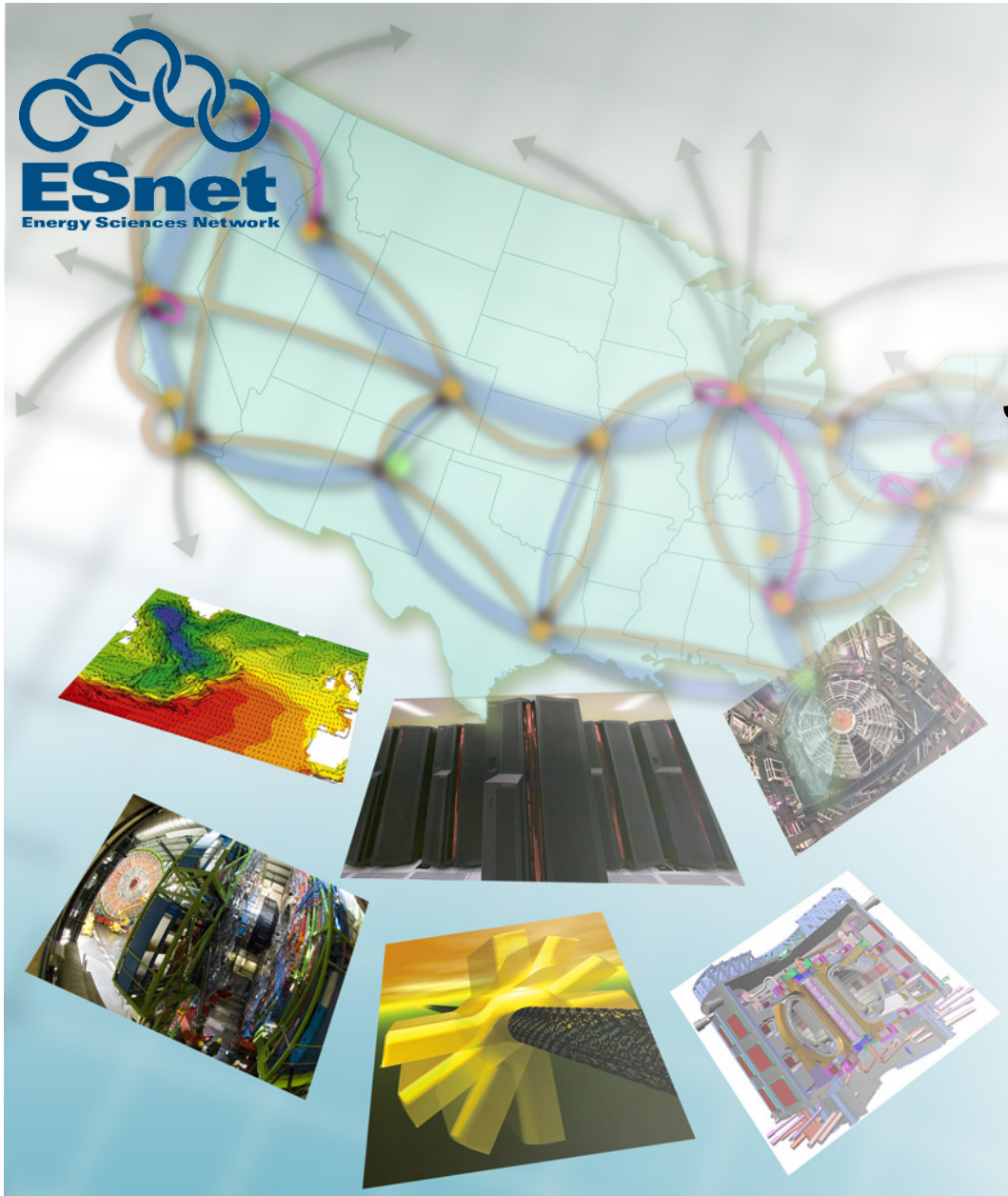
ESnet
Energy Sciences Network



ESnet Update
Summer 2007
Joint Techs Workshop

Joe Burrescia
ESnet General Manager

Energy Sciences Network
Lawrence Berkeley National Laboratory

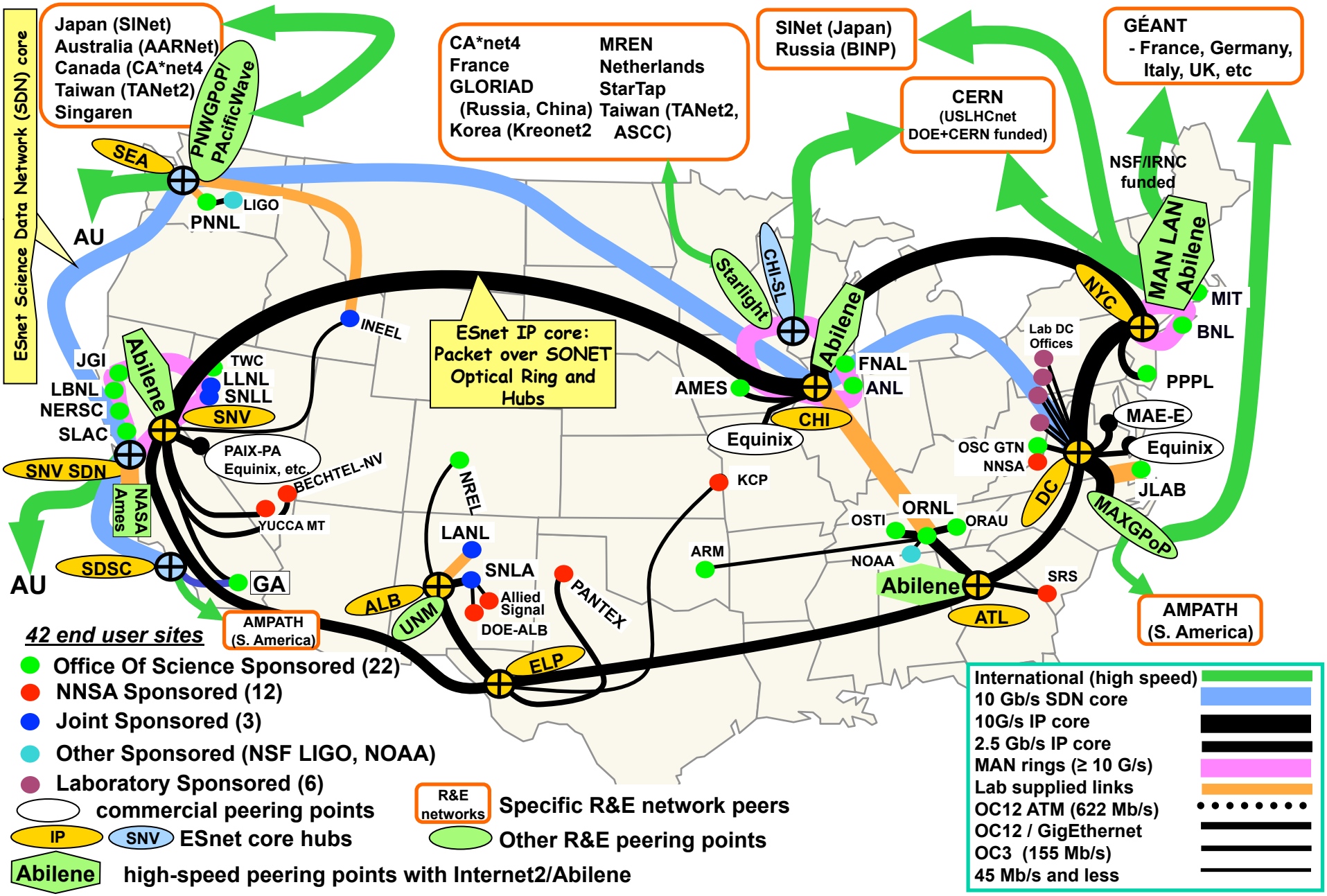
July 16,2007

Networking for the Future of Science

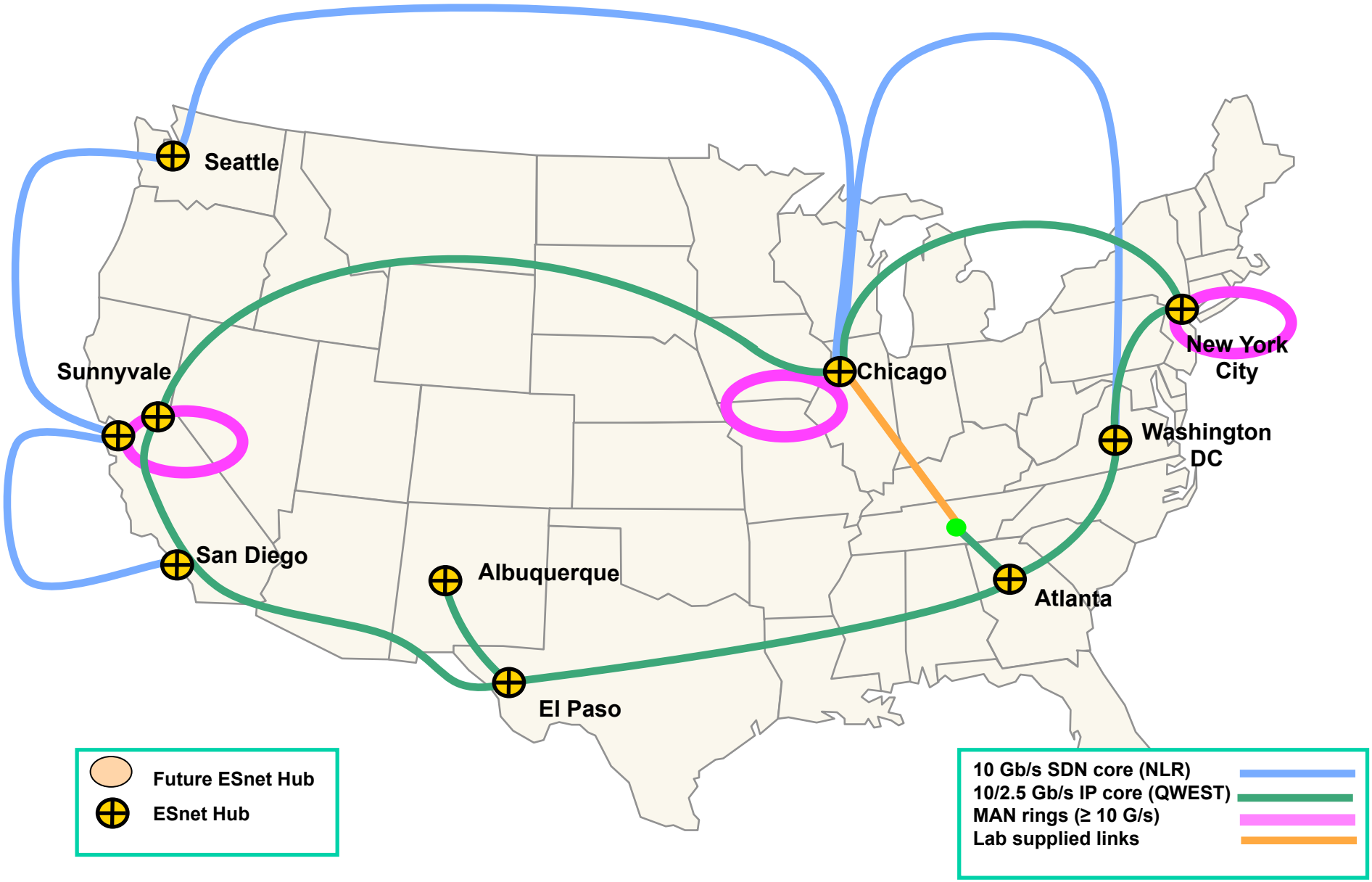
BERKELEY LAB

Office of Science
U.S. DEPARTMENT OF ENERGY

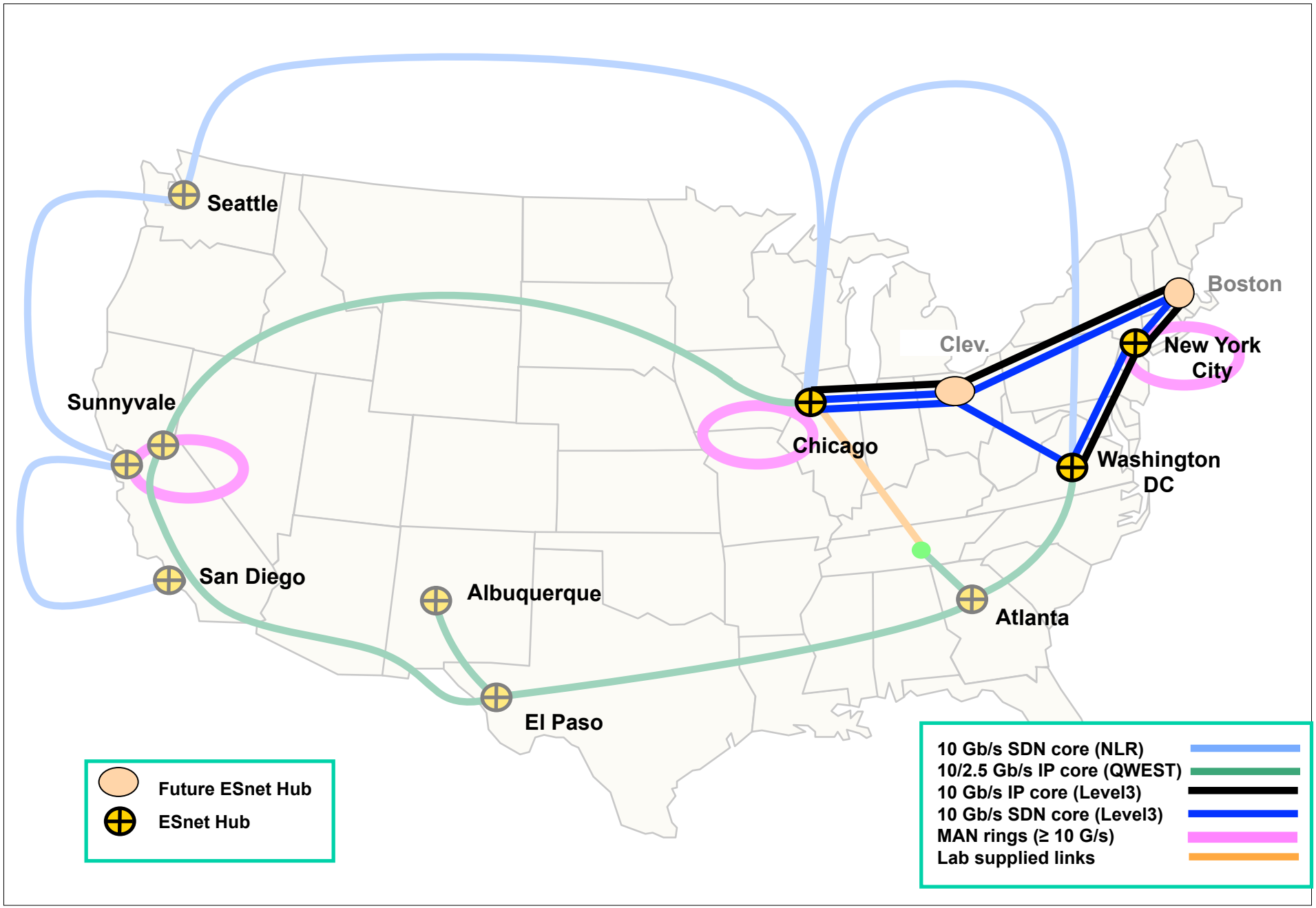
ESnet 3 with Sites and Peers (Early 2007)



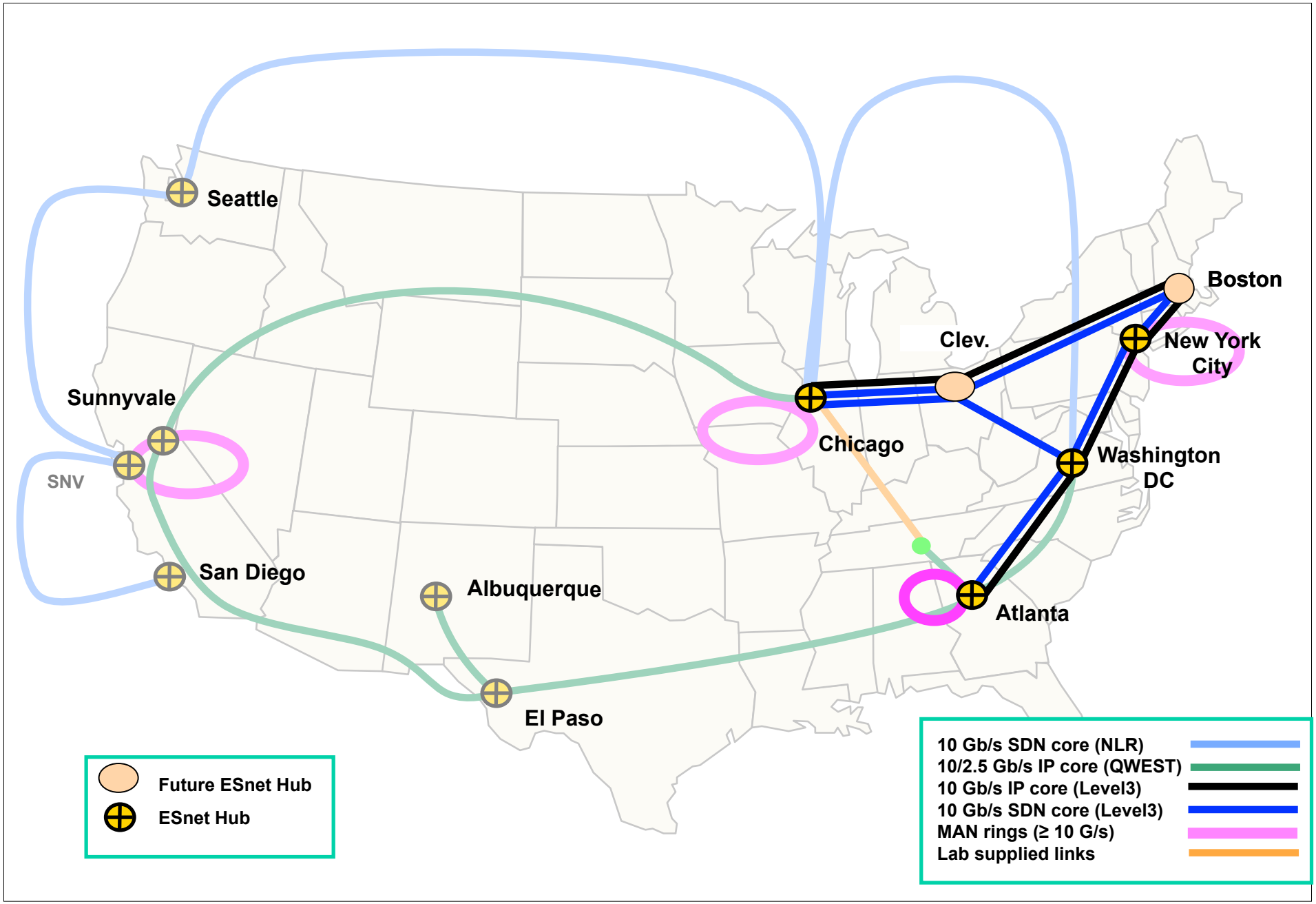
ESnet 3 Backbone as of January 1, 2007



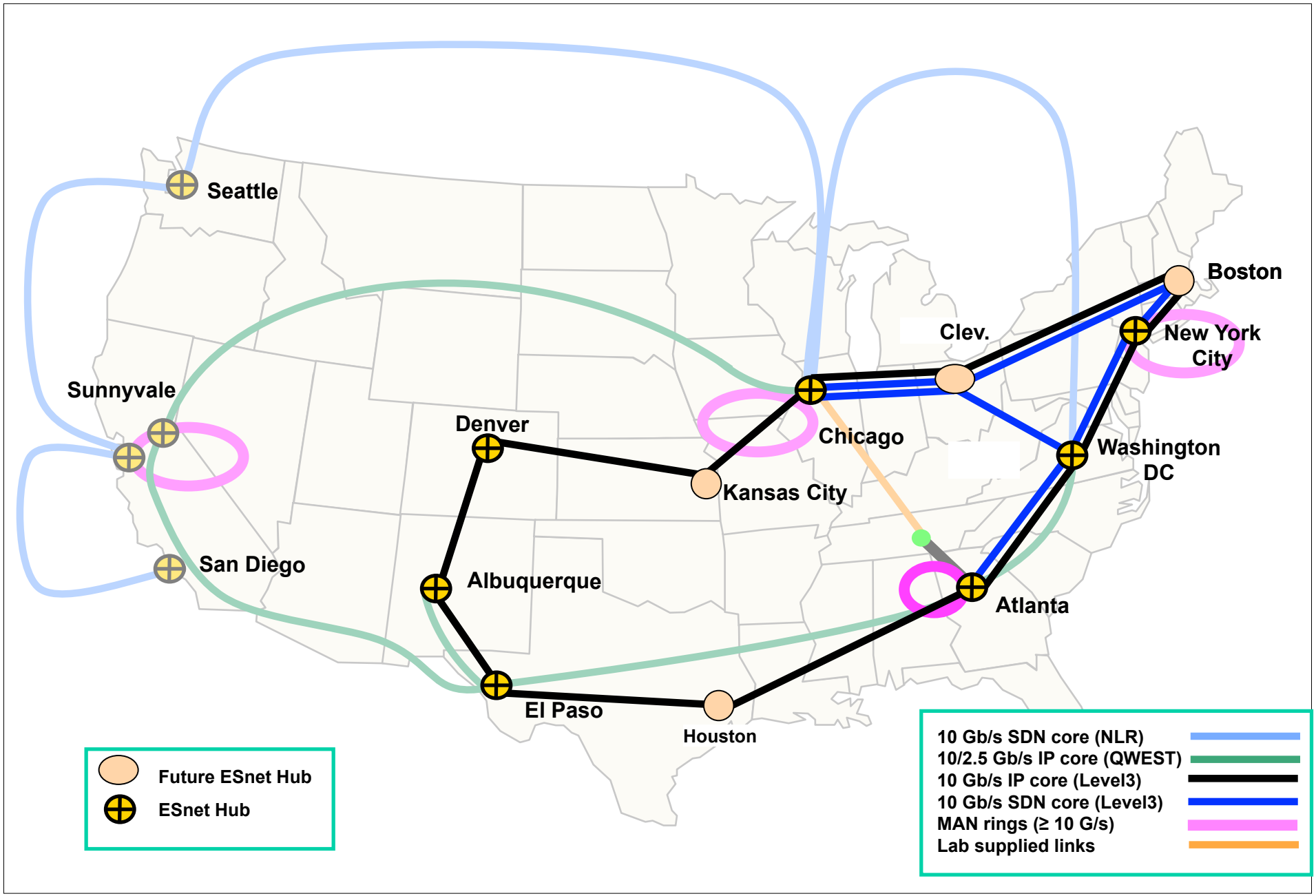
ESnet 4 Backbone as of April 15, 2007



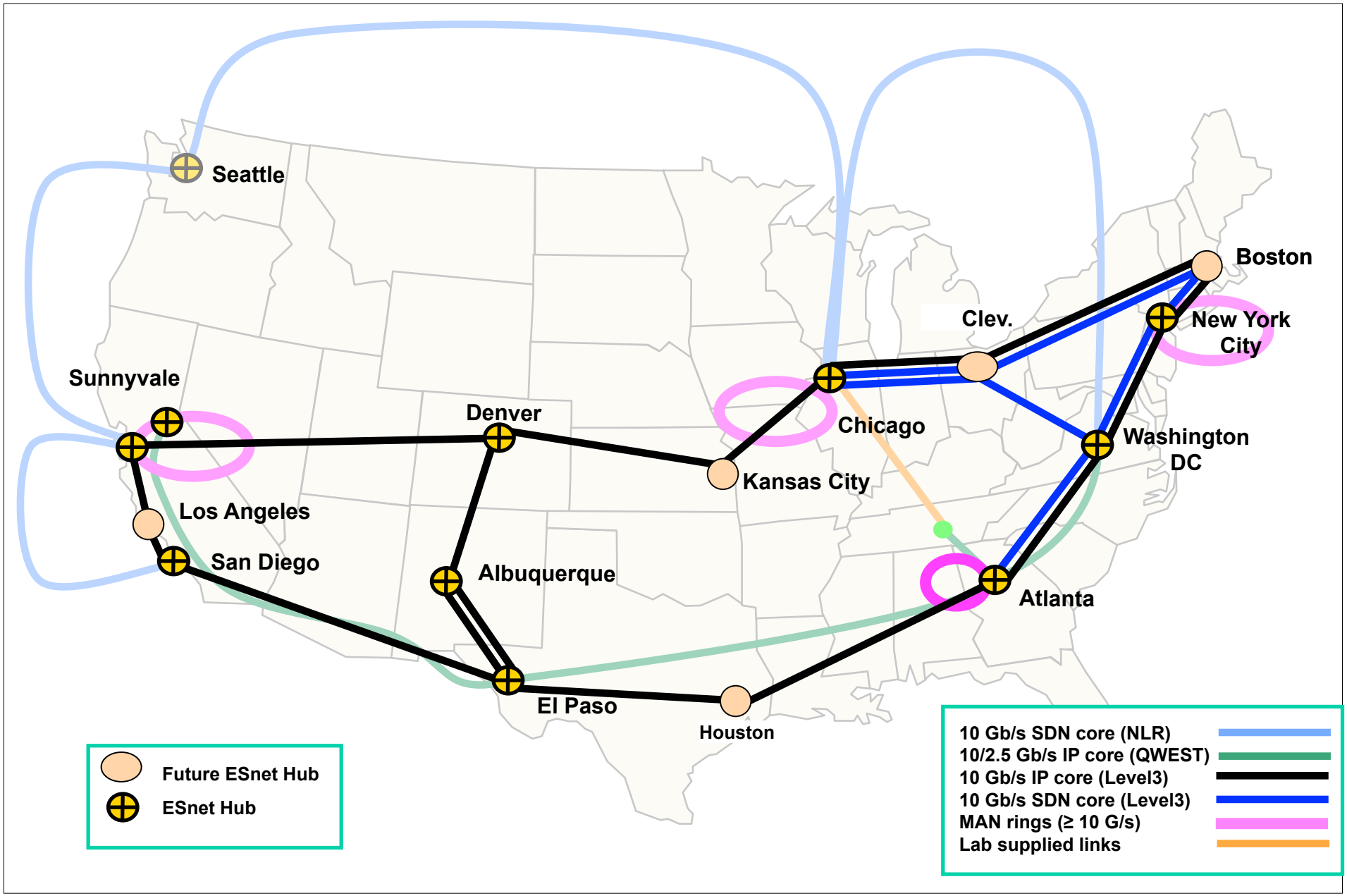
ESnet 4 Backbone as of May 15, 2007



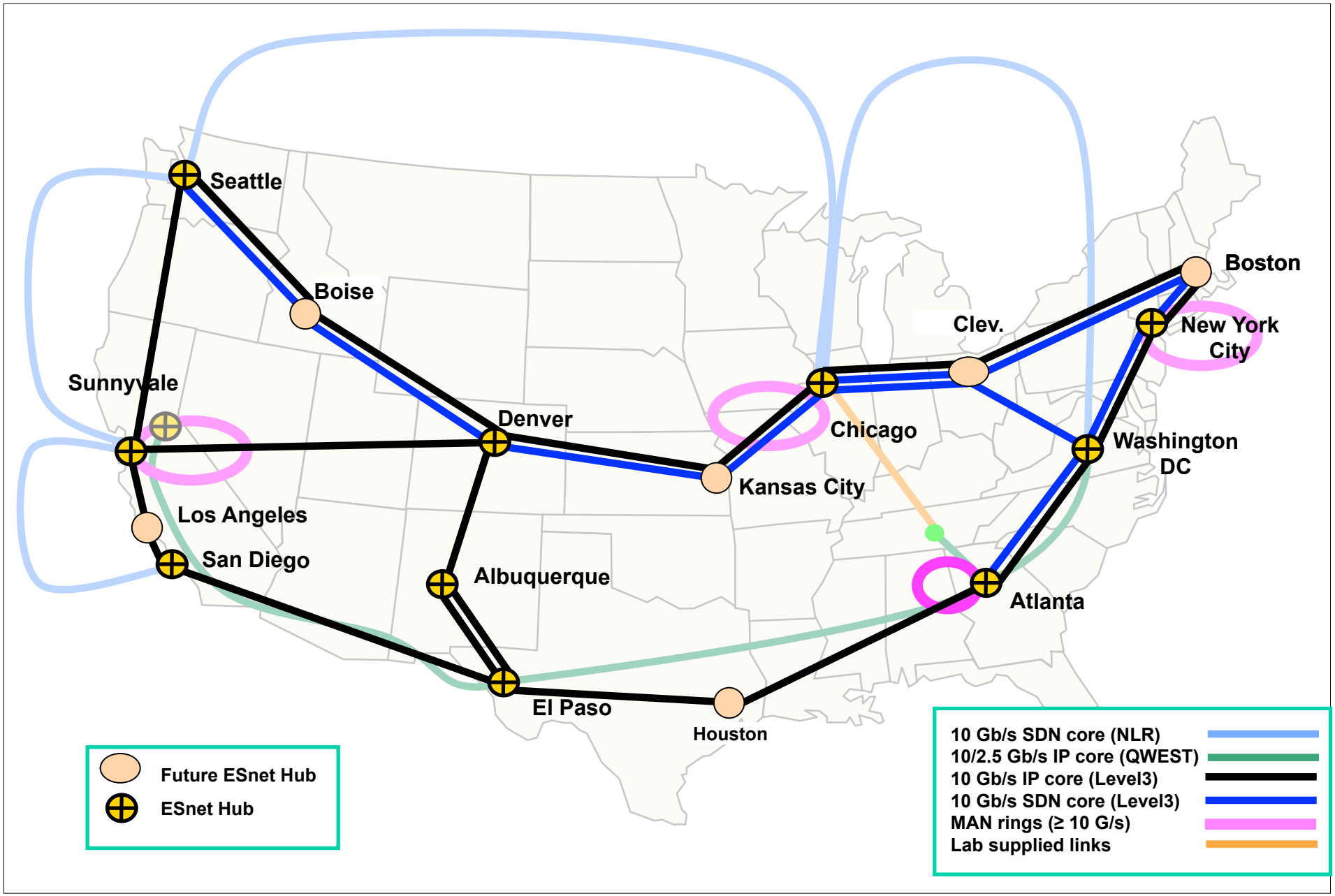
ESnet 4 Backbone as of June 20, 2007



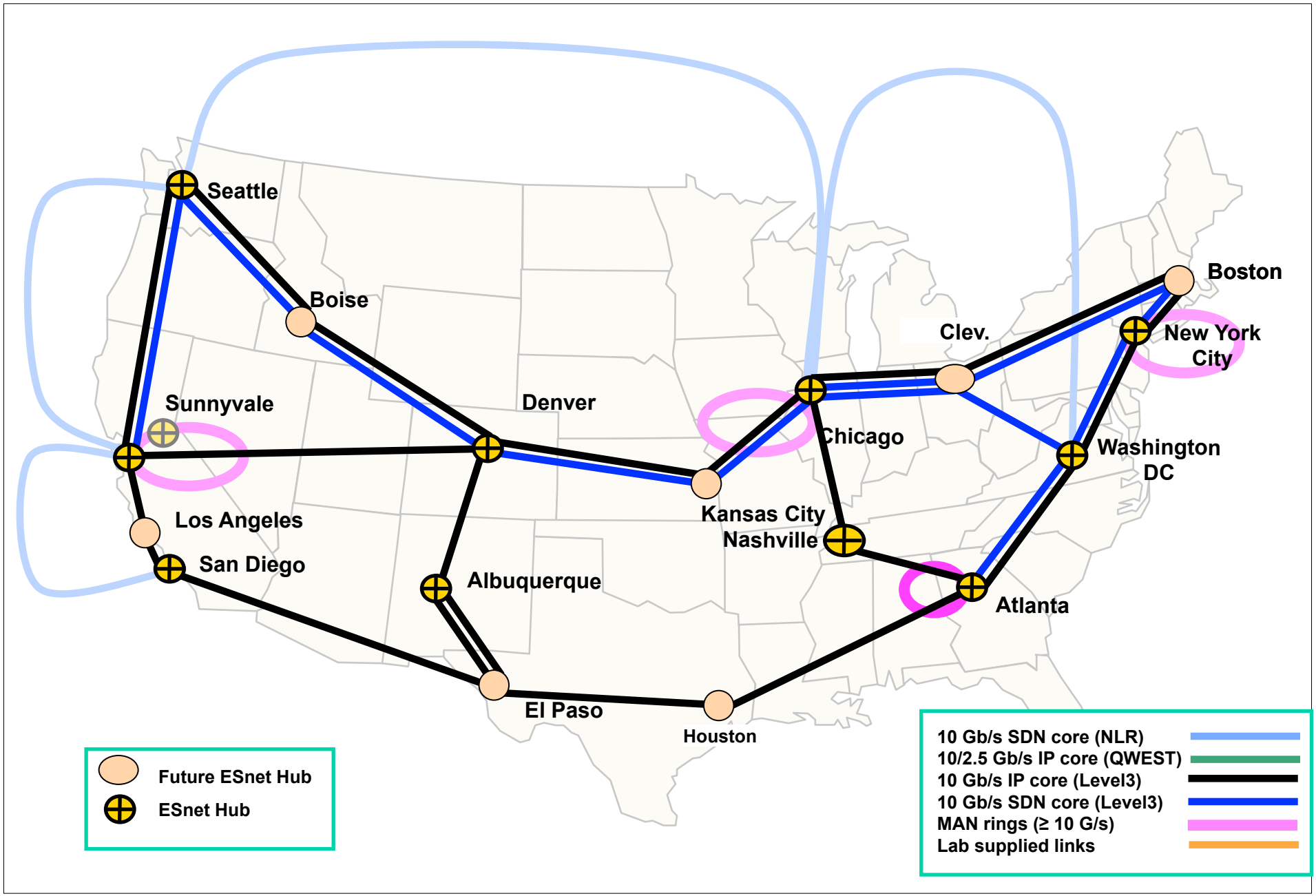
ESnet 4 Backbone Target August 1, 2007



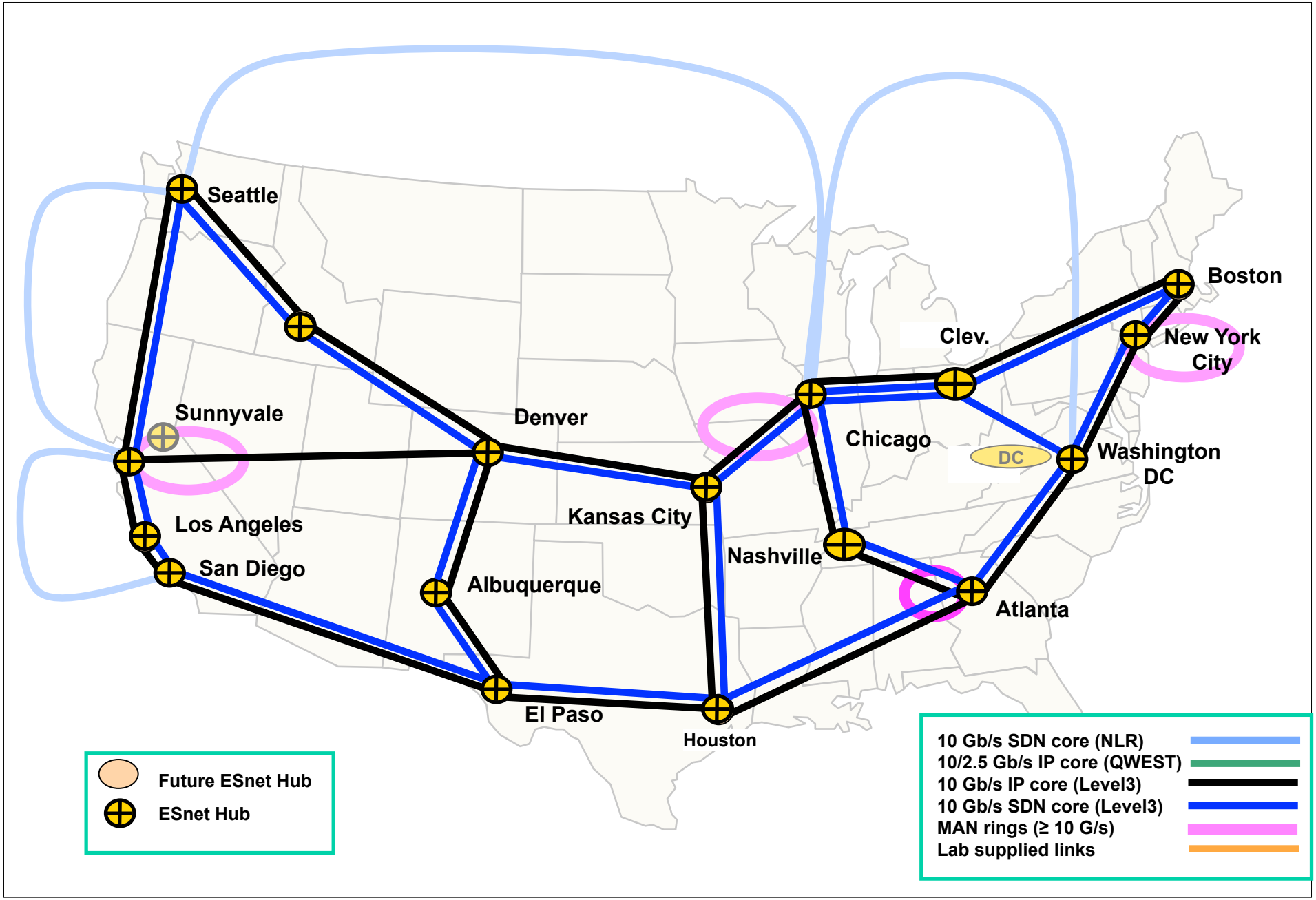
ESnet 4 Backbone Target August 30, 2007



ESnet 4 Backbone Target September 30, 2007

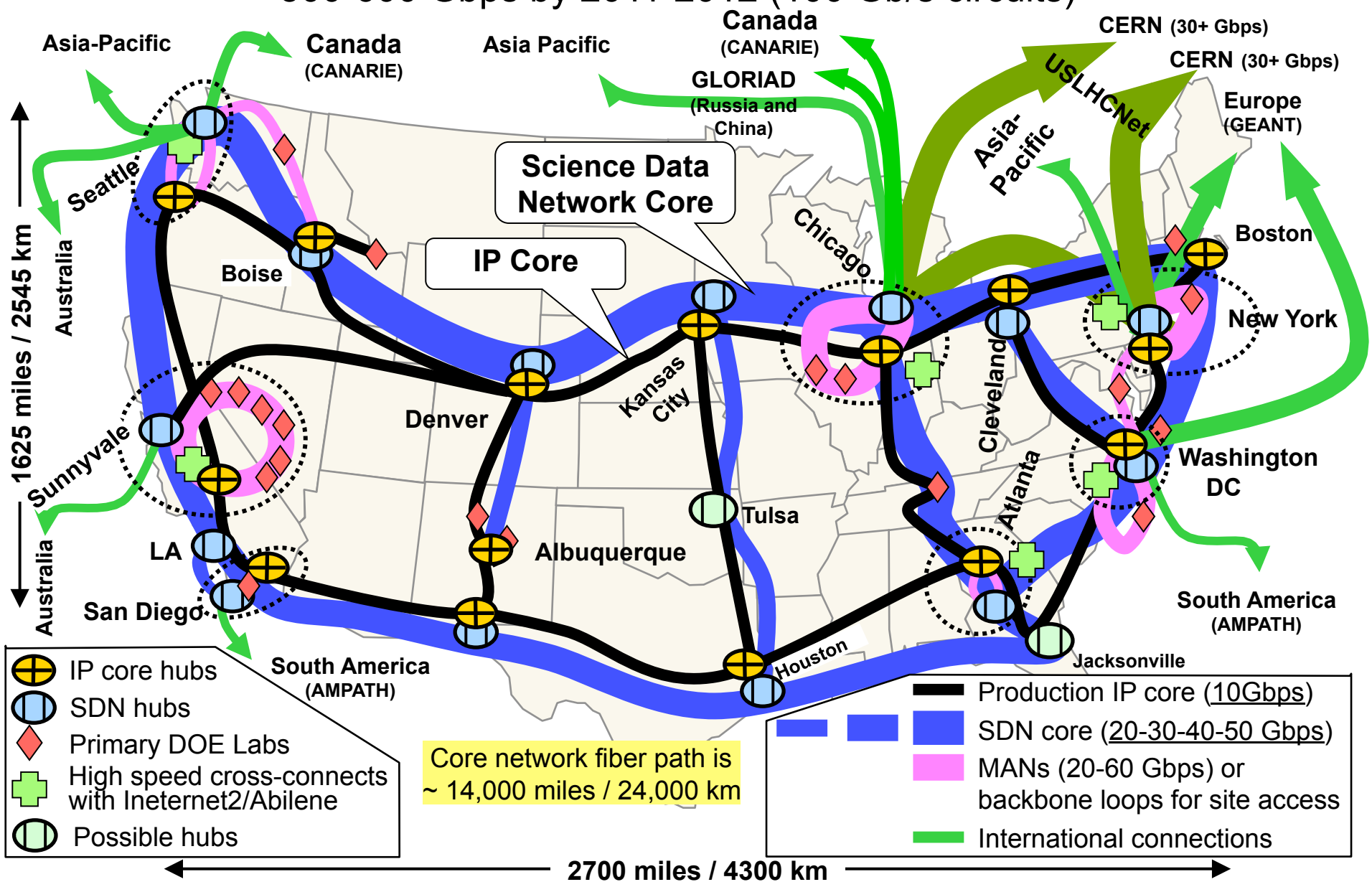


ESnet 4 Backbone Target September 15, 2008



ESnet4

Core networks 50-60 Gbps by 2009-2010 (10Gb/s circuits),
500-600 Gbps by 2011-2012 (100 Gb/s circuits)



Typical ESnet 4 Hub

OWAMP Measurement Device

Power Controllers

10G Performance Tester

7609 Switch

Secure Term Server

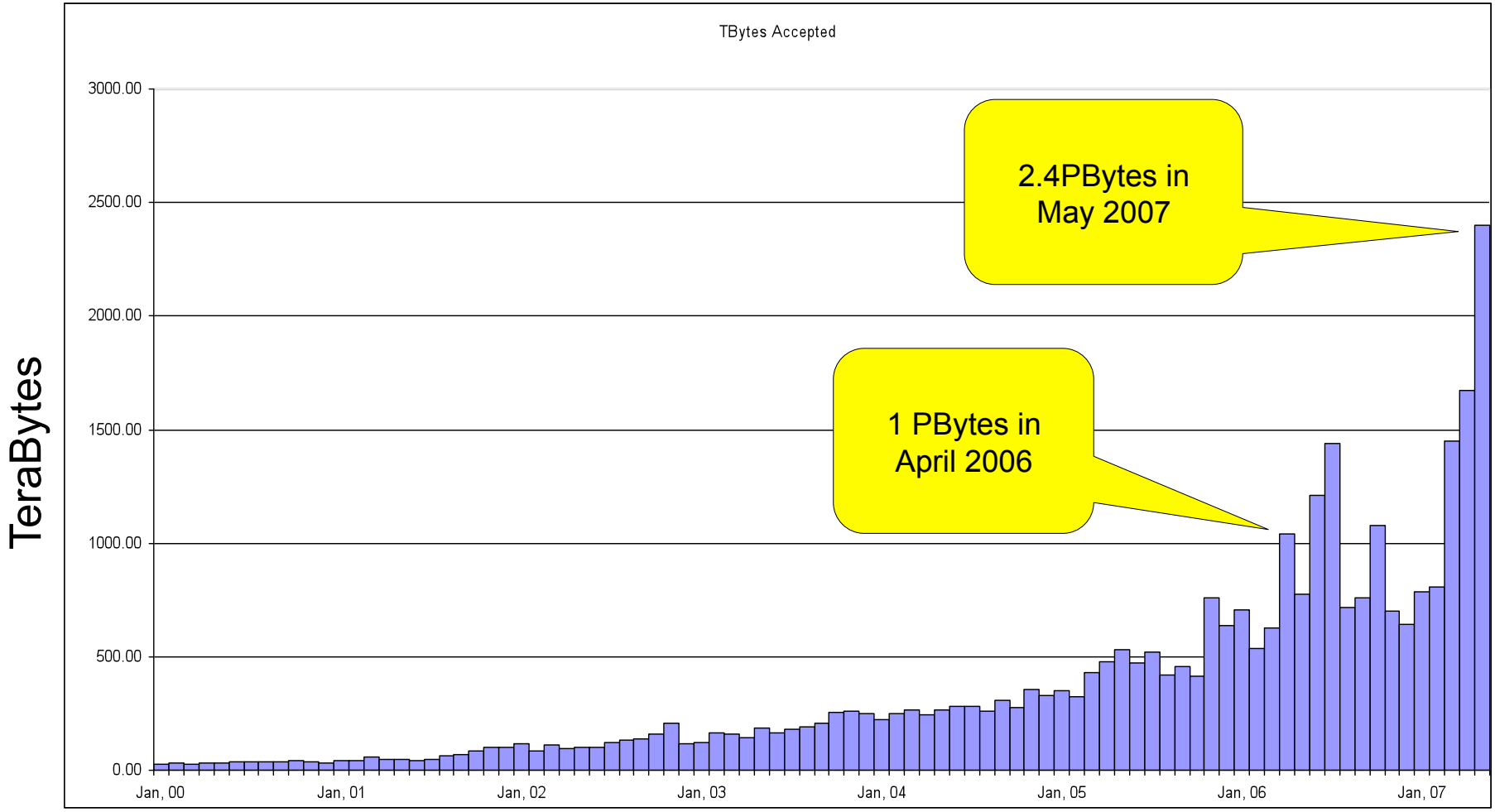
Peering Router

M320 Router

ESnet 4 Factiods as of July 16, 2007

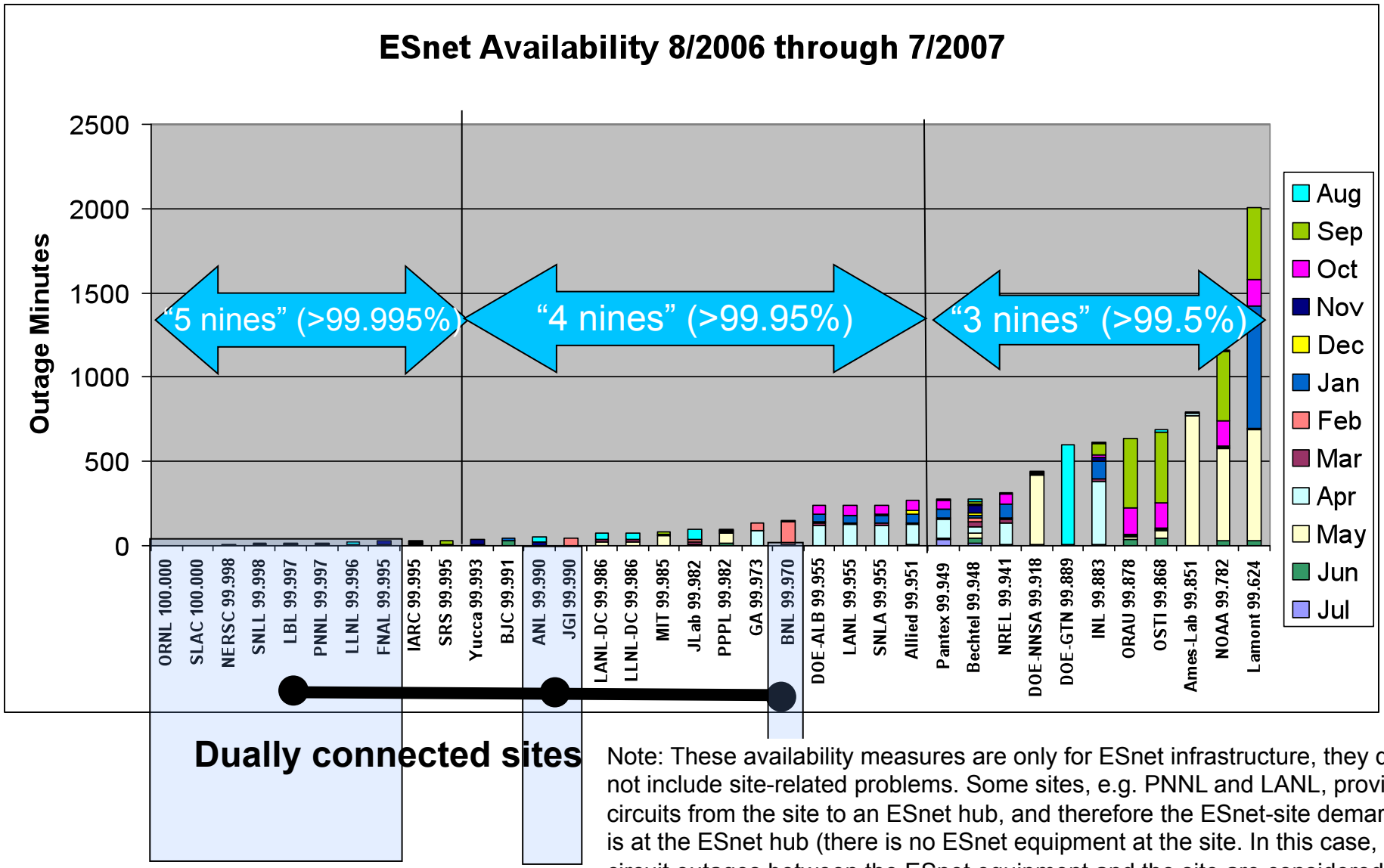
- Installation to date:
  - 10 new 10Gb/s circuits
  - ~10,000 Route Miles
  - 6 new hubs
  - 5 new routers 4 new switches
    - Total of 70 individual pieces of equipment shipped
      - Over two and a half tons of electronics
  - 15 round trip airline tickets for our install team
    - About 60,000 miles traveled so far….
    - 6 cities
      - 5 Brazilian Bar-B-Qs/Grills sampled

ESnet Traffic Now Exceeding 2 PetaBytes/Month



ESnet traffic historically has increased 10x every 47 months

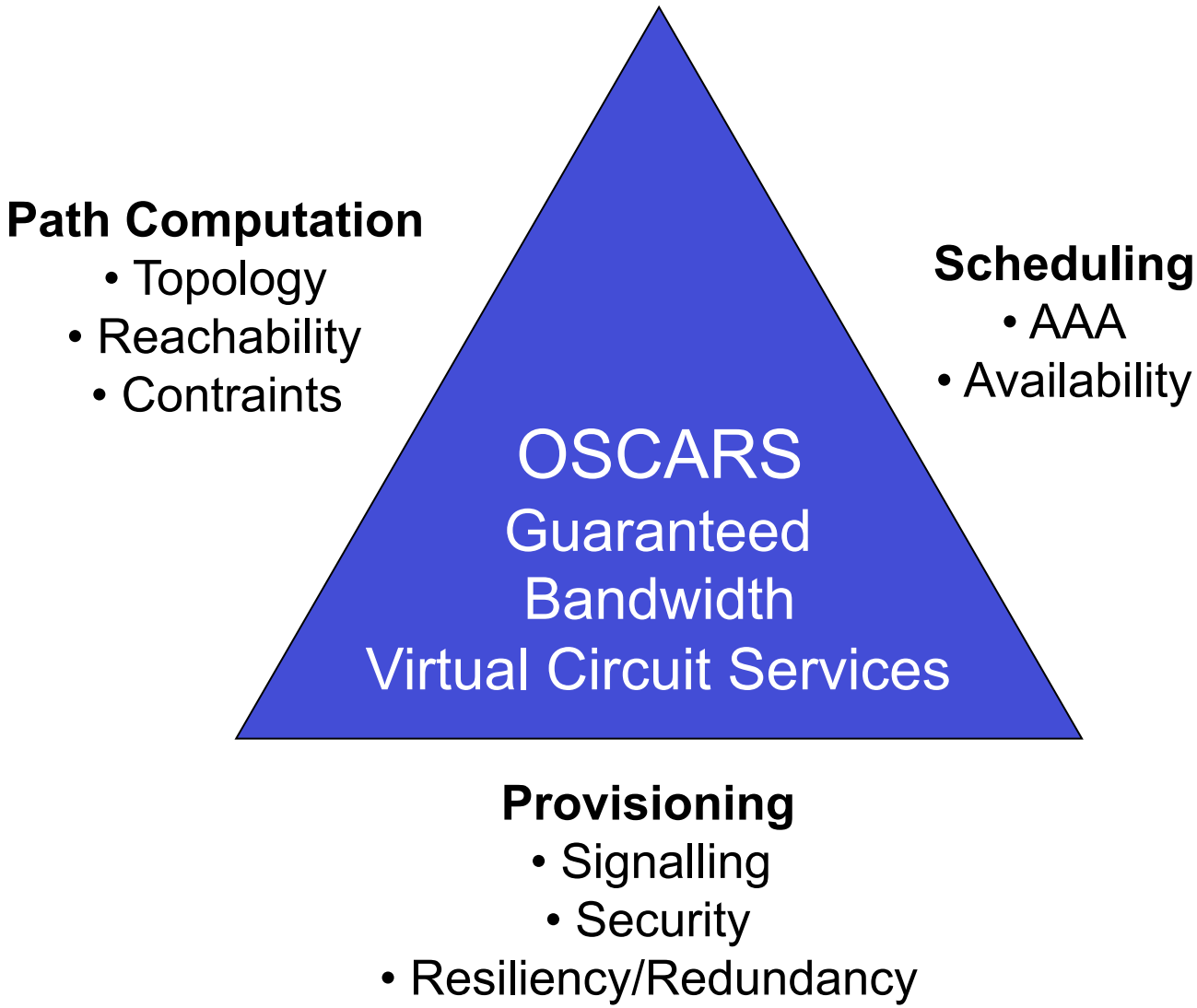
ESnet Availability



Note: These availability measures are only for ESnet infrastructure, they do not include site-related problems. Some sites, e.g. PNNL and LANL, provide circuits from the site to an ESnet hub, and therefore the ESnet-site demarc is at the ESnet hub (there is no ESnet equipment at the site. In this case, circuit outages between the ESnet equipment and the site are considered site issues and are not included in the ESnet availability metric.

OSCARS Overview

On-demand Secure Circuits and Advance Reservation System



OSCARS Status Update

- ESnet Centric Deployment
  - Prototype layer 3 (IP) guaranteed bandwidth virtual circuit service deployed in ESnet (1Q05)
  - Layer 2 (Ethernet VLAN) virtual circuit service under development
- Inter-Domain Collaborative Efforts
  - Terapaths
    - **Inter-domain interoperability for layer 3 virtual circuits demonstrated (3Q06)**
    - Inter-domain interoperability for layer 2 virtual circuits under development
  - HOPI/DRAGON
    - **Inter-domain exchange of control messages demonstrated (1Q07)**
    - **Initial integration of OSCARS and DRAGON has been successful (1Q07)**
  - DICE
    - First draft of topology exchange schema has been formalized (in collaboration with NMWG) (2Q07), interoperability test scheduled for 3Q07
    - Drafts on reservation and signaling messages under discussion
  - UVA
    - Integration of Token based authorization in OSCARS under discussion

ESnet Measurement Update

- perfSONAR Services Deployed
  - Measurement Archives serving Utilization information (Demo later today)
  - E2EMP serving end-to-end circuit status information
  - Visualization tools
- Bandwidth & Latency Measurement Points
  - Deployed at ESnet4 hubs as they are configured
- Working with the LHC community
  - To define a set of perfSONAR services that can meet the network measurement & monitoring needs of large distributed science application communities.