

A blurred photograph of several people in business attire walking in a hallway. In the upper right corner, there is a sign with the numbers '2' and '3' inside red circles. The overall image has a motion blur effect, suggesting a busy, fast-paced environment.

# Bandwidth on Demand

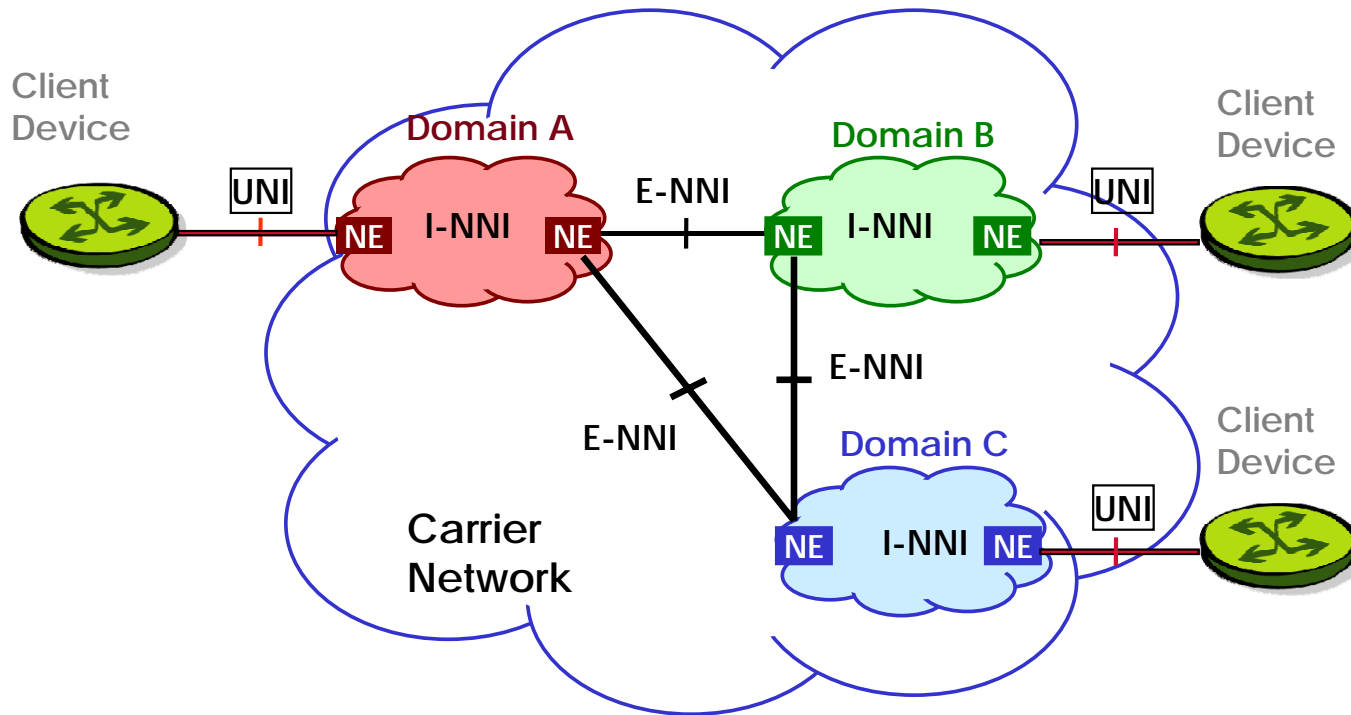
Dr. Lyndon Ong ([lyong@ciena.com](mailto:lyong@ciena.com))

Ciena Corporation

November 27, 2006

**ciena.**

# Standards for Intelligent Optical Networking



**Generally accepted model:**

- Signaling and routing protocols (typically RSVP and OSPF-based but sometimes others) applied
- Multiple Domains within a network
- UNI and E-NNI border interfaces
- Independent Internal domain protocol (I-NNI)

# Carrier Deployment

## → Primary Motivation

- #1 – Improved Network Performance and Reliability
- #2 – Simplified Operations
- #3 – New Services such as Bandwidth on Demand

## → Deployment Area

### → Carrier Core Networks

- AT&T, BT, others
- Largest deployment well over 100 core optical switches
- Supporting mesh restoration for high availability
- Others, e.g., DT, TI, FT, NTT, KDDI, CTC closely studying work

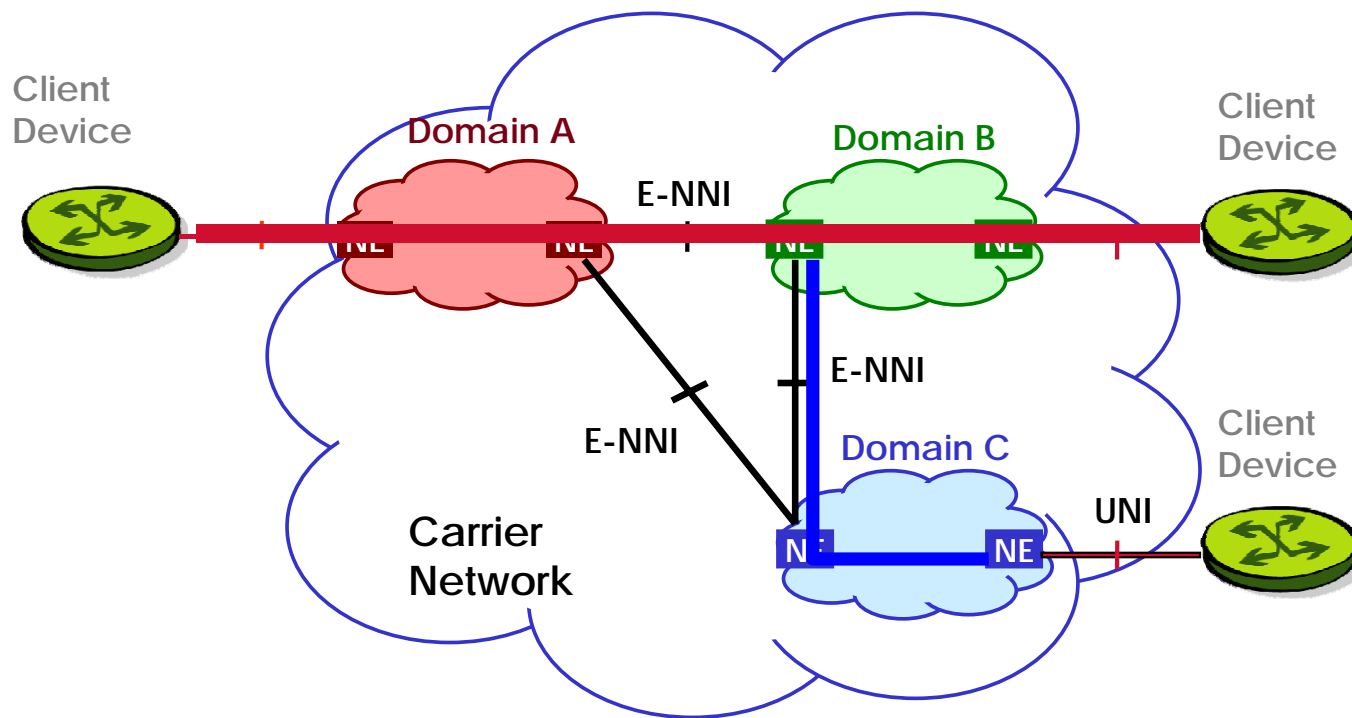
# What Ciena Supports

- **Fully Functional ASON-based Interior Control Plane (I-NNI)**
  - **Automated neighbor discovery**
  - **Topology and resource availability dissemination**
  - **Distributed path computation**
  - **Distributed connection provisioning and restoration**
- **ASON-based Interoperability Interfaces and Testing**
  - **OIF UNI (ITU-T G.7713.2) available**
  - **OIF E-NNI (ITU-T G.7713.2 and G.7715.1) in progress**
    - **Interop testing done through OIF demonstrations**

# Role of OIF

- The only industry group uniting representatives from data and optical networking disciplines
- Open forum: 100+ member companies
  - Carriers, Component and systems vendors, Testing and software companies
- Mission: The OIF promotes the development and deployment of interoperable networking solutions and services through the creation of Implementation Agreements (IAs) for optical, interconnect, network processing and component technologies, and optical networking systems
- Control layer interoperability between data and optical layers a main area
  - Dynamic configuration using intelligent signaling and control mechanisms

# Toolkit for Support for BoD Services



Variety of possible tools offered by the Control Plane:

- Switched Connections (UNI initiated)
- Soft Permanent Connections (Management initiated)
- L1 Virtual Private Networks (still under development)

# Commercial Experiences with Bandwidth on Demand

## → AT&T Optical Mesh Service

- Nationwide availability

- SONET/SDH services up to OC48

- Relies on AT&T's core intelligent optical network

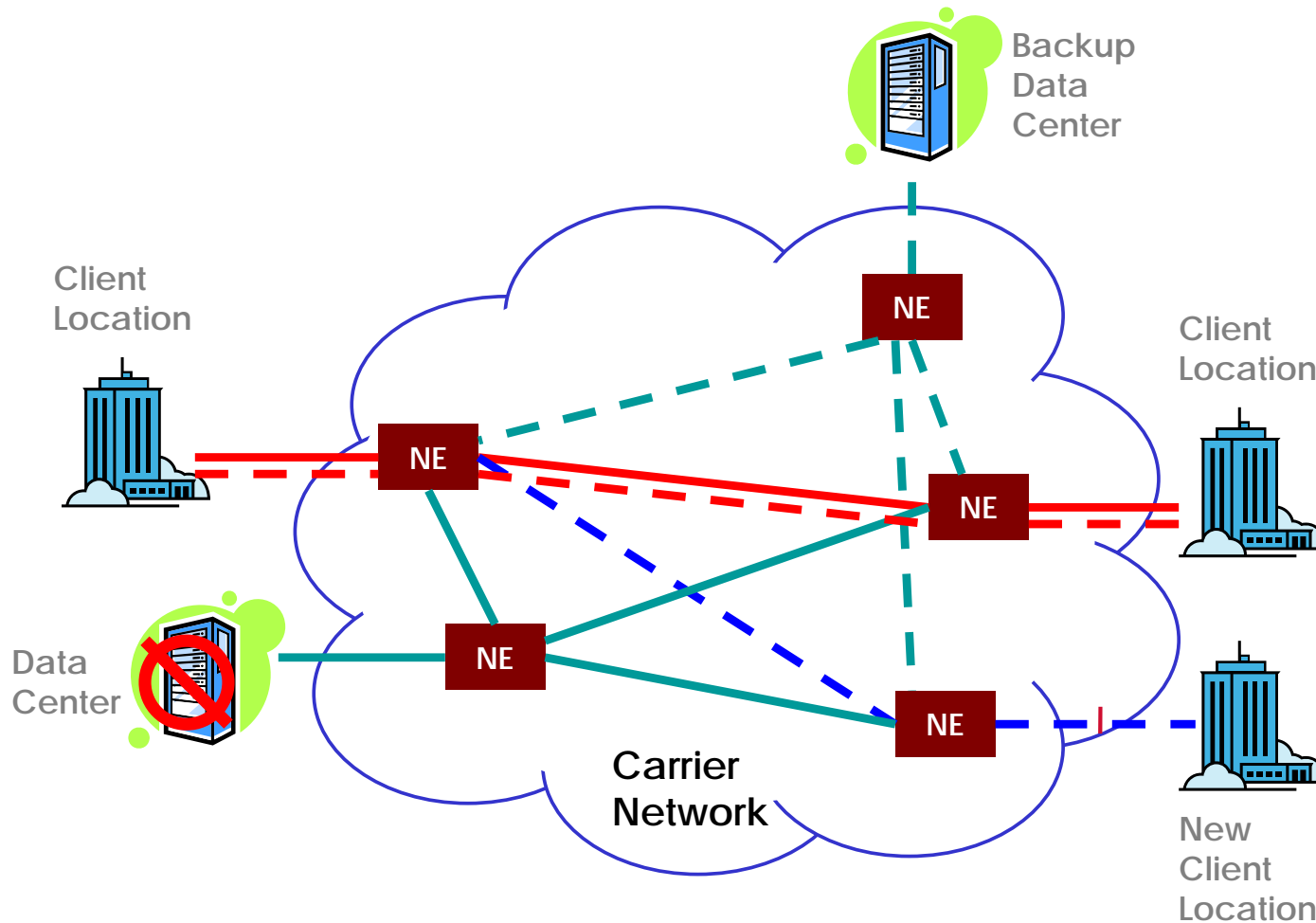
  - provisioning of new circuits in seconds vs. weeks

## → Extensions Beyond Basic Control Plane

- Interaction between control and management planes

- AT&T-designed portal for service control

# Commercial BoD Drivers



## Applications of BoD Service:

- Adaptive Bandwidth
- Dynamic Service Provisioning
- Disaster Recovery

# BoD in Research vs. Commercial Networks

## → Research

- Large storage/bandwidth applications
- Shared usage model – visibility into network resources
- Changing somewhat with regional/global networks

## → Commercial

- Enterprise business service
- Dedicated usage model – overlay on public network
- Accounting needs, performance monitoring – OSS interaction

# Issues For BoD Deployment

- **Security Concerns**
- **Backend systems development**
  - **Accounting, Authorization**
  - **More than just the pipes**
- **Variance in Enterprise Networking Needs**
  - **Certain Enterprise types more dynamic, e.g., media**
- **More now being deployed**
  - **AT&T Optical Mesh Service –commercially available**
  - **Verizon JiT – control plane-based New York trial**

# Potential future steps

- **Greater deployment of control plane technology**
  - **Experience with operating/managing control plane**
  - **Note carrier with the longest experience was first to deploy BoD**
- **Better experience and understanding of customer needs**
  - **Future trials to be expected**
- **Look at richer or more standard backend applications**
  - **SIP/IMS**
  - **Research programs such as UCLP, DRAGON, GN2**
  - **Scheduled services as well as dynamic**

A blurred photograph of people walking in a hallway, likely a transit station. The image is taken from a low angle, focusing on the lower legs and feet of several individuals. The people are wearing dark suits and trousers. The background shows a dark wall with a window or glass partition. In the upper right corner, there are two red circular signs with white numbers '2' and '3'. The overall image has a motion blur effect, suggesting a busy, fast-paced environment.

**Thank You!**

**ciena.**