OIF worldwide interoperability demonstrations on ASON inter-domain interfaces
A carrier's point of view

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Outline

- Introduction
- Inter-domain ASON/GMPLS interfaces
- OIF worldwide interoperability demonstrations 2005
- Considerations from a carrier's perspective
- Summary

OIF Background and Mission

- 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
- Launched in April of 1998

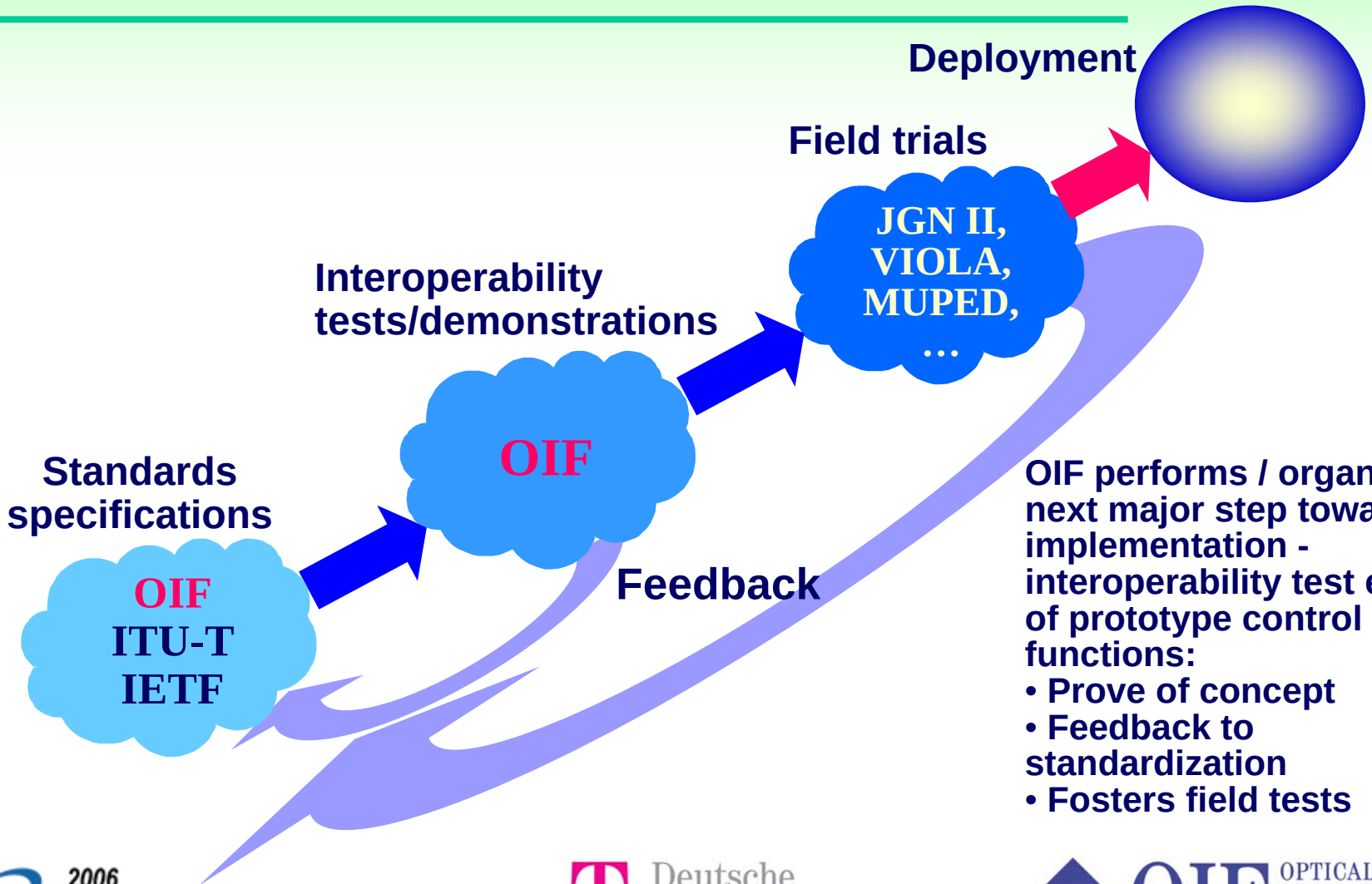
- Mission: The OIF promotes the development and deployment of interoperable networking solutions and services through the creation of Implementation Agreements (IAs) for optical, interconnect, network processing and component technologies, and optical networking systems

OIF Focus

- Low-cost scaleable optical internetworking
- IP-over-switched optical network architecture
- Physical layer
  - Low-cost optical interfaces between networking elements
  - Standard device level electrical interfaces for low-cost systems
- Control layer interoperability between data and optical layers
  - Dynamic configuration using IP signaling and control mechanisms
- Accommodate legacy network under the new physical and control layer mechanisms

Evolution from Standards to Deployment

Close relation of standardization and R&D activities



OIF performs / organizes the next major step towards implementation - interoperability test events of prototype control plane functions:

- **Prove of concept**
- **Feedback to standardization**
- **Fosters field tests**

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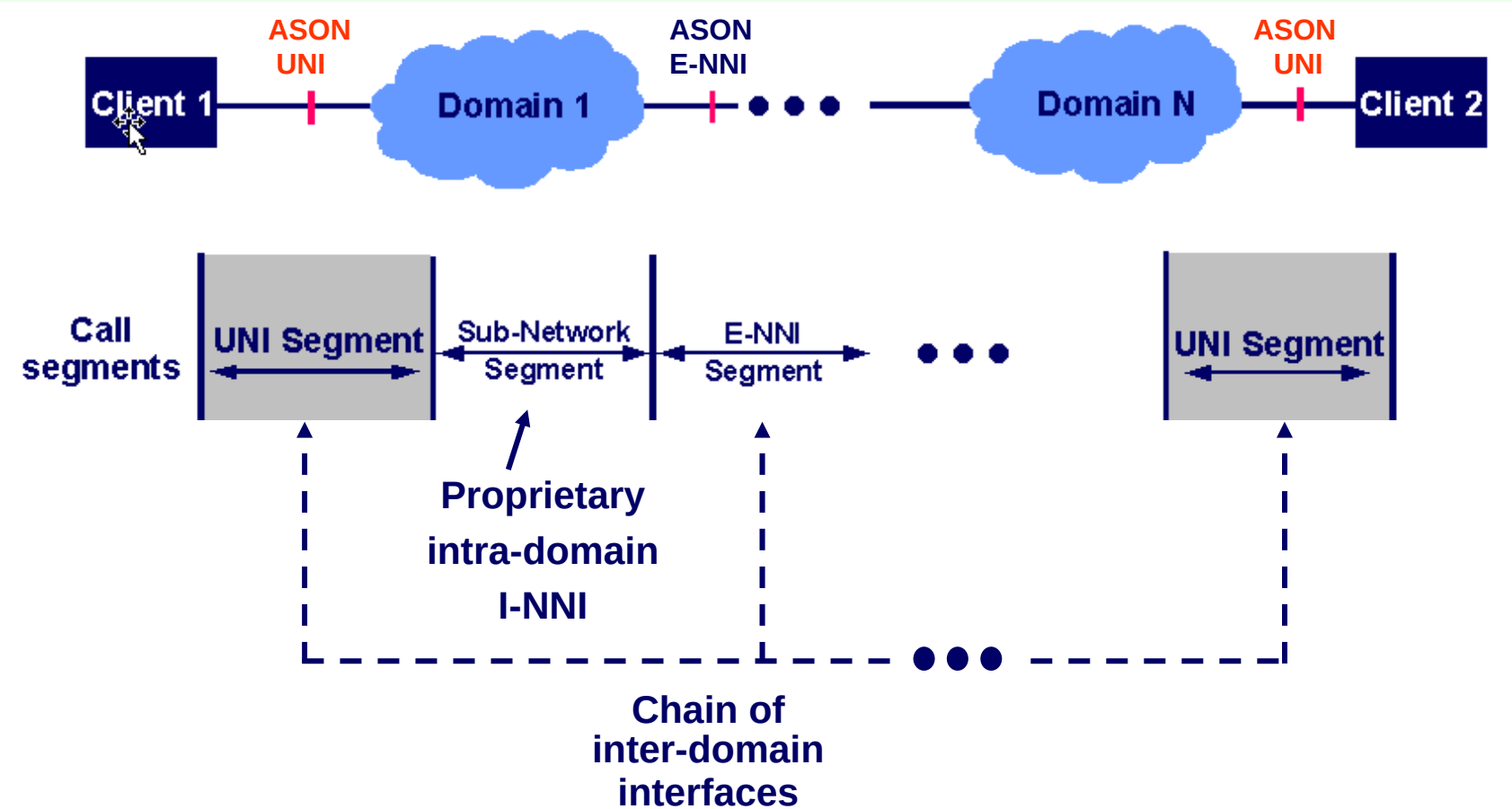
Inter-Domain ASON Interfaces

Enable multi-domain, on-demand services



ITU-T and OIF Collaboration

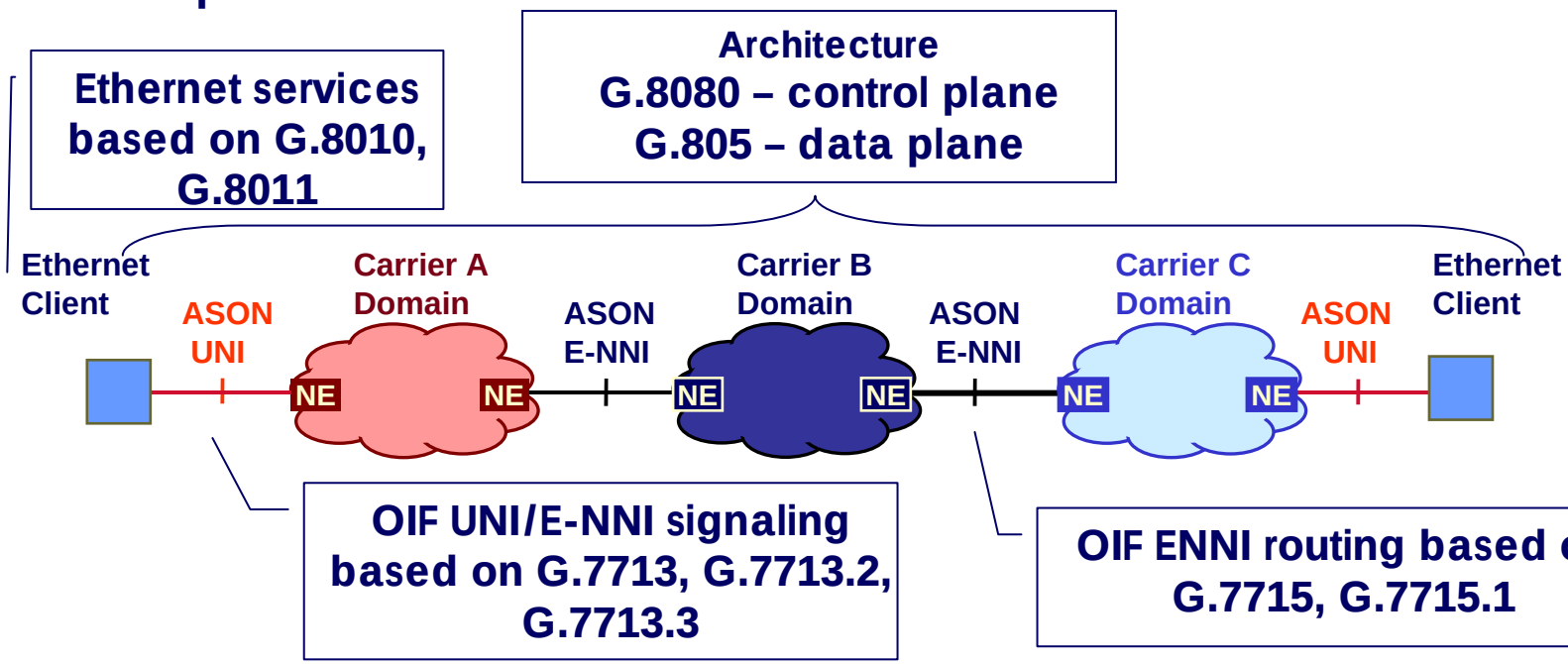
Correlation of IUT-T and OIF standards/specifications

OIF

- Carrier requirements
- Interoperability testing
- Protocol specifications in Implementation Agreement
- Adoption of ITU-T Recs.

ITU-T

- ASON Recommendations for optical signaling and routing
- Transport Recommendations



UNI 2.0 Functions

Main characteristics

- UNI2.0 is based on UNI1.0R2 functions
- The UNI 2.0 provides advanced services and applications to leverage capabilities of UNI 1.0
  - Driven by carrier priorities
  - Aligned with OIF E-NNI developments
- Major UNI 2.0 enhancements:
  - Call control for ITU-T ASON compliance
  - Additional transport signal types:
    - Ethernet
    - G.709
    - sub STS-1 rates
  - Control plane security
  - Improved network resiliency

UNI 2.0 Ethernet Functions

Related standards and specifications

OIF draft specifications:

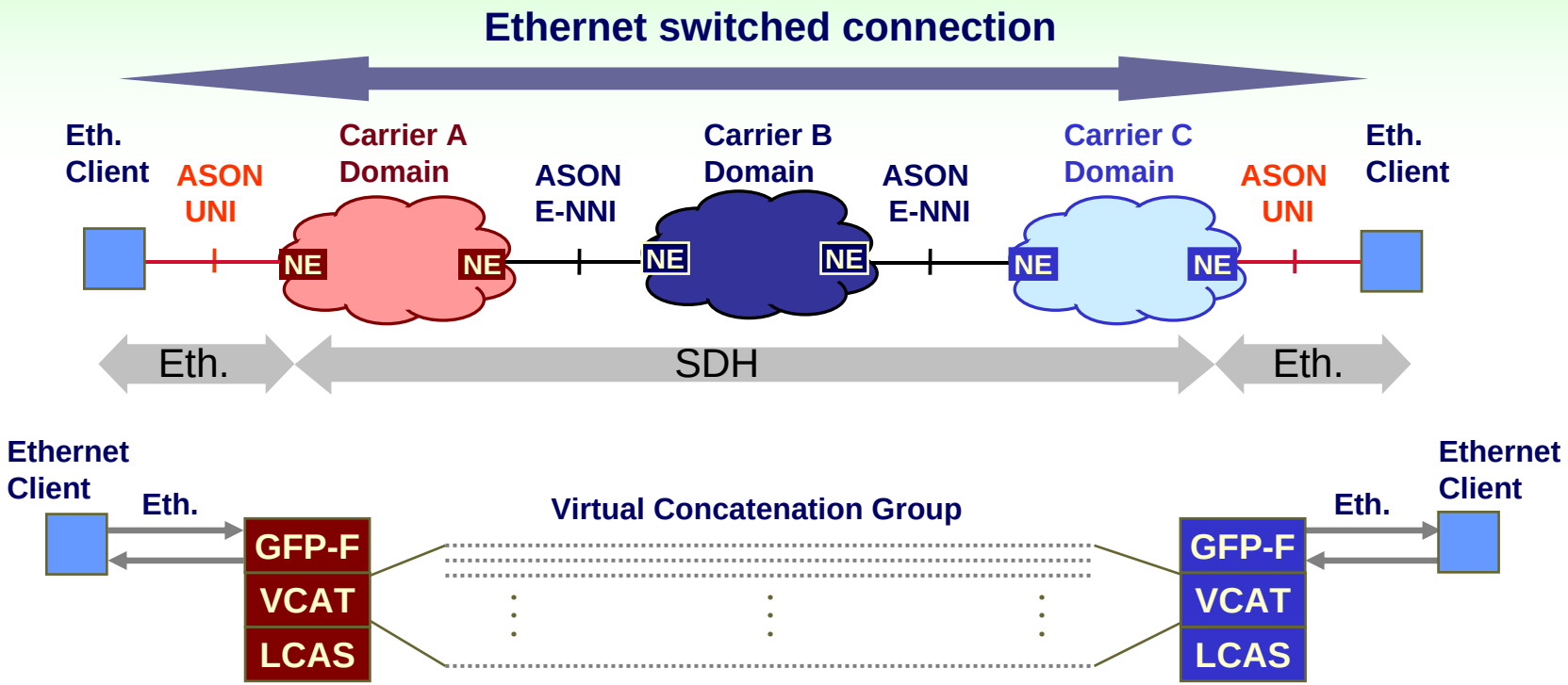
- oif2005.204.01 User Network Interface (UNI) 2.0 signaling specification: Common part (draft document)
- oif2005.205.00 RSVP extensions for User Network Interface (UNI) 2.0 signaling specification (draft document)

ITU-T standards related to UNI 2.0 Ethernet

- Data plane:
  - G.805: Functional architecture of transport networks
  - G.707: Network node interface for SDH, incl. VCAT function
  - G.7041: Generic Framing Procedure (GFP)
  - G.7042: Link Capacity Adjustment Scheme (LCAS)
  - G.8010: Architecture of Ethernet layer networks
  - G.8011: Ethernet over Transport – Ethernet services framework
- Control plane (ASON):
  - G.8080: Architecture for ASON
  - G.7713: Distributed connection management

UNI 2.0 Ethernet: Data Plane

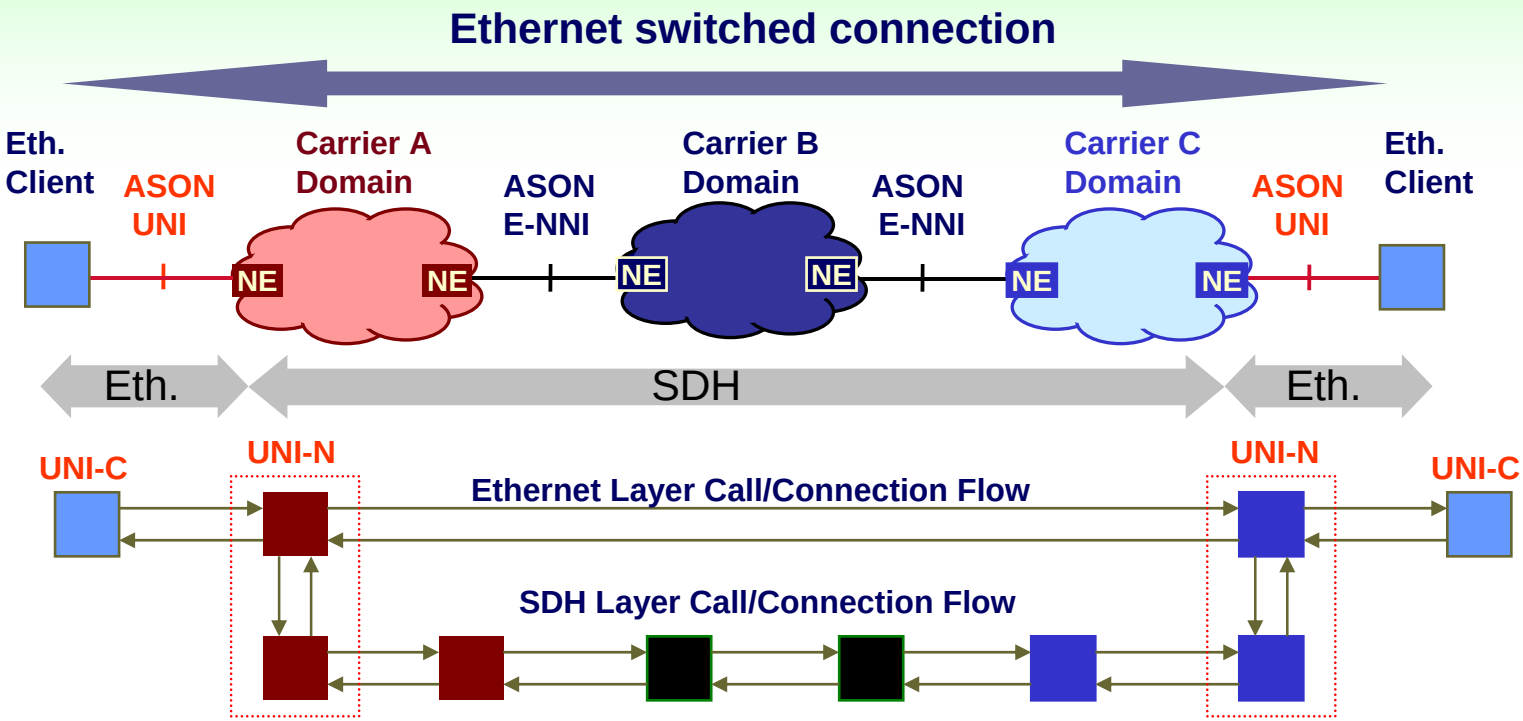
Data plane flow of Ethernet-SC (UNI 2.0 Eth/E-NNI)



The SDH transport network domains connect the Ethernet client domains with VC-x-nv according to the Ethernet service bandwidth requested

UNI 2.0 Ethernet: Control Plane

Control plane flow of Ethernet-SC (UNI 2.0 Eth/E-NNI)



- **ASON UNI2.0 Ethernet signaling interfaces enable customers to directly signal their Ethernet transport requests to SDH based ASON transport networks**
- **Including E-NNI intra-domain interfaces, automatic Ethernet service provisioning over multiple domains could be configured**

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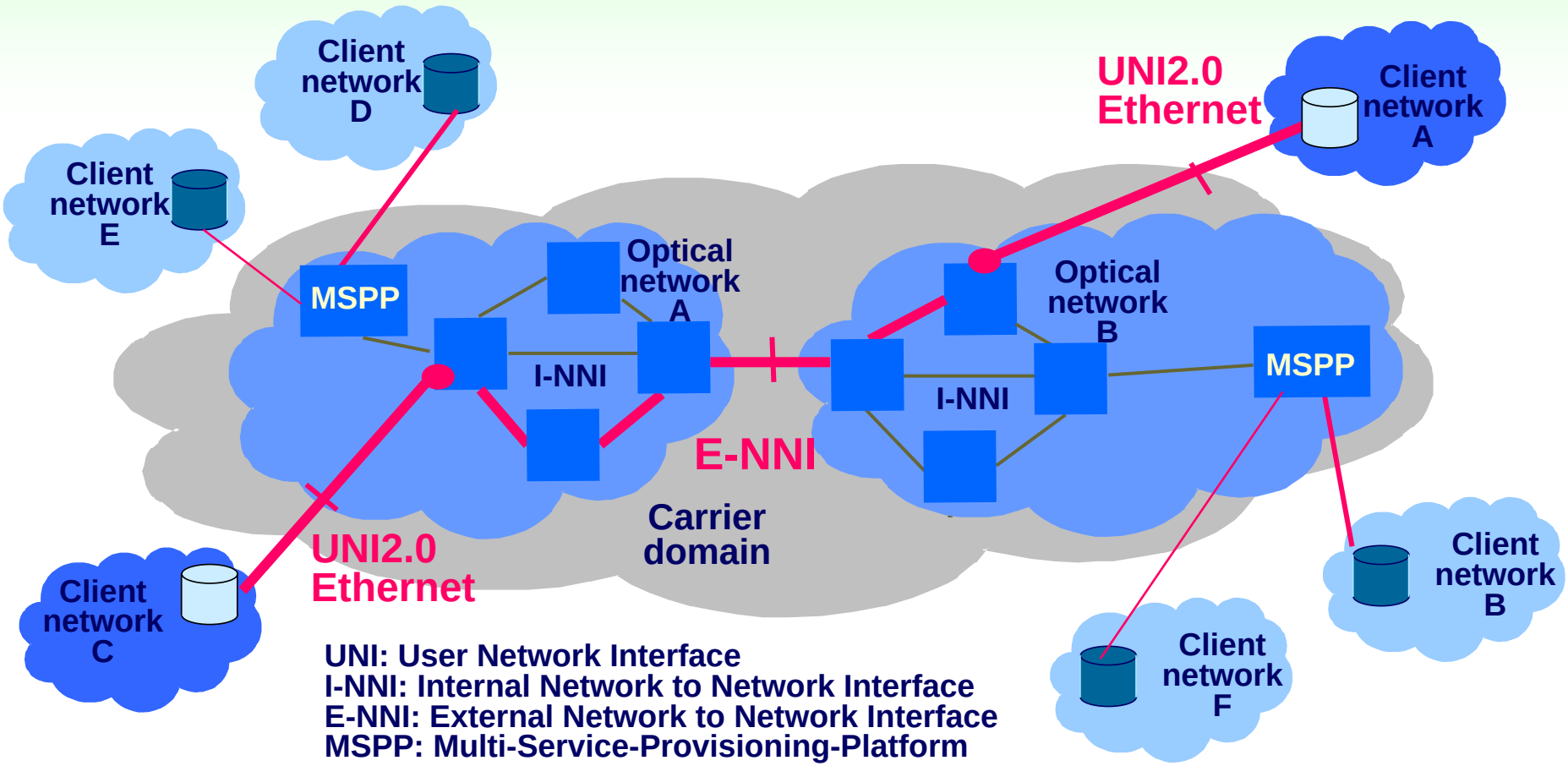
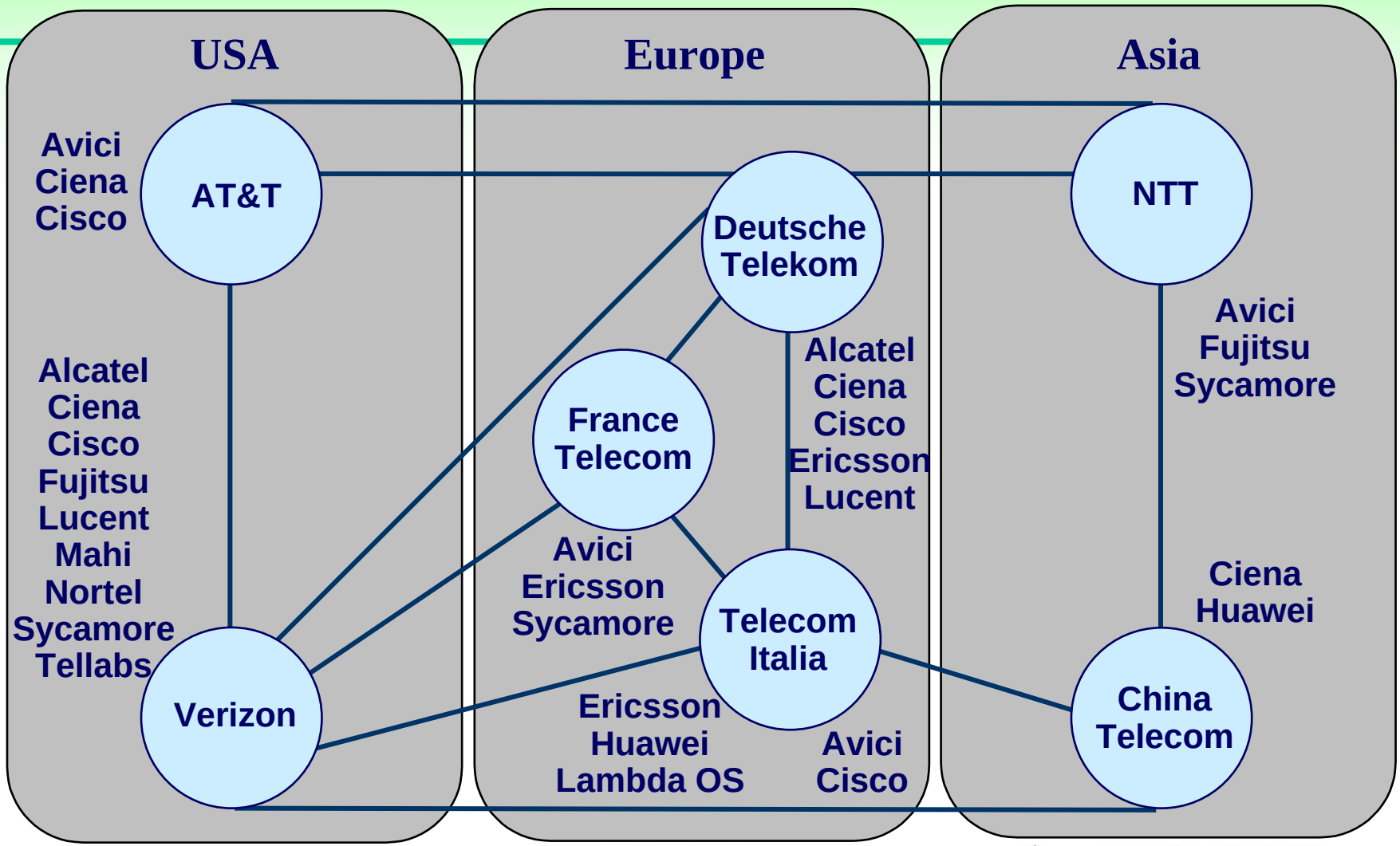
OIF Interoperability Tests 2005

Overall OIF world interoperability tests architecture

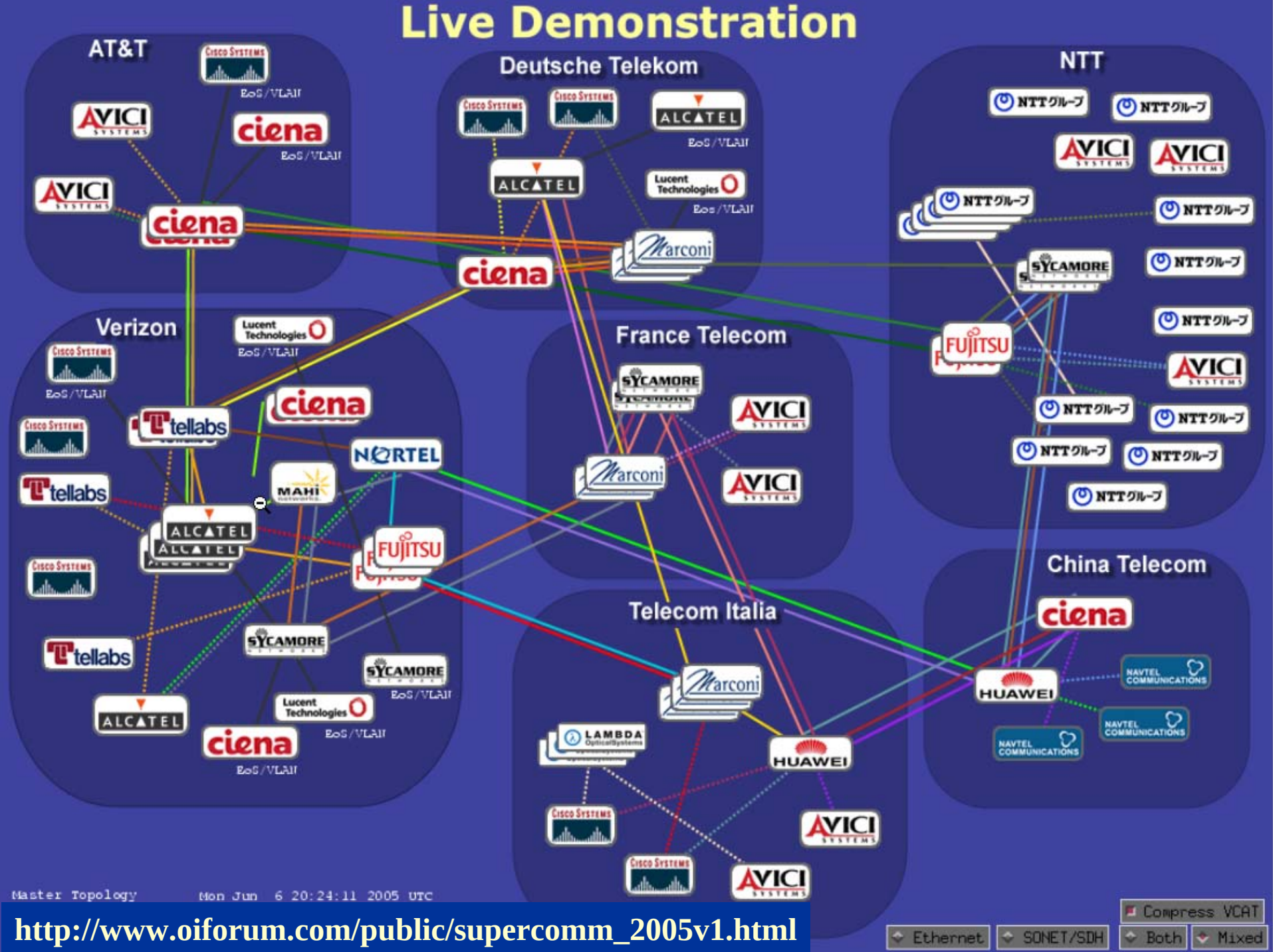


OIF Interoperability Demonstration 2005

Global test network topology




OIF Worldwide Interoperability
AT&T
China Telecom
Deutsche Telekom
france telecom
NTT
TELECOM ITALIA
verizon
ALCATEL
AVICI SYSTEMS
ciena
Cisco Systems
FUJITSU
HUAWEI
LAMBDA OpticalSystems
Lucent Technologies
MAHI networks
Marconi
NORTEL
SYCAMORE NETWORKS
tellabs
NTT
Live Demonstration
OIF
verizon


Live Demonstration
AT&T
Deutsche Telekom
NTT
Verizon
France Telecom
China Telecom
Telecom Italia
Master Topology
Mon Jun 6 20:24:11 2005 UTC
http://www.oiforum.com/public/supercomm_2005v1.html
Compress VCAT
Ethernet
SONET/SDH
Both
Mixed

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Multi-layer, integrated DP & CP Solution

Efficient, integrated multi-layer solution

UNI 2.0 Ethernet: First multi-/ dual-layer, integrated data and control plane solution within a network domain

It enables:

- Automatic, dual-layer connection provisioning
- Efficient inter-layer interworking
- Concept could be extended to any other dual/multi-layer approach

Multi-layer, integrated DP & CP Solution

Mandates cooperation among SDOs and forums

Data and control plane functions integration mandates integration of function from different SDOs / forums and therefore their close cooperation, e.g. for UNI2.0 Ethernet:

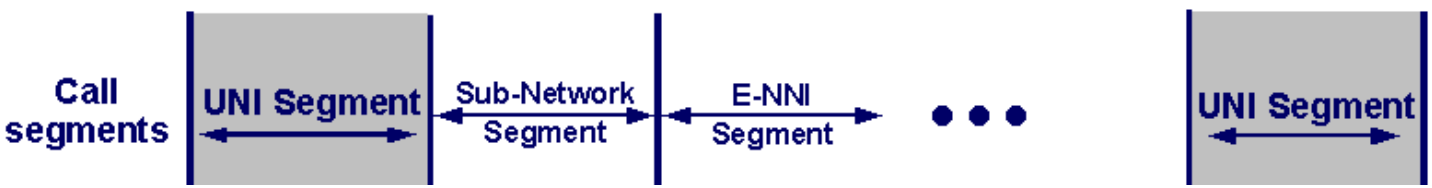
- OIF UNI2.0 Ethernet specification
- ITU-T set of ASON Rec.
- ITU-T set of NG-SDH Rec.
- ITU-T set of Ethernet service Rec.
- IETF signaling standards
- IEEE set of Ethernet standards
- MEF Ethernet service specifications

Interoperability of UNI & E-NNI functions

Multi-domain coverage of client controlled services

Interoperable UNI and E-NNI specifications and implementations ensure multi-domain coverage of services invoked by transport network clients via UNI

- Ethernet and SDH/SONET switched connections
- Address correctly the multi-domain carrier environment of today and future
- Enable national and global service coverage



Separation of TN and client view

Independent technology platforms used by TN and client

Using UNI2.0Ethernet the client and transport network (TN) view is separated not only on the control plane level, but even on the technology level (data plane), enabling

- Client Ethernet view and functions
- For the TN an independent selection of the technology platform as appropriate, e.g.
  - Native Ethernet
  - SDH/SONET
  - OTN

UNI-C 2.0 Ethernet – Cient Interface

As simple as possible

Client could stay with the preferred Ethernet functions, capabilities and know how, all the needed adaptation and multi-domain issues are accomplished by the TN: UNI-N and E-NNI interfaces.

Nevertheless the UNI-C control plane functions have to be implemented by the clients!

- How to insure broad implementation/deployment of UNI-C 2.0 Ethernet interfaces in a client environment not familiar with control plane topics??
  - Advertisement & education, by making the implementation easy to understand (cookbook)
  - Making UNI-C 2.0 Ethernet proxy commercially available

Follow-up Activities

The OIF interoperability tests and demonstration area a main, but intermediate achievement on the roadmap to deployment.

They build the bases or starting point for various ASON/GMPLS field trials, e.g.

- Japan, NiCT / JGN II (www.jgn.nict.go.jp/e/02-about/02-3/index.html)
- Germany, VIOLA (www.viola-testbed.de)
- Europe, MUPBED (www.ist-mupbed.org)
- Europe, NOBEL (www.ist-nobel.org)
- …

Summary

ASON/GMPLS inter-domain interfaces build the bases for interoperable solutions and carrier benefits:

- Provisioning of end-to-end dynamic connections for flexible data services over multiple, control plane enabled SDH domains
- Deploy at faster pace innovative network technologies
- Select cost effective and leading edge network elements, platforms and multi-vendor solutions
- Reduce operations overheads and simplify provisioning of new services


Live Demonstration
Leadership Team


Lucent Technologies
Bell Labs Innovations
MAHI networks
Marconi
Live Demonstration
Support Team


Live Demonstration
Vendors


Carriers