



Success of Large Scale Control Plane Internetworking: *An Update from the OIF*

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Topics

- **Introduction on the OIF organization**
 - Driving force towards an unified-control plane of the next generation IP-optical network
- **Service model for the unified control plane solutions**
- **Service model for multi domain Ethernet over SONET/SDH transport networks**
- **Overview of the recent OIF Interoperability testing**
- **Conclusion**



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OIF History

- Founded in 1998, OIF is an open forum focused on accelerating the deployment of next generation optical interworking networks
- OIF provides a venue for equipment manufacturers, users, carriers and service providers to work together to
 - develop key specifications to ensure the interoperability of optical networks
 - resolve deployment issues



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Market Requirements Towards an Unified-control Plane

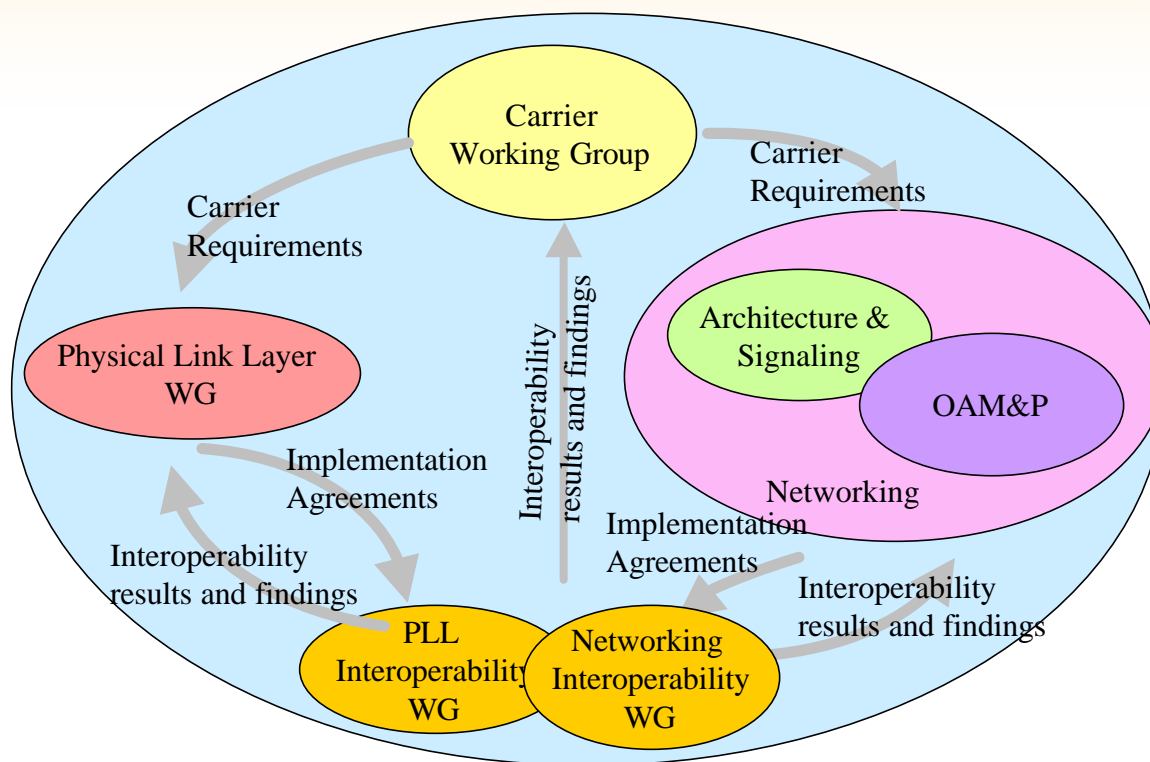
- Robust vendor implementations that integrate control plane, management plane and data plane seamlessly
 - Rapid service turn up
 - Streamlined provisioning process
 - Efficient network resource management
 - Flexible for future network expansion
- Open standard, inter-working solutions
 - Adopted by vendors including IP routers, MSPP, OXC, and WDM/DWDM in industry
 - Interoperability among multi-vendor implementations
- Value added service offerings such as support control plane capability on GE interface, protection and restoration mechanisms, bandwidth on demand, VPN, QoS etc.



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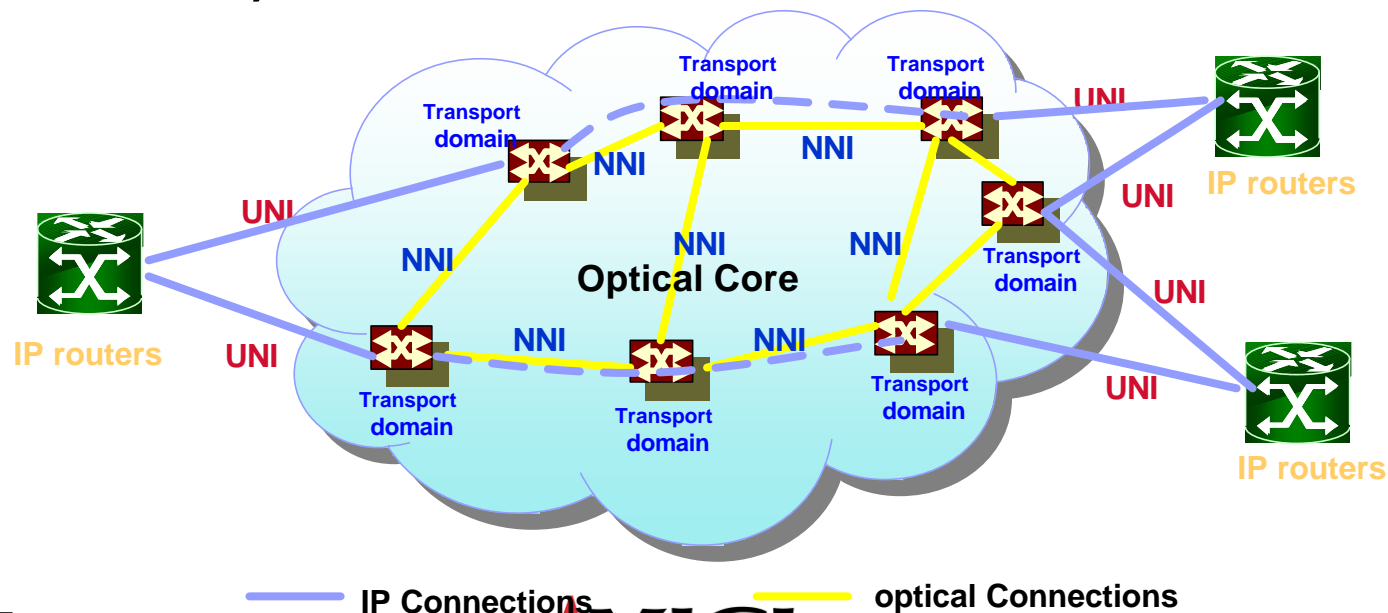


OIF Technical Working Groups



OIF UNI/NNI Network Reference Model

- UNI (User-Network Interface) - a signaling mechanism between clients and transport devices
- NNI - communication and signaling method among optical domains in the optical core network (intra carrier, inter domain)



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ITU-T and OIF Collaboration

OIF

- Promotes the global development of optical internetworking products
- Recognized by ITU-T



- Carrier Requirements
- Interop Experience
- Protocol Specifications in UNI Implementation Agreement
- Adoption of ITU-T Recs.

ITU-T

- Study Group 15 is the focal point for studies on optical and other transport networks, systems and equipment.



- ASON Recommendations for Optical Signalling and Routing
- Transport Recommendations for GFP, LCAS, VCat, Ethernet

Synergy benefits carriers, vendors and users



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2004 Multi carrier, Multi-vendor Interoperability Demonstration Content

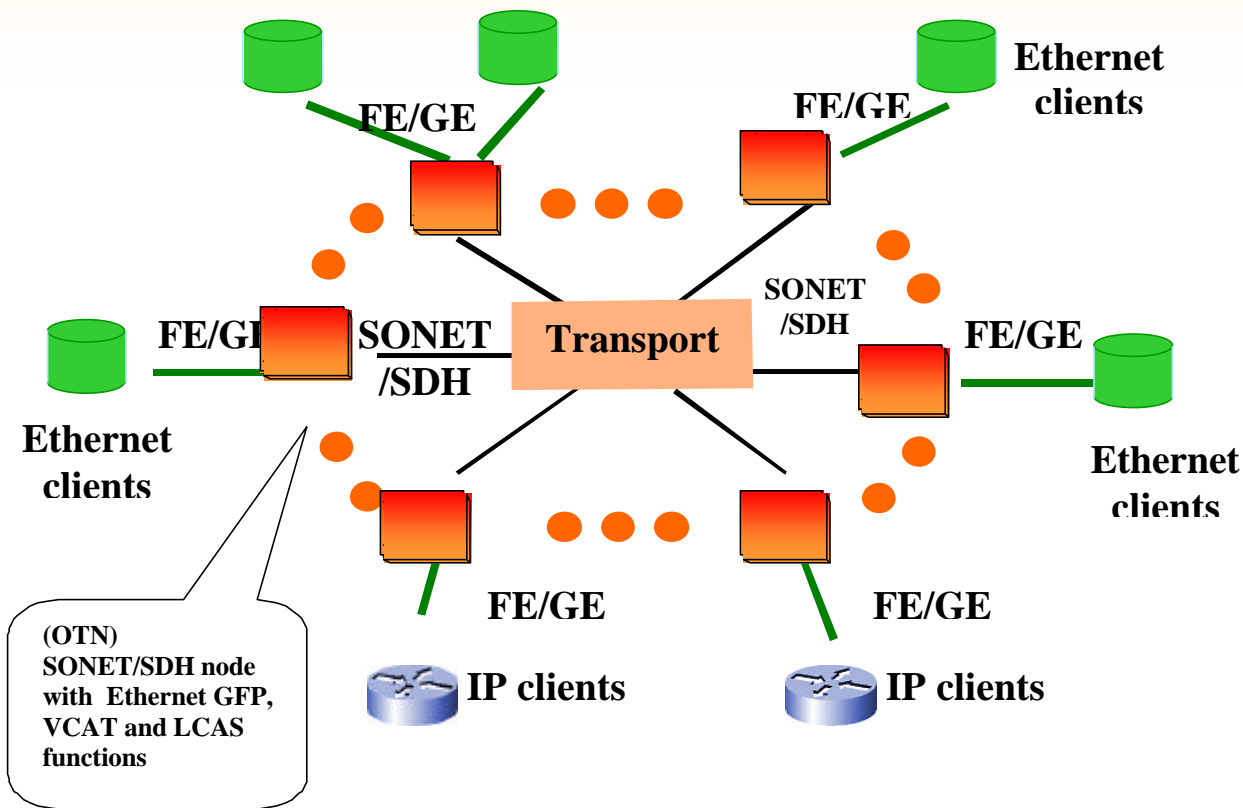
- Tested in the following area
 - Ethernet-over-SDH/SONET Adaptation (GFP-F / VCAT / LCAS)
 - UNI 1.0 R2 + E-NNI (control plane + data plane)
 - UNI initiated connection
 - Soft permanent connection
- Networked to connect multiple carrier labs globally
- Service capabilities are initiated at the carrier labs by participating OIF vendor members
- Live, dynamic network topology of the interoperability demo is showcased at the OIF booth



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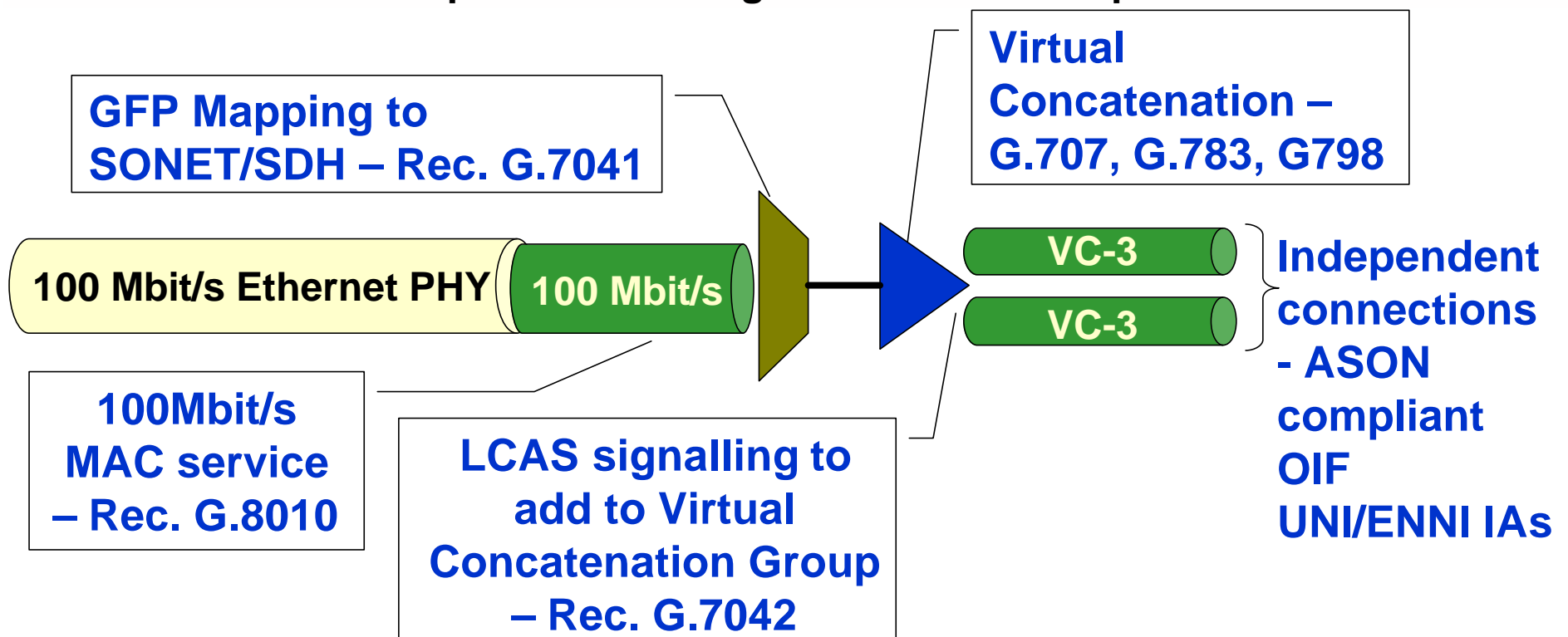


Ethernet-over-SDH/SONET Adaptation (GFP-F / VCAT / LCAS)



GFP + VCat + LCAS

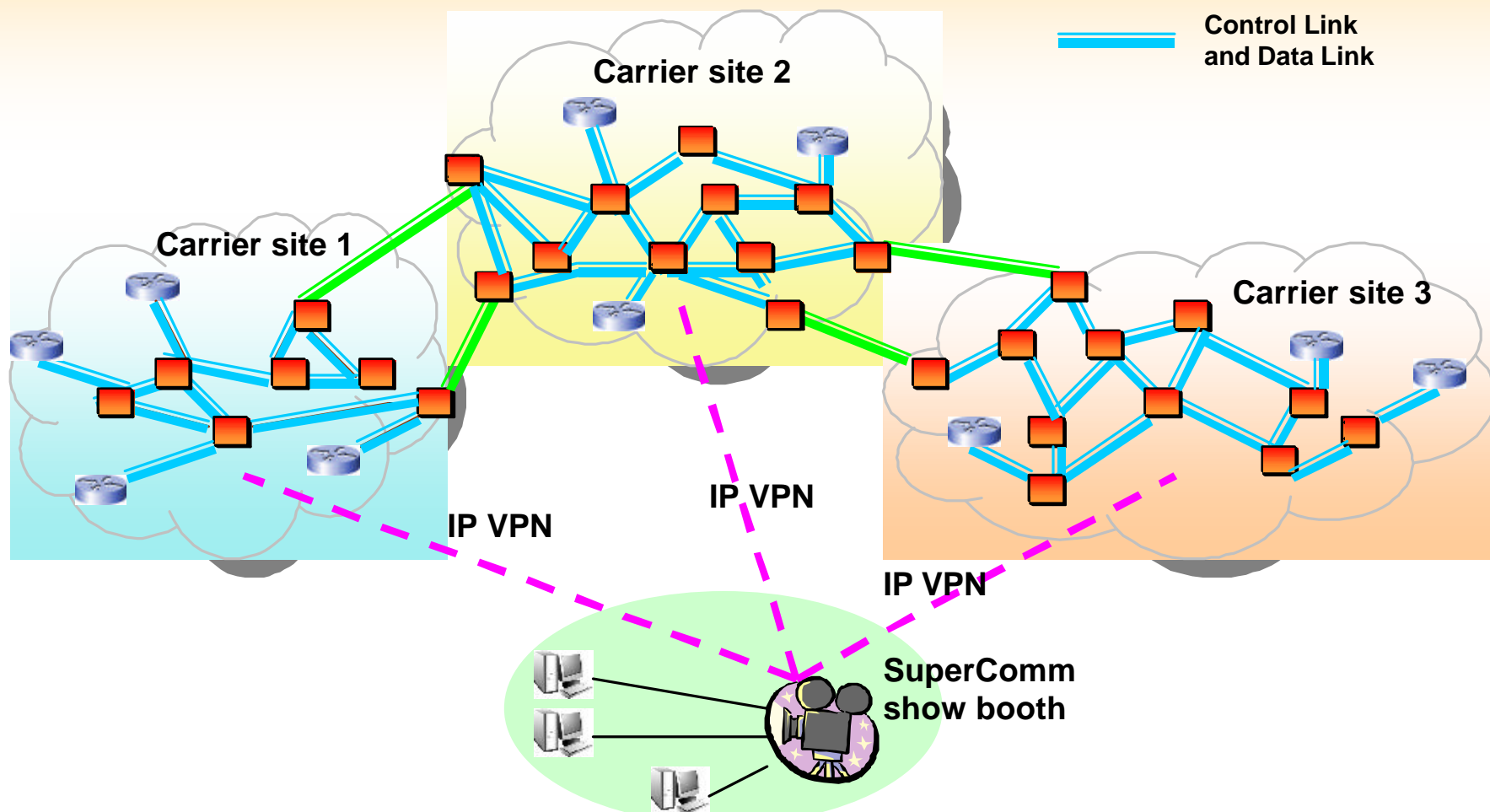
- ITU-T Standards enable Ethernet service over optical network.
- OIF World Interop Demo shows global Ethernet adaptation service



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UNI 1.0 R2 + E-NNI Sample Topology



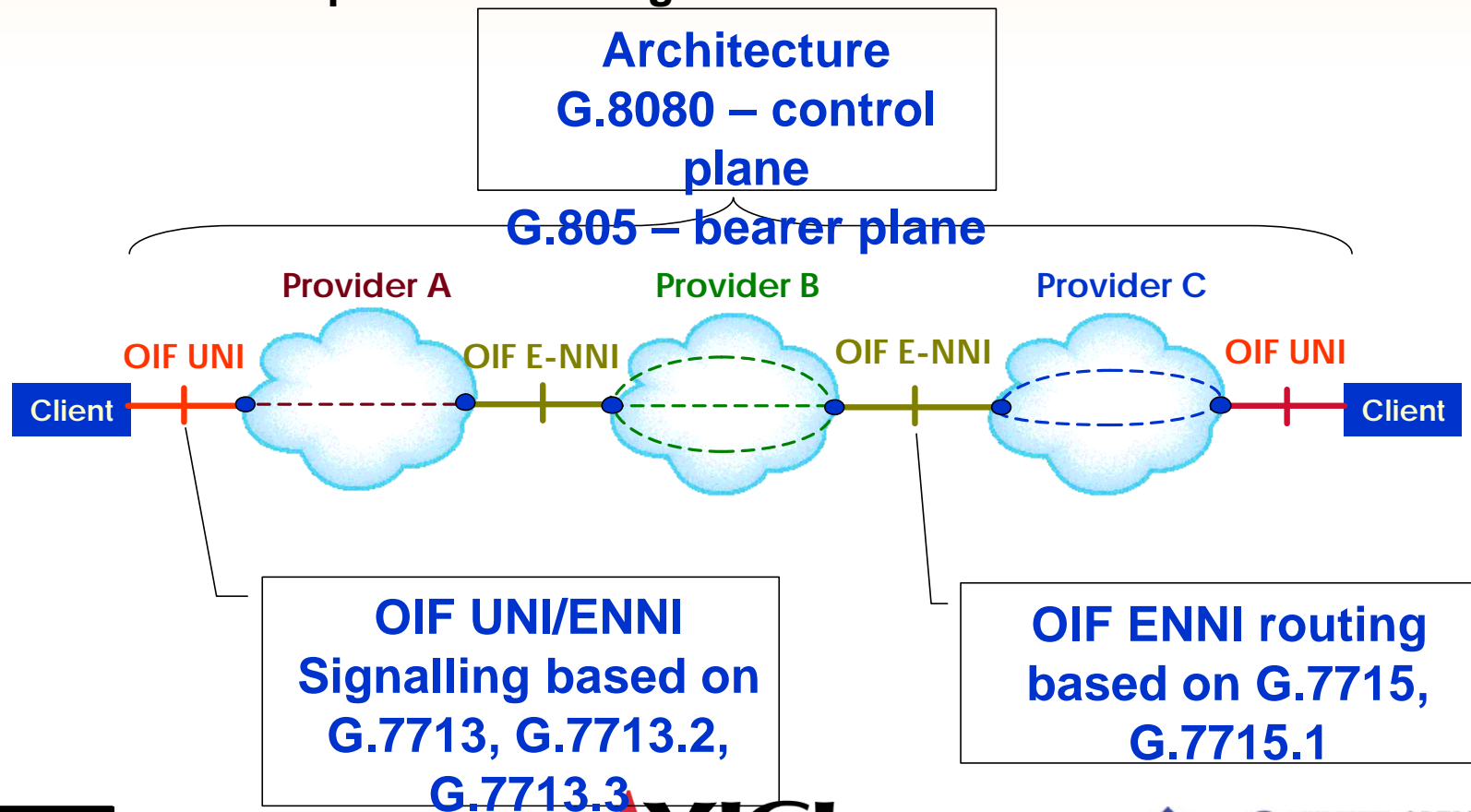
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Automatic Switched Optical Network

- Dynamic signalling and routing control over OTN/SONET/SDH network.
- OIF UNI/ENNI Implementation Agreements based on ASON Recommendations



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OIF Supercomm 2004 Joint Carrier, Multi Vendor Demonstration



- 7 major carriers world wide participated the global testing in three continent

- AT&T
- China Telecom
- Deutsche Telekom
- KDDI
- NTT
- Telecom Italia
- Verizon



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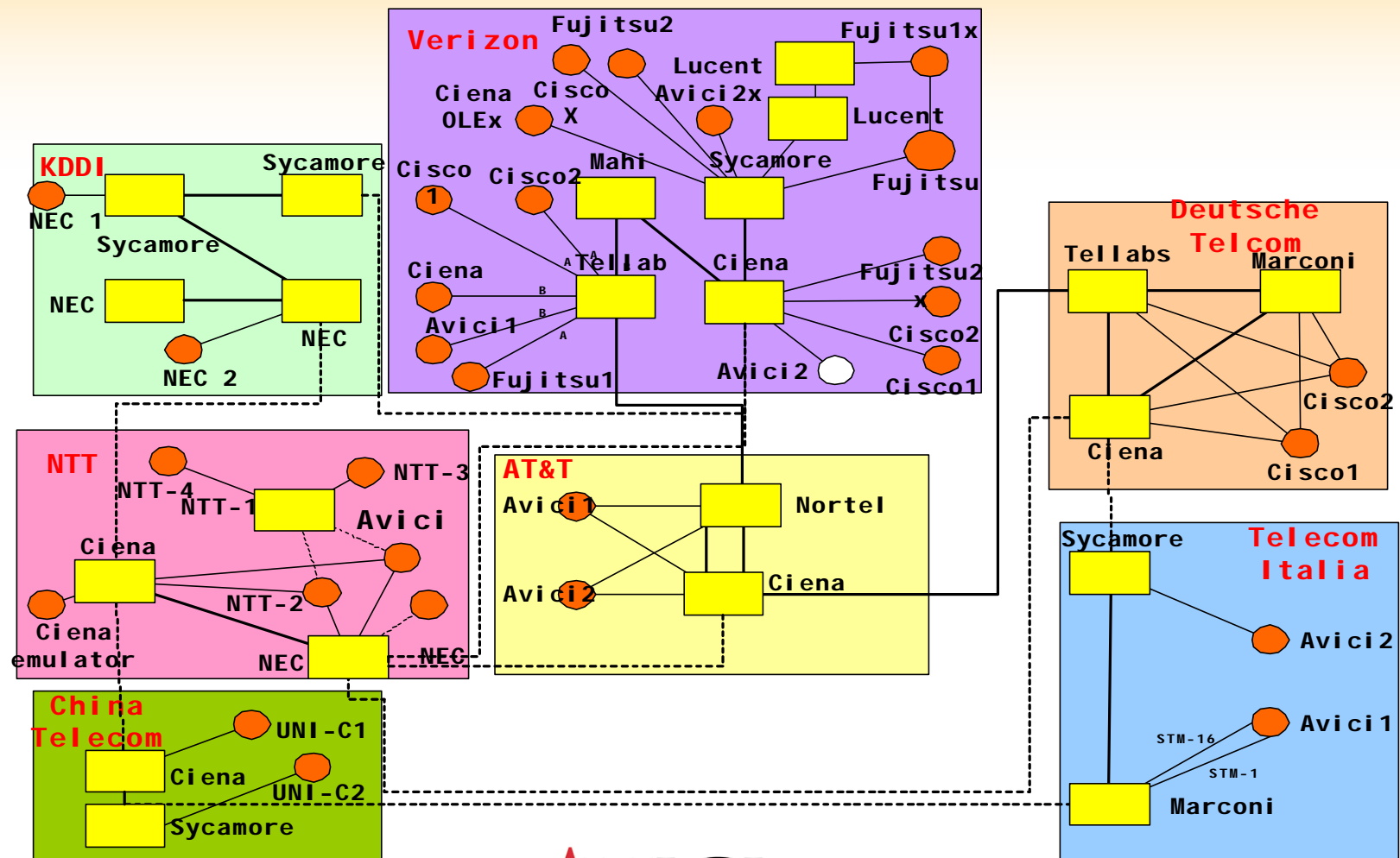
OIF Supercomm 2004 Joint Carrier, Multi Vendor Demonstration – *vendor participation*

Company	Product Platforms
ADVA AG Optical Networking	FSP1500
Alcatel	1660 SM, 1674 LG, 1678 MCC
Avici Systems	TSR / SSR
CIENA	Core Director and Online Edge
Cisco	15454 / GSR12000
Fujitsu	Flashwave 4020, Flashwave 4300
Lucent	DMX (Metropolis)
Mahi	Mi7
Marconi	MSH64c
Movaz	WSM
NEC	SpectralWave U-Node / SpectralWave Networking
Nortel	OME / HDXc
Siemens	Surpass hiT7070
Sycamore	SN16000 Optical switch
Tellabs	5500-N6X Transport Switch / 6350 Switch Node
Turin	Traverse 1600



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2004 OIF World Demo – Global Topology

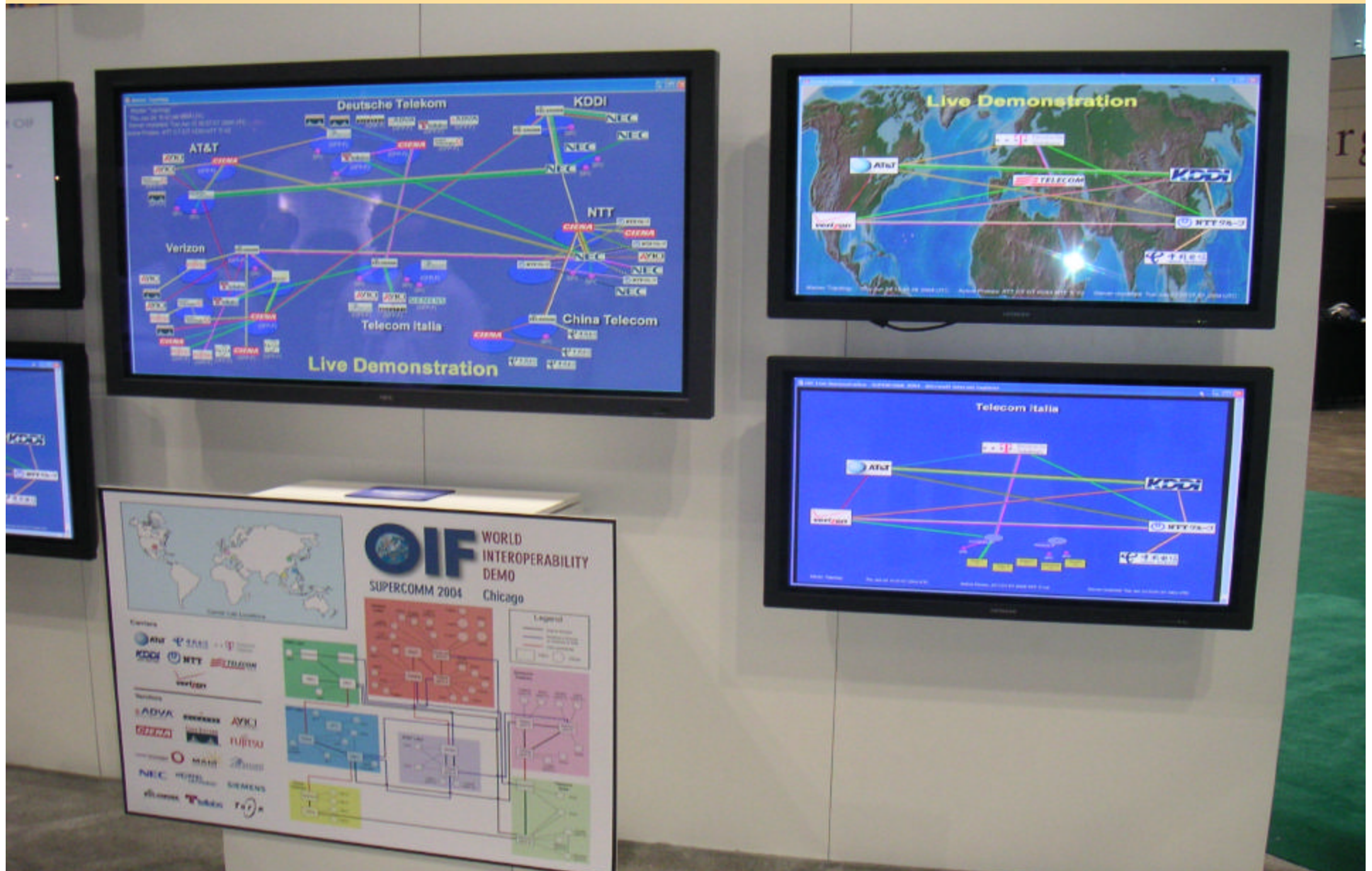


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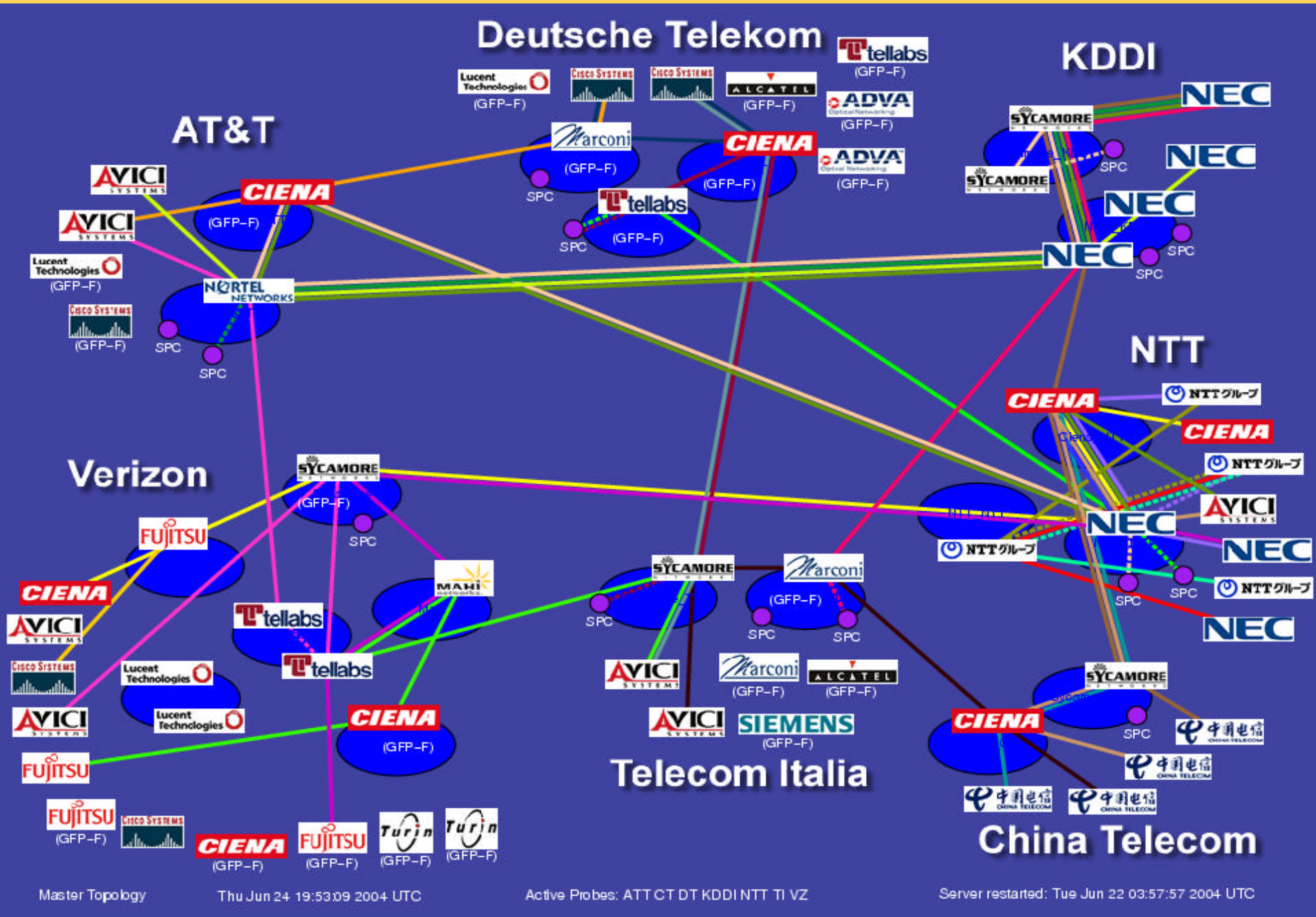
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Supercomm 2004 Booth



Supercomm 2004 Global Topology



Significance of the Large Scale Interoperability Testing

- The world wide multi carrier interoperability testing was conducted with
 - carriers' close involvement and strong support are key to the technology advancement towards industry adoption
- Control plane connectivity build out around the world lays the foundation for future testing methodology and infrastructure
- Successful control plane and data plane integration validates OIF's IP optical Implementation Agreement
 - among 15 industry leading router vendors, optical switch vendors, and software test vendors signifies the wide technology adoption in industry



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Plan Ahead

- Due to the positive responses and strong feedback from the OIF member companies, OIF will continue the interoperability work in 2005
 - Testing will be focused on control plane support of the Ethernet connection over multi domain SONET/SDH core
 - Additional testing will also be conducted on GFP functions with Ethernet virtual line services
 - More details will be disclosed soon!



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Conclusions

- Carriers are driving the requirements of the next generation IP optical networks under an unified control plane
- Evolutional approach towards the integrated network architecture of an unified control plane has gained wide supports in the service provider and vendor community in the industry
- OIF plays an important role in the continued service provider trial and public interoperability events, which are the key steps to ensure successful and deployable next generation network architecture
- Large scale, world wide interoperability testing validates the technology maturity
 - Validated interoperability among industry leading vendors
 - Allowed service provider to examine performance and network behavior of the next generation network
 - Demonstrated new network service models and applications



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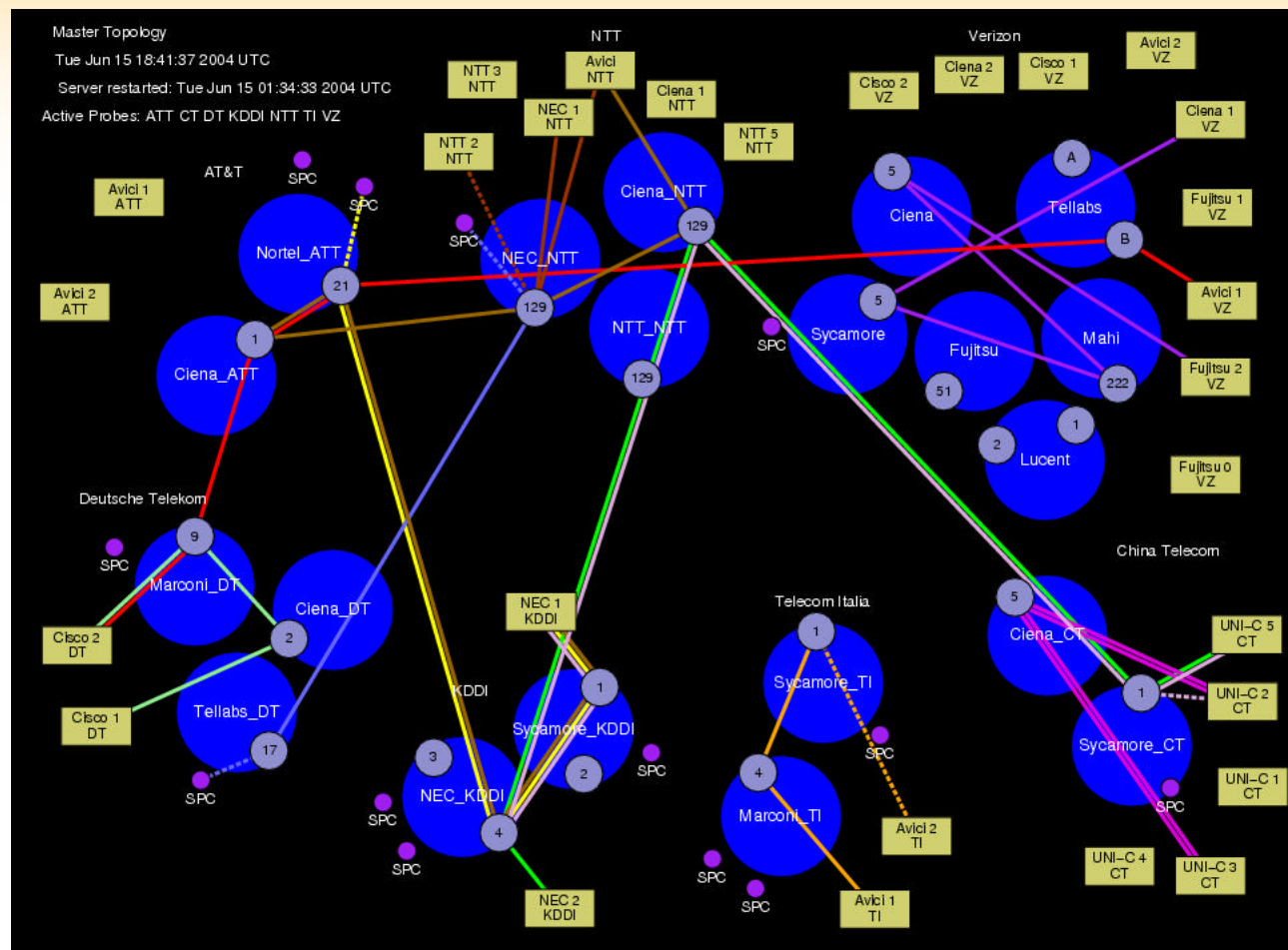
Backups



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Example #2 of the Connections



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