



Nuevas redes ¿Catalizadores para el GRID?



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Introducción



Contenidos

- Introducción
- GRID, búsqueda de soluciones
 - Problema con IP - Soluciones IP
 - MPLS -> VPN L2, VPN L3 y VPLS
 - GMPLS
- Visión de Fabricante

We need...

- Gran Ancho de Banda . Y más, y más ... y más...
- Gran capacidad de crecimiento.
- Latencias muy bajas.
- Flexibilidad en el suministro de ancho de banda.
- Interfaces 10G y Giga... ahora...
- Servicios End to End a todos los niveles.
- Integrable y compatible con todos los servicios avanzados de REDIRIS, GEANT2 e INTERNET2, actuales....

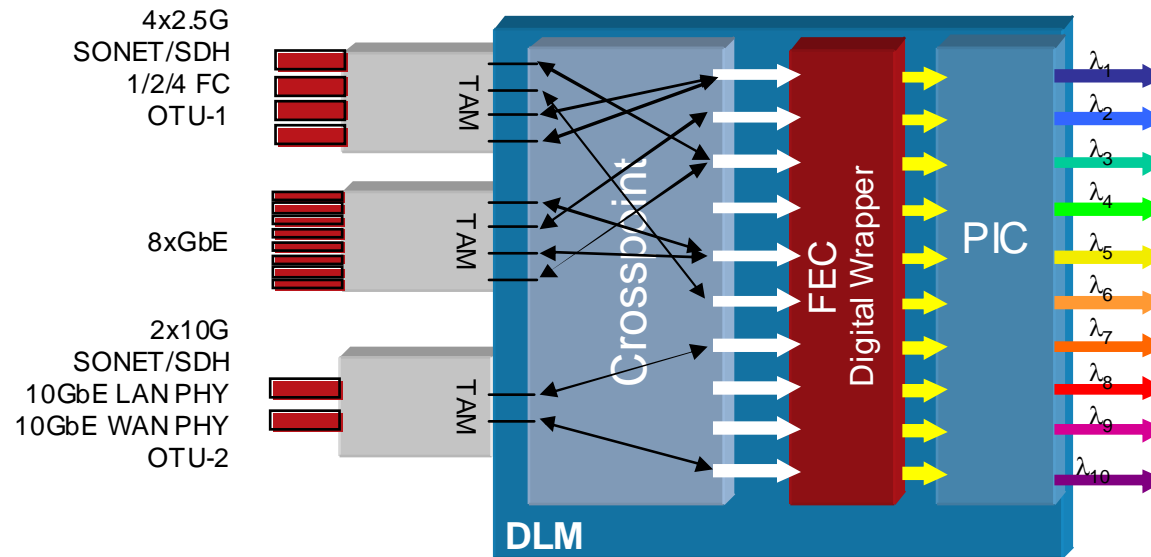
Y, dentro de lo razonable, los previstos.

Some answers...

- Multi Protocol Label Switching MPLS
 - VPN L2, VPN L3
- Virtual Private Lan Service VPLS
 - Intra and Interdomain. Cesga-Rediris.
- Dark Fiber.
- Optic equipment DWDM.
 - Dual Control Plane
 - Single Control Plane - GMPLS.
- Optic links between Research Networks.
- And QoS where needed...

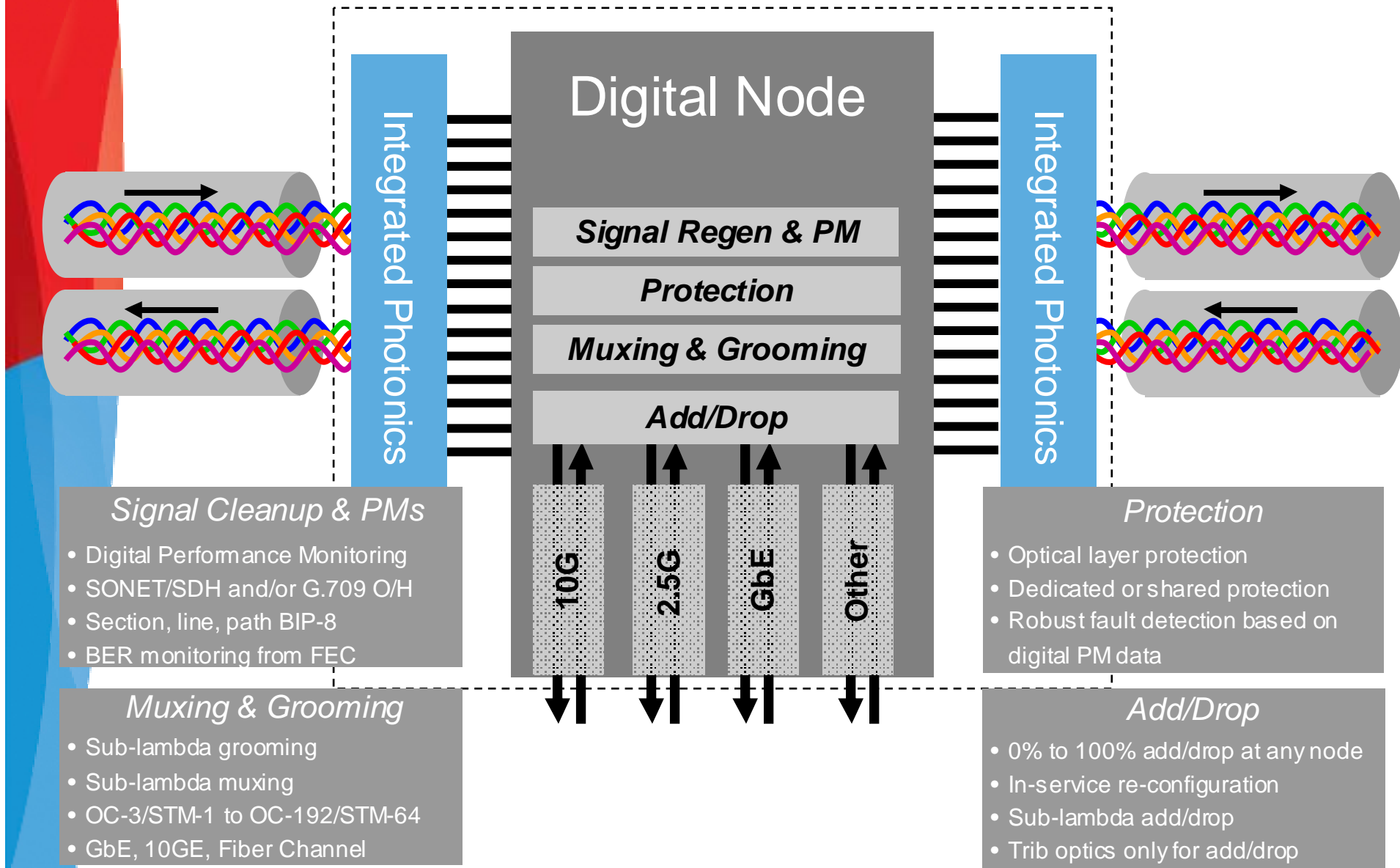
Tecnología

DWDM



- Flexible client-side mapping
 - Any client to any timeslot in any wavelength
 - Individually routable & accessible at any Digital Node
- Asynchronous Client Multiplexing
 - Client transparency fully preserved via digital wrapping
 - Mix-and-match digitally wrapped client payloads

Optic Node Features



Aproximaciones Operativas: Modelos de Capa y Peers

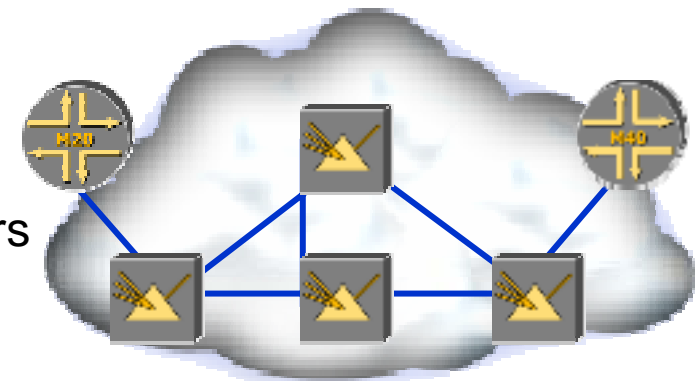
- Modelo de capas

- Dos planos de control independientes
 - IP/MPLS routing
 - Optical domain routing
- Los Routers son clientes de dominio óptico
- La topología óptica es invisible a los routers



- Modelo de Peers

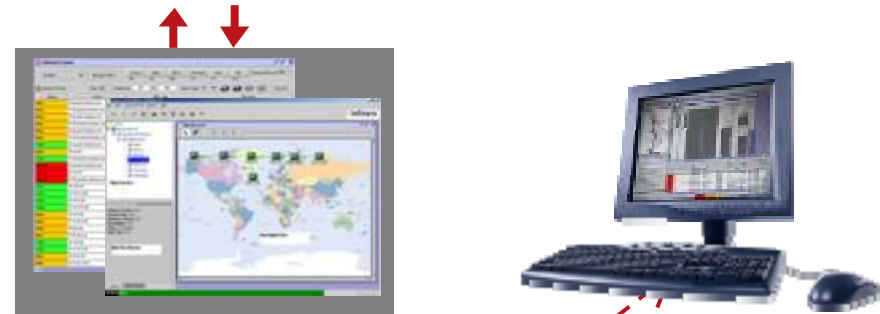
- Único plano de control
- Los Router y los switches ópticos son peer
- La topología óptica es visible para los routers
- Similar al modelo IP/MPLS



Infraestructura GMPLS

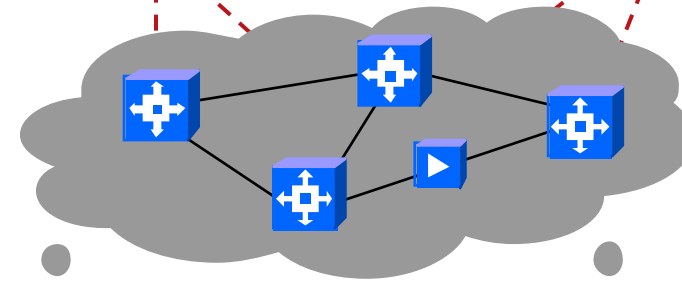
Management Suite

DNA Network & Node Management
Network Planning
OSS Integration



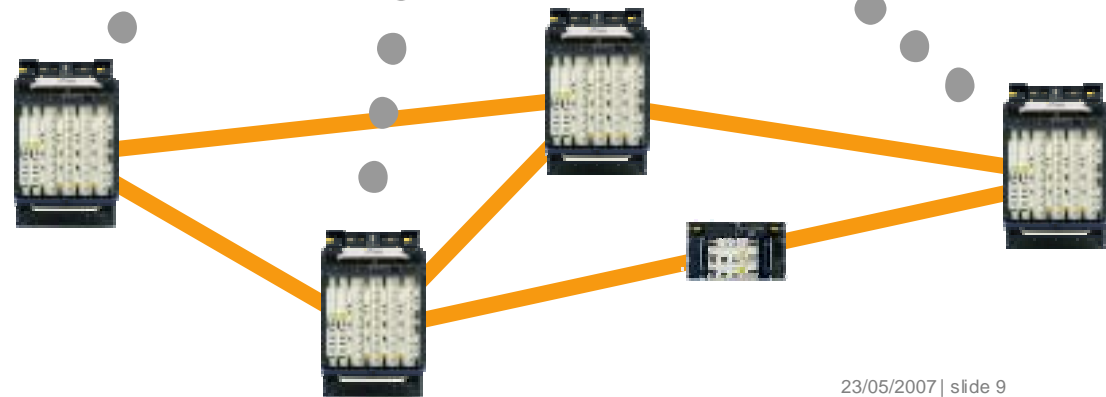
IQ

Network Operating
System

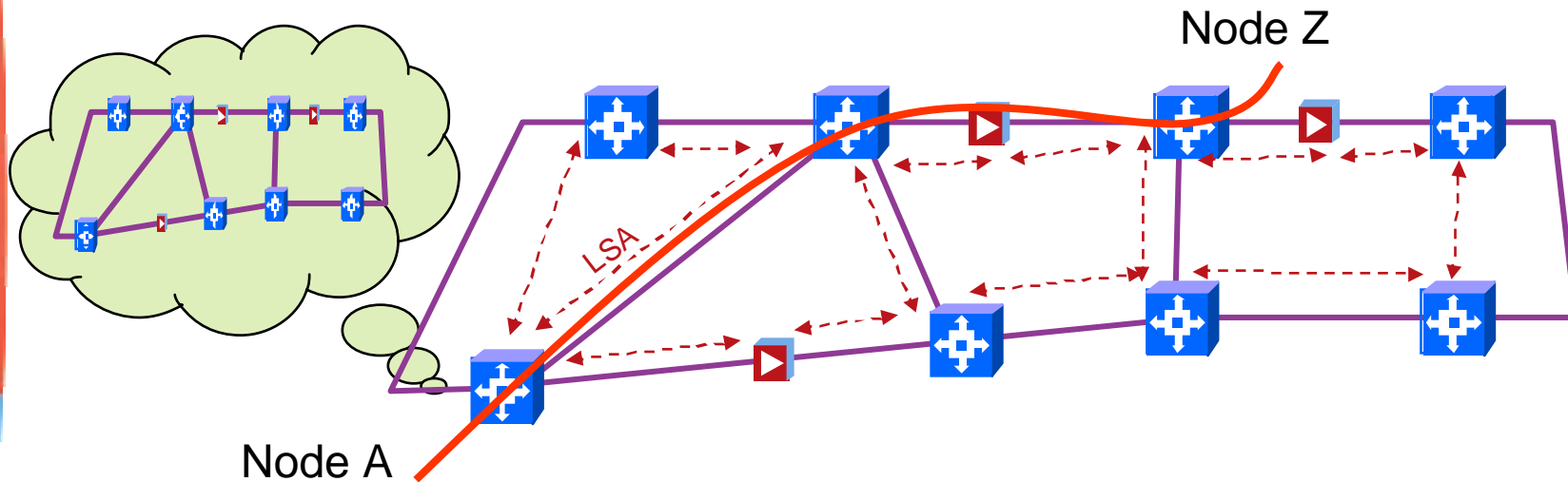


DTN

Digital Optical
Networking Systems

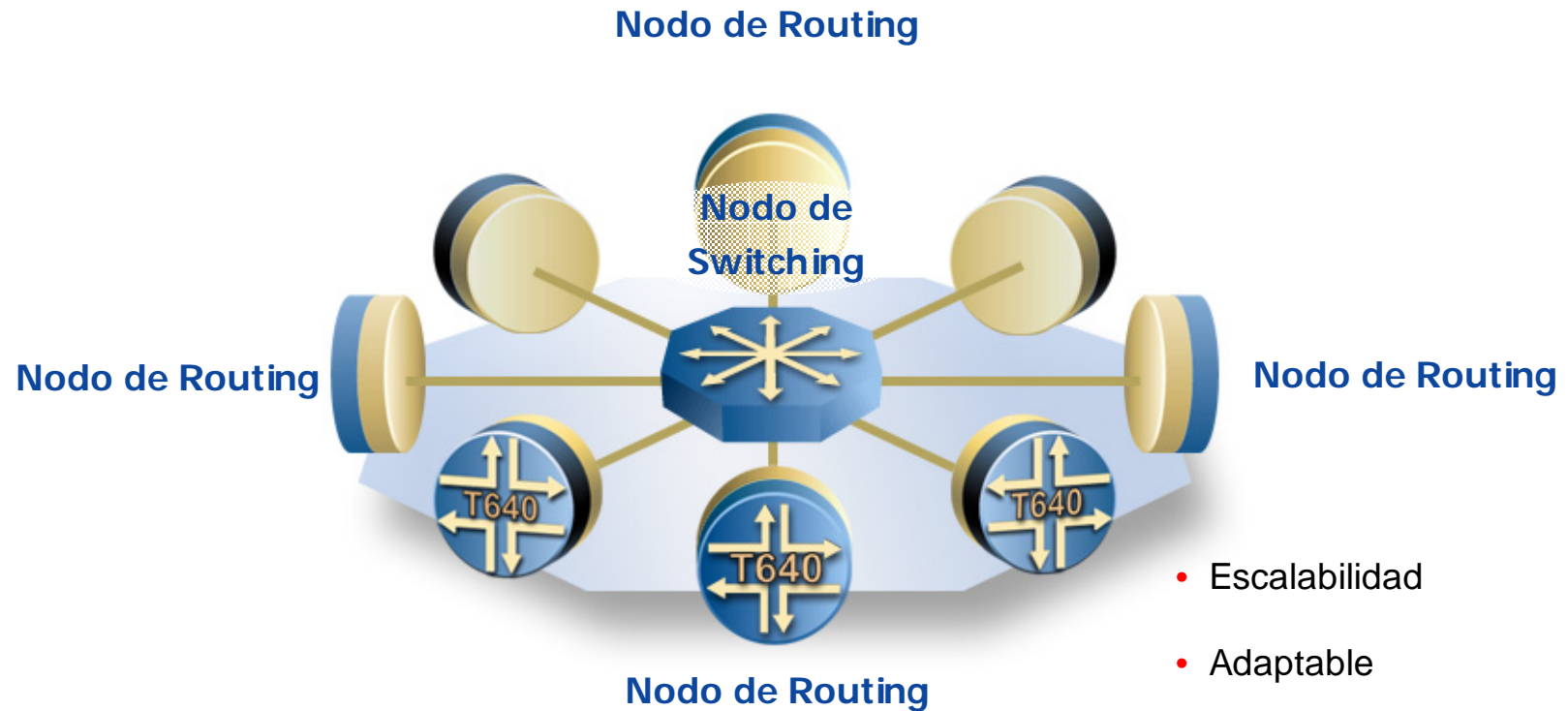


Intelligent GMPLS Control Plane



- Automated network topology discovery
 - Routing nodes & links dynamically advertised as changes occur
 - Automated source-based circuit routing
 - Traffic engineering for explicit routing control
- Automated point-and-click bandwidth turn-up
 - Robust signaling protocol for dynamic provisioning
 - Speeds service delivery
 - Enabler for service restoration schemes

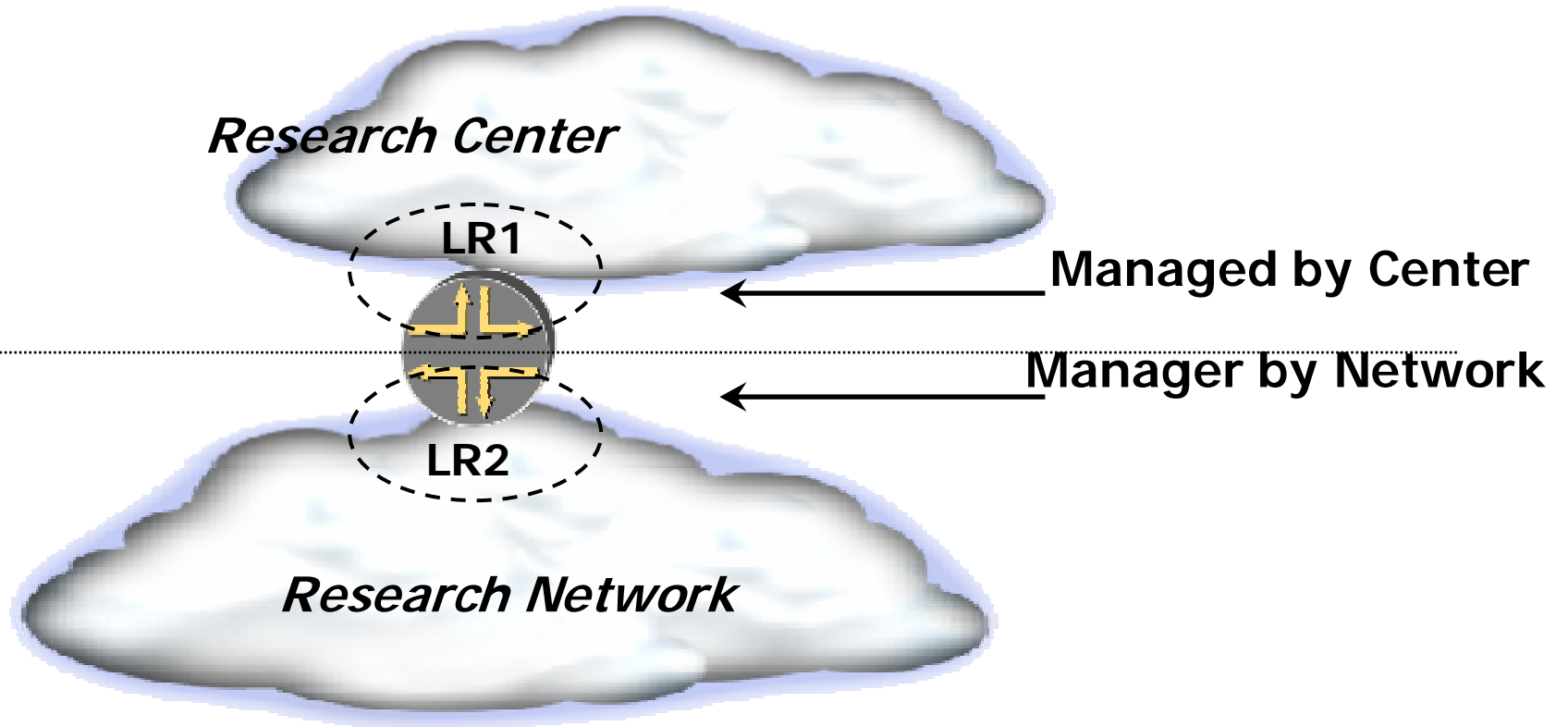
The Network is the Switch.



- Escalabilidad
- Adaptable
- Baja latencia/jitter

New ways to Network Management

Just one physical router but 2 logical Routers

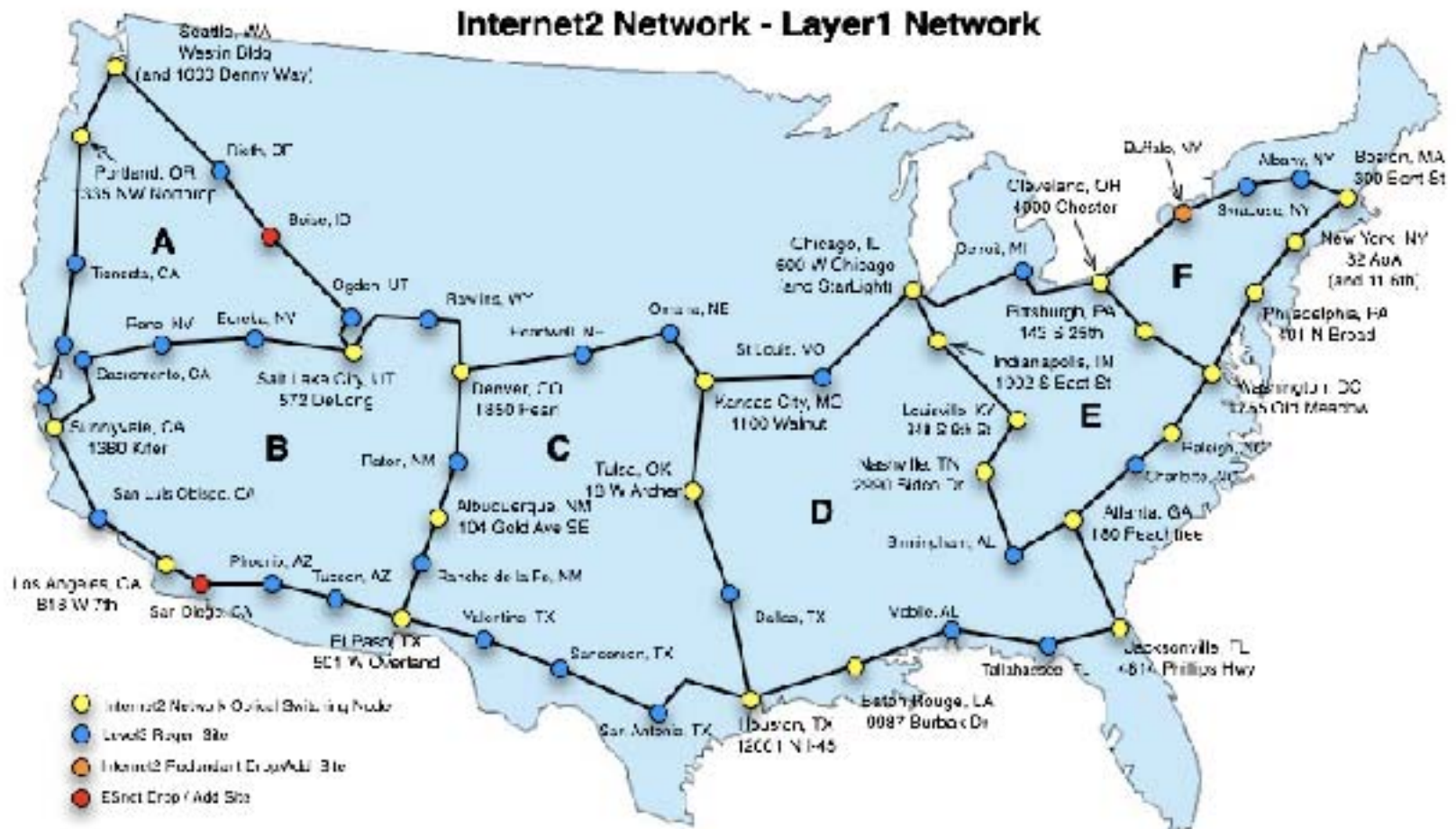


The Highways

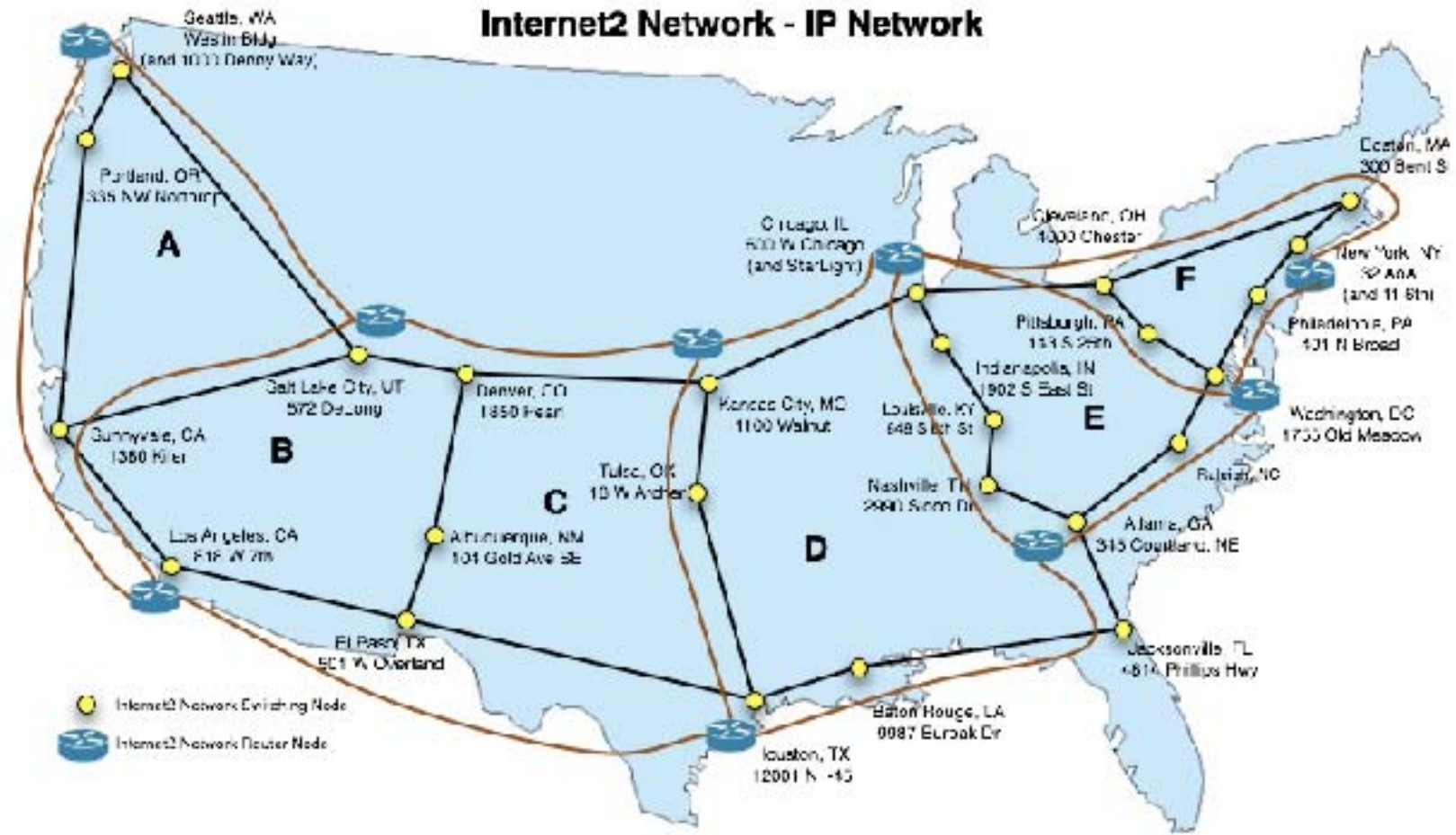
The Internet2 Network

- Hybrid IP and Dedicated Wave System
 - utilizes Level3 optical fiber platform
 - equipment and fiber dedicated to Internet2
 - sparing and equipment maintenance by Level3
 - including SLA for wave system
- Initially provisioned with ten 10-Gbps wavelengths, with unlimited capacity; scalability potential for 40 and 100 Gbps interfaces
- Flexible add-drop wave capabilities for RON's and other networks
- Simplified and rapid wave provisioning, within minutes for full waves

Optical Topology



IP Network

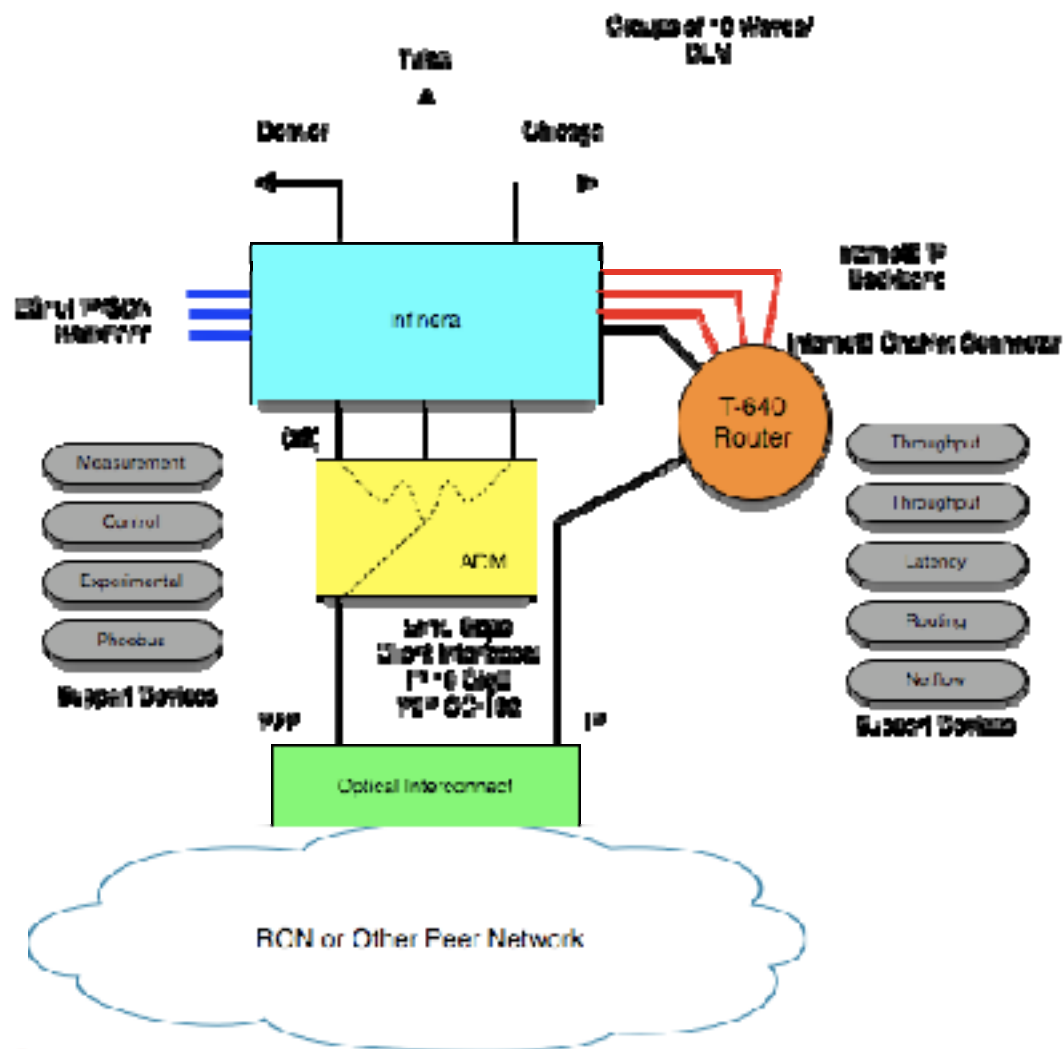


Internet2 equipment

- Nodes
 - Infinera DWDM Equipment - GMPLS control plane
 - Will be static at the beginning
 - Grooming Equipment - Ciena CoreDirector
 - Integration of DRAGON and Ciena control planes
 - At router nodes, Juniper Routers - GMPLS implementation
- Integration of control planes

Kansas City, MO

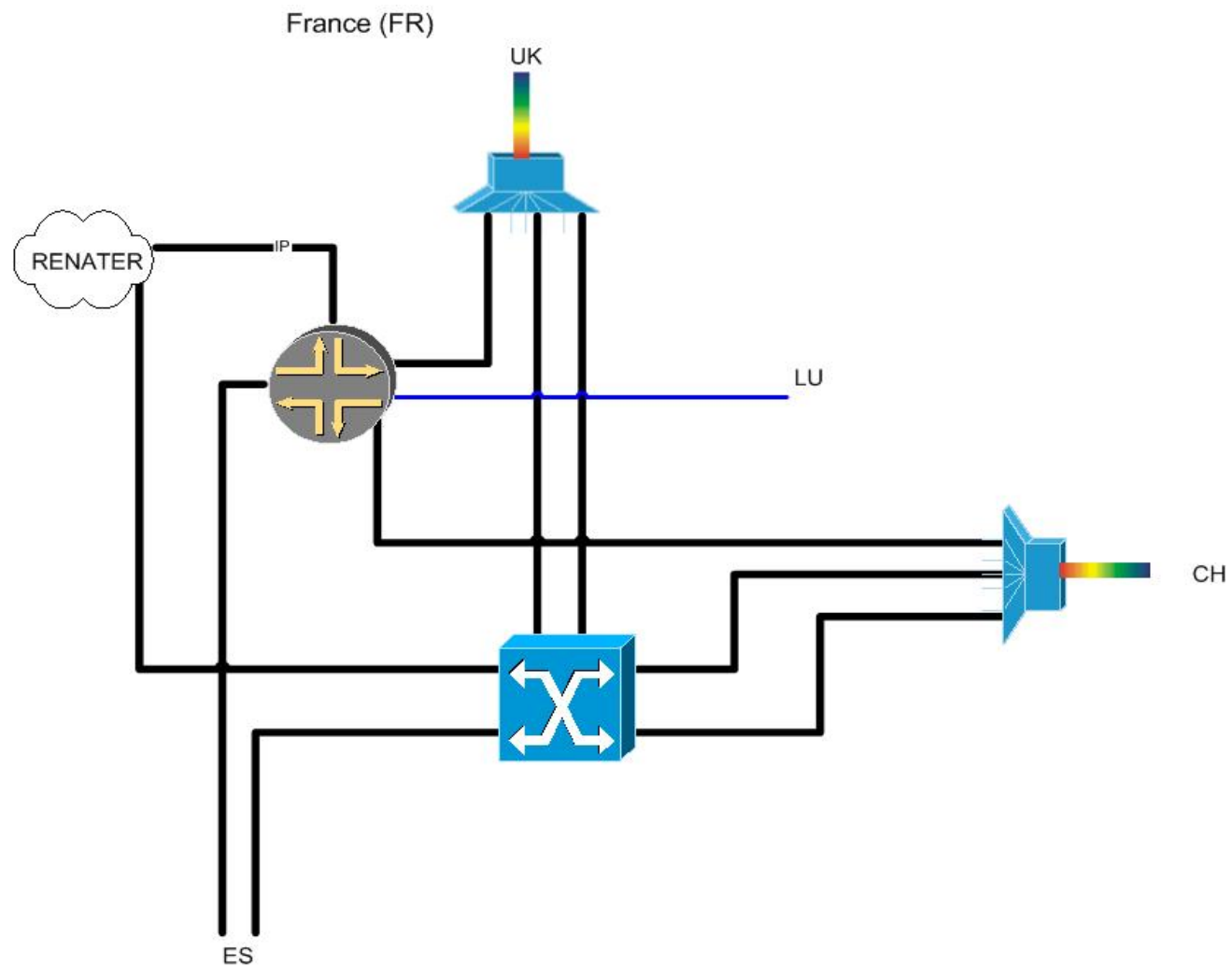
Common GP4



Internet2 Network Node Architecture

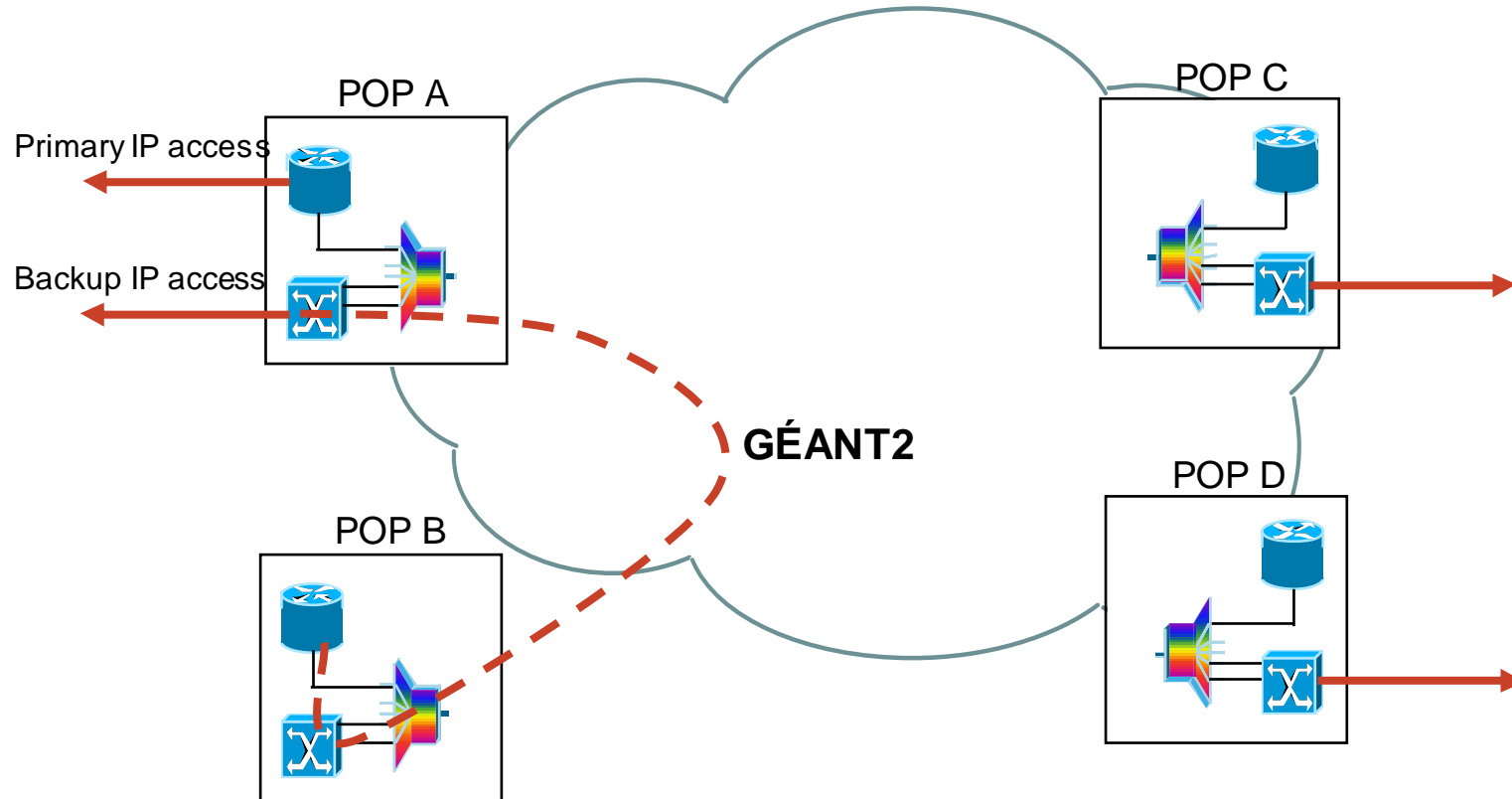
- Infinera DWDM Gear - Static at the start
- Grooming capabilities in ADM to provide sub channels and HOPI types of activities at the start
- Simplified and standardized interface to connectors, exchange points, and other global research and education networks - 2 x 10 Gbps interfaces
- Measurement and control servers will support the node

Typical GÉANT2 POP



Circuit Services over GÉANT2

More resilient IP service

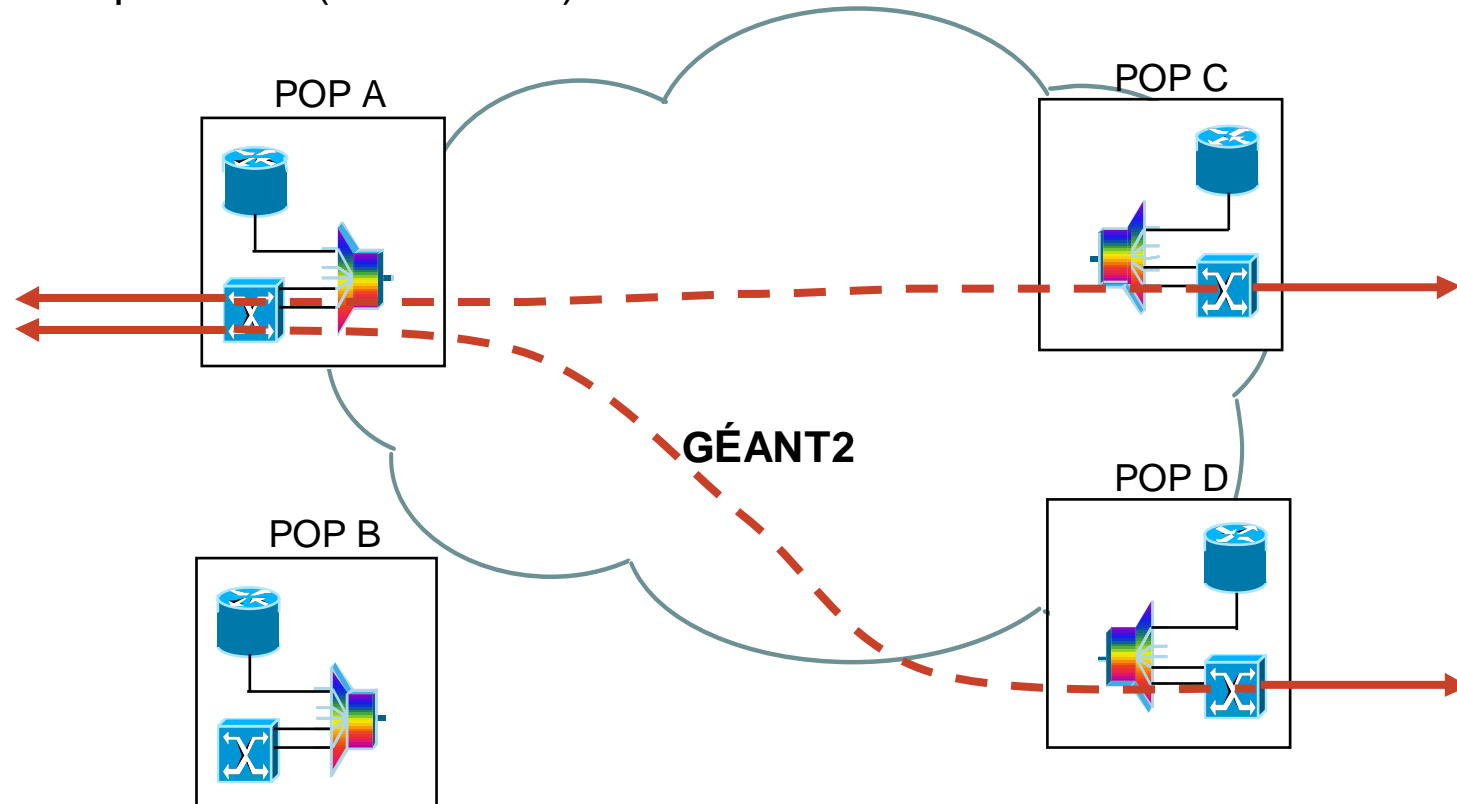


Features:

- uses GFP/VCAT
- GE port per instance
- more dynamic
- sub 1G possible

Circuit Services over GÉANT2

Point-to-point GE (GE access)

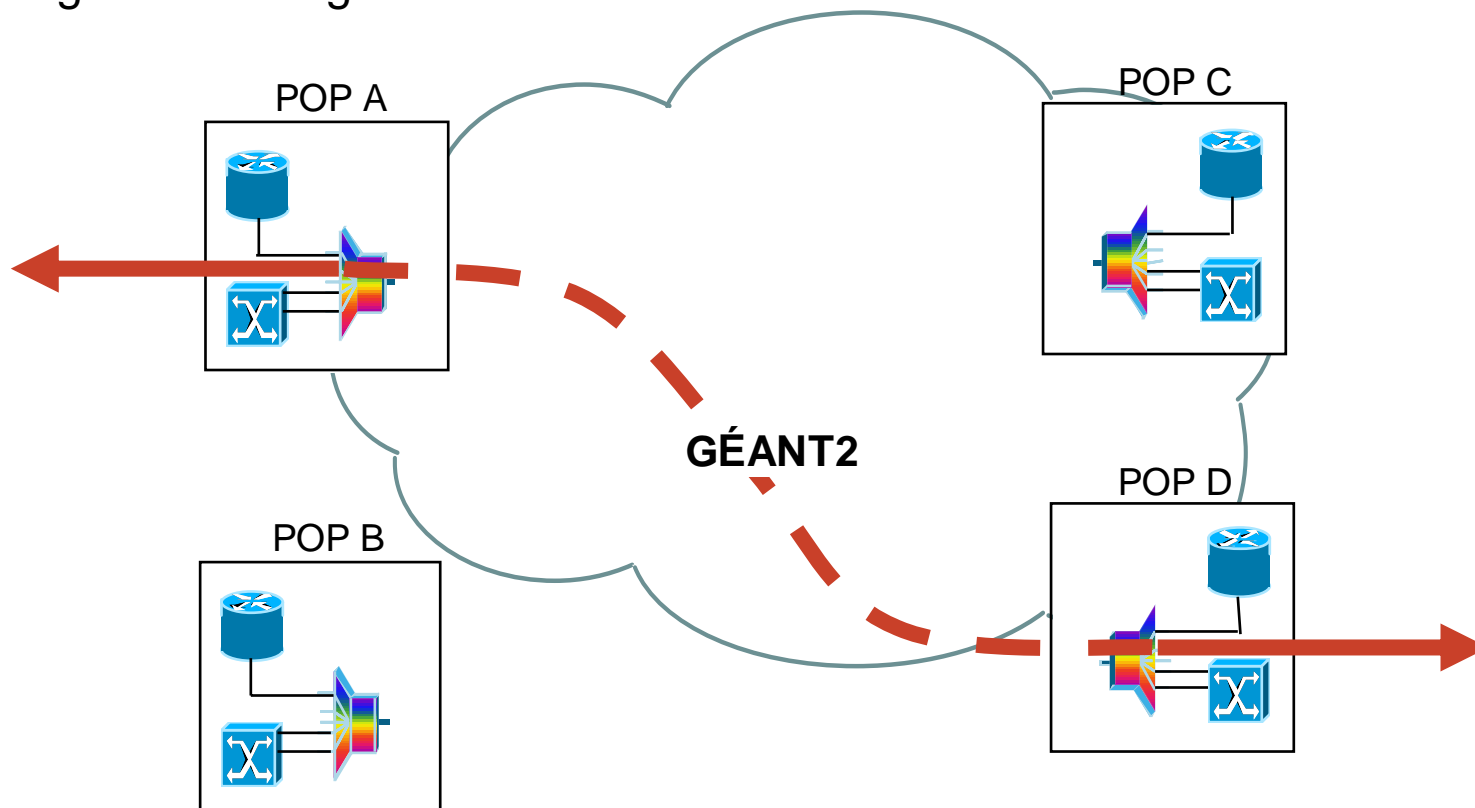


Features:

- uses GFP/VCAT
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Circuit Services over GÉANT2

Managed wavelength service

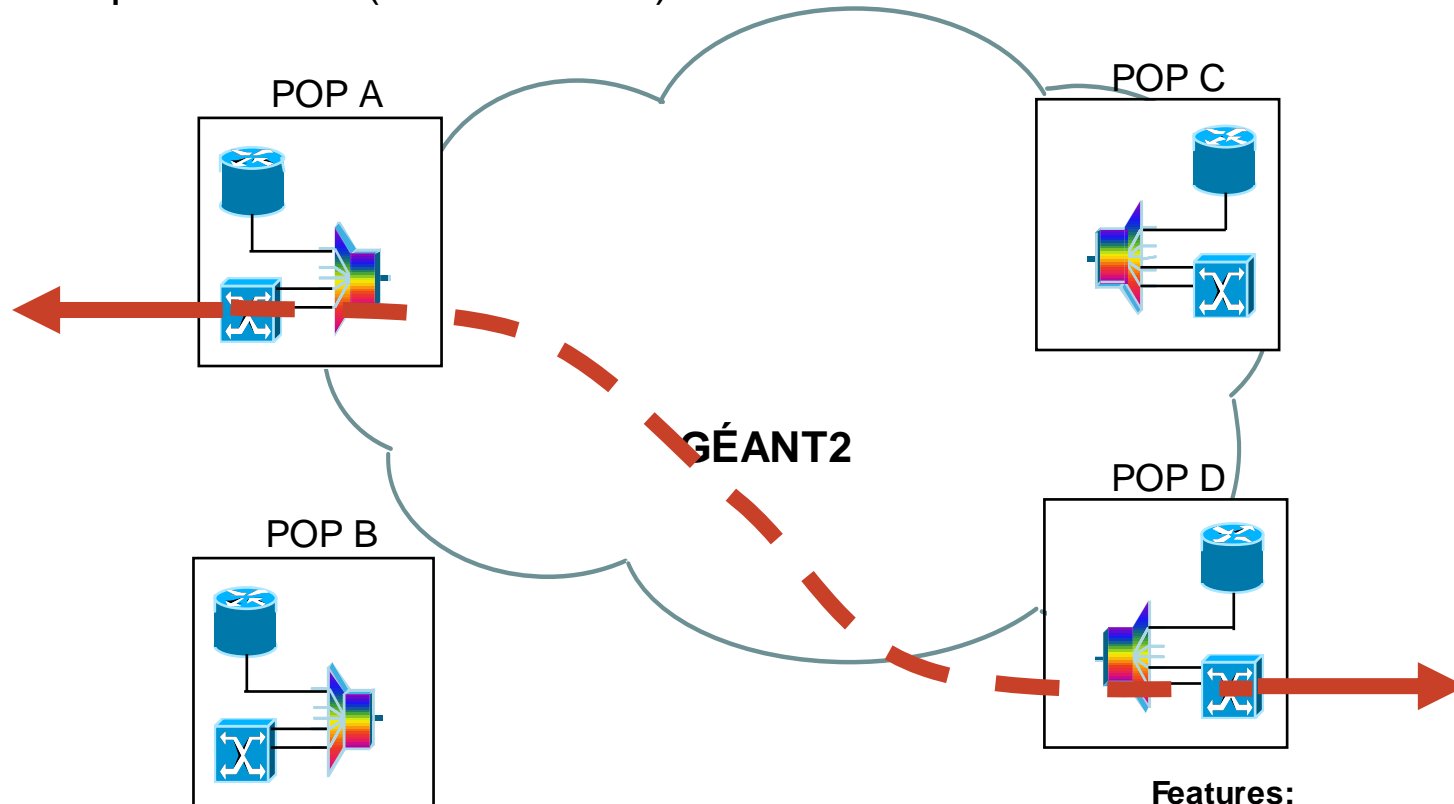


Features:

- 10G only
- SONET/SDH or 10GE LAN PHY
- static
- 10GE is full-rate

Circuit Services over GÉANT2

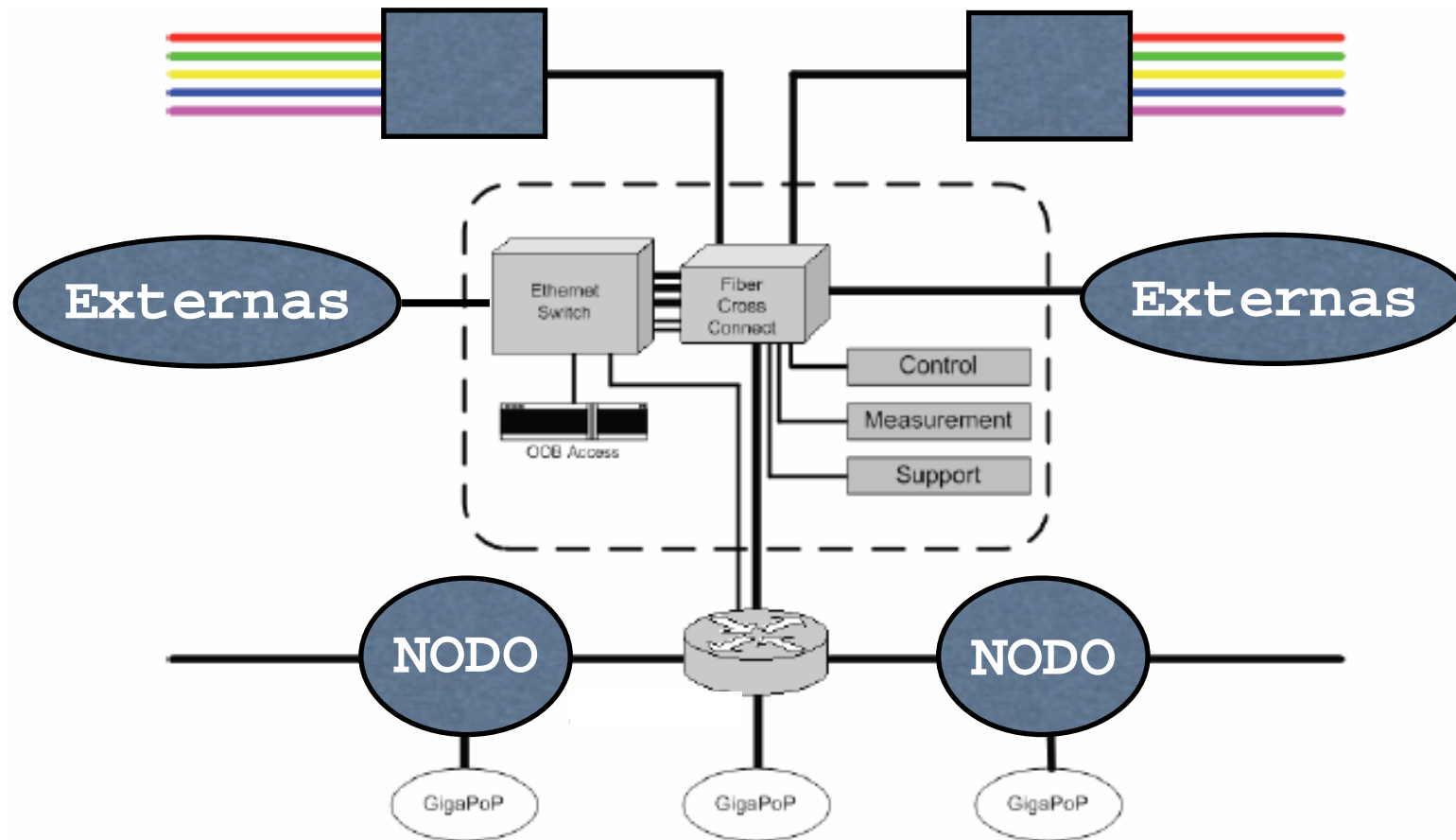
Point-to-point 10GE (and SDH too)



Features:

- uses GFP/VCAT (for 10GE)
- NOT line rate! (for 10GE)
- more dynamic
- sub 10G possible

Nodo tipo



SURFnet's new Industry Partners (2004-2010)

NORTEL
NETWORKS™

- Leader of the consortium
- Optical equipment
- Ethernet equipment
- Network management equipment

AVICI
S Y S T E M S

- Routing equipment

TELINDUS

- Installation services
- Maintenance services

 **telindus**

SURFnet6 overview

- A hybrid optical and packet switching infrastructure
- Based on customer-owned managed dark fiber
- Native IPv4, IPv6 and Light Path Provisioning over a single transmission infrastructure
 - Managed via a single control plane
 - Network nodes reduced from 20 routed locations to 2 routed locations

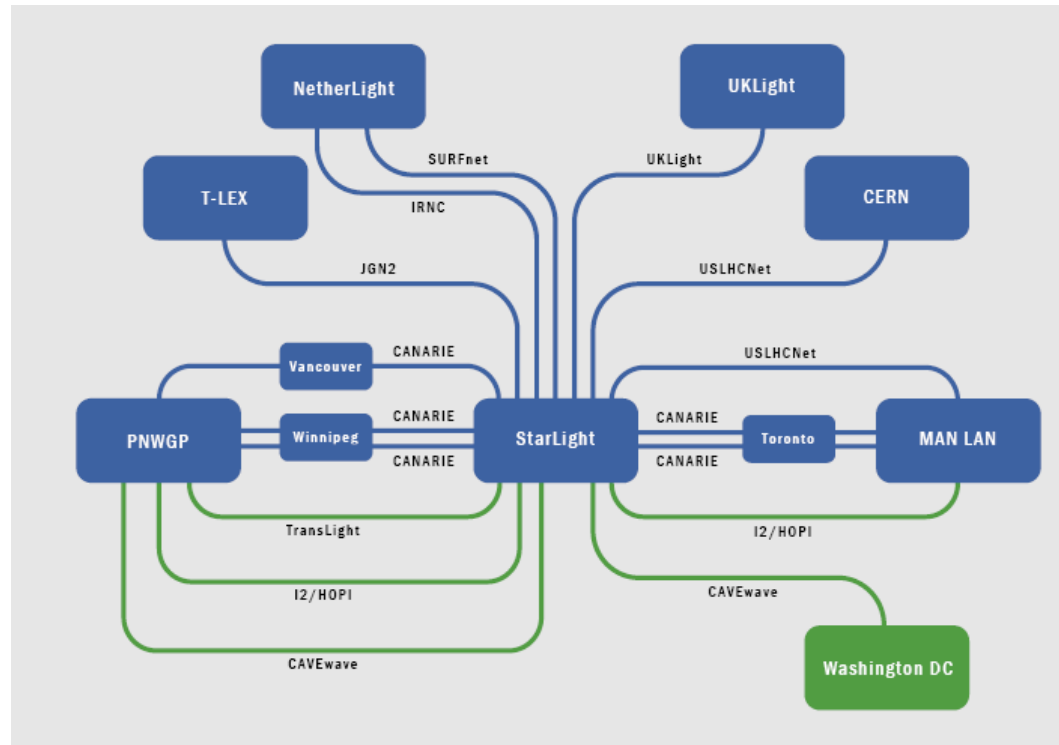
Paving the way to a ubiquitous and scalable
Services Grid

SURFnet6: IP Services

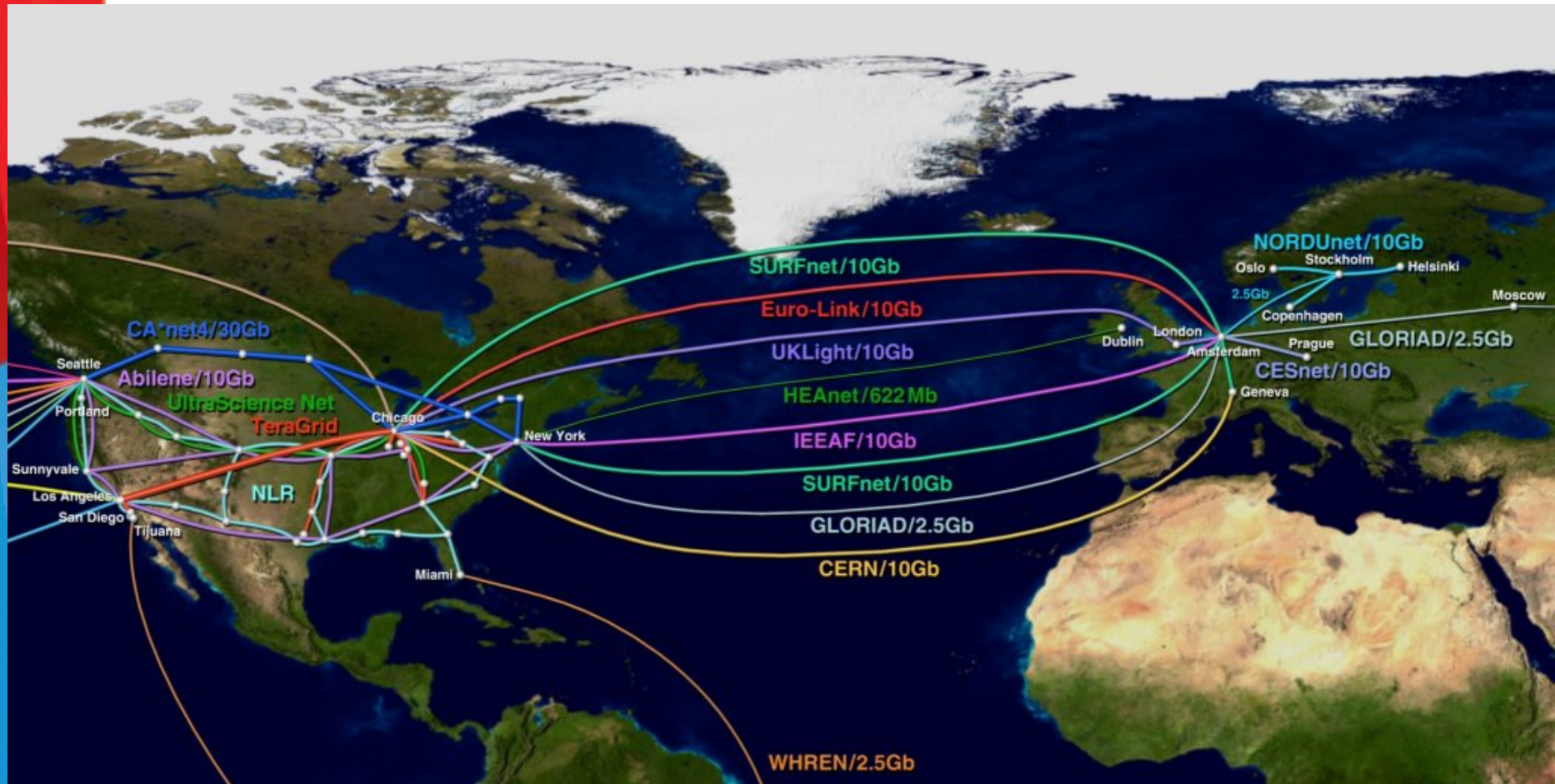
- IPv4 and IPv6 connectivity
 - Unicast
 - Multicast
- 1 and 10 Gigabit Ethernet connections
- Small routed IP core in Amsterdam at two separate locations
- Congestion-free via overprovisioning
- Resilient

Global Lambda Integrated Facility

GLIF is an international virtual organisation that promotes and supports optical networking. It is a collaborative initiative of research networks across the world, as well as institutions and consortia working with lambdas.



Global Lambda Integrated Facility



www.glif.is

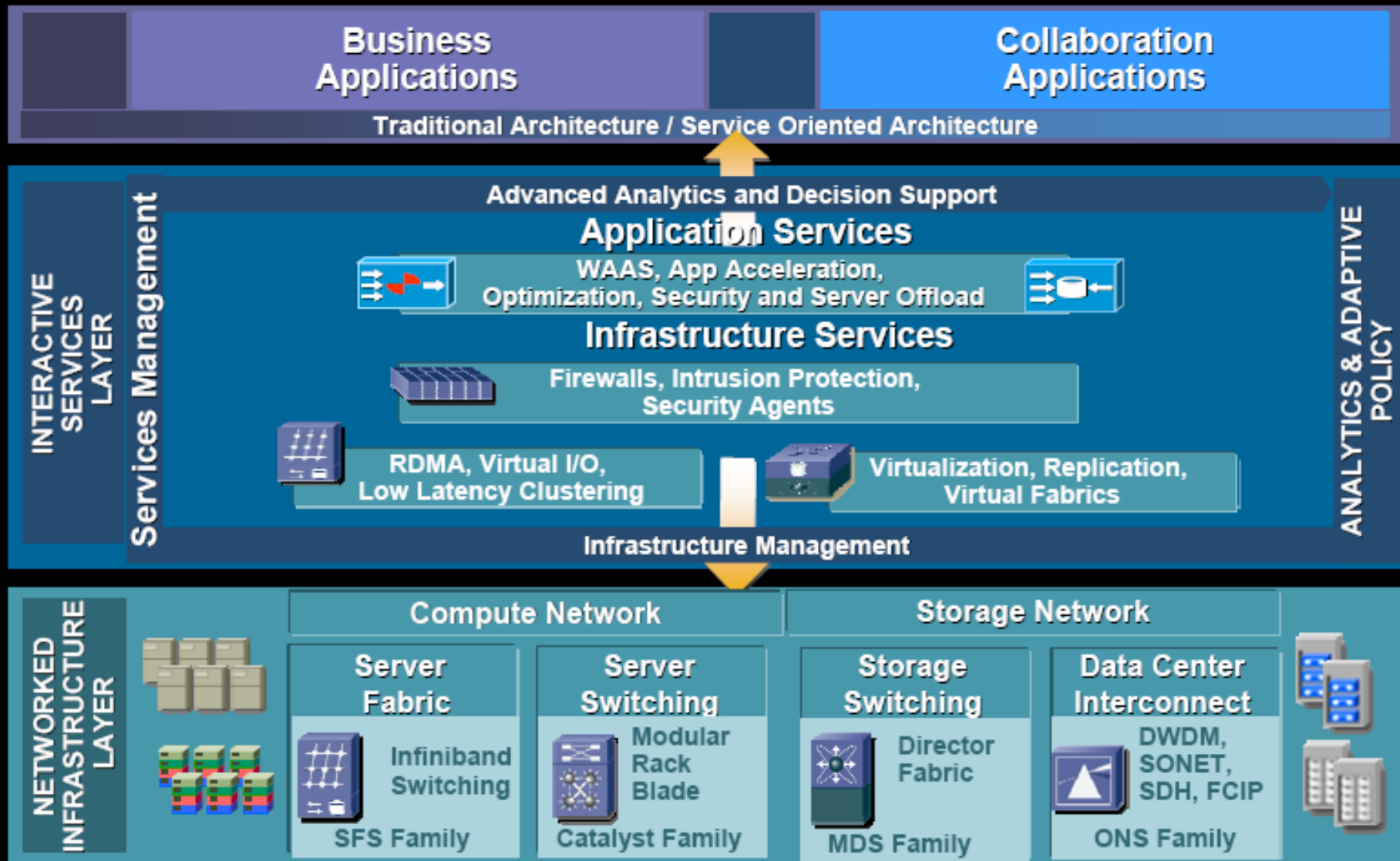


Visualization courtesy of
Bob Patterson, NCSA.

Visión de Fabricante: A donde vamos...

- CISCO

Cisco Data Center Network Architecture



NUEVAS REDES, NUEVAS POSIBILIDADES

- Sistema híbrido IP y óptico
 - Utiliza fibra óptica oscura
 - Utiliza radio enlaces nativos IP de alta capacidad para la última milla.
 - Plano único de gestión utilizando GMPLS
 - Permite una gestión completa de forma centralizada
- Inicialmente utiliza lambdas de 10-Gbps; escalable a interfaces de 40 y 100 Gbps
- ¿¿INFINIBAND en el CORE???
- Se pueden suministrar lambdas de forma flexible a los centros.
- Suministro de ancho de banda allí donde se necesita.
- Ubicación de los routers según el interés. La red como conmutador.



Gracias por su atención

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