Lightpath provisioning: Is GMPLS the solution?

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Outline

- Introduction
- Lightpaths (What, Why, How)
- GMPLS and integrating the Control Planes
- Q&A
Who We Are

- Wavium started summer 2000
- Spinoff from Telia Research
- Develop and sell Optical WaveSwitches

Customers:
- Eurofiber, Acreo, Royal Institute of Tech. Stockholm,
- Telia Sonera, France Telecom
Lightpaths (What)

What: A Lightpath is a high bandwidth dedicated transport channel, e.g.

- WaveLength
- SONET/SDH 2,5Gb and above
- Ethernet 1Gb and above
Why: A Lightpath provides:

- **Router End to End Lightpath**
  - Higher speed, lower latency, lower cost
- **LAN Interconnect**
- **GRID**
- **Transparent Services**
  - Other protocols than Ethernet/SDH/SONET
- **Resilience (Protection, Restoration)**
How: Provisioning of the Lightpath

Necessary functions

- Create, Tear, Monitor, Protect, etc

Centralized or Distributed Network Control

Automatic Provisioning between IP and Transport network

- OIF, GMPLS, ASON
Lightpath Services

WX's: A transparent server network; IP, SDH, etc are clients
Lightpath Services
Wavium node concept

- Router interconnect
- Raw bandwidth services
  - E.g. GRID
- Network partitioning
  - "Optical VPN"
- Protection/Restoration

WaveSwitch

- IP basic connectivity
- IP VPN Services
- QoS

IP/Ethernet

Bandwidth

User domain

ISP domain

Carrier domain

GbE
2.5G
10G
1.25G, 2.5G, 10G
(Eth, POS, \(\lambda\))

Dark fibre
Managing the network

Today: Separate management for IP network and Transport network
  - Management for each network layer is mature

Tomorrow: Provisioning across layers and technologies is the challenge
  - Protocols
  - Peer model vs Overlay model
A Natural Migration

- MPLS already successful for packet networks
  - Some issues for big multidomain IP networks
- GMPLS the natural evolution
  - Additional support for TDM, WDM and Fibre
  - Bidirectional LSP
  - Datacom/Telecom merging, A unified protocol is needed

- ASON provide the framework for interdomain interop
Interoperability
- Most vendors only support subset
- Standard not fully set

What about legacy equipment?
Opaque interfaces between administrative and vendor domains

Full Peering within 'islands’
Separation between Service (IP) and Transport layer. (Overlay model)
- IETF/ITU reference point signalling (UNI, NNI)
- Ok with non-GMPLS islands as long as they support IETF/ITU reference-point signalling
Solution: Network Partitioning

Operator A
Proprietary control plane

Operator B
Manual handling

Operator C
Proprietary

Operator D
Pre-ASON

“Global” operator
Pre-GMPLS

Wavelength switch
Ethernet switch
IP router
SDH crossconnect
It Works Today

*If:*

- Automated Signalling within subnetworks
  - GMPLS/ASON or Proprietary protocols
  - Distributed or Centralised

- Support standardised UNI/NNI Interfaces
Advantages with GMPLS

- Interoperability
  - Between technologies, layers
  - Between vendors

- Already present in IP networks in the form of MPLS

- GMPLS can be introduced in the network step by step due to UNI/NNI

- Faster development time / Interop testing for vendors as the standard becomes mature
Example Testbed

- Acreo Testbed with Wavium and Juniper Equipment
- Using IETF (RSVP-TE UNI)
- Fully automatic Lightpath create and tear

1. Path Create message from Router A to Network control (RSVP-TE)
2. NMS Configure Transport Network (only edge is visible to routers)
3. NMS forwards Path Create message to Router B which responds (RSVP-TE)
4. NMS responds to Router A. Path Create Ok. (RSVP-TE)
The Question was: *Lightpath provisioning: Is GMPLS the solution?*

**Answer:** Yes, but also:

- IETF/ITU UNI/NNI necessary
- GMPLS can be introduced step by step in different parts of the network
- Control can be either distributed or centralized in different subnetworks
Questions?