

# GLIF @ OGF 25: GOLE philosophy revisited

**Cees de Laat**

GLIF.is founding member

**SURFnet**

**EU**

**BSIK**

**NWO**

**University of Amsterdam**

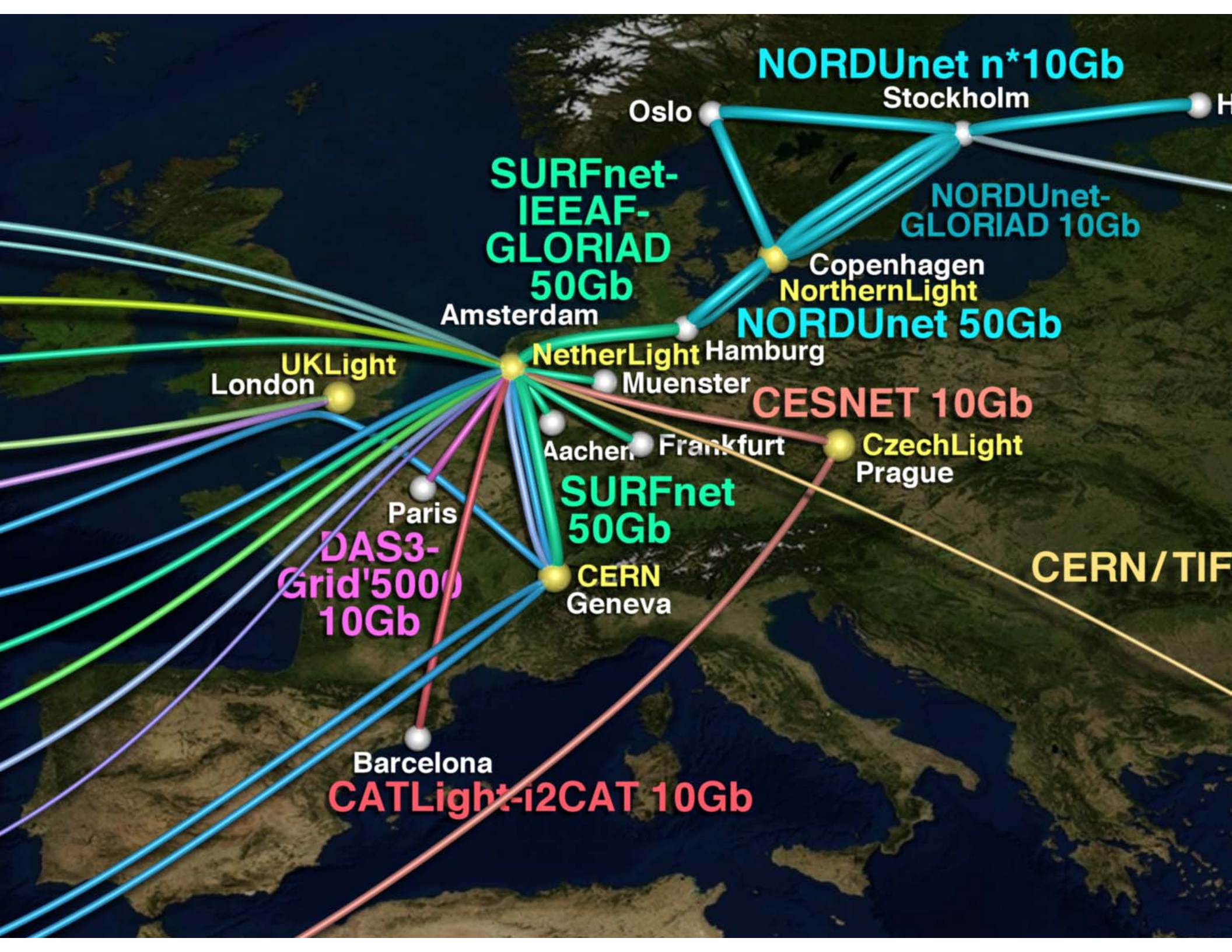
TNO  
NCF



They pay this trip ☺







# VIZ

DataExploration

RemoteControl

TV

Medical

CineGrid



Conference

Gaming

Mining

Web2.0

Management

Backup

Media

Visualisation

Security

Meta

## NetherLight

Workflow

Clouds

Distributed



EventProcessing

# GRID

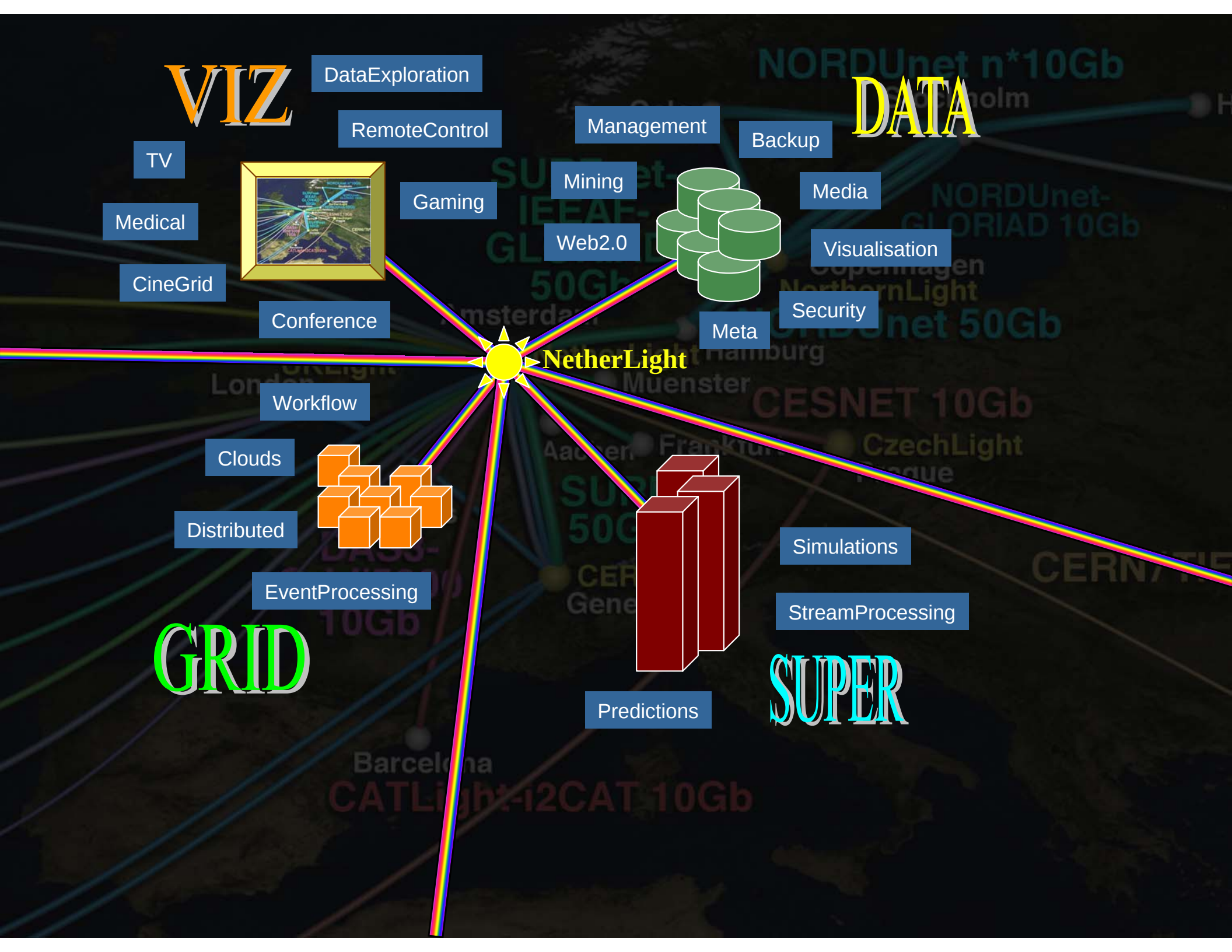
Predictions

Simulations

StreamProcessing

# SUPER

# DATA



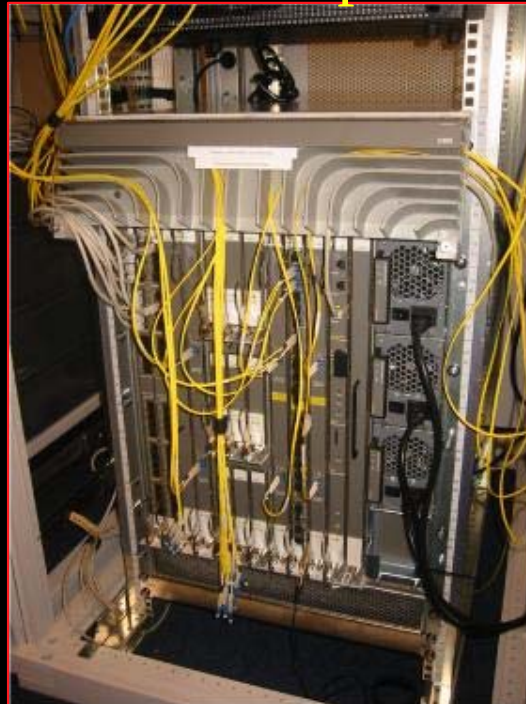
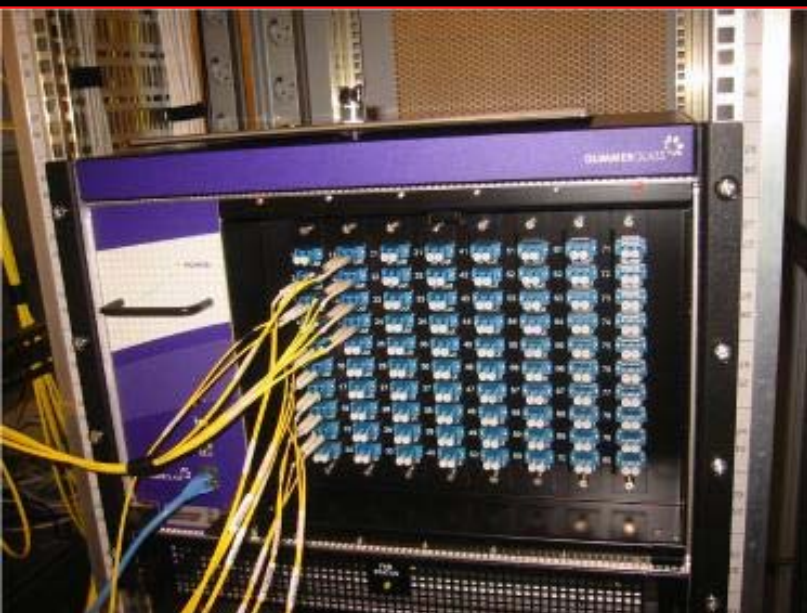
# Towards Hybrid Networking!

- Costs of photonic equipment 10% of switching 10 % of full routing
  - for same throughput!
  - Photonic vs Optical (optical used for SONET, etc, 10-50 k\$/port)
  - DWDM lasers for long reach expensive, 10-50 k\$
- Bottom line: look for a hybrid architecture which serves all classes in a cost effective way
  - map A -> L3 , B -> L2 , C -> L1 and L2
- Give each packet in the network the service it needs, but no more !

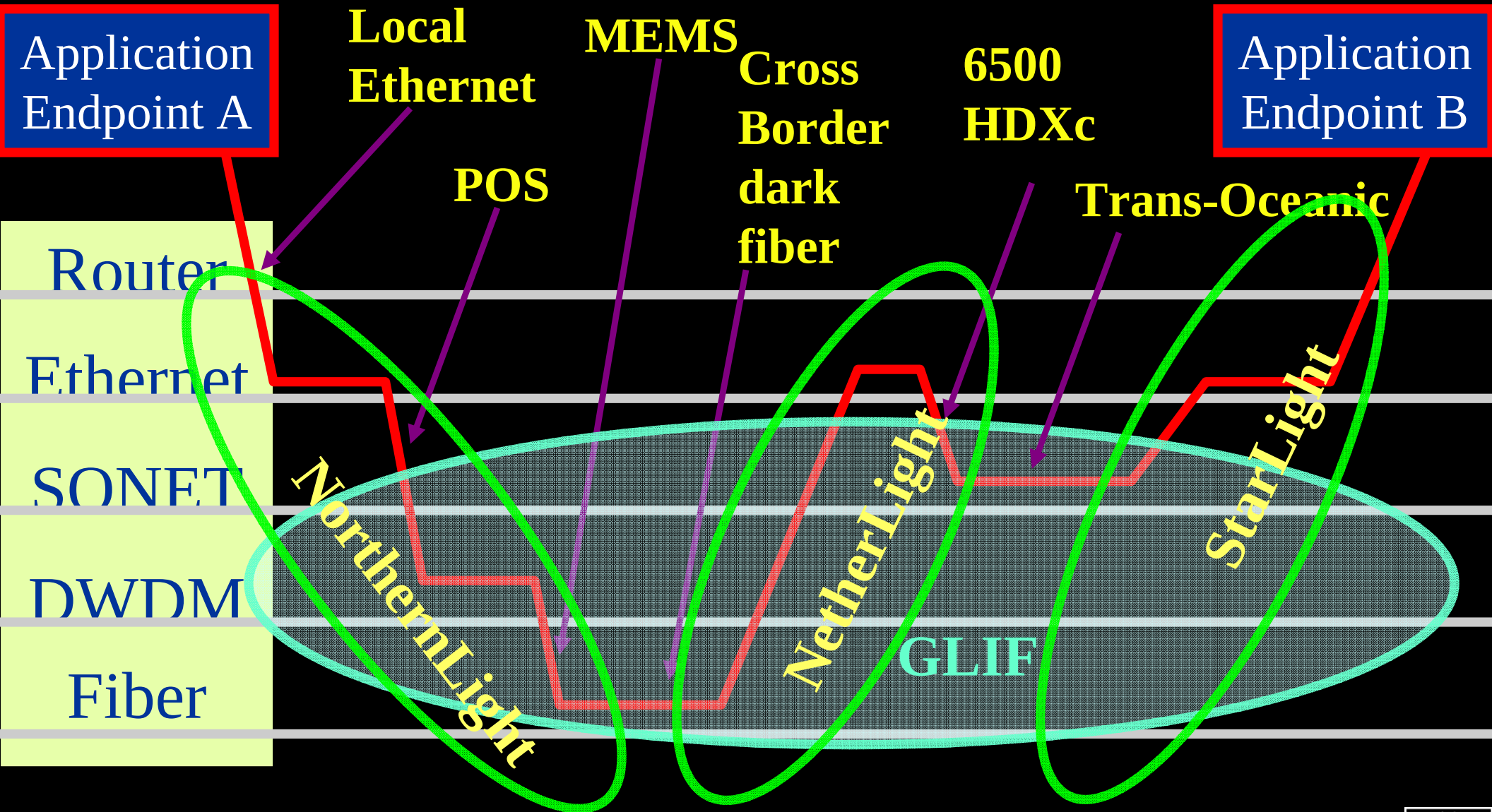
L1 . 2-3 k\$/port  
0.5 W/port

L2 . 5-8 k\$/port  
10-15 W/port

L3 . 75+ k\$/port  
250 W/port



# How low can you go?



# Function of a GOLE

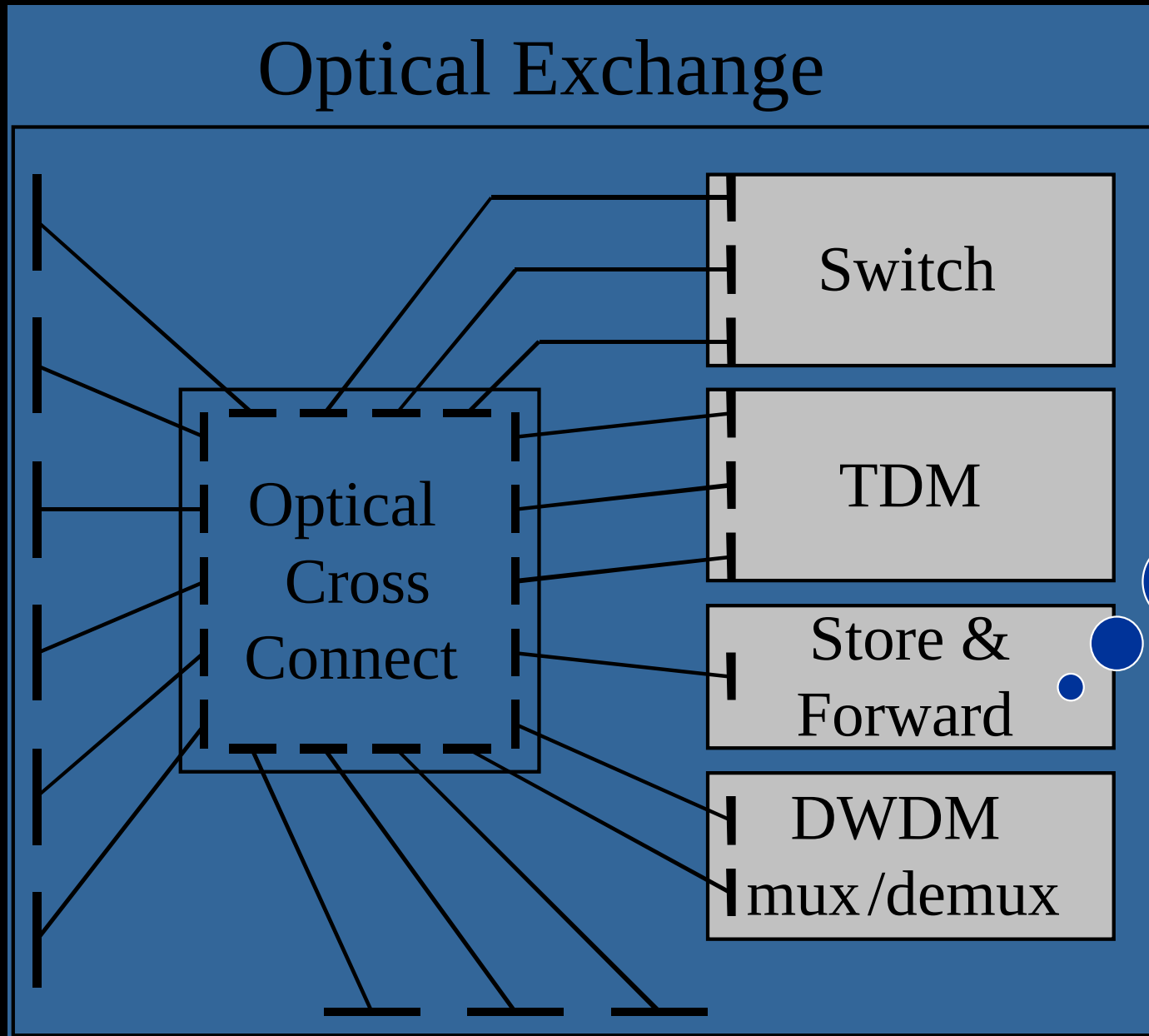
- Enable traffic exchange among peers
- Adapt data/traffic formats when necessary
- AND NOTHING MORE!

Why?

- Economy of scale



# Optical Exchange as Black Box



- TeraByte
- Email
- Service

# Service Matrix

| From \ To                           | WDM<br>(multiple $\lambda$ )                            | Single $\lambda$ , any<br>bitstream                     | SONET/<br>SDH         | 1 Gb/s<br>Ethernet                     | LAN PHY<br>Ethernet                    | WAN PHY<br>Ethernet                    | VLAN<br>tagged<br>Ethernet            | IP over<br>Ethernet                   |
|-------------------------------------|---------------------------------------------------------|---------------------------------------------------------|-----------------------|----------------------------------------|----------------------------------------|----------------------------------------|---------------------------------------|---------------------------------------|
| WDM<br>(multiple $\lambda$ )        | cross-connect<br>multicast,<br>regenerate,<br>multicast | WDM demux                                               | WDM<br>demux*         | WDM demux<br>*                         | WDM demux<br>*                         | WDM demux<br>*                         | WDM demux<br>*                        | WDM demux<br>*                        |
| Single $\lambda$ , any<br>bitstream | WDM mux                                                 | cross-connect<br>multicast,<br>regenerate,<br>multicast | N/A *                 | N/A *                                  | N/A *                                  | N/A *                                  | N/A *                                 | N/A *                                 |
| SONET/SDH                           | WDM mux                                                 | N/A *                                                   | SONET<br>switch,<br>+ | TDM demux<br>*                         | TDM demux <sup>6</sup>                 | SONET<br>switch                        | TDM demux<br>*                        | TDM demux<br>*                        |
| 1 Gb/s Ethernet                     | WDM mux                                                 | N/A *                                                   | TDM mux               | aggregate,<br>Ethernet<br>conversion + | aggregate,<br>eth. convert             | aggregate,<br>Ethernet<br>conversion   | aggregate,<br>VLAN encap              | L3 entry *                            |
| LAN PHY<br>Ethernet                 | WDM mux                                                 | N/A*                                                    | TDM mux <sup>6</sup>  | aggregate,<br>Ethernet<br>conversion   | aggregate,<br>Ethernet<br>conversion + | Ethernet<br>conversion                 | aggregate,<br>VLAN encap              | L3 entry *                            |
| WAN PHY<br>Ethernet                 | WDM mux                                                 | N/A *                                                   | SONET<br>switch       | aggregate,<br>Ethernet<br>conversion   | Ethernet<br>conversion                 | aggregate,<br>Ethernet<br>conversion + | aggregate,<br>VLAN encap              | L3 entry *                            |
| VLAN tagged<br>Ethernet             | WDM mux                                                 | N/A *                                                   | TDM mux               | aggregate,<br>VLAN decap               | aggregate,<br>VLAN decap               | aggregate,<br>VLAN decap               | Aggregate,<br>VLAN decap<br>& encap + | N/A                                   |
| IP over Ethernet                    | WDM mux                                                 | N/A *                                                   | TDM mux               | L3 exit *                              | L3 exit *                              | L3 exit *                              | N/A                                   | Store &<br>forward, L3<br>entry/exit+ |

# What can we learn from Internet Exchanges?

- Example: Amsterdam Internet Exchange
  - Basically a big Ethernet switch
  - L2 functionality
  - Peers do their BGP thing
  - Do not need to inform AMS-IX when setting up new peering arrangement (works for packet world, automatic mac learning)
- Exchange is agnostic to what is exchanged
- Exchange works on a need to know basis



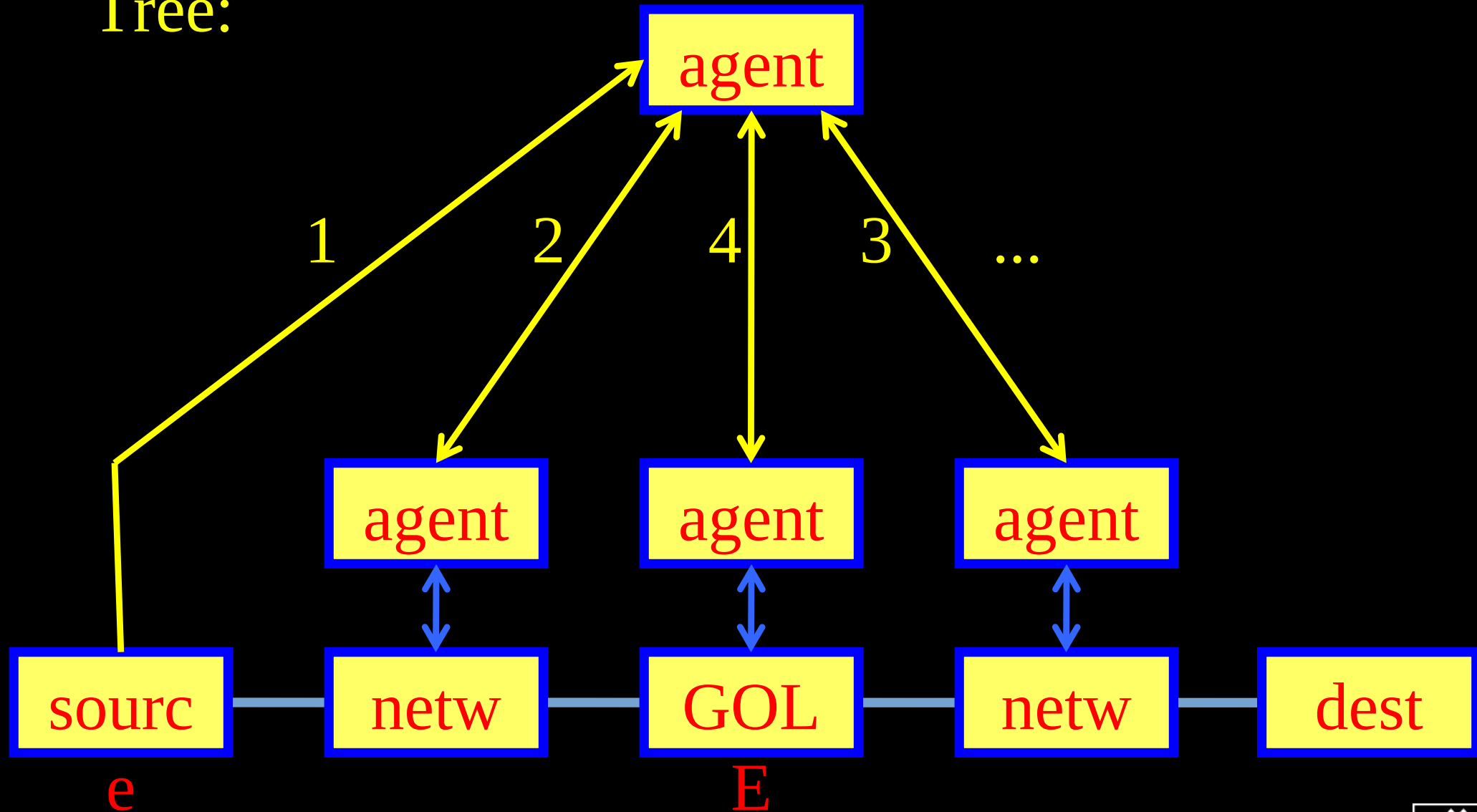
# What does that mean for GOLE's ?

- Open: do not introduce any other policy than device (or technical) policy
- Act on requests that are ack'ed by both peers, nothing else
- Keep in mind carefully on what attributes or labels you do the connection or forwarding!
- Work on need to know basis.



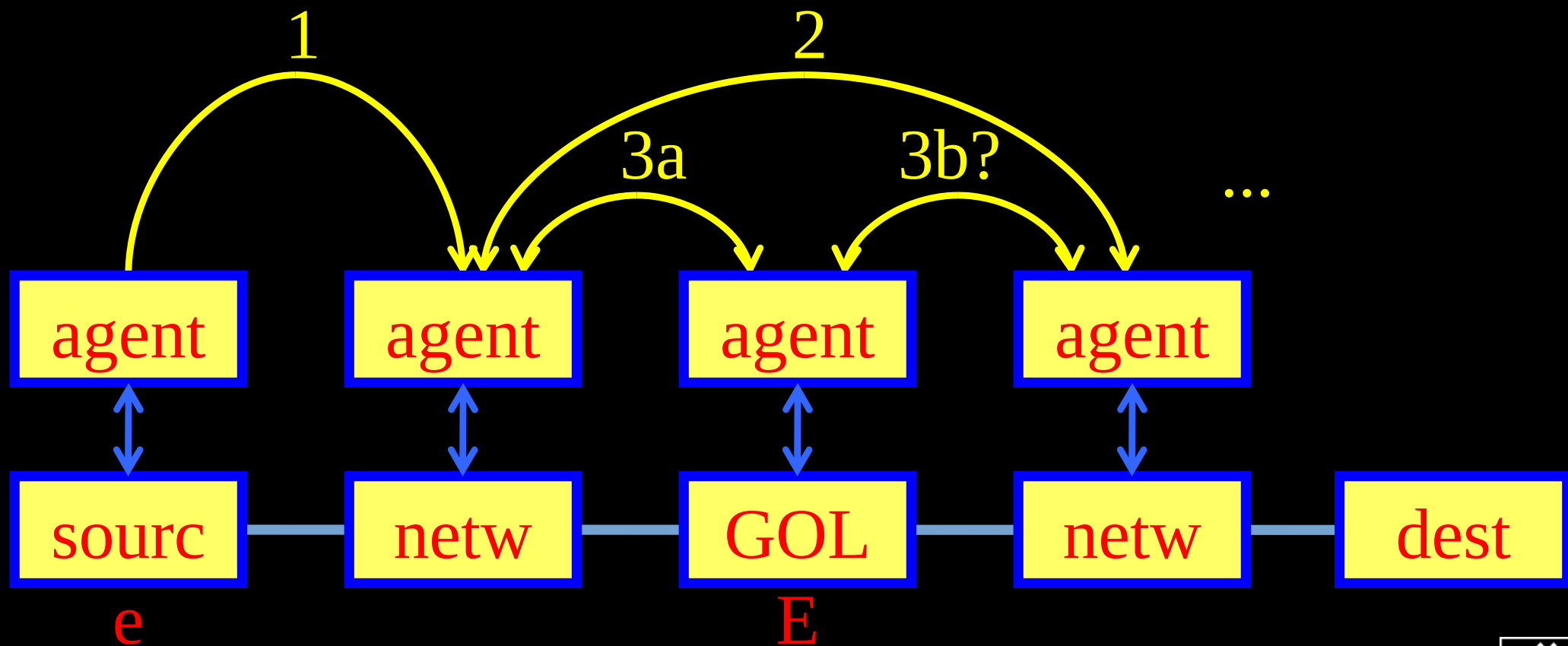
# Consequences for signaling

Tree:



# Consequences for signaling

Chain:



*Questions ?*

