Global Lambda Integrated Facility

GLIF

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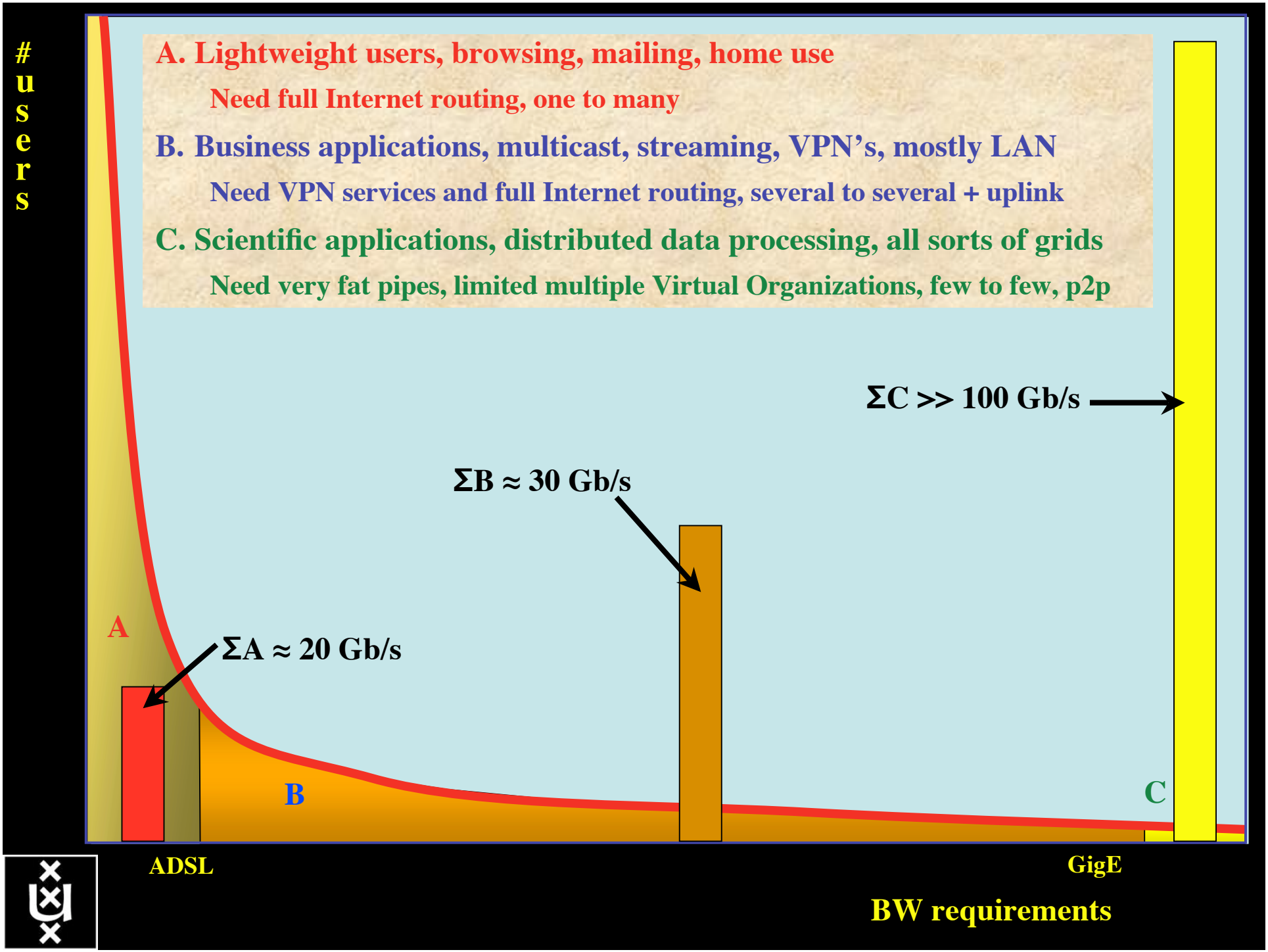
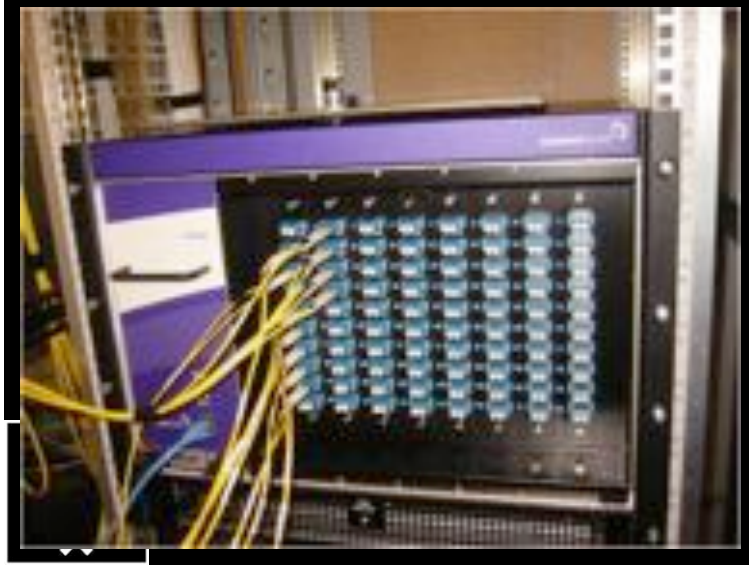
www.glif.is


#users
A. Lightweight users, browsing, mailing, home use
Need full Internet routing, one to many
B. Business applications, multicast, streaming, VPN's, mostly LAN
Need VPN services and full Internet routing, several to several + uplink
C. Scientific applications, distributed data processing, all sorts of grids
Need very fat pipes, limited multiple Virtual Organizations, few to few, p2p
ΣC >> 100 Gb/s
ΣB ≈ 30 Gb/s
ΣA ≈ 20 Gb/s
A
B
C
ADSL
GigE
BW requirements

Towards Hybrid Networking!

- Costs of optical equipment 10% of switching 10 % of full routing equipment for same throughput
  - 10G routerblade -> 75-300 k$, 10G switch port -> 5-10 k$, MEMS port -> 0.5-1.5 k$
  - 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
- Give each packet in the network the service it needs, but no more !

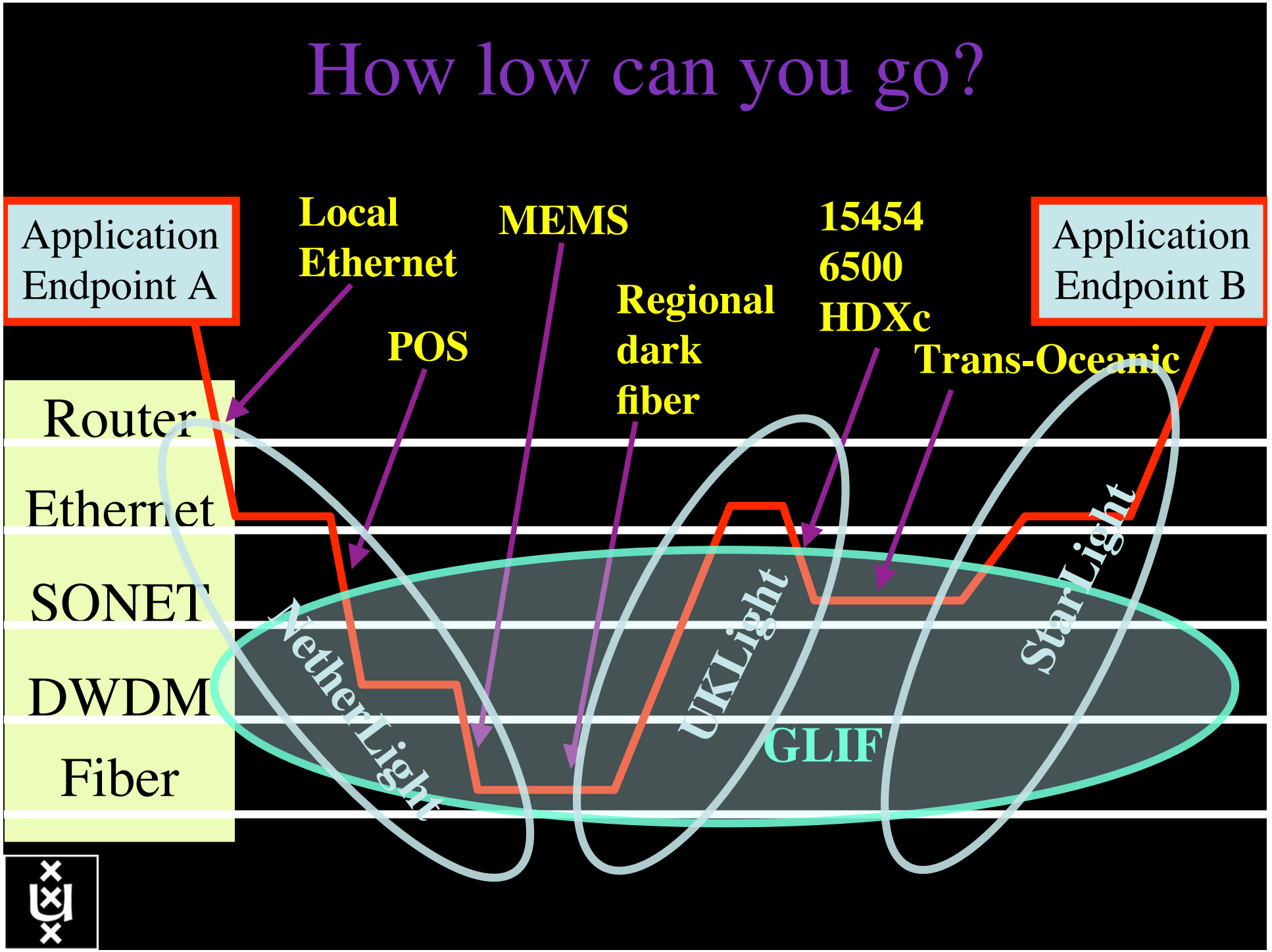
L1 ≈ 0.5-1.5 k$/port

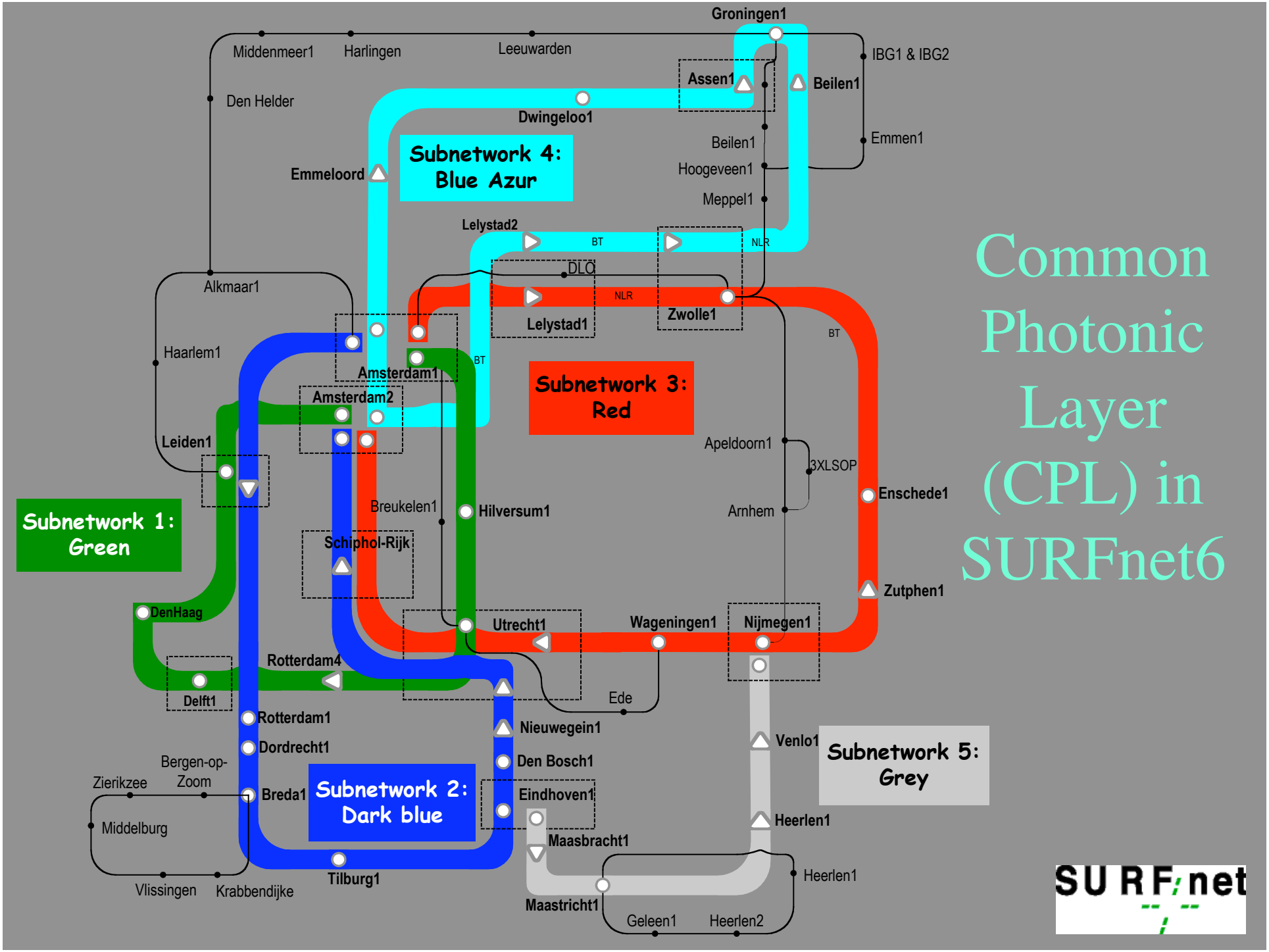


L2 ≈ 5-10 k$/port

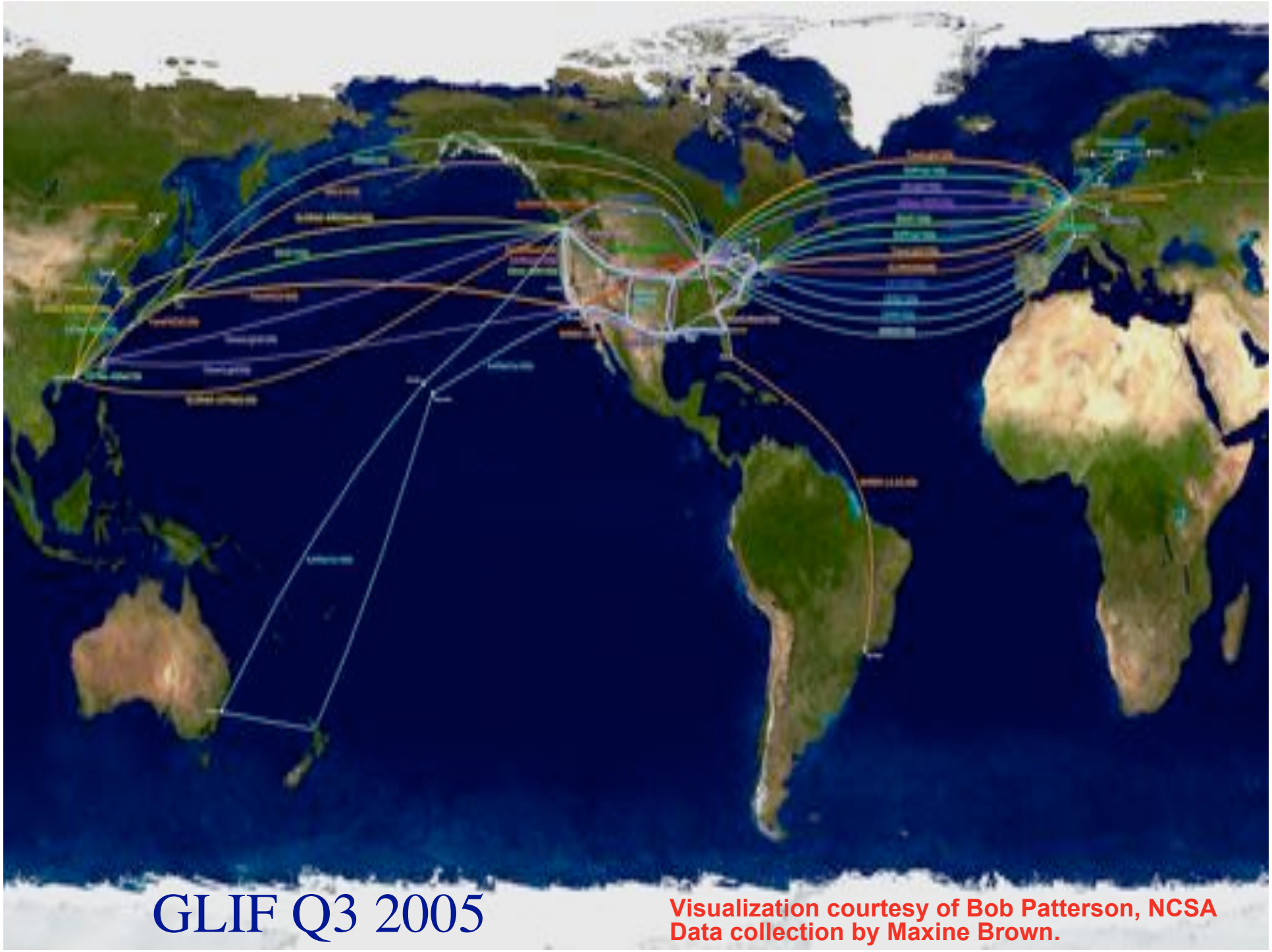
L3 ≈ 75+ k$/port

How low can you go?





Common Photonic Layer (CPL) in SURFnet6



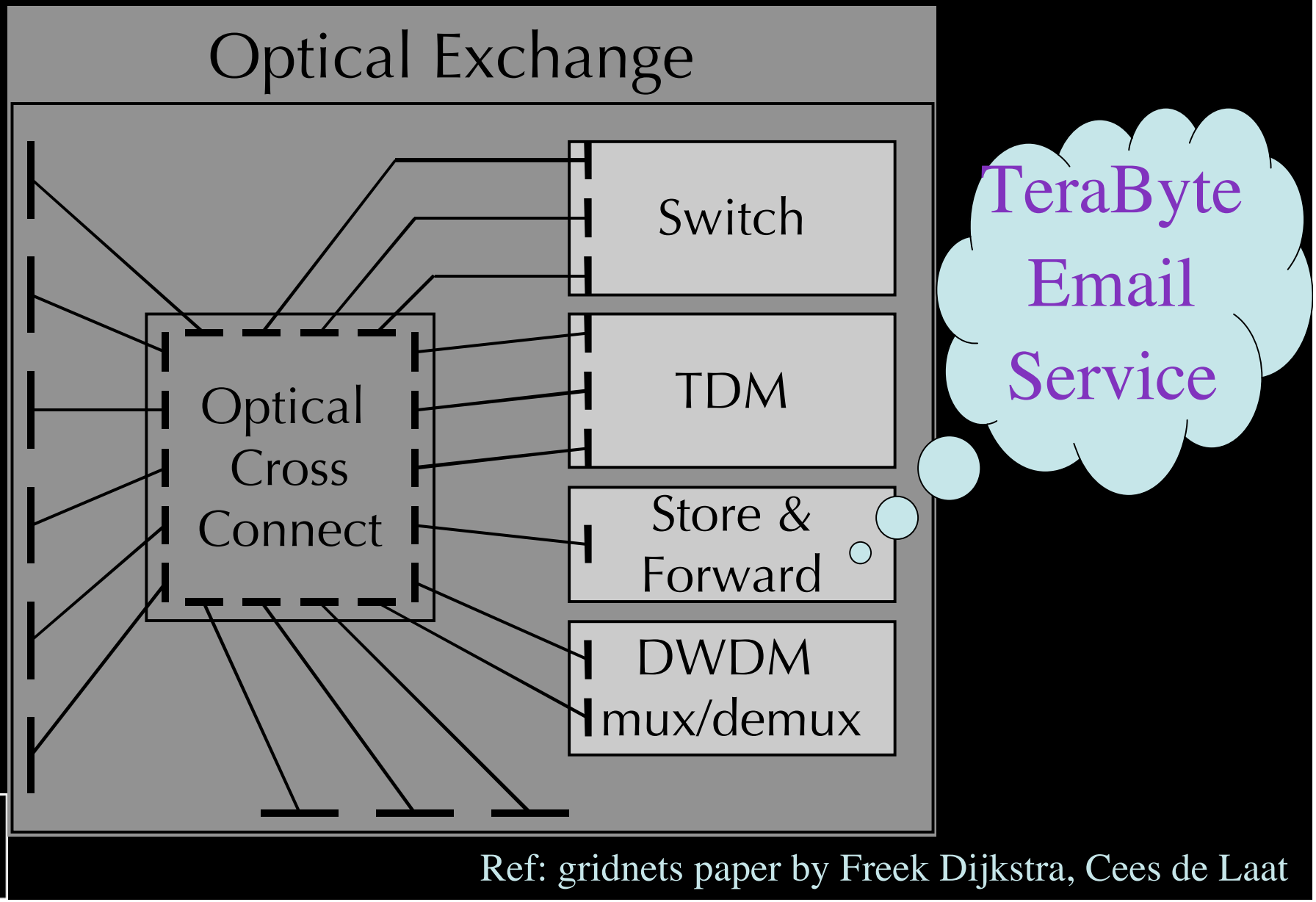
GLIF Q3 2005

Visualization courtesy of Bob Patterson, NCSA
Data collection by Maxine Brown.

Services

SCALE / CLASS	2 Metro	20 National/ regional	200 World
A	Switching/ routing	Routing	ROUTER$
B	Switches + E-WANPHY VPN's	Switches + E-WANPHY (G)MPLS	ROUTER$
C	dark fiber DWDM MEMS switch	DWDM, TDM / SONET Lambda switching	Lambdas, VLAN's SONET Ethernet

Optical Exchange as Black Box



Ref: gridnets paper by Freek Dijkstra, Cees de Laat

Service Matrix

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

GLIF History

Brainstorming in Antalya at Terena conf. 2001

1th meeting at Terena offices 11-12 sep 2001

On invitation only (15) + public part

Thinking, SURFnet test lambda Starlight-Netherlight

2nd meeting appended to iGrid 2002 in Amsterdam

Public part in track, on invitation only day (22)

Core testbed brainstorming, idea checks, seeds for Translight

3th meeting Reykjavik, hosted by NORDUnet 2003

Grid/Lambda track in conference + this meeting (35!)

Brainstorm applications and showcases

Technology roadmap

GLIF established --> glif.is

GLIF Mission Statement

- **GLIF is a world-scale Lambda-based Laboratory for application and middleware development on emerging LambdaGrids, where applications rely on dynamically configured networks based on optical wavelengths**

- **GLIF is an environment (networking infrastructure, network engineering, system integration, middleware, applications) to accomplish real work**

GLIF - 4 meeting

- Invitation only
- Nottingham 2-3 September 2004
- 60 participants
- Attendance from China, Japan, Netherlands, Switzerland, US, UK, Taiwan, Australia, Tsjech, Korea, Canada, Ireland, Russia, Belgium, Denmark
- Truly Worldwide!

GLIF - 5 meeting

- Collocated with iGrid2005 San Diego
- CAL-$(IT)^2$
- Thursday 29 sept 2005
  - Presentations track
- Friday 30 sept 2005
  - Work group meetings
- NOT on invitation only anymore!
  - Open meeting for participants
  - Industry rep's only on workgroup chairs invitation (no marketing!)

GLIF Structure

GLIF Governance and policy

Our small-scale Lambda Workshop is now turning into a global activity. TransLight and similar projects contribute to the infrastructure part of GLIF. A good and well understood governance structure is key to the manageability and success of GLIF. Our prime goal is to decide upon and agree to the GLIF governance and infrastructure usage policy.

GLIF Lambda infrastructure and Lambda exchange implementations

A major function for previous Lambda Workshops was to get the network engineers together to discuss and agree on the topology, connectivity and interfaces of the Lambda facility. Technology developments need to be folded into the architecture and the expected outcome of this meeting is an agreed view on the interfaces and services of Lambda exchanges and a connectivity map of Lambdas for the next year, with a focus on iGrid 2005 and the emerging applications.

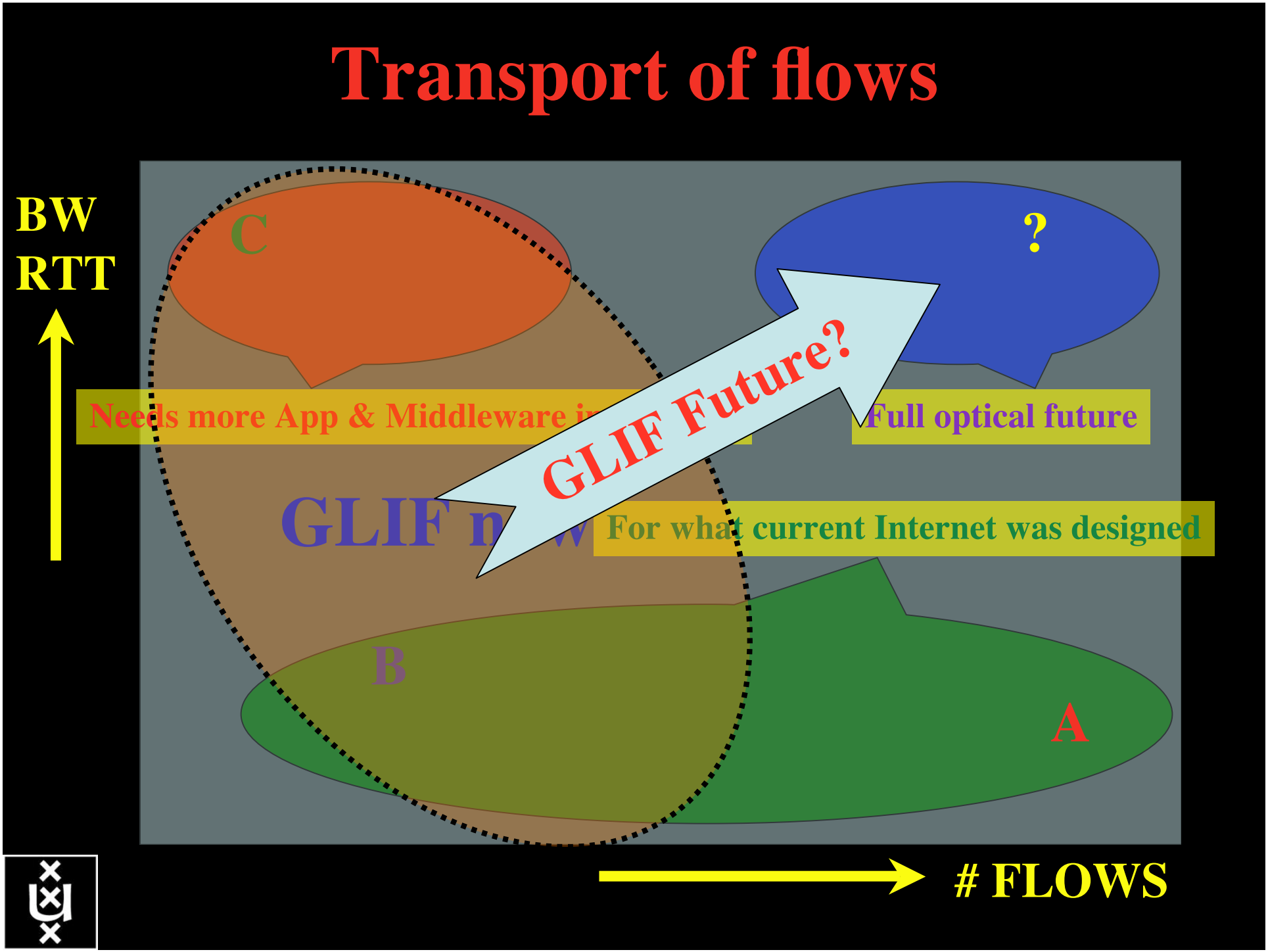
Persistent Applications

Key to the success of the GLIF effort is to connect the major applications to the Facility. We, therefore, need a list of prime applications to focus on and a roadmap to work with those applications to get them up to speed. The demonstrations at SC2004 and iGrid 2005 can be determined in this meeting.

Control Plane and Grid Integration

The GLIF can only function if we agree on the interfaces and protocols that talk to each other in the control plane on the contributed Lambda resources. The main players in this field are already meeting, almost on a bi-monthly schedule. Although not essential, this GLIF meeting could also host a breakout session on control plane middleware.

Transport of flows



Questions ?

More info:

http://www.glif.is/

http://www.science.uva.nl/~delaat

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