

GÉANT2

Network Infrastructure

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Michael Enrico
Network Engineering & Planning, DANTE

Agenda

- Reminder of Remit
- Procurement history (why so long?)
- Planned GÉANT2 build
- Equipment to do it

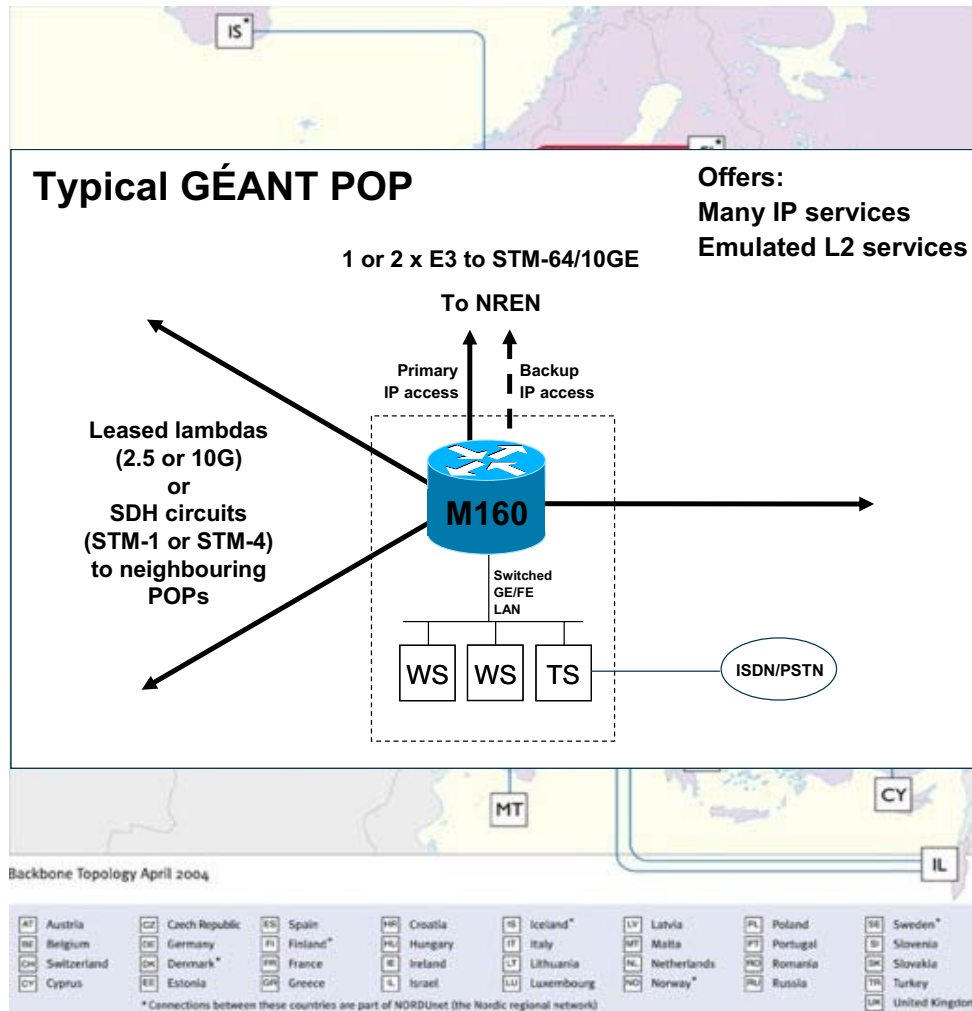
GÉANT2 (GN2 I3) Remit

- Upgrade GÉANT (1)
 - Reached end of 4-year funding cycle
 - Possibility for greater infrastructure ownership (fibre)
 - But requires longer term views than hitherto adopted
- Provide support for new services
 - Not just a bigger IP network...
 - ...support for high-capacity P2P services...
 - ...and (if needed)...lots of them!
- Facilitate (joint) R&D efforts
- Extend geographical coverage

Review of Procurement

Q4 2003	started drafting connectivity ITT
Q1 2004	announced & issued ITT
Apr/May 2004	first supplier meetings, “DF lighting” modelling
June 2004	started on equipment & NOC ITT
Sept 2004	GN2 contract (with EC) came into force first equipment supplier meetings
Oct/Nov 2004	equipment suppliers shortlisted
Dec 2004	connectivity suppliers shortlisted started hands-on “testing” of final 3 equipment suppliers first NREN engineer consultation workshop
Jan/Feb 2005	further equipment “testing”
March 2005	second NREN engineer consultation workshop
Apr-June 2005	connectivity & equipment suppliers decided (LOIs issued)
Now	contracts being finalised and signed

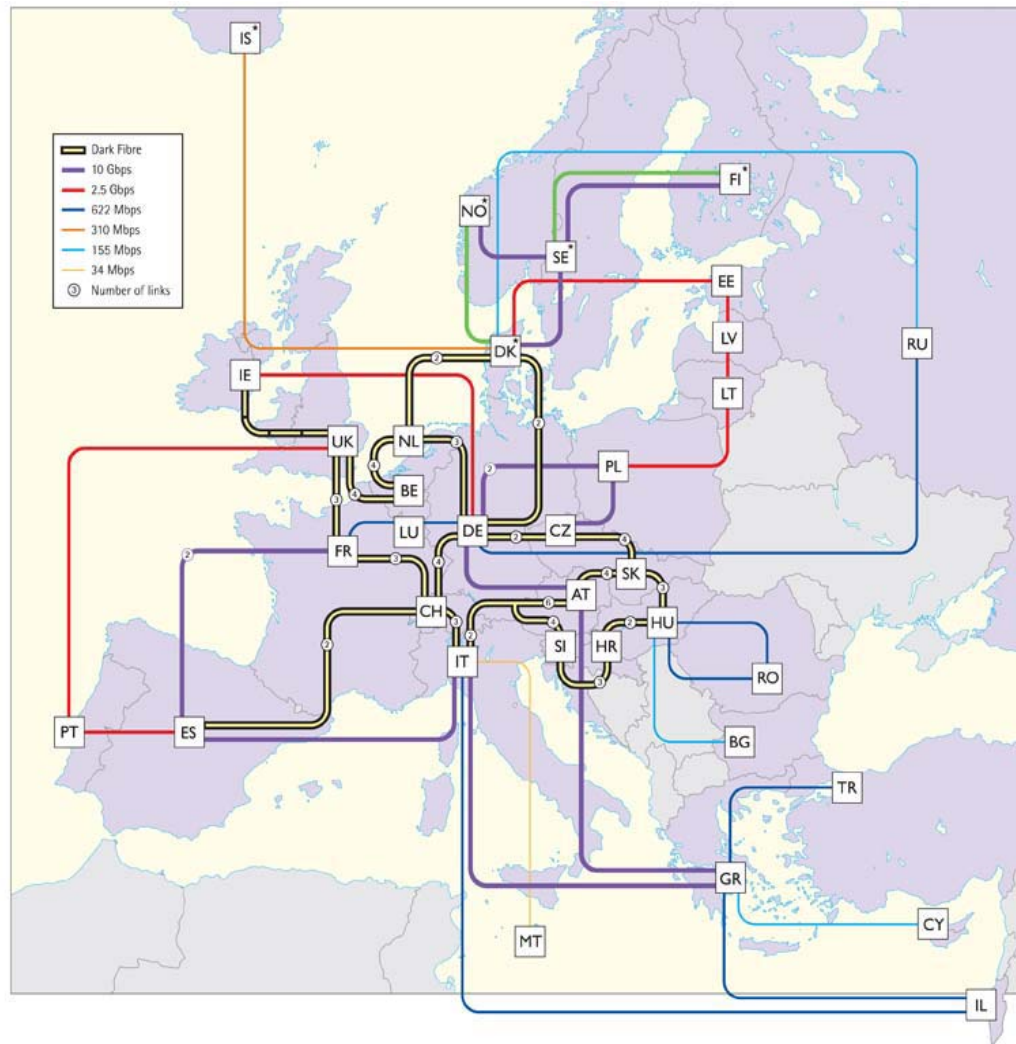
GÉANT in 2005 (the starting point)



Some Facts & Figures...

- 21 POPs
- serves 29 European NRENs
- 16 x 10G lambda
- 13 x 2.5G “lambda”
- + some lower speed links
- Juniper M160 & M40 routers in POPs with
- NREN accesses at up to 10Gbps (+ backup)
- 12G to North America
- POP in NY
- connections to R&E networks in:
 - USA, Canada & Japan
 - AND Mediterranean
 - AND Latin America
 - AND (soon) South East Asia

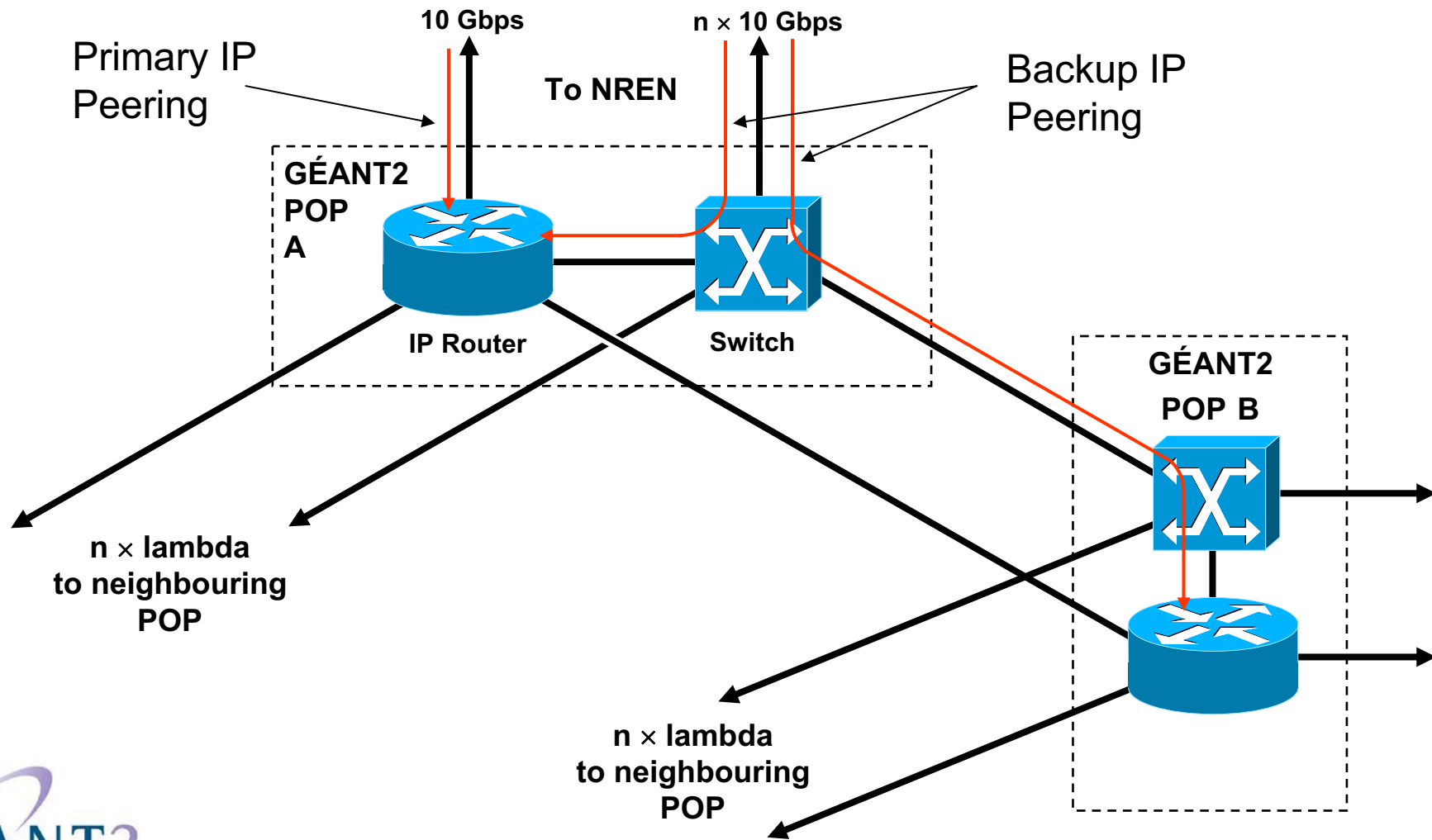
GÉANT(1) → GÉANT2



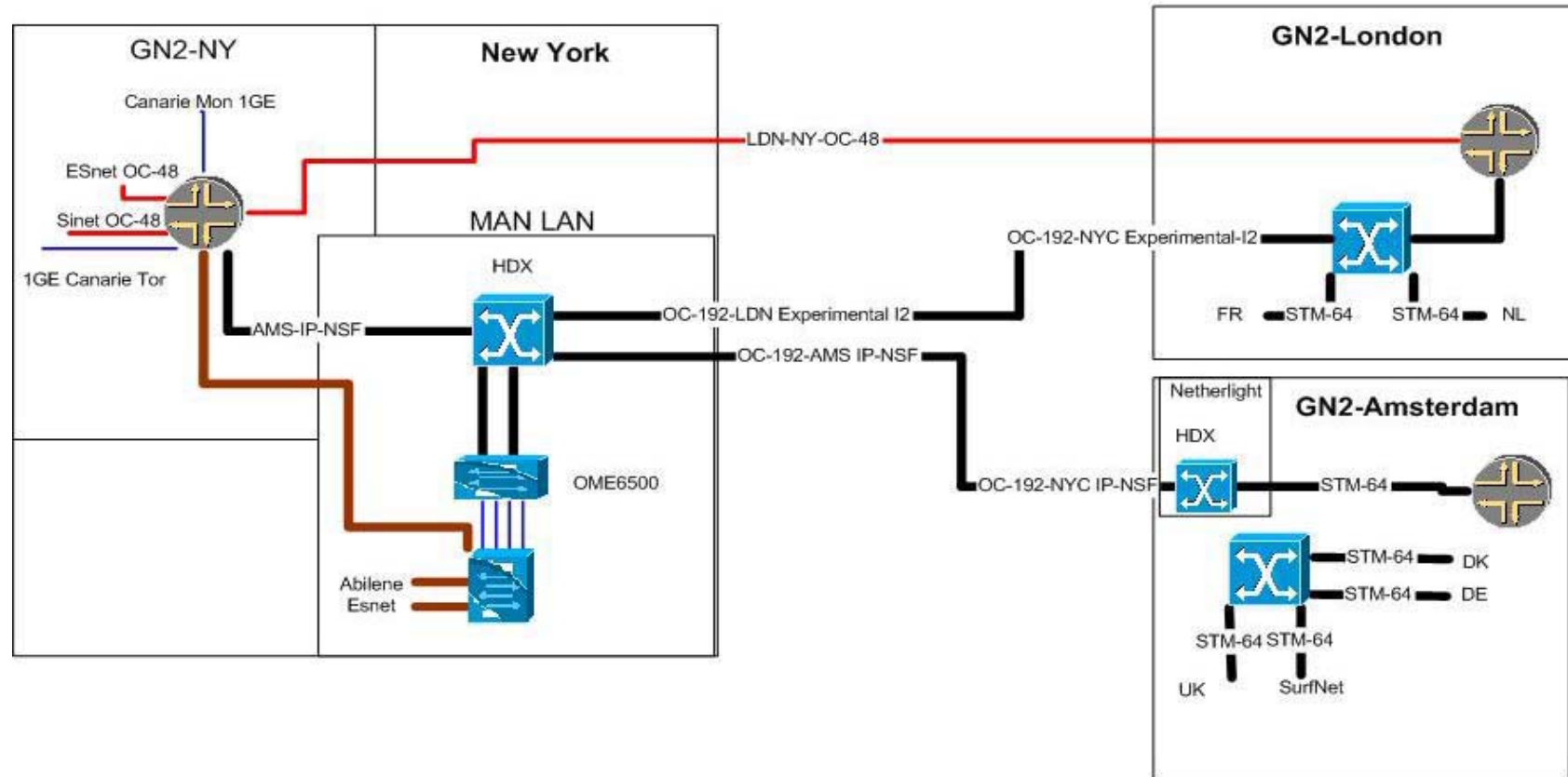
Some New Facts & Figures...

- 25 POPs (+4)
- to serve 30 NRENs (+1)
- 11600 km of fibre
- 140+ ILA sites
- 50+ x (own) 10G lambdas
- 9 x (leased) 10G lambda
- 8 x 2.5G (leased) “lambda”
- + some lower speed links
- Juniper T640, M160 & M40 routers in POPs with
- NREN accesses at up to 10Gbps (+ backup) + P2P
- 4 x 10G to North America
- POP in NY
- connections to other R&E networks as before...

GÉANT2: A hybrid infrastructure



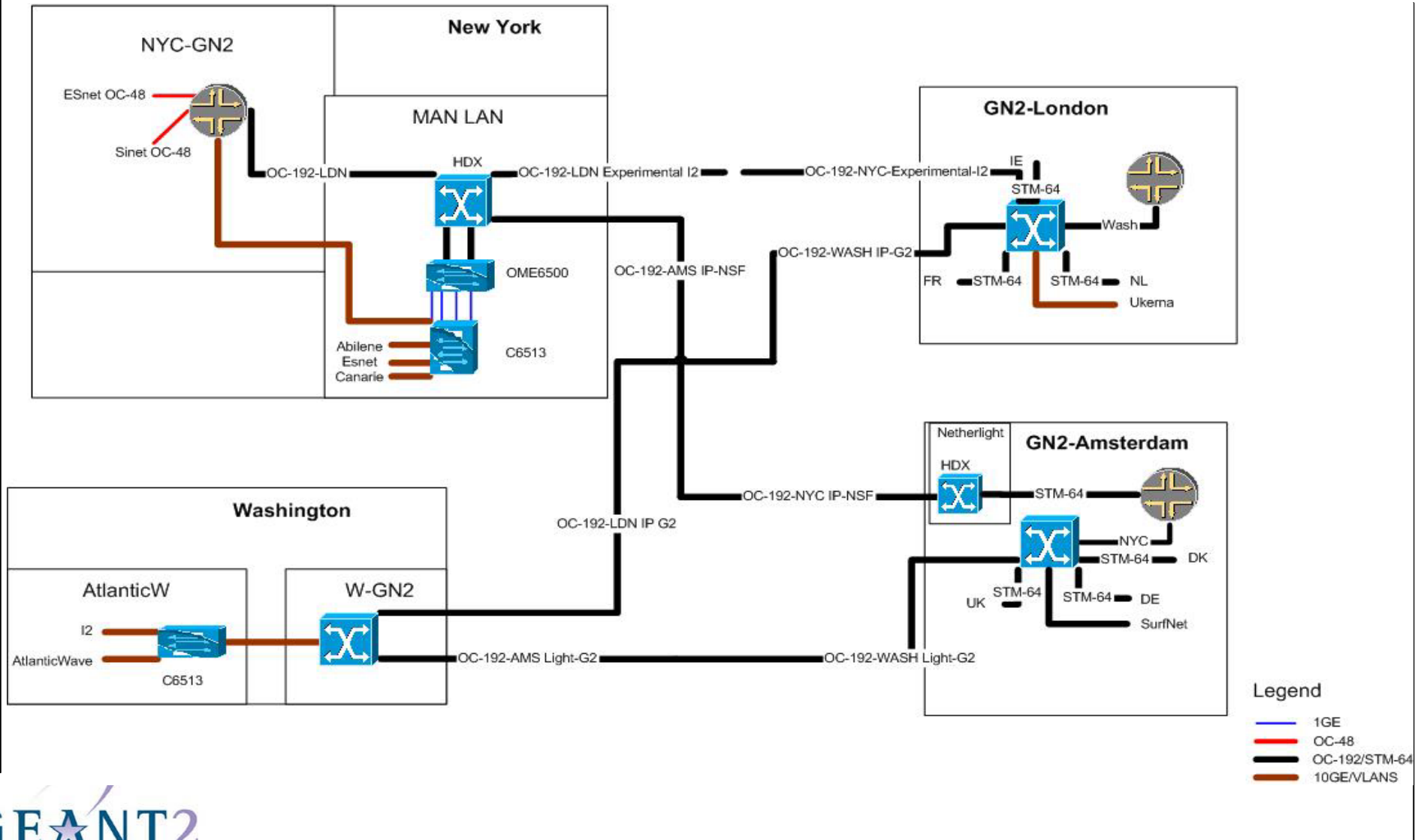
Transatlantic (Phase 1)



Legend

- 1GE
- OC-48
- OC-192/STM-64
- 10GE

Transatlantic (Phase 2)



Equipment

Alcatel 1626 Light Manager

- New product.
- On paper:
 - Up to 96 λ 's in ext C-band
 - Up to 4500km reach
- P2P, ring and mesh
- “Plug & Play” operation



466 x 500 x 290mm

1626 LM Terminal

Mux/demuxes:

- 1:8 channel mux/demux

Optical bit rate, client side:

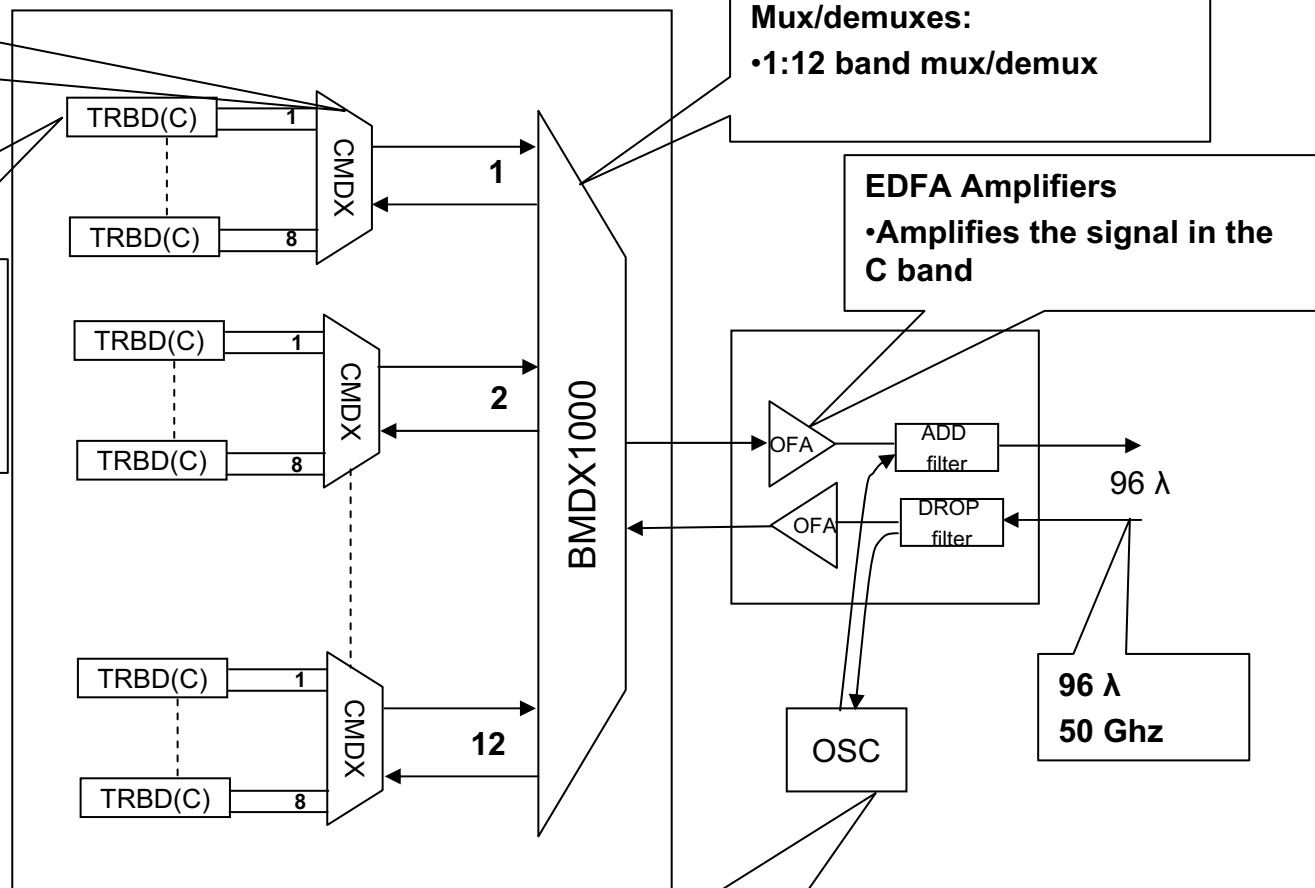
- 9.9532 Gbps.
- 10.709 Gbps.
- 2.488 Gbps.

Mux/demuxes:

- 1:12 band mux/demux

EDFA Amplifiers

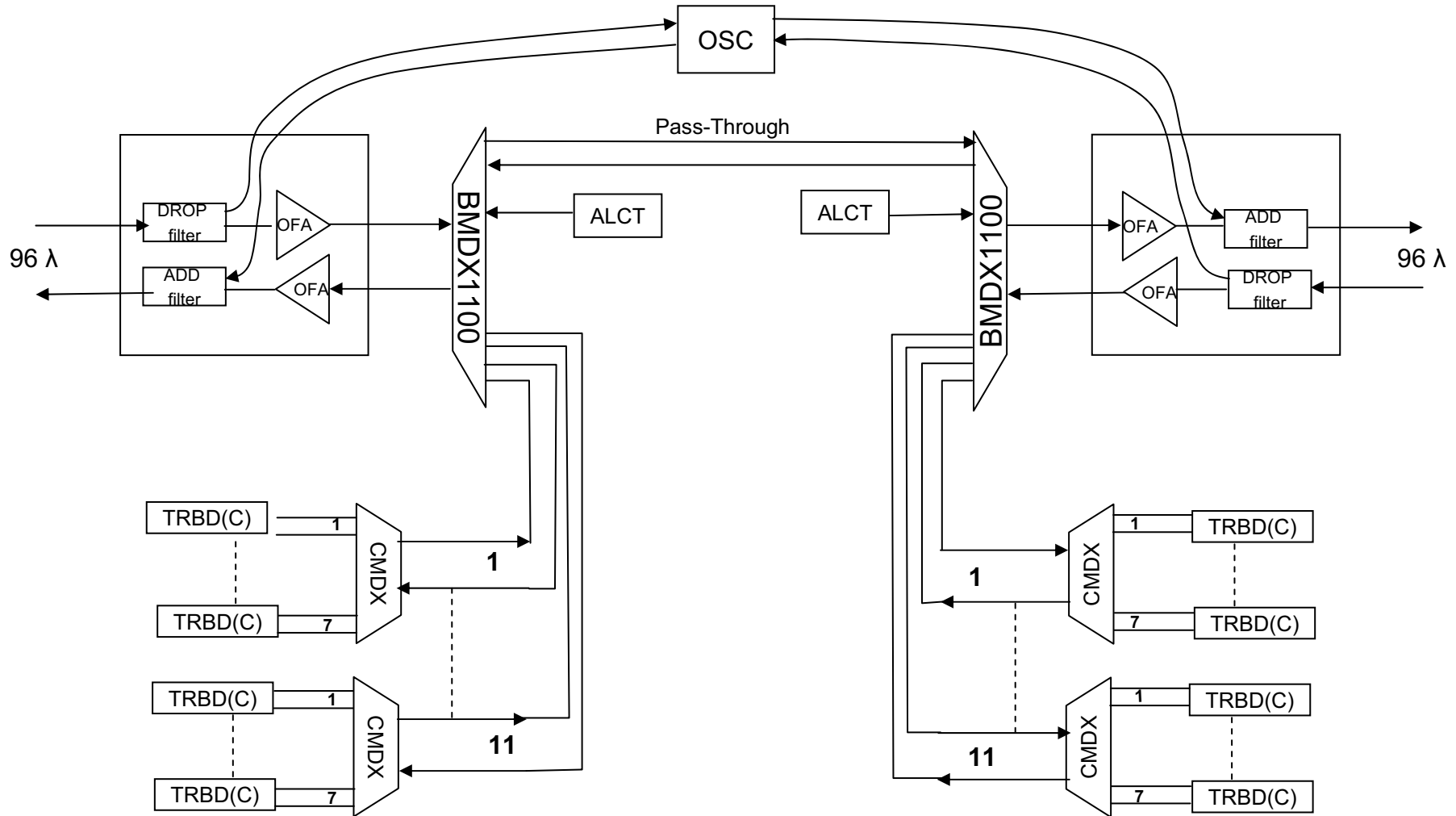
- Amplifies the signal in the C band



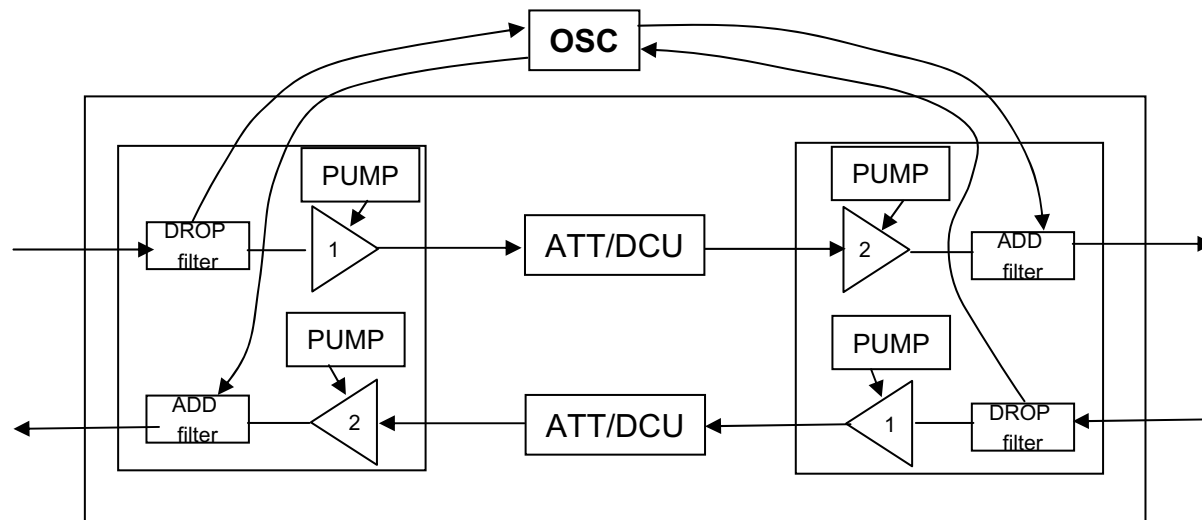
OSC

- 1510nm – 4Mbps
- CLNP(ISO) only over OSC

1626 LM B-OADM



1626 LM Line Repeater (ILA)



Two stage amplifiers

Transmission Overview

Mux/demuxes:

- 1:8 channel mux
- 1:12 band mux

Currently supports 50GHz
channel spacing

OSC running at 1510nm
(4Mbps)

CLNP (ISO) only over OSC

10G transponder options

- Tunable over whole band
(VLH reach)
- Cheaper version tunable over
two λ 's (LH reach)

10GE LAN-PHY transponder
available

4 x 2.5G muxponder (SFP)

4 x Any muxponder

Plan to support XFP modules
on client side in future

Alcatel 1678 Metro Core Connect (MCC)

- SONET/SDH/OTH switch
- Switching matrix up to 640Gbps
 - 1+1 protected
 - VC-4 granularity
- LO matrix available
 - VC-12 & VC-3 switching
- 16 x 40G line card slots



575 x 533 x 294mm

Alcatel 1678 MCC

- G.ASON (G.7713.2) control plane available.
- OIF UNI1.0 support.
- In-band (DCC) or OOB (Ethernet) management access
- TMN Q3 interface used between NMS and NEs
 - but unlike with 1626 could be run over IP
- Large MTU (9k) support in the GE cards

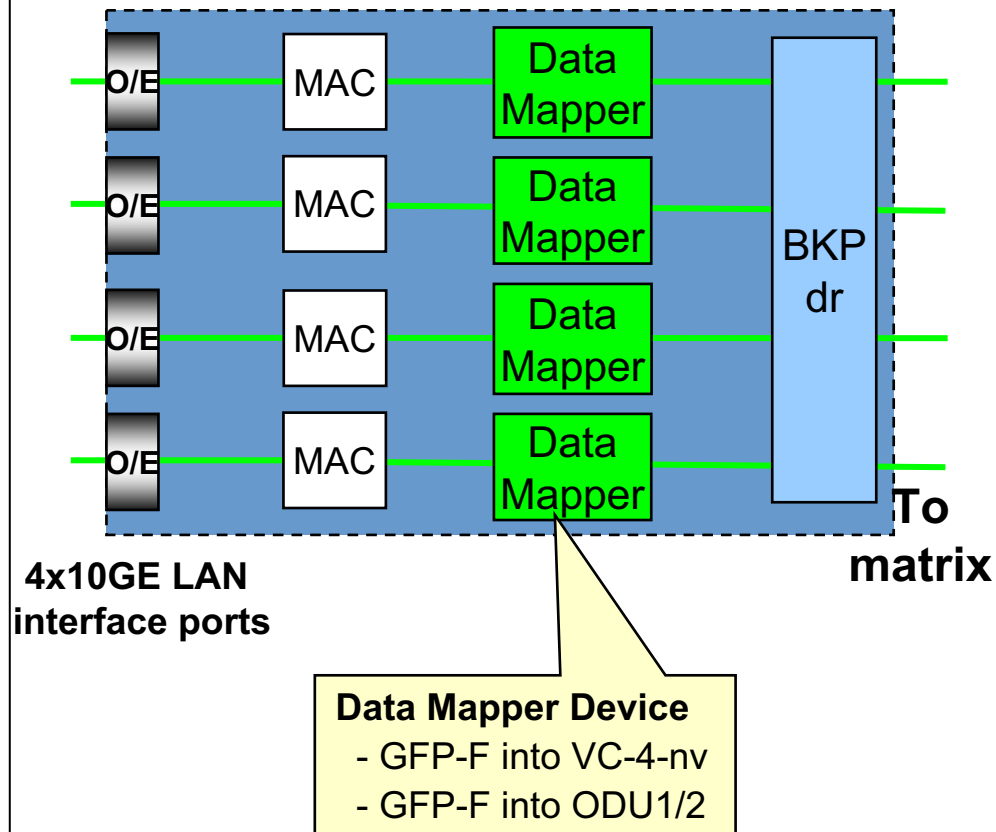
Alcatel 1678 MCC

- Usual array of line cards:
 - 4 x STM-64 fixed optics
 - Lower port count for longer reach optics
 - XFP support in future
 - 16 x STM-16 using SFPs
 - 16 x STM-1/4 using SFPs
 - 4/8/16 x GE (SX/LX) using SFP
 - 4 x 10GE LAN PHY (Sept 2005)
 - 2 x 10GE LAN PHY VLAN (Feb 2006)
 - STM-256 (future)

10GE-LAN interface board in 1678 MCC



4x 10GE LAN board in 1678MCC



Generic solution:

- Rate adaptive mapping into VC4-nv **with flow ctrl.** and LCAS, n=1..64;
- up to 4 ports per board

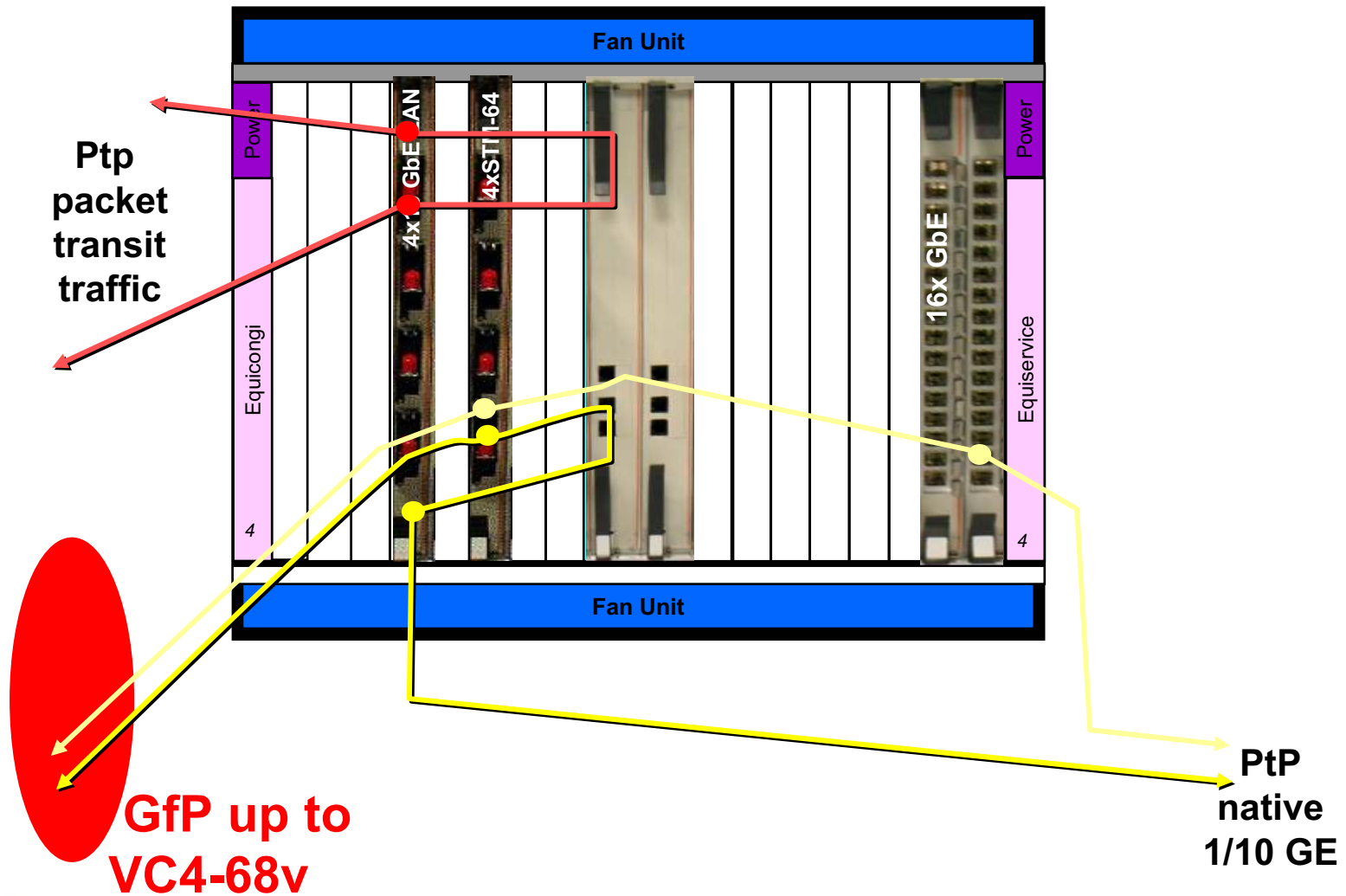
Full rate option:

- Ethernet **full rate** up to VC4-68v, flow ctrl. and LCAS for n<68

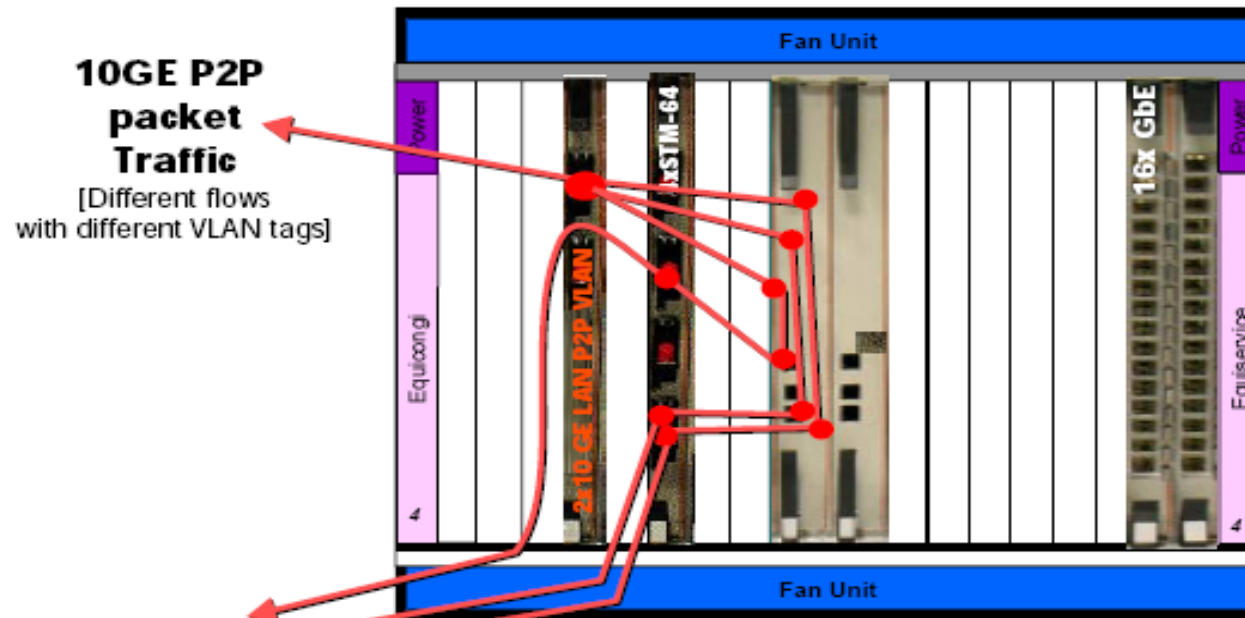
OTH option:

- Mapping into ODU1/2 with flow ctrl.

1678 MCC Release 4 supporting 10GE LAN



1678 MCC supporting 2x10GE LAN P2P VLAN



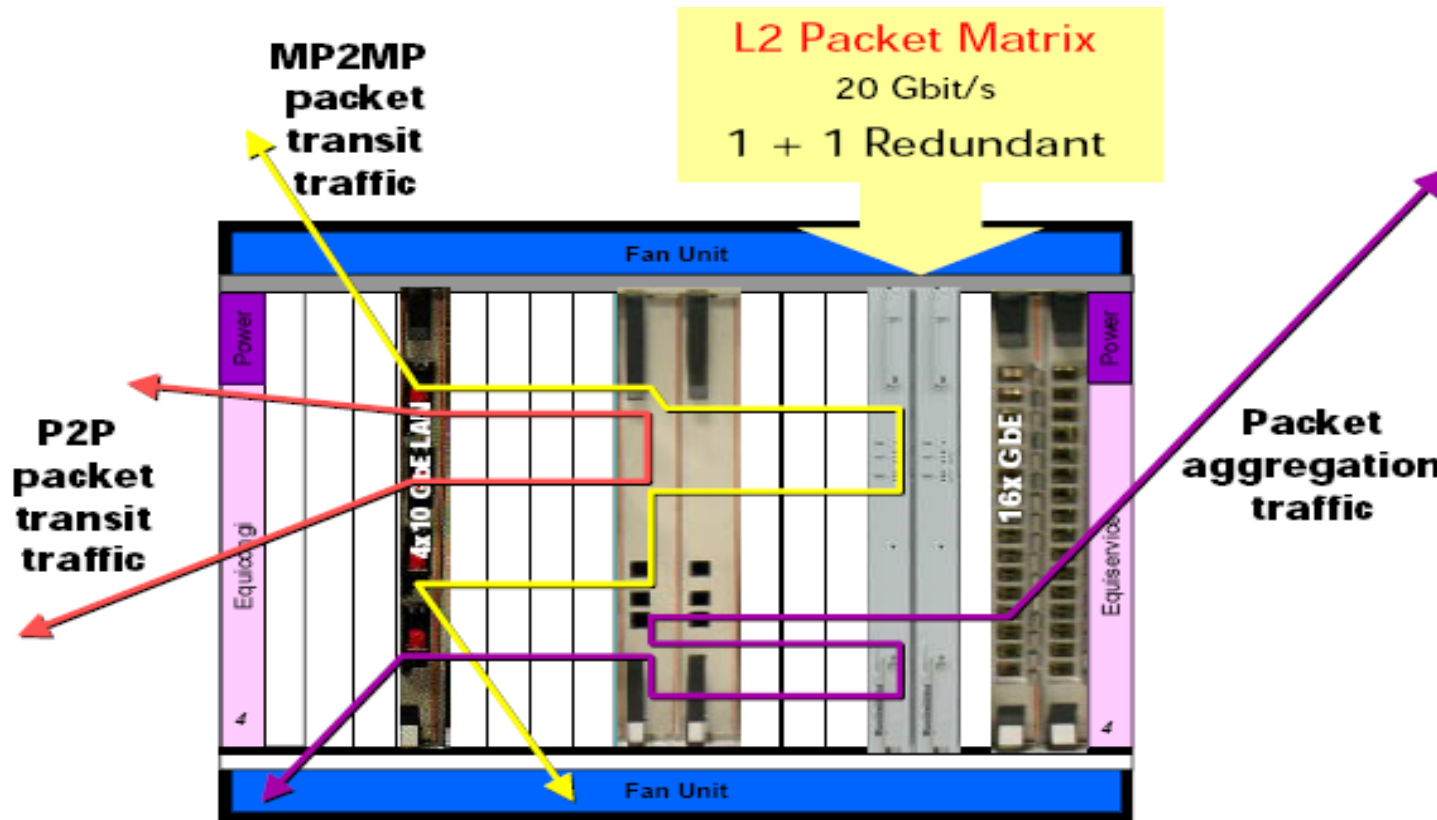
10GE P2P packet Traffic
[Different flows with different VLAN tags]



Multiple GfP VCGs based on VLAN tag identification

[Example 3 different flows to 2 different destinations using 2 STM-64 ports]

1678 MCC with 4x10GE LAN P2P and ES64



Questions ?