

Alcatel Router Testing Update

**TF-NGN Meeting,
Cambridge,
15-16 September 2003**

**Michael Enrico,
Network Engineering & Planning
DANTE**

What follows is...

- ...not a detailed overview of the **A7770 OBX**
- ...subject to an **NDA**

Rationale for Testing

- **New kid on the block (in core IP router space)?**
 - More competition for the Cisco/Juniper duopoly?
- **A product developed in Europe**
 - important for the EC!
- **Framework Programmes**
 - making European industry more competitive
 - European R&E networking community can contribute by lending their experiences and providing feedback to the developers

A7770 OBX Shelf

Single Shelf: (HxWxD)
98 x 58 x 60 cm
38.5 x 23 x 23.6"

Line Cards
with Distributed Forwarding
(slots 3 to 12)

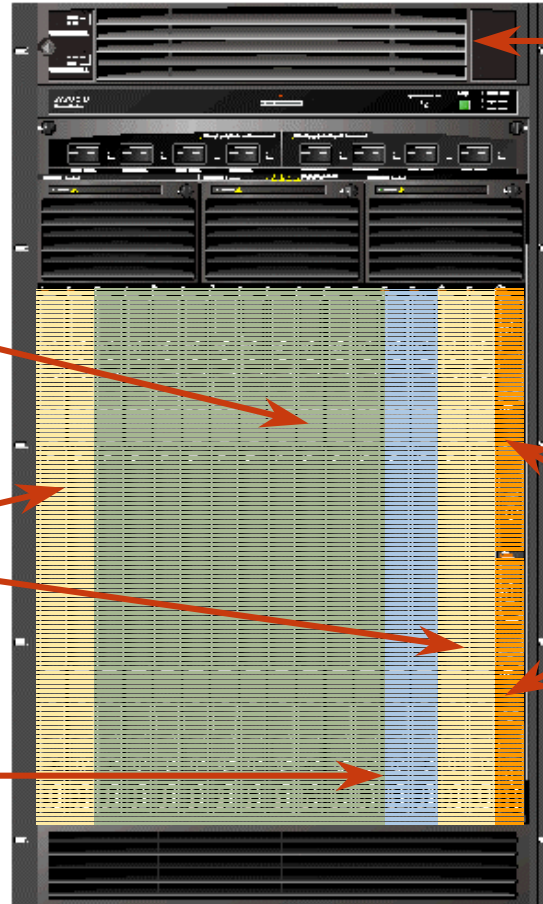
Switching Fabric
(slots 1, 2, 15 and 16)

Route Server Modules
(slots 13 and 14)

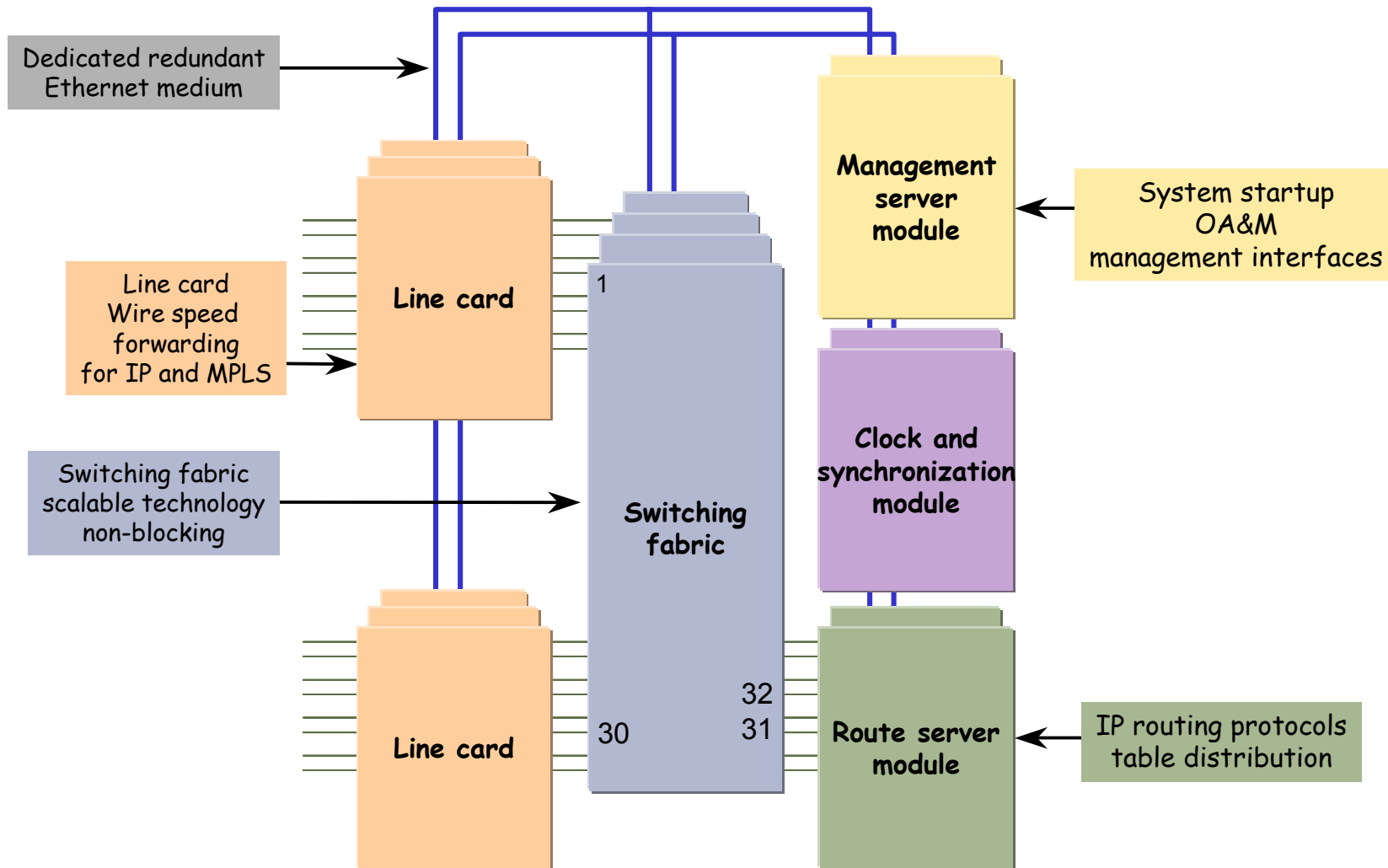
Control Shelf with
Redundant Management
Servers

Clock and Synchronization
Modules

DC Powered
NEBS Level 3 Compliant



A7770 OBX Architecture



A7770 OBX Design Principles

- **Use of Network processors: forwarding power per interface.**
- **The Switching Fabric: a real switch allowing growth and scalability due to 320Gbps available throughput, for one shelf entry level.**
- **Distribution of the Control Plane.**
 - Line boards have local processing power and memory.
 - Functions are executed as close as possible to the interface.

Goals of Testing

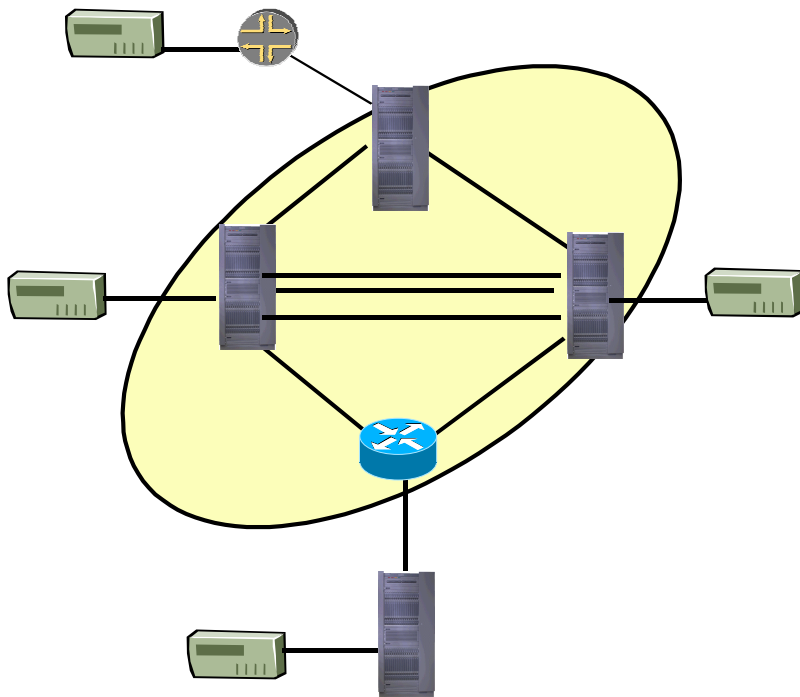
- **Gain knowledge of the OBX: router architecture and functionality**
- **Provide objective feedback to Alcatel as regards all areas of the OBX**
- **Gain basic hands-on experience**
- **Perform basic interoperability tests**
- **Perform basic tests on functionality: BGP, IS-IS, QoS, multicast, MPLS**

Logistics

- **Two week long sessions at Alcatel, Antwerp**
- **March 2003**
 - DANTE, CS (GÉANT NOC) & GRNET
 - Basic forwarding, BGP, IS-IS, SNMP, basic QoS
- **July 2003**
 - DANTE, CS
 - Advanced QoS, multicast, MPLS

Example Test Setup

- **Four A7770's**
- **One Juniper M40**
- **One Cisco 7507**
- **Agilent Router Testers**



Tests & Results: BGP

- **Learning and propagating routes**
 - 100,000 routes were learned via eBGP and correctly propagated to all iBGP peerings and external AS peerings.
- **Maximum number of routes**
 - 500,000 routes were injected on an eBGP peering.
 - The session failed after 250,000 routes.
 - This is a safety feature implemented to prevent a DoS attack. This limit is increased in newer s/w releases.
- **MD5 - this was tested with the config being done at various stages. MD5 was always initialised without issue.**

Tests & Results: BGP (cont)

- **Various tests with BGP attributes: no problems seen**
- **Bug seen during testing:**
 - **GÉANT /20 advertised to our eBGP peers by redistributing into BGP a static route with next hop discard.**
 - **This failed on the A7770 because of a software bug, which has now been rectified in newer s/w releases.**

Tests & Results: IS-IS

- **Basic testing was to ensure functionality in a diverse router environment**
 - wide metrics & passive external interfaces
- **Traffic was injected into the network and checks were made to verify that the shortest path was taken.**
- **The only difference seen was that a cost of 10 was associated with loopback interfaces (Cisco and Juniper assign a cost of 0). This was modified to be the same as Cisco and Juniper because of the implications for anycast.**

Tests & Results: SNMP

- **Monitoring features are grouped under the same MIB, forming a well-defined structure**
- **Good range of standard MIBs supported:**

STM	PPP	GE	OSPF
BGP	IS-IS	MPLS	RSVP
QoS	OSI NLCP	IP Forwarding	RMON
MROUTE	PIM	MCAST BGP	LSP
MSDP	GMPLS	VPN	VLAN
interface level	equipment		

- **Plus many proprietary MIBs**

Tests & Results: SNMP (cont)

- **Generally no problems noticed when retrieving statistics from the MIBs**
- **However room for improvement WRT monitoring of router performance statistics**

Tests & Results: QoS

- **Tests done on: classification, remarking, policing and queue behaviour**
- **Tests of classification function:**
 - **Flow-based classification (based on DSCP)**
 - node level
 - interface level (overriding node level config)
 - **Interface-based classification (all traffic)**
 - **Some inefficiencies in configuration syntax noted**

Tests & Results: QoS (cont)

- **Tests of remarking function:**
 - remarking successfully performed at three different points on the path through the router (2 on ingress side & 1 on egress side)
 - noted that if remarking and classification performed at first point on ingress side then remarking occurred first

Tests & Results: QoS (cont)

- **Tests of policing function:**
 - **policing only available on ingress side**
 - **rate-limiting based on source/destination IP successfully performed (but all packets same size)**
 - **above test repeated less successfully when mixture of packet sizes used (smaller packets favoured)**
 - **number of policers (up to 21) did not seem to influence latency**
 - **rate-limiting based on BGP next hop successfully performed**
 - **collective rate-limiting based on two BGP next-hops successfully performed**

Tests & Results: QoS (cont)

- **Tests of queue behaviour:**
 - 12 queues per interface
 - many tests done concerning behaviour under congestion
 - separate queues for BE, DWS, PIP, LBE & NC
 - results were (on the whole) satisfactory
 - tail drops observed during some tests (when RED drops expected)...
 - ...but problem quickly fixed by Alcatel engineers

Tests & Results: Multicast

- Tests oriented to GÉANT mcast configuration
- Anycast RP successfully established
- Change the anycast RP (single domain)
- MSDP meshgroup successfully established
- Anycast RP usability in multi-domain setup
- Filter MSDP SAs
 - also possible to filter SAs based on the originator

Tests & Results: Multicast (cont)

- **MSDP Storm load testing**
 - 130,000 SAs injected from multiple router testers
 - established mcast flows and overall operational status of router unaffected
 - **MSDP peerings began to flap**
 - this was due to MSDP process behaving according to draft-ietf-msdp-spec-13 (i.e. peerings reset on error)
 - addressed in draft 14 onwards (and hence future A7770 code releases)

Tests & Results: MPLS

- **Very basic testing performed (due to time constraints)**
 - Interoperability with Juniper
 - Primary to backup path failover
 - No time to test LSP monitoring via SNMP
- **Some hands-on with Alcatel 5620 TSOM tool (Traffic & Service Optimisation Module)**

Conclusions

- Overall impressions were mostly good
- Resilient h/w & s/w architecture (hitless upgrades, etc)
- Interoperability seems good
- Multicast stable
- QoS well-defined and implemented (although more complex than other vendors)
- CLI “*different*” to other vendors
- Some protocols crucial to current GÉANT design (e.g. IPv6, IGMP) still not available

Next Steps

- **A7770 to be included in GÉANT testbed (probably located in Paris POP)**
- **Further testing over a period of a few months**
- **If results are satisfactory then move to production network (details TBD) possibly at the end of the year**