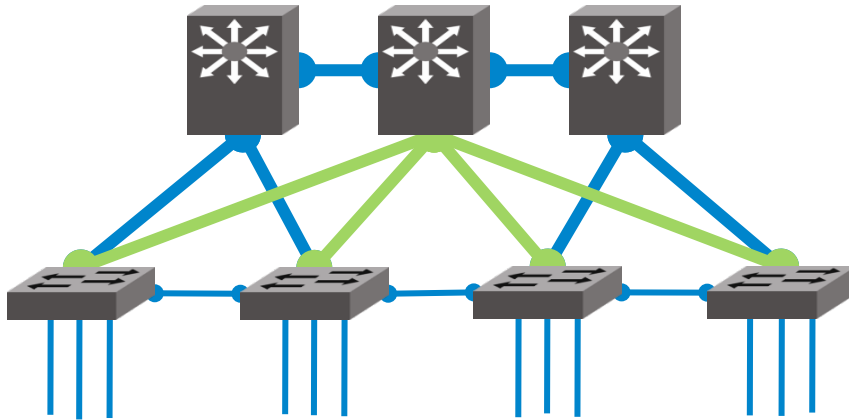


Brocade @ Meet the (new) VIX

Joerg Ammon <jammon@brocade.com>
Principal Systems Engineer Service Provider

Layer2 networking technology



Layer 2: only 1 active path

STP / G.8032 and others disable other paths

40%-50% of links not used

Link failure

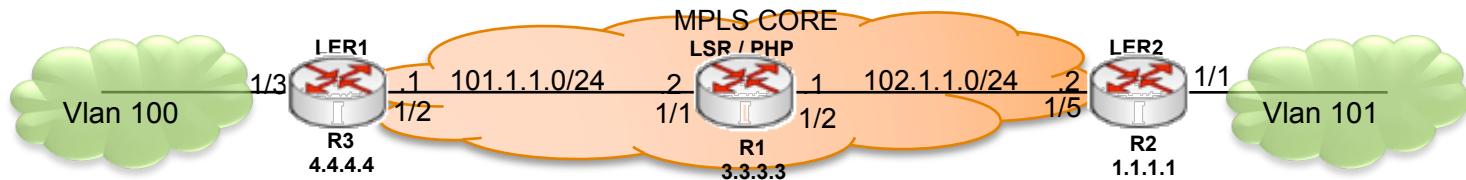
STP reconvergence, temp loops

No TTL

FIB defined by data plane

Aim: Use all links for traffic

Transitioning to VPLS (and VLL)



VPLS

LER1 [R3]

```
router mpls
```

```
mpls-interface e1/2
```

```
lsp toMLX  
to 1.1.1.1  
enable
```

```
vpls abc 1  
vpls-peer 1.1.1.1  
vlan 100  
tagged ethe 1/3
```

LSR/PHP [R1]

```
router mpls
```

```
mpls-interface e1/1  
mpls-interface e1/2
```

Egress LER [R2]

```
router mpls
```

```
mpls-interface e1/5
```

```
lsp toCES2  
to 4.4.4.4  
enable
```

```
vpls abc 1  
vpls-peer 4.4.4.4  
vlan 101  
tagged ethe 1/1
```



Resiliency and Redundancy

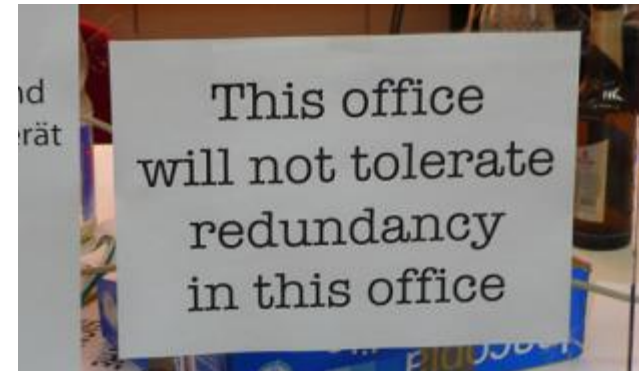
Definition

re · sil · ien · cy (noun) \ri-'zil-yən(t)-sē

- the ability to become strong, healthy, or successful again after something bad happens
- an ability to recover from or adjust easily to misfortune or change
- the ability of something to return to its original shape after it has been pulled, stretched, pressed, bent, etc.

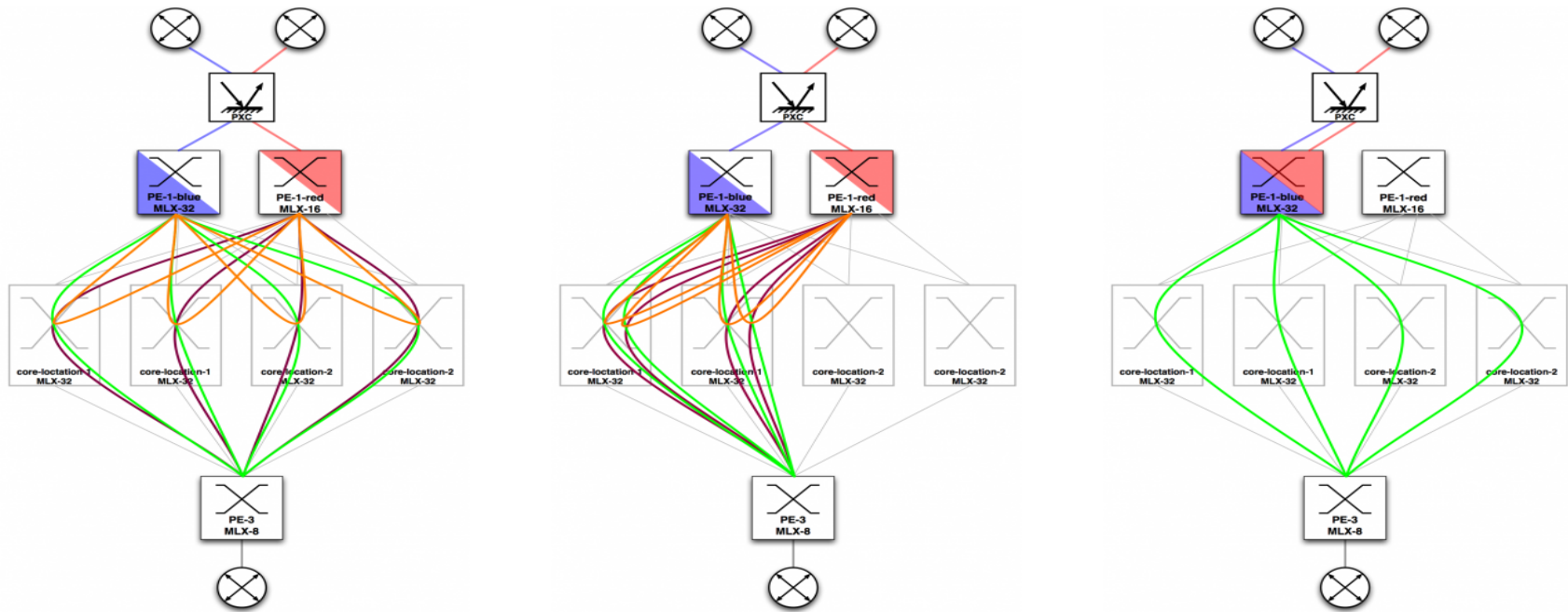
re · dun · dan · cy (noun) \ri-'dən-dən(t)-sē

- a part in a machine, system, etc., that has the same function as another part and that exists so that the entire machine, system, etc., will not fail if the main part fails



Resiliency and redundancy – cont'd

The AMS-IX MPLS/VPLS infrastructure

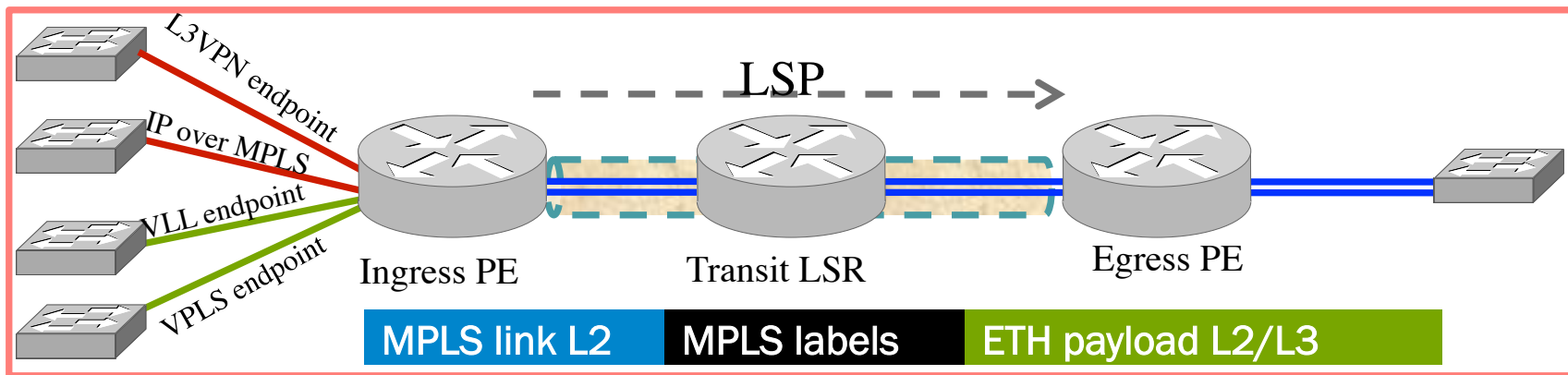


Source: <https://www.ams-ix.net/technical/ams-ix-infrastructure/the-ams-ix-mpls-vpls-infrastructure>



Scale Beyond 10-Gigabit Ethernet

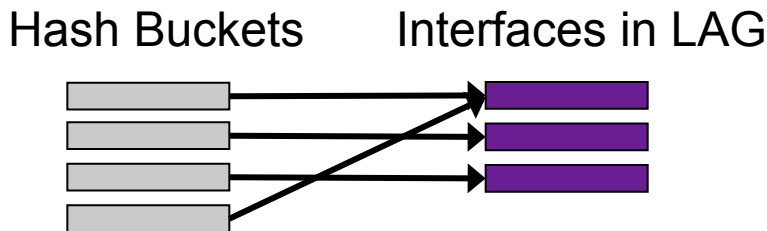
Effective load Sharing on MPLS systems



- At Ingress PE (packets entering a MPLS LSP):
 - Load shares IP packets (IP/MPLS, L3VPN, IPv4/v6 in VPLS/VLL) using “L2/L3/L4” headers
- At transit LSR (Checks first nibble after bottommost label):
 - If 4/6, load shares using “MPLS link L2/LSP Label/VC label/Payload(L3/L4)” headers
 - Else, load shares using “MPLS link L2/LSP Label/VC label/Payload(L2/L3)” headers
- At Egress PE (packets exiting a MPLS LSP):
 - Load shares IP packets with no Ethernet header (IP/MPLS, L3VPN) using “MPLS link L2/Label1/Label2/Payload(L3/L4)” headers
 - Load shares IP packets with Ethernet header (IPv4/v6 in VPLS/VLL) using “MPLS link L2/Label1/Label2/Payload(L2/L3)” headers

Effectively Scaling Capacity

Type of value	Typical Value
Number of ports in a link aggregation group (LAG)	32
Number of parallel equal cost multipath	8
Number of optional physical pathes	256
Number of hash-buckets	64k



of Hash buckets >> # of LAG-Interfaces

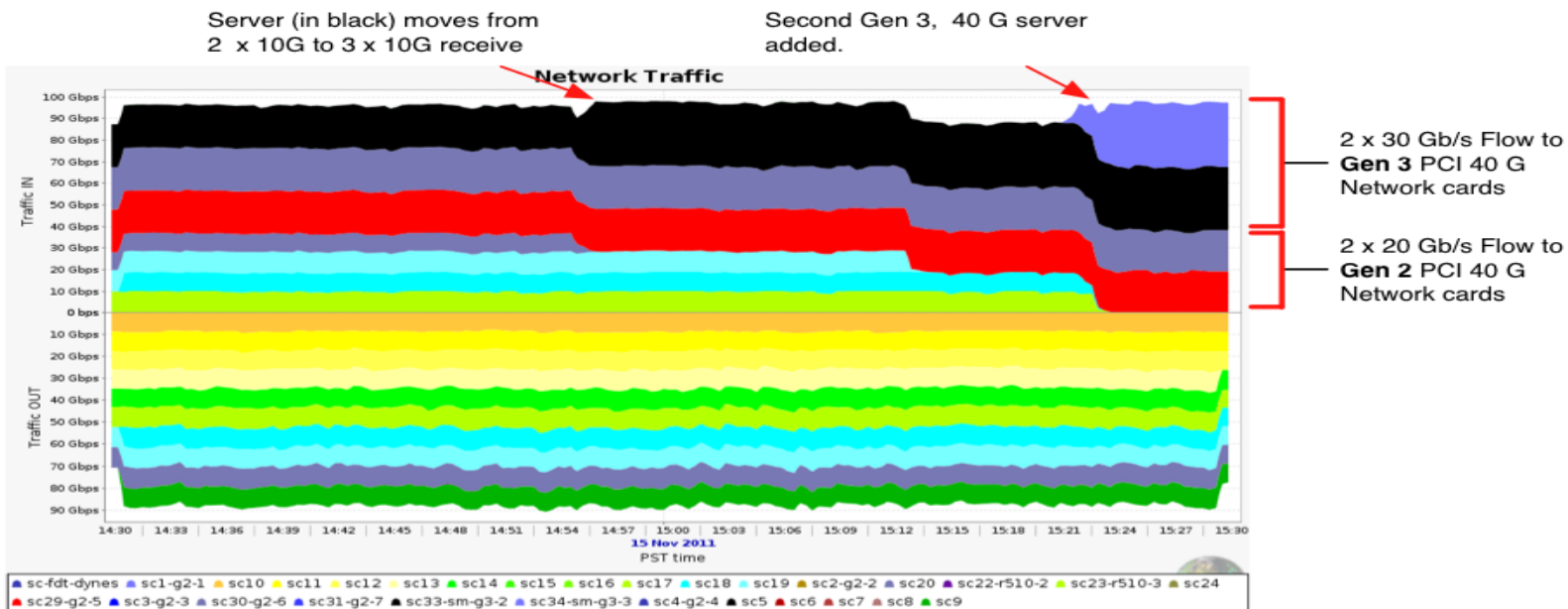


Very large flows

100Gigabit Ethernet in the media

- SuperComputing 2011 – 100 G Networks (217km)

Source: <http://supercomputing.uvic.ca/>



Memory to Memory Transfers showing 4 servers receiving data at an aggregate speed greater than 98 Gb/s (top right corner). We also see a total bi-directional data flow of 186 Gb/s



MLX 2x100 GbE Line Module

Industry's first **2-port** 100 GbE module

Massive 100 GbE density of **32 wire-speed** ports

Multiple **full** 100 Gigabit packet processors

Terabit trunks with 1.6 Tbps per trunk

Ports on demand enables a pay as you grow strategy

Full featured card with advanced IPv4/IPv6 and MPLS

1M IPv4 or 240K IPv6 FIB capacity

802.3ba and **10x10 MSA** compliant CFP optics

Backwards compatible with existing interface modules

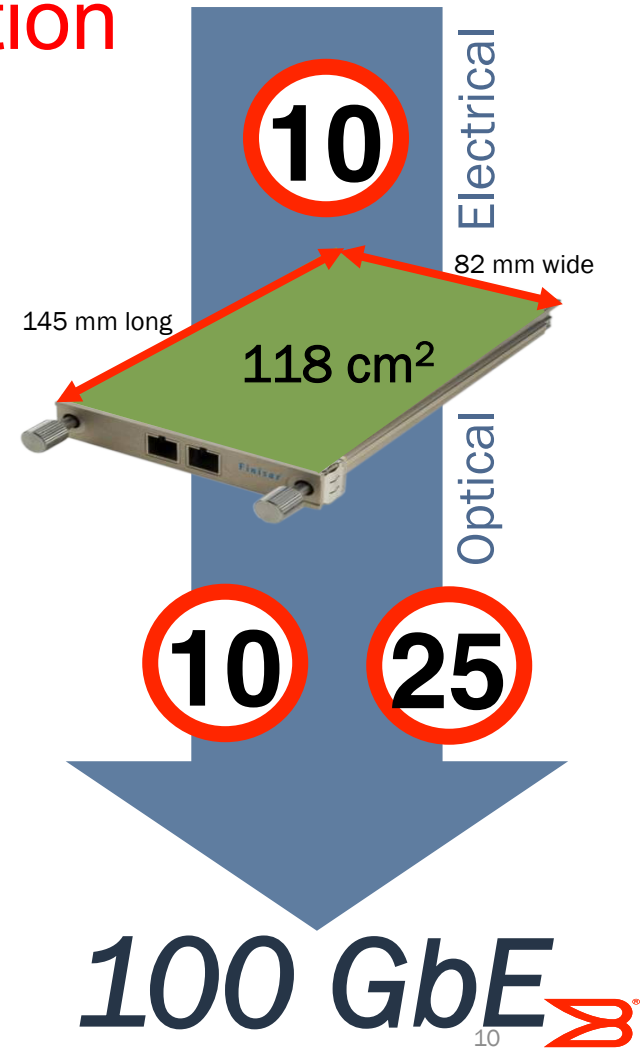
Field upgradeable programmable network processors



Supported CFP Modules	CFP Roadmap Q4 2012
10x10 MSA 2km (2 km SMF)	IEEE 100GBASE-SR10 (100 m OM3, 150 m OM4)
10x10 MSA 10km (10 km SMF)	IEEE 100GBASE-ER4 (40 km SMF)
IEEE 100GBASE-LR4 (10 km SMF)	

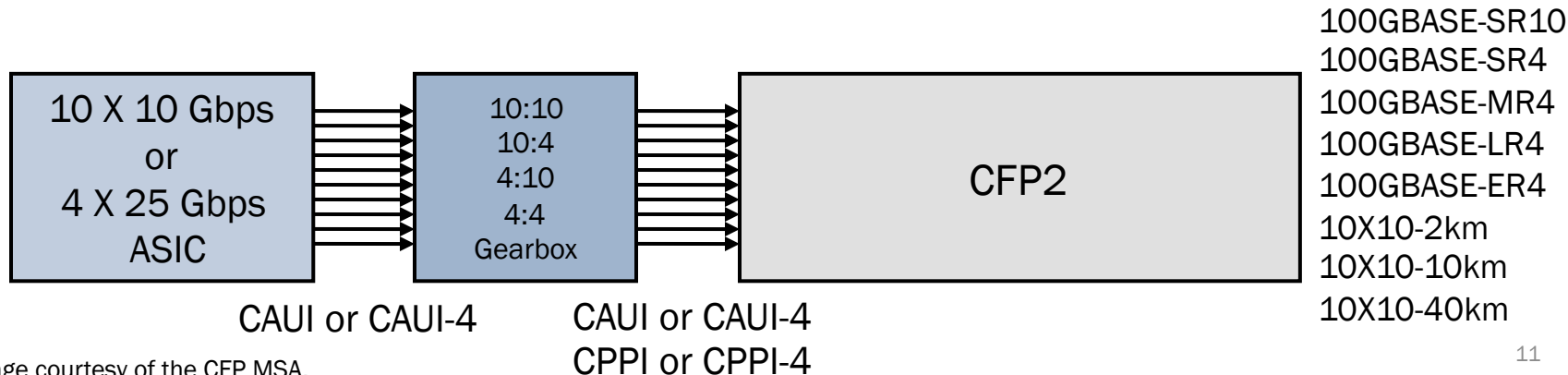
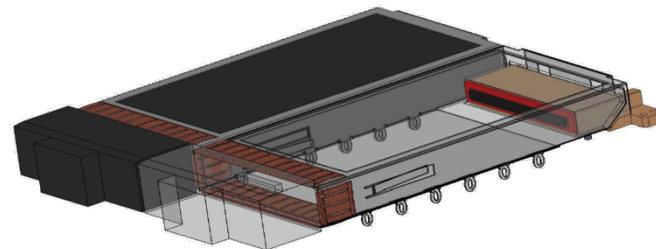
1st Generation vs 2nd Generation 100 GbE Technology

- Fundamental 1st generation technology constraints limit higher 100 GbE density and lower cost
 - 10x10 Gbps electrical signaling to media
 - 10x10 Gbps and 4 x 25 Gbps optical signaling
 - CFP module size and power consumption



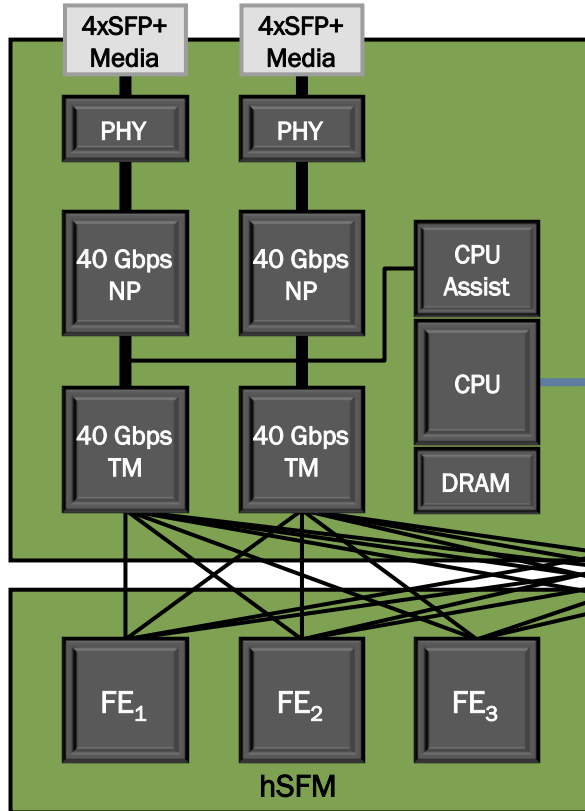
100 Gbps CFP2 Media Module

- Universal gearboxes outside optic
- CFP2 supports 10 electrical lanes that can run at multiple speeds
 - 10 x 10 Gbps lanes
 - 8 x 25 Gbps lanes
- Lower cost, size, complexity and power consumption

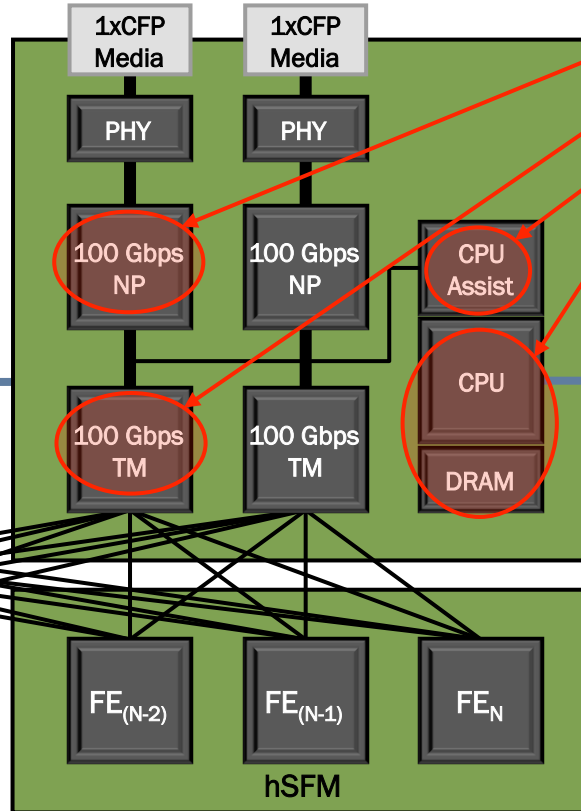


MLX Interface Module Architecture

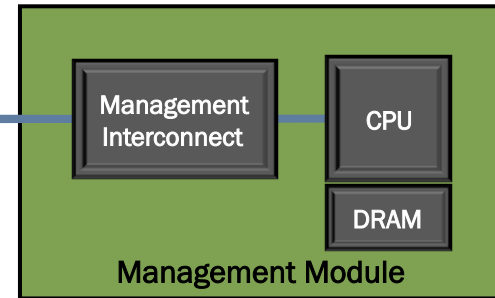
8x10 GbE Interface Module (Half Slot)



2x100 GbE Interface Module (Full Slot)



- 100 Gbps Network Processors
- 100 Gbps Traffic Managers
- Scalable Hardware CPU Assist
- Upgraded CPU and DRAM



M+N
Switch
Fabric
Modules
■ ■ ■

- Legend:
- FE - Fabric Element
 - hSFM - High-speed Switch Fabric Module
 - NP - Network Processor
 - PHY - Physical Layer
 - TM - Traffic Manager
 - - Control Plane Path
 - - Data Plane Path



Brocade NetIron MLXe Chassis Design

Interface Modules

- Half-Slot Modules for Flexible Growth and Lower Sparring Cost
- 32 Half-Slot Modules
- 16 100 GbE Full-Slot Modules

Switch Fabrics

- N+1 Redundancy
- Eight Single-Stage Clos Switch Fabric Modules

Management Modules

- 1:1 Redundancy
- 4 GB SDRAM
- Same System Software for Entire NetIron Product Line

Integrated Cable Management

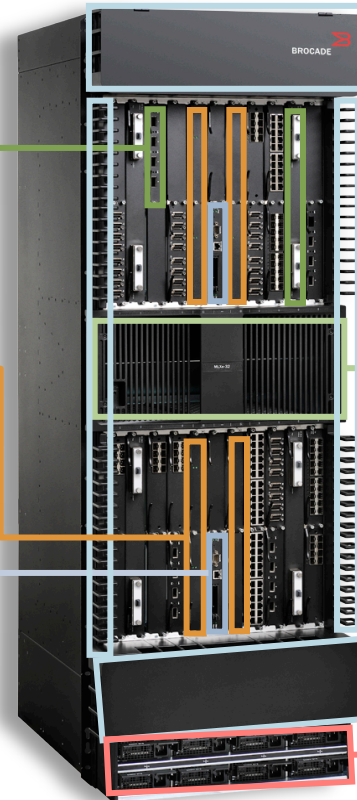
Top, Bottom and Side

Modular Cooling System

Front to Back Airflow

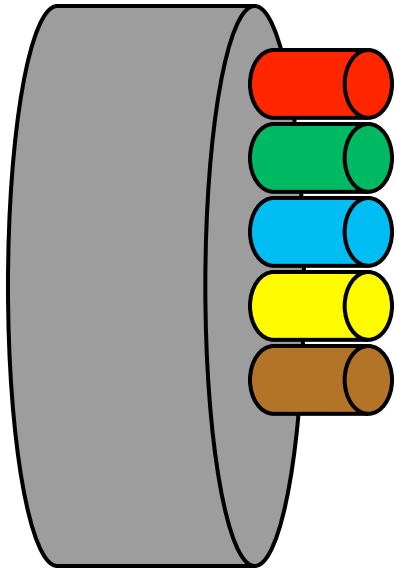
1+1 Power Supply Redundancy (AC and DC)

NEBS Certified



VLAN-ID abstraction and translation

ethernet 1/1



VLAN-IDs can overlap on the system,
has to be unique on this port only



Customer 1 - VLAN-ID 101 - source-MAC 00:00:AF:FE:00:01 - rate 500Mbps

Customer 2 - VLAN-ID 102 - source-MAC 00:00:AF:FE:00:02 - rate 1Gbps

Customer 3 - VLAN-ID 103 - source-MAC 00:00:AF:FE:00:03 - rate 2Gbps

Customer 4 - VLAN-ID 104 - source-MAC 00:00:AF:FE:00:04 - rate 500Mbps

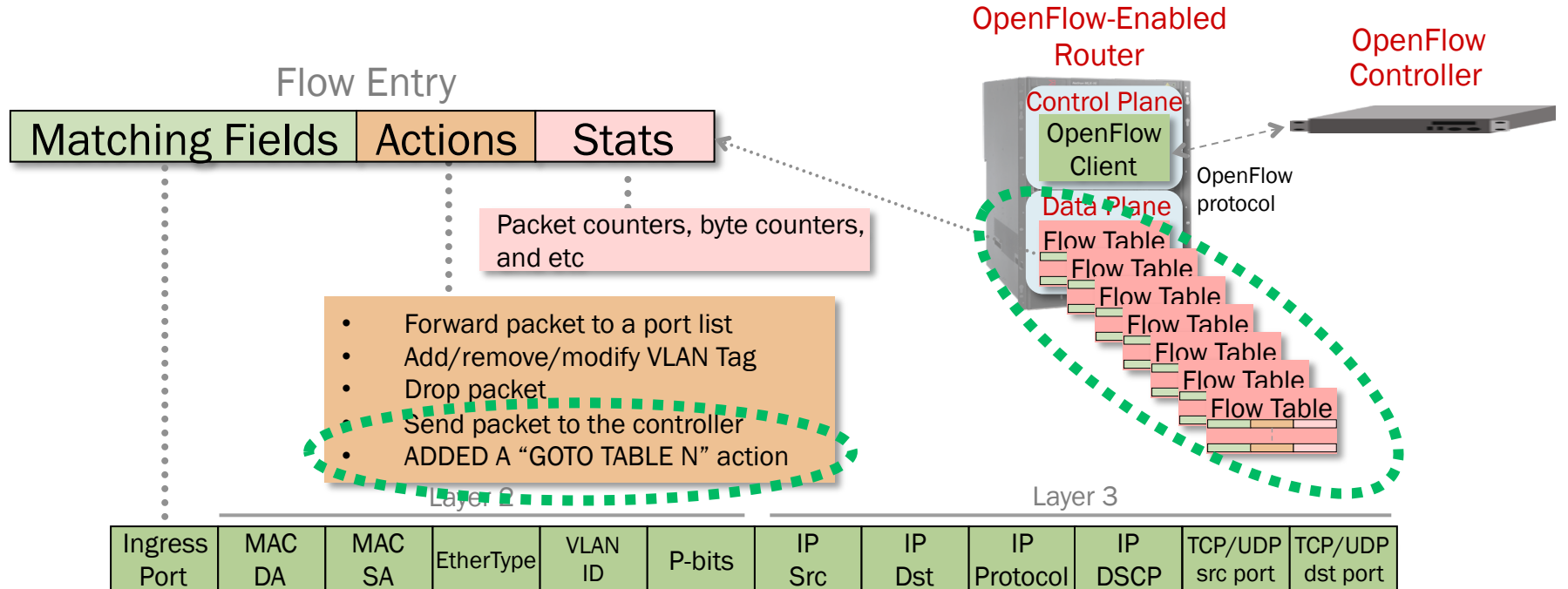
Customer 5 - VLAN-ID 105 - source-MAC 00:00:AF:FE:00:05 - rate 1Gbps

```
vpls VIX 100
vlan 101
  tagged eth 1/1
vlan 102
  tagged eth 1/1
vlan 103
  tagged eth 1/1
vlan 104
  tagged eth 1/1
vlan 105
  tagged eth 1/1
```



OpenFlow 1.1 (.2, .3) added multiple tables

Plus “group tables” and various new actions for IPv6 support, MPLS, etc





BROCADE

Thank You