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亞太電信

Cisco ASR 9000 Architecture

2016/7/1

ASR 9000 Next-Gen Edge Routing Platform

Key Design Goals & System Benefits

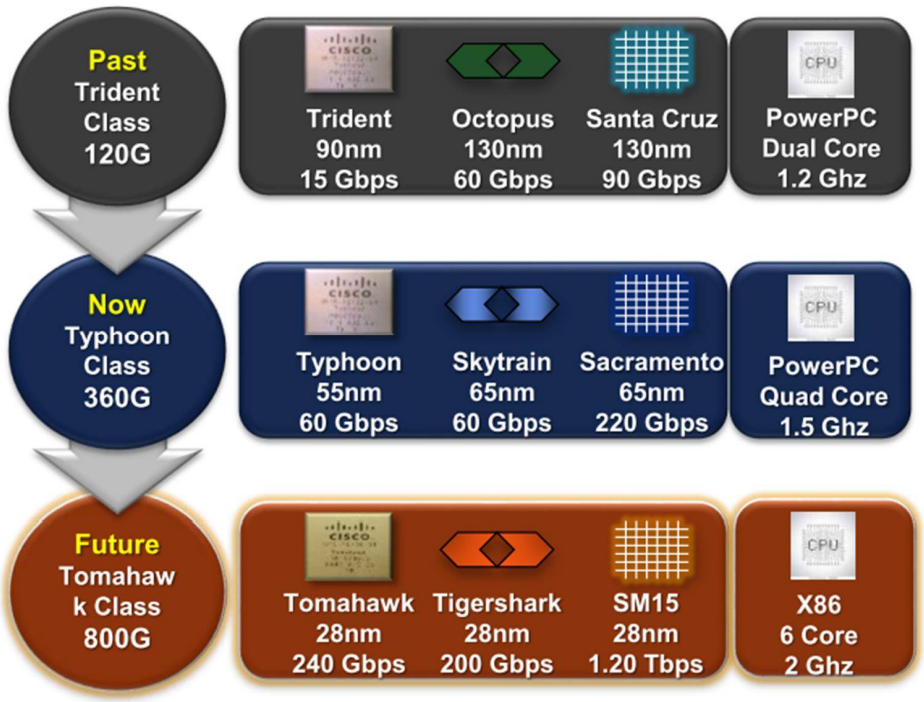
- Architectural Design for Longevity
- Product Portfolio with significant HW and SW commonality
- Highly integrated Network Processors for High Speed Scale and Feature Flexibility
- Cisco IOS XR based :
  - Truly modular, full distributed OS
  - Enhanced for the Edge (L2 and L3)

ASR 9000 Chassis Overview

ASR9k Chassis Portfolio - Physical+Virtual Flexibility

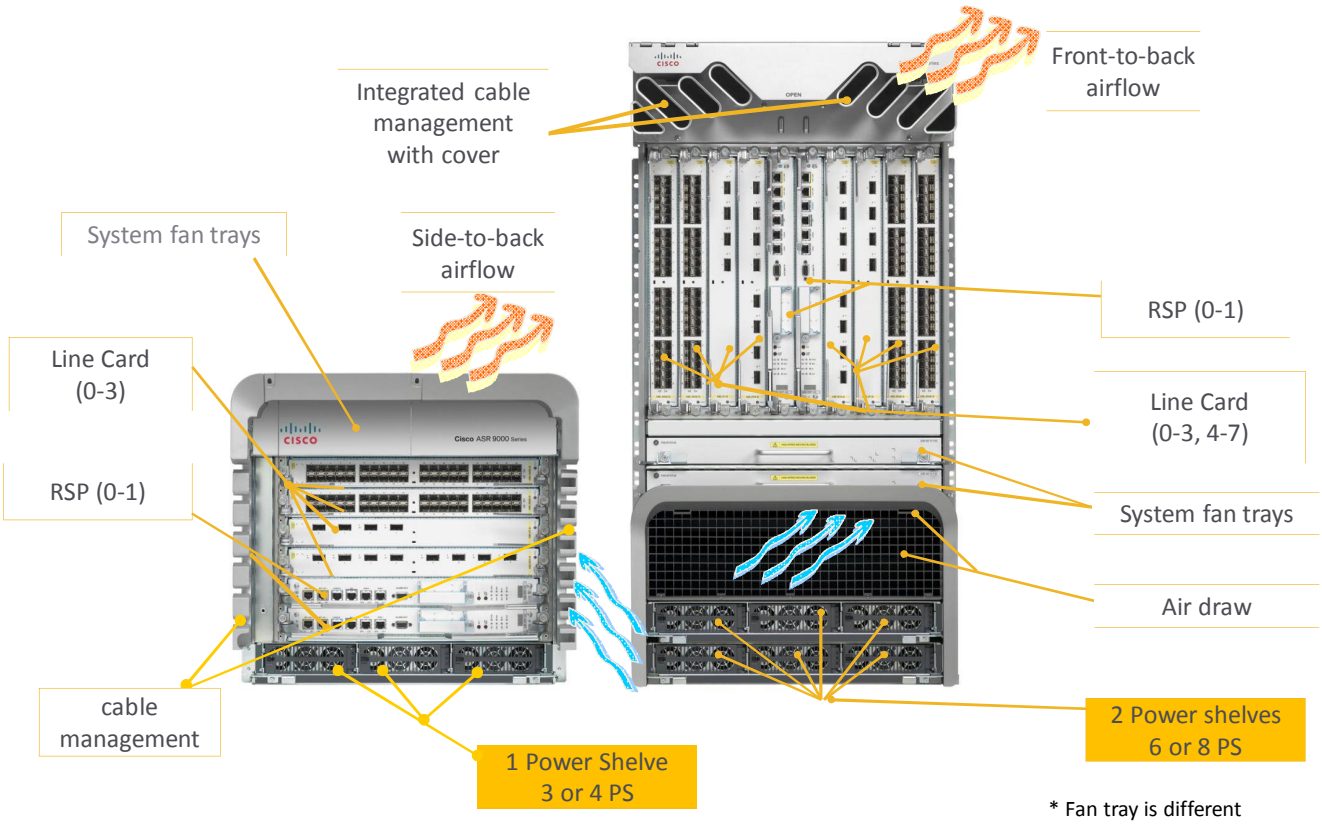
Compact & Powerful Access/Aggregation	Flexible Service Edge	High Density Service Edge and Core
• Small footprint with full IOS-XR feature capabilities for distributed environments (BNG, Pre-agg etc.)	• Optimized for ESE and MSE with high M-D scale for medium to large sites	• Scalable, ultra high density service routers for large, high-growth sites

Edge Linecard Silicon Slice Evolution



ASR 9010 and ASR 9006 Chassis

Identical HW components across two chassis*

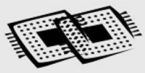
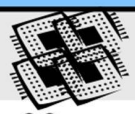


* Fan tray is different

ASR 9912 Large Scale Chassis

Features	Description
Total Capacity	30T
Capacity per Slot	3T
Slots	10 slot chassis
Rack Size	30 RU
Power	4 Power Trays 2.1 KW DC / 3.0 KW AC supplies 4.4 KW DC / 6.0 KW AC supplies
Fan	2 Fan Trays Front to back airflow
RP	1+1 RP redundancy
Fabric (SFC)	6+1 fabric redundancy
SW	XR 4.3.2 – Shipping

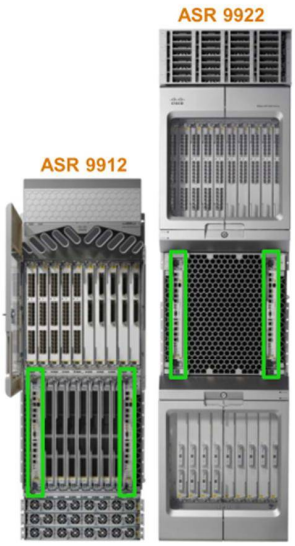
Control Processors (RP and RSP)

	RSP	RSP440	9922-RP
Cores			
Processors	PPC/Freescale 2 Core 1.5GHz	Intel x86 4 Core 2.27 GHz	Intel x86 4 Core 2.27 GHz
RAM	RSP-4G: 4GB RSP-8G: 8GB	RSP440-TR: 6GB RSP440-SE: 12GB	-TR: 6GB -SE: 12GB
nV EOBC ports	No	Yes, 2 x 1G/10G SFP+	Yes, 2 x 1G/10G SFP+
Switch fabric bandwidth	92G + 92G (with dual RSP)	220+220G (with dual RSP)	660+110 (7-fabric model)

ASR 9000 Route Switch Processor(RSP)

	RPS440
Availability	Q1CY12
Processor	Four Cores - 2.1GHz
NPU Bandwidth	60G
Fabric Planes	5
Fabric Capacity	440G
Memory	6G for TR 12G for SE
SSD	2x 16GB Slim SATA
LC Support	Typhoon/Trident

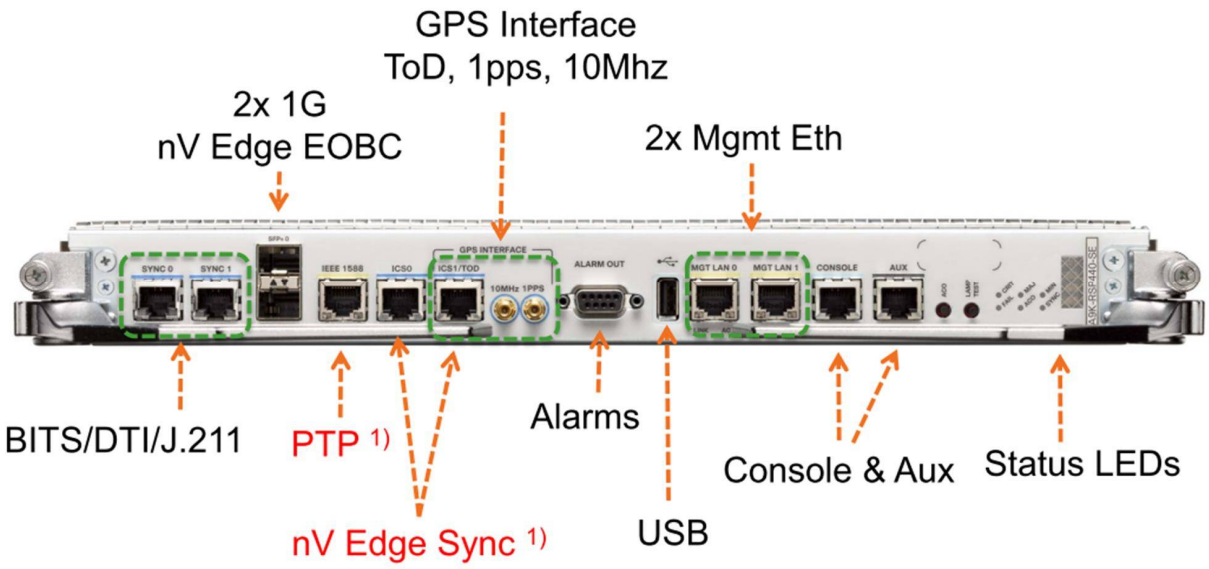
ASR 9900 Route Processor



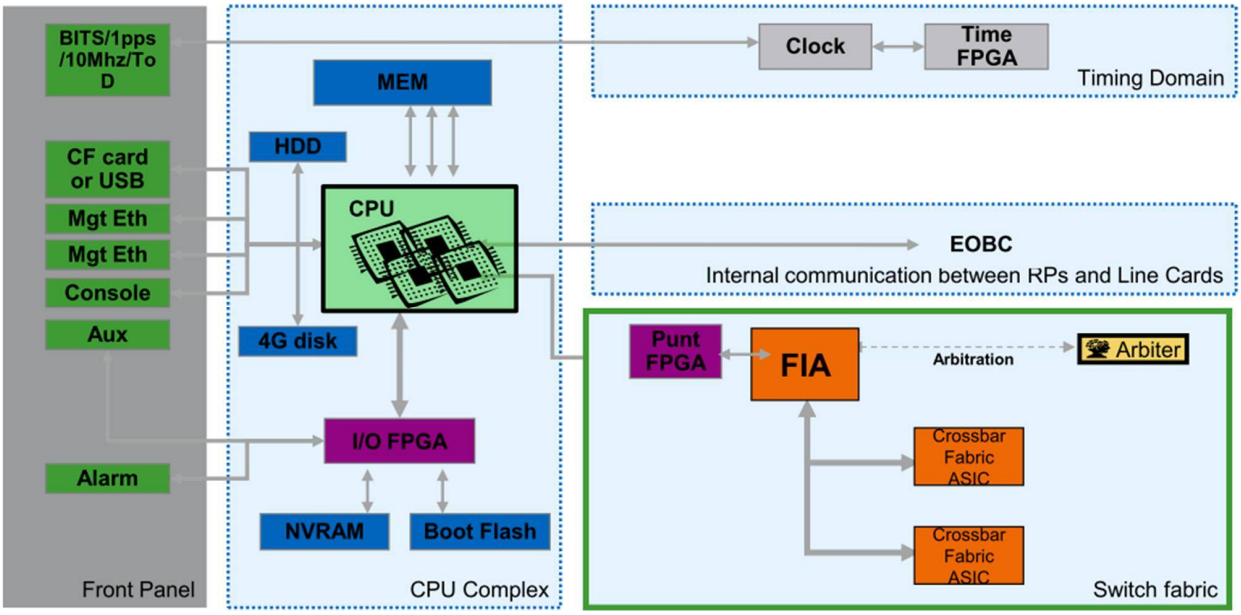
- ✓ Common for ASR 9912 and ASR 9922
- ✓ Built for massive control place scale
- ✓ Ultra High Speed Control Plane with Multi-Core Intel CPU
- ✓ Huge Scale through High Memory options
- ✓ Time and Synchronization Support

	RP1	RP2
Availability	Q1CY12	Q1CY15
Processor	Four Cores 2.1GHz	Eight Cores 2.2GHz
NPU Bandwidth	60G	240G
Memory	6G for TR 12G for SE	16G for TR 32G for SE
SSD	2x 16GB Slim SATA	2x 32GB Slim SATA
LC Support	Typhoon	Tomahawk/Typhoon

RSP440 Faceplate and Interfaces



RSP 440



RSP440

- **Switch fabric ASIC reside on the RSP blade physically**
- Switch fabric ASIC is controlled by low level hardware, it operates separately from RSP function
- **All fabric ASIC run in active mode regardless of the RSP status**
- RSP SW switch over, reload, crash including kernel crash have NO impact on fabric operation
- RSP OIR has no traffic impact due to long/short pin backplane design and instant fabric switch over
  - Short pin trig the control signaling for fabric switchover in hardware
  - Long pin is used for data packet. It can continue draining the in-flight packets from the fabric during the extended short period of time

Modular SPA Linecard

- 20Gbps, feature ritch, high scale, low speed Interfaces

Quality of Service

- 128k Queues
- 128k Policers
- H-QoS
- Color Policing

Scalability

- Distributed Control and Data Plane
- 20Gbits, 4 SPA Bays
- L3 i/f, route, session protocol – scaled for MSE needs

High Availability

- IC-Stateful Switch Over Capability
- MR-APS
- IOS-XR base for high scale and Reliability

Powerful & Flexible QFP Processor

- Flexible uCode Architectue for Feature Richness
- L2 + L3 ServicesL FR, PPP, HDLC, MLPPP, LFI
- L3VPN, MPLS, Netflow, 6PE/6VPE

SIP-700

SPAs

SPA Support

- ChOC-3/12/48 (STM1/4/16)
- POS: OC3/STM1, OC12/STM4, OC-48/STM16, OC192/STM64
- ChT1/E1, ChT3/E3, CEoPs, ATM

ASR 9000 Ethernet Line Card Overview

-L, -B, -E

First-generation LC Trident NPU:
15Gbps, ~15Mpps, bi-directional

A9K-40G | A9K-4T | A9K-8T/4 | A9K-2T20G | A9K-8T | A9K-16T/8

-TR, -SE

Second-gen LC Typhoon NPU:
60Gbps, ~45Mpps, bi-directional

A9K-24x10GE

A9K-2x100GE (A9K-1x100G)

A9K-MOD160

A9K-MOD80

A9K-36x10GE

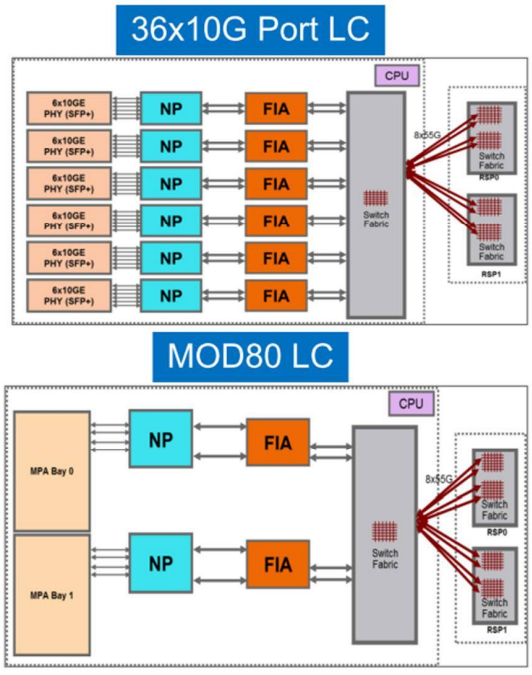
MPAs
20x1GE
2x10GE
4x10GE
8x10GE
1x40GE
2x40GE

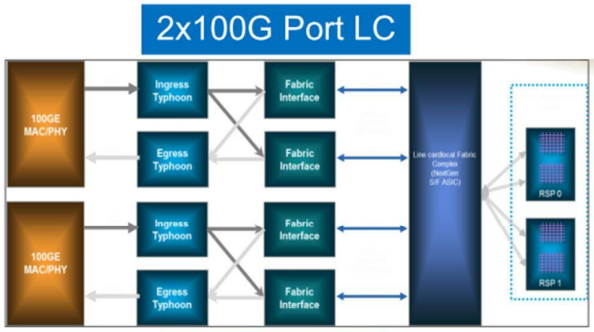
-L: low queue, -B: Medium queue, -E: Large queue, -TR: transport optimized, -SE: Service edge optimized

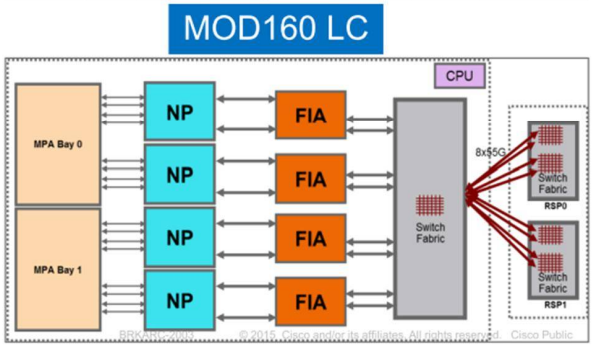
ASR 9000 Typhoon Linecards

- **High Control Plane Scale**
  - 4M IPv4 or 2M IPv6 FIB per line card
  - 2M MACs learned in hardware
- **High Performance**
  - Line rate performance on all line cards
  - End-to-End Internal System QoS
  - Efficient multicast replication
- **Micro-CPU based forwarding chip**
  - Feature flexibility, future proven
  - Programmable forwarding tables

Typhoon Line Card Architectures







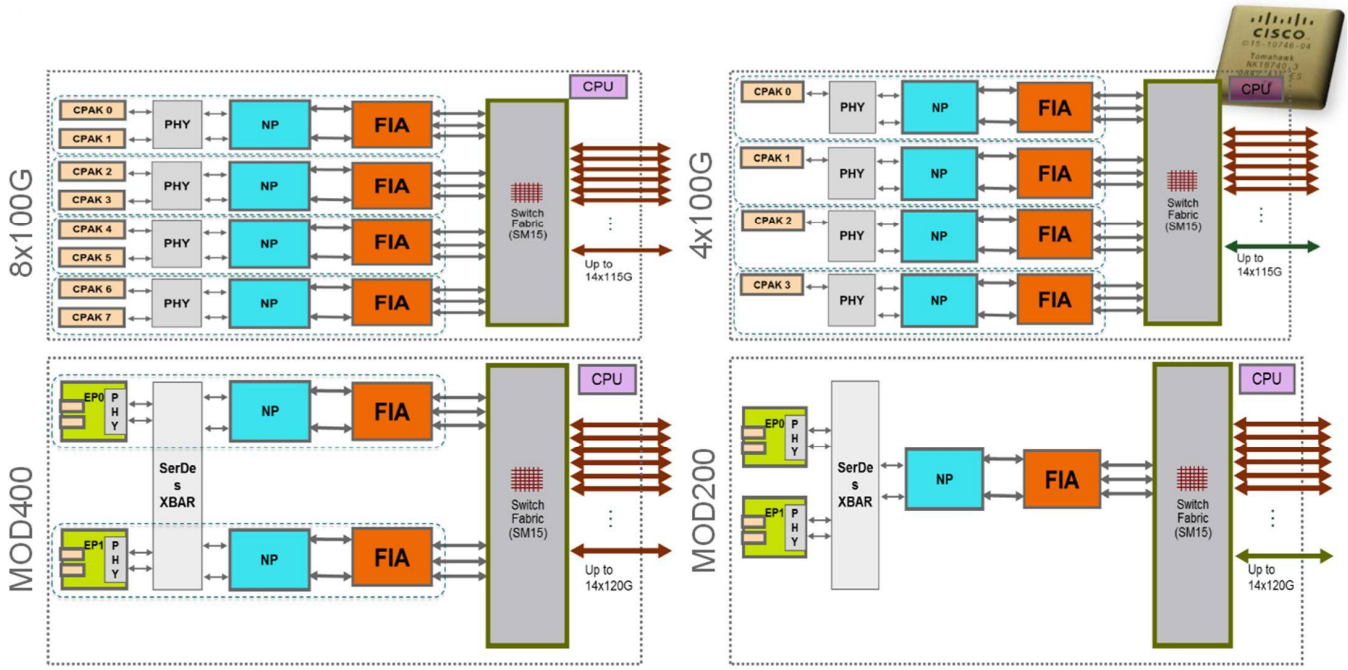
Tomahawk Line Card

Tomahawk 8x100GE CPAK Line Card

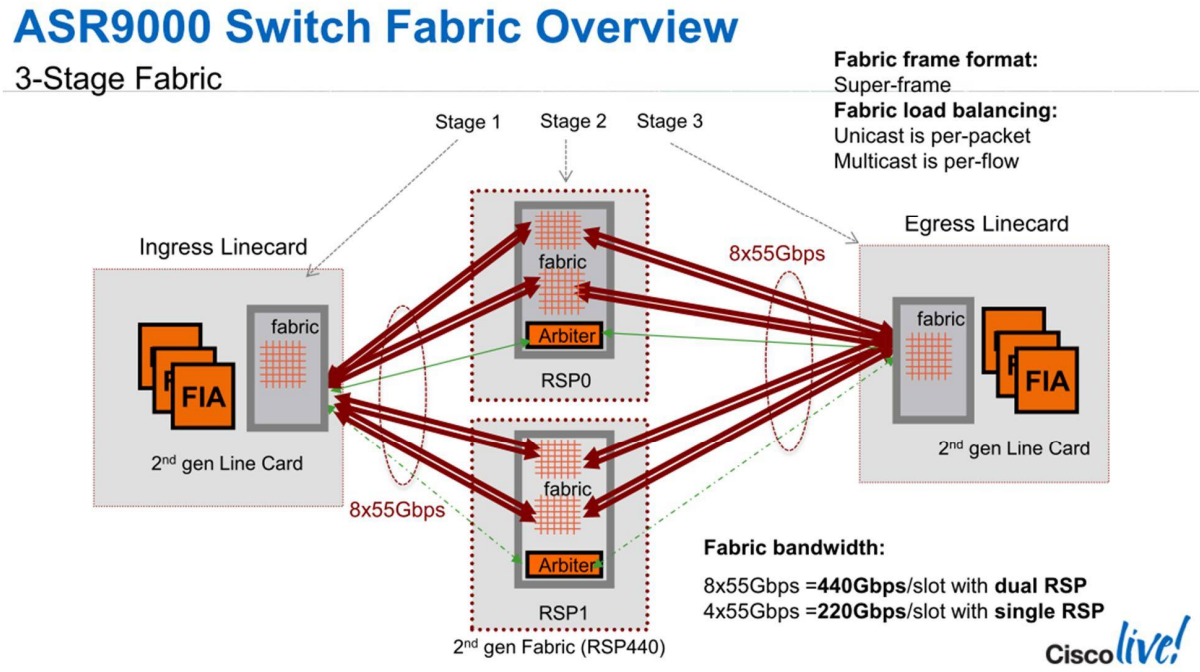
Tomahawk 4x100GE CPAK Line Card

ASR 9000 MOD-400 GE Line card
20x10GE and 2x100GE Modular Port Adapter

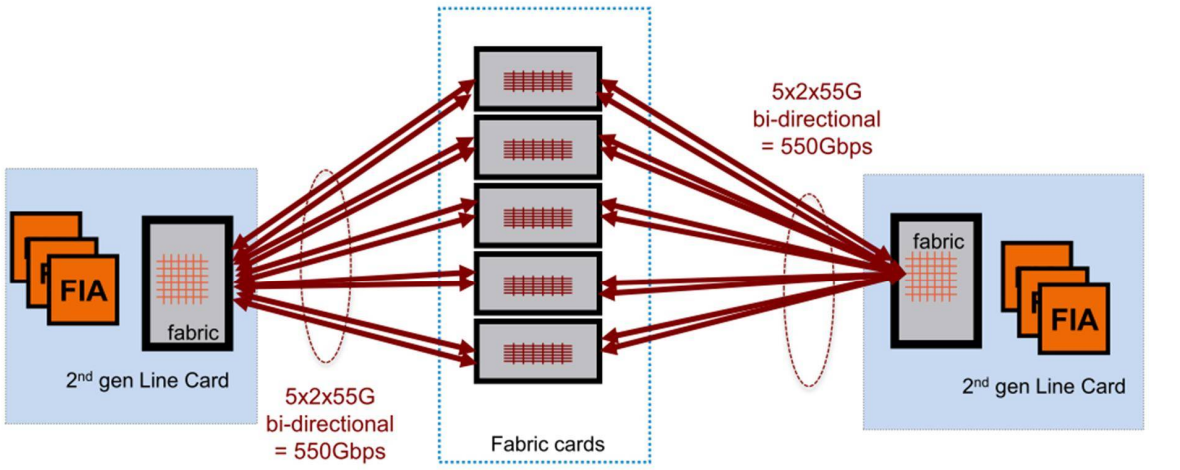
Tomahawk Line Card Architectures



RSP440 switch Fabric Overview



ASR 9922 Fabric Architecture : 5-plane System



550Gbps/LC or 440Gbps/LC with fabric redundancy

Cisco live!