

CISCO *Live!*



#CiscoLive



The bridge to possible

Deploying High Dense Aggregation, Peering

For Communication, Content Service Provider

Akshaya Kumar Sankaran
Product Management
@aks4talk
BRKSPG-2032

Cisco Webex App

Questions?

Use Cisco Webex App to chat with the speaker after the session

How

- 1 Find this session in the Cisco Live Mobile App
- 2 Click “Join the Discussion”
- 3 Install the Webex App or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until June 17, 2022.



<https://ciscolive.ciscoevents.com/ciscolivebot/#BRKSPG-2032>



Agenda

- Introduction
- Network Design & Scale
- Resource Optimization for NCS5500
- NCS5700 based Design
- Flexibility with Modular Database
- Conclusion

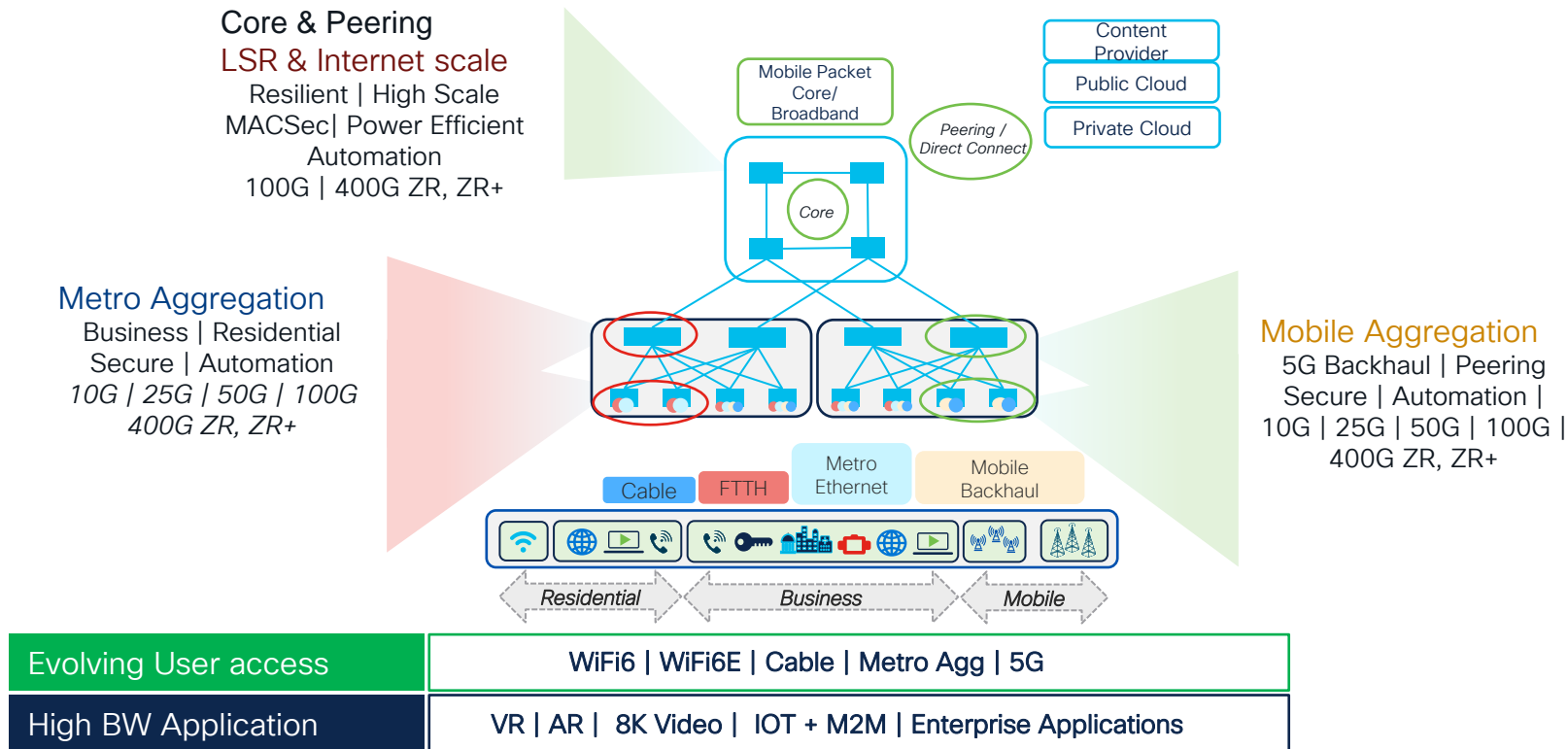
Network Design

Design impact on scale ..



Converged Aggregation Design

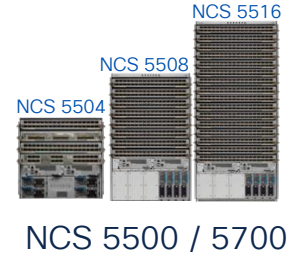
What is driving High Scale Aggregation



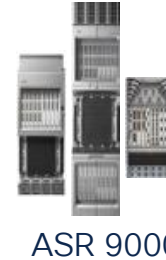
Choosing Right Platform to Scale



Single stage Forwarding



Two stage Forwarding



Understanding Application vs Resource mapping

Shared Resources

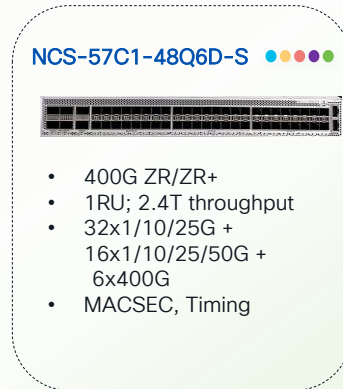
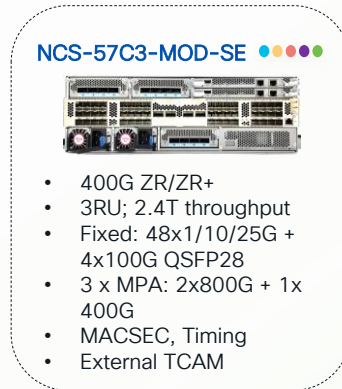
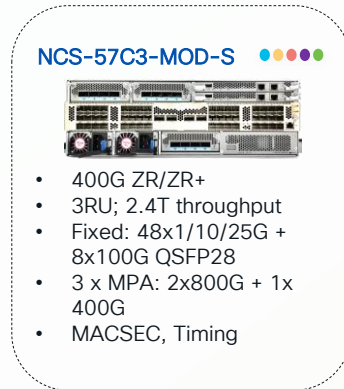
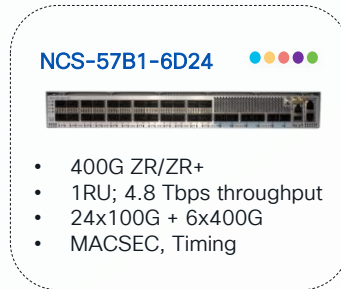
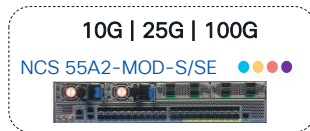
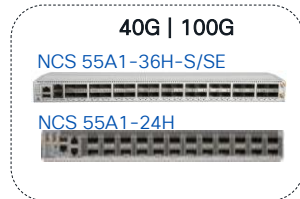
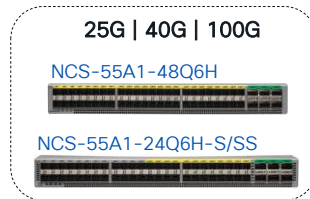
Applications	Resource
IPv4 or IPv6 Prefixes	LPM - Longest Prefix Match
MAC Address, MPLS Labels, IP Host/32	LEM - Large Exact Match data
Forwarding Paths; Multipath	FEC - Forwarding Equivalence Class
Encapsulation - ARP, MPLS Labels - Transport:SR, SRv6, LDP Services L3VPN/L2VPN)	EEDB - Egress Encapsulation Database
L3 Interfaces, Bridge Domains	VSI - Virtual Switch Interface
ACL	iTCAM - Internal TCAM
OAM Classification	OEM - OEM Exact Match

One or More Applications sharing resources

NCS 5500/5700 – Fixed Portfolio

High Scale Aggregation evolution

NCS5700 Products



NCS 5500/5700 – Modular Portfolio

High Scale Aggregation evolution

NCS5700 Products

40G | 100G

NC55-24H12F-SE

NC55-18H18F

100G

NC55-36X100G/-S

NC55-24X100G-SE

NC55-6x200-DWDM-S

40G | 100G

NC55-36X100G-A-SE

Modular

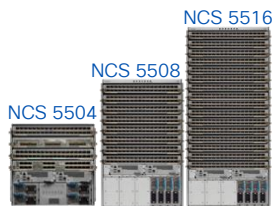
NC55-MOD-A-S/SE

NC55-MOD-A-SE

10G | 25G | 100G

NC55-32T16Q4H-A

- Segment Routing
- EVPN
- MACSec
- Timing
- 400G ZR/ZRP



NC57-24DD

NC57-18DD-SE

NC57-36H6D-S

NC57-36H-SE

NC57-MOD-S

- 400G ZR/ZR+
- 18x100G, 30x200G/100G
- Through put 9.6 Tbps
- No eTCAM

- 400G ZR/ZR+
- 18x100G, 30x200G/100G
- Through put 7.2 Tbps
- External TCAM

- 400G ZR/ZR+
- 100G, 400G
- Throughput 4.8 Tbps
- Timing, MACSEC, 800G-MPA

- 400G ZR/ZR+
- 100G, 400G
- Throughput 3.6 Tbps
- External TCAM

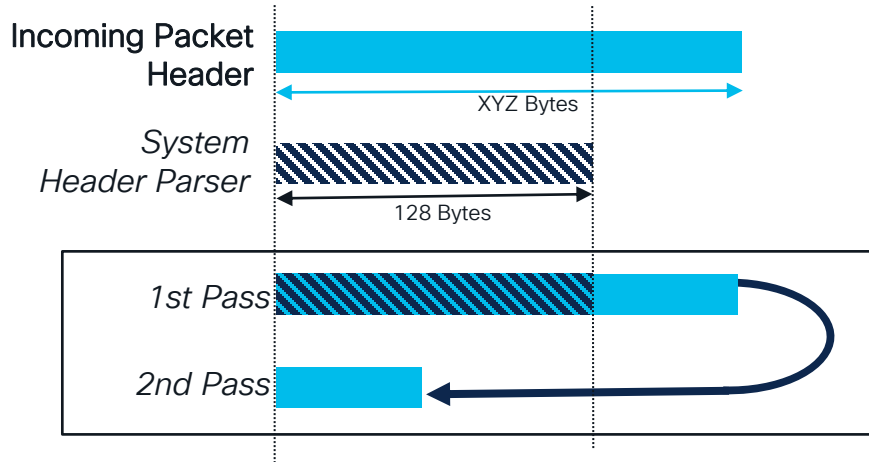
- 400G ZR/ZR+
- 10G, 25G, 50G, 100G, 400G
- Throughput 4.8 Tbps
- Timing, MACSEC, 800G-MPA

High dense Aggregation on NCS5500



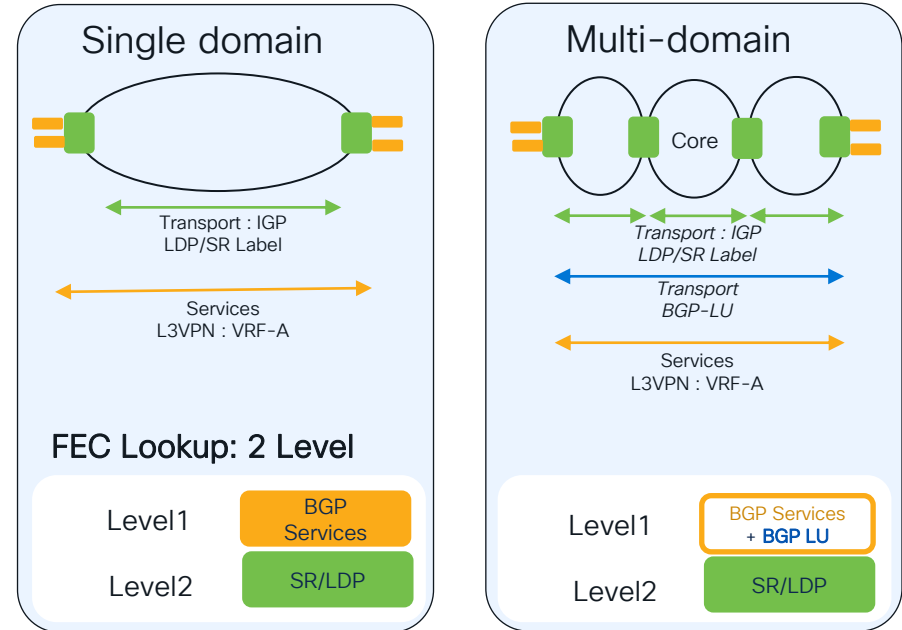
Need for More Forwarding Operations

Introducing New Applications



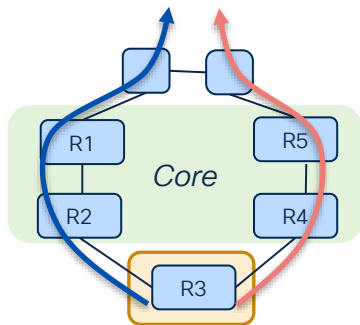
"if new applications has more Header information"

Scaling Single Domain to Multi-Domain

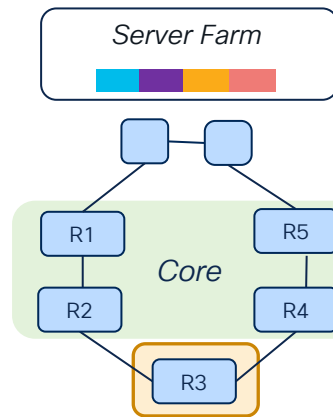
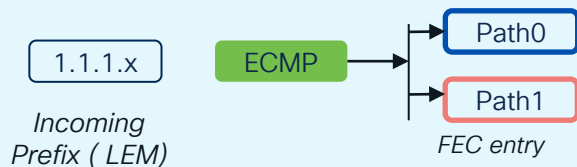


Equal Cost Multipath

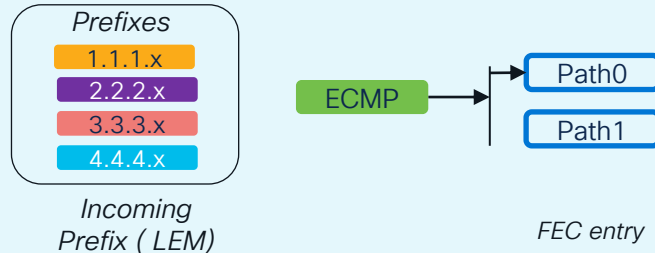
Relook at ECMP Benefits



1. Convergence



2. Load balance

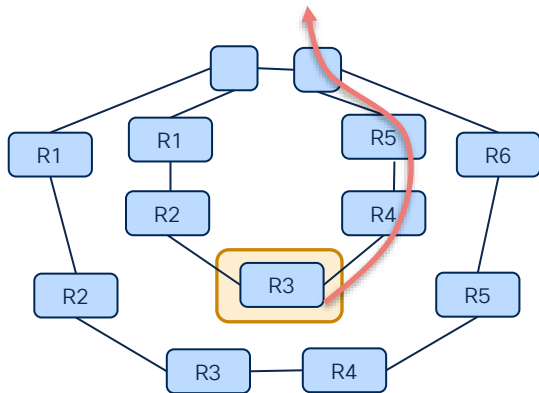


4000 entries | Challenge scaling MPLS Underlay

Choosing Design for your Application

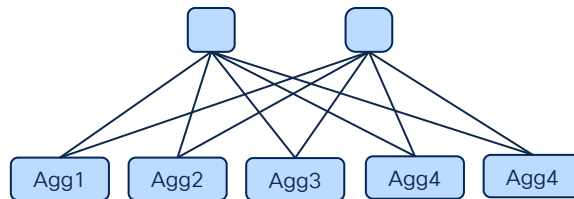
Common examples

1. Ring



- Number of rings
- Number of Nodes per ring (even | odd)
- Prefix / Label Distribution & redistribution
- ECMP path prefixes on specific node(s) only

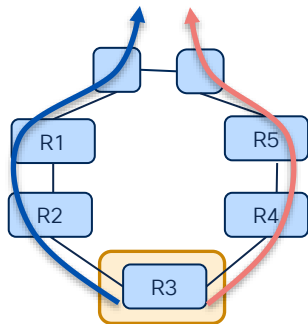
2. Clos



- All Nodes needs East west low latency paths
- Every prefix has ECMP paths
- More Spine nodes for more ECMP paths/higher backplane BW
- More Leaf for scale number of nodes

Addressing with Unipath

IGP Max-path 1

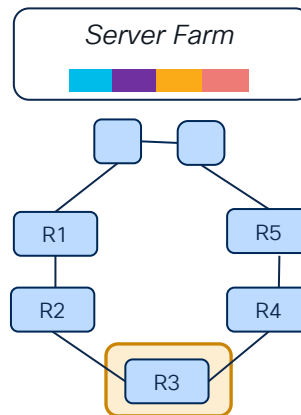


1. Convergence

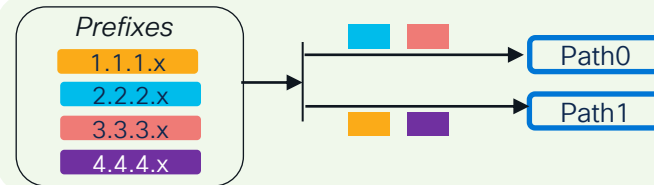
LFA/ TILFA



Protection configured; backup path(s) programmed



2. Load balance



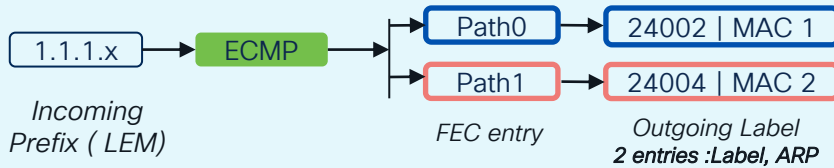
IGP loadbalance

Building Multipath Transport

MPLS Transport (LDP)

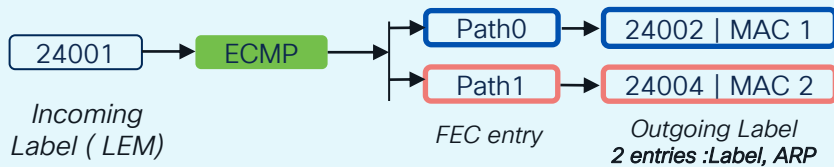
Forwarding chain **PUSH**

Incoming Unlabelled; Outgoing Labelled

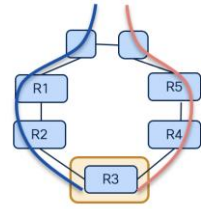


Forwarding chain **SWAP**

Incoming & Outgoing Labelled

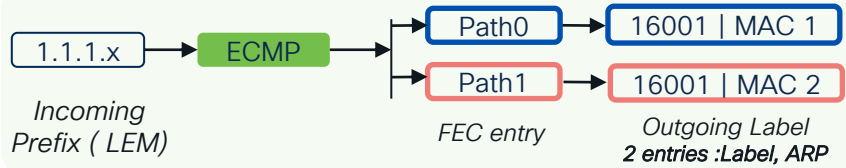


MPLS Transport (SR)



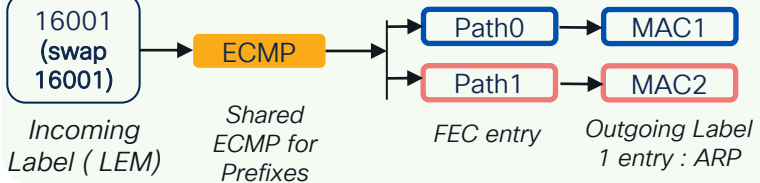
Forwarding chain **PUSH**

Incoming Unlabelled; Outgoing Labelled



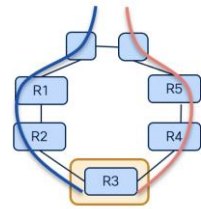
Forwarding chain **SWAP**

Incoming & Outgoing Labelled



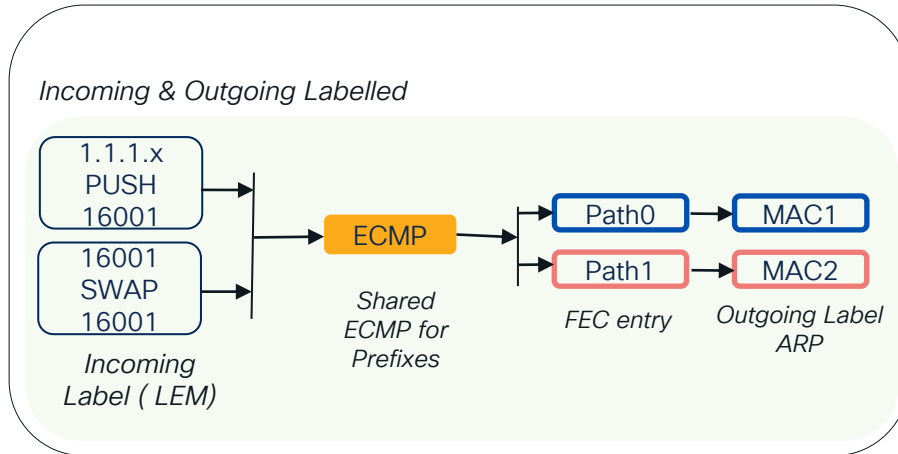
*Note: Default Optimization in swap chain;
SR*

Building Multipath Transport



MPLS Transport (SR) – with Hardware optimization

Forwarding chain for **PUSH & SWAP**



hw-module fib mpls label lsr-optimized

Optimization works when

- Outgoing labels across All paths are same for given prefix; (Primary and Backup)
- Homogenous SRGB on all nodes(i.e same SR label range)

If any protection needs additional label (eg: TILFA Node protection with extra PQ label) the above condition will fail

We can also support basic L3 and L2 services after Hardware Label optimization

High dense Aggregation on NCS5700



Enhancements in NCS5500 – J/J+ based platforms

- LEM/ LPM
 - (eTCAM) – higher route/ mcast acl etc
- EEDB resources
 - With SR we have swap labels
- ECMP FEC
 - Resource optimizations with dlb programming
 - LSR & LER – with services (XR7.1.1, XR7.4.1)
 - BGP-LU enhancement – (XR7.5.2)
- SRv6 – on J+

Database	Description	Feature/Application
LPM/ KAPS	Longest Prefix Match or KBP Assisted Prefix Search	IPv4/v6 prefixes
LEM	Large Exact Match Database	IP Host /32, MAC, MPLS
<u>ITCAM</u>	Internal TCAM	ACL
eTCAM	External TCAM on Scaled formfactors (–SE) only	Extended unicast routes, ACL & counters
OEM	OAM Exact Match	OAM Classification
FEC	Forwarding Equivalence Class	Forwarding Information
VSI	Virtual Switch interface	L3 interface, Bridge domains
In-LIF	Ingress Logical Interface table	Logical interface table
EEDB	Egress Encapsulation Database	Tunnel Encapsulation information
GLEM	Global LIF exact Match	Global Id Match

All enhancements focuses on
how features mapped to fixed
set of resources

What's new with J2/J2C/Q2A/Q2C/J2C+

MDB

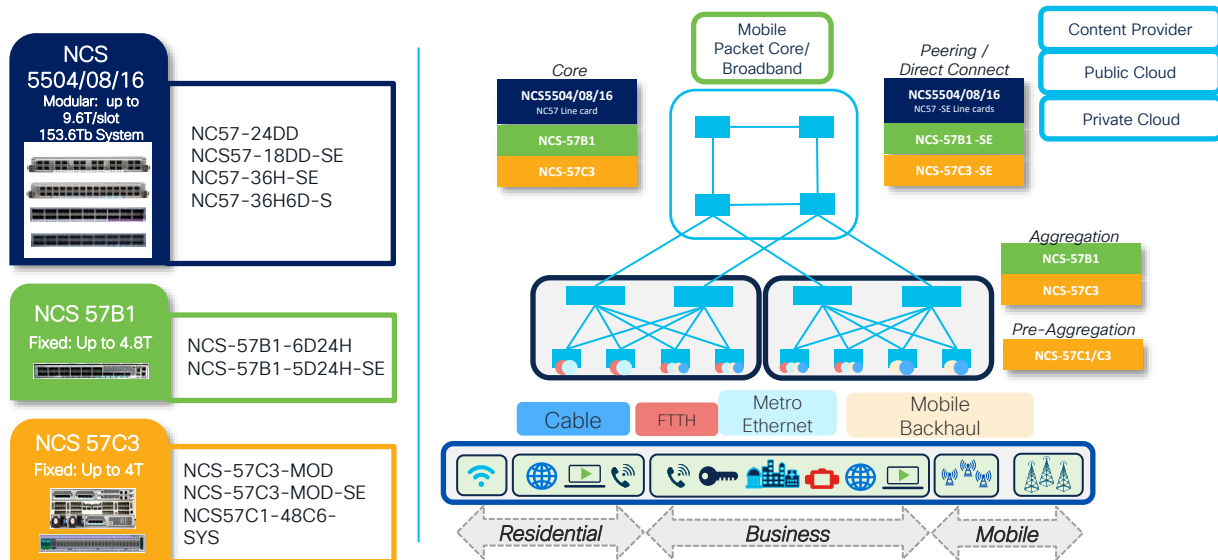
Modular Database

Enhancements on
how ASIC
resources are
carved

Database	Description	Feature/Application
LPM/ KAPS	Longest Prefix Match or KBP Assisted Prefix Search	IPv4/v6 prefixes
LEM	Large Exact Match Database	IP Host /32, MAC, MPLS
<u>iTCAM</u>	Internal TCAM	ACL
eTCAM	External TCAM on Scaled formfactors (-SE) only	Extended unicast routes, ACL & counters
OEM	OAM Exact Match	OAM Classification
FEC	Forwarding Equivalence Class	Forwarding Information
VSI	Virtual Switch interface	L3 interface, Bridge domains
In-LIF	Ingress Logical Interface table	Logical interface table
EEDB	Egress Encapsulation Database	Tunnel Encapsulation information
GLEM	Global LIF exact Match	Global Id Match

Enhancement on
how features
mapped to
resources

High Scale Converged SDN Network



- Unique services / scale for different use cases

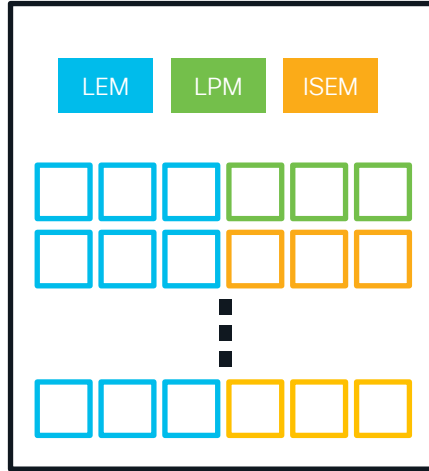
L3 Profile

L2 Profile

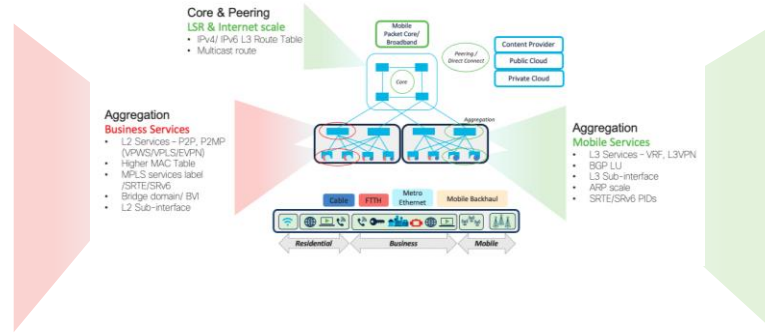
- NCS5700 ASIC



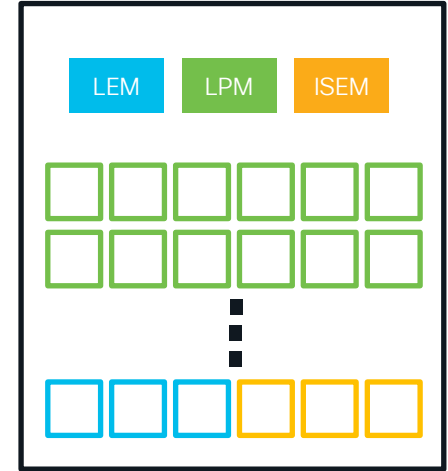
MDB Profile resource carving



L2 Profile



- Higher or Lower database based on usecase
- Total Database is still same
- If LPM reduced by X amount, then LEM need not be increased same amount

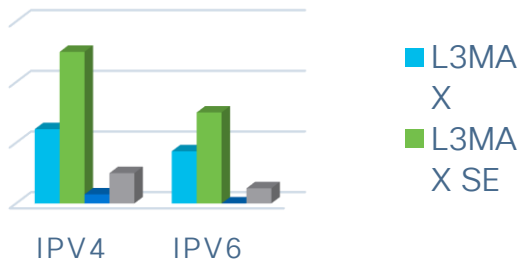


L3 Profile

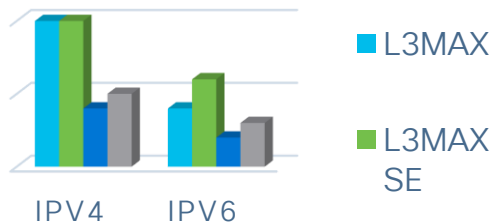
MDB profiles Scale comparison

Compare between all 4 Profiles on NCS5700

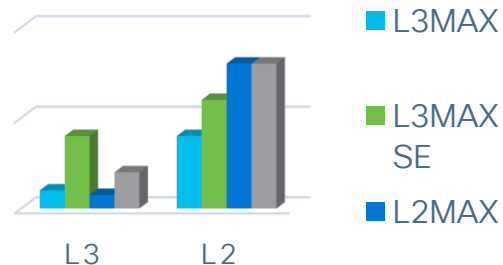
UNICAST ROUTE SCALE



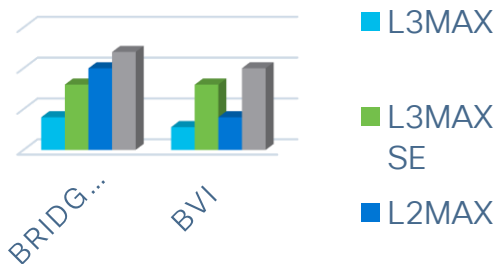
MULTICAST ROUTE SCALE



INTERFACE SCALE



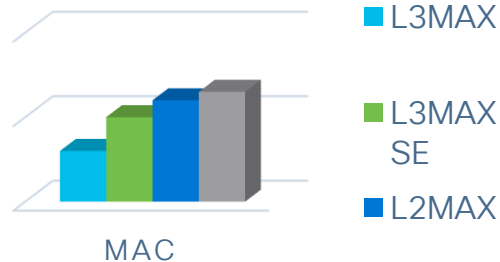
BVI/ BD SCALE



L3 & L2 SERVICES SCALE



MAC ADDRESSES



MDB Profiles

Today we have planned 4 MDB Profiles

MDB Scale

L3Max-SE

L2Max-SE

Fixed

NCS-57B1-SE

NCS-57C3-SE

Modular

NC57-18DD-SE

NC57-36H-SE

Scale Platform can run MDB Base Profile also (although not required)

MDB Base

L3Max

L2Max

Fixed

NCS-57B1

NCS-57C3

NCS-57C1-48S6H**

NCS-57D2**

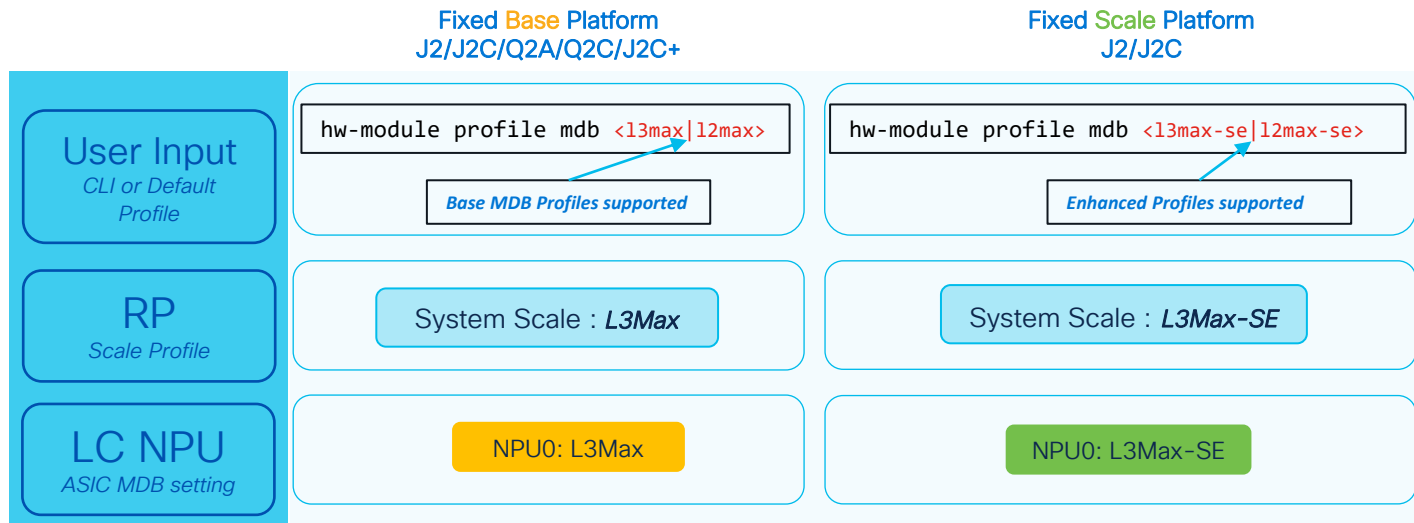
Modular

NC57-24DD

NC57-36H6D-S

NC57-MOD-S**

How MDB Profile works in Fixed NCS5700



How MDB Profile works in Modular NCS5500 + NC57 Line card

NCS5504 Mix **Base** and **Scale** Linecards
Only Base MDB Profiles supported

NCS5504 Only **Scale** Linecards
All MDB Profiles supported

User Input

CLI or Default
Profile

```
hw-module profile mdb <13max|12max>
```

Base MDB Profiles supported

```
hw-module profile mdb <13max-se|12max-se>
```

Enhanced MDB Profiles supported*

RP

Scale Profile

System Scale :

L3Max

System Scale :

L3Max-SE

LC0: L3Max

Base
Linecard

LC1: L3Max

Scale
Linecard

LC2: L3Max

Scale
Linecard

LC3: L3Max

Scale
Linecard

Slot 0 : Base J2 Linecard

Slot 1-3: Scale J2 Line cards



No
Linecard

LC1:
L3Max-SE

Scale
Linecard

LC2:
L3Max-SE

Scale
Linecard

LC3:
L3Max-SE

Scale
Linecard

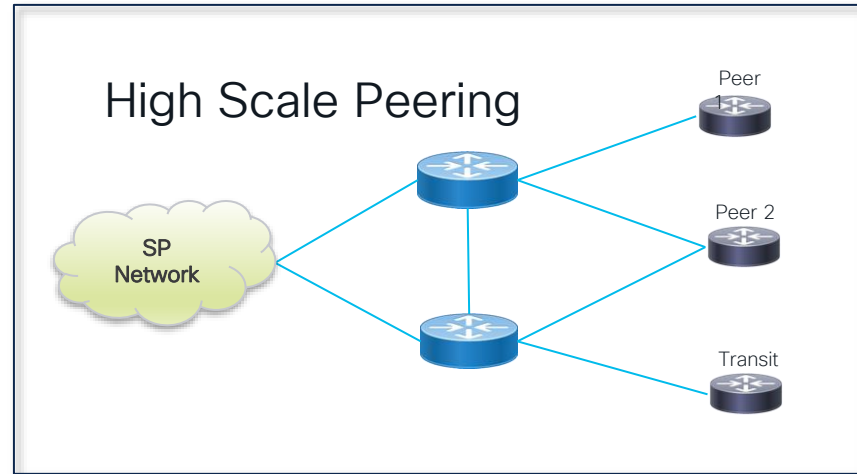
Slot 0 : Remove Base LC

Slot 1-3: Scale J2 Line cards

Use case 1: Peering Network Requirements

L3 Internet Edge

- Peering Profile with Higher route scale,
 - Internet route scale
 - IPv4 with uRPF
 - IPv6 with uRPF
- Security Focus
 - BGP FlowSpec
 - ACL
 - uRPF
- High density peering interfaces – 8K
- Routing Control Plane
 - 20% BGP
 - 80% static

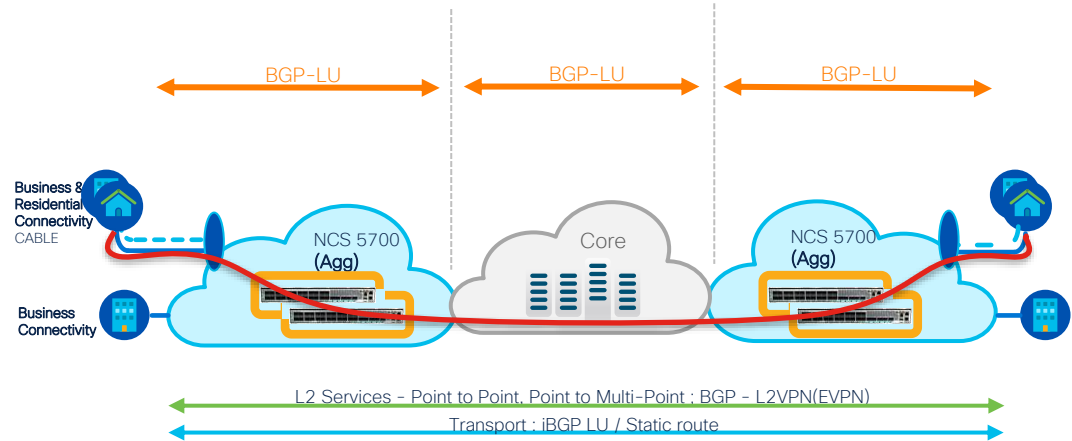


Use Case	Peering
Line Cards	J2-SE
MDB Profile	L3Max-SE

Use case 2: Business L2 Services

NCS5700 is Aggregation node for L2 Services

- Old Network based on L2VPN VPLS/VPWS
- Port and VLAN Based L2 Services
- BGP EVPN
- EVPN control plane based for MAC learning over core



Use Case	Business L2 Services
Line Cards	J2-SE
MDB Profile	L3Max-SE

Summary

- NCS5700 – most feature rich, 400G capable High scale aggregation platforms
- Capabilities such as Modular Database & Egress Traffic Manager brings newer capabilities
- Continued Software and Hardware innovation to address new requirements



Additional Service Provider Sessions

- Visit the Service Provider Walk-in Labs
 - LABSP-3393
 - LABSP-3395
- Attend the Service Provider Interactive Breakout Sessions
 - IBOSPG-2005
- Attend the Service Provider Breakout Sessions
 - BRKSPG-2032

Technical Session Surveys

- Attendees who fill out a minimum of four session surveys and the overall event survey will get Cisco Live branded socks!
- Attendees will also earn 100 points in the Cisco Live Game for every survey completed.
- These points help you get on the leaderboard and increase your chances of winning daily and grand prizes.



Cisco Learning and Certifications

From technology training and team development to Cisco certifications and learning plans, let us help you empower your business and career. www.cisco.com/go/certs

Pay for Learning with Cisco Learning Credits

(CLCs) are prepaid training vouchers redeemed directly with Cisco.



Learn

Cisco U.

IT learning hub that guides teams and learners toward their goals

Cisco Digital Learning

Subscription-based product, technology, and certification training

Cisco Modeling Labs

Network simulation platform for design, testing, and troubleshooting

Cisco Learning Network

Resource community portal for certifications and learning



Train

Cisco Training Bootcamps

Intensive team & individual automation and technology training programs

Cisco Learning Partner Program

Authorized training partners supporting Cisco technology and career certifications

Cisco Instructor-led and Virtual Instructor-led training

Accelerated curriculum of product, technology, and certification courses



Certify

Cisco Certifications and Specialist Certifications

Award-winning certification program empowers students and IT Professionals to advance their technical careers

Cisco Guided Study Groups

180-day certification prep program with learning and support

Cisco Continuing Education Program

Recertification training options for Cisco certified individuals

Here at the event? Visit us at **The Learning and Certifications lounge at the World of Solutions**



Continue your education

- Visit the Cisco Showcase for related demos
- Book your one-on-one Meet the Engineer meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the On-Demand Library for more sessions at www.CiscoLive.com/on-demand



The bridge to possible

Thank you

CISCO *Live!*



#CiscoLive