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#CiscoLive

The bridge to possible

How to choose the Correct Branch Device

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Product Manager ISR4000 & Cat8000
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@isrguru
BRKENT-2139

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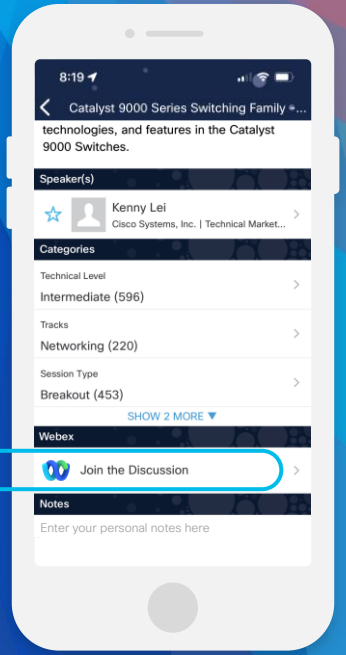

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Agenda

- Basics – Looking for new CPEs?
  - Can I trust published Performance Data?
  - Make sure you're comparing apples to apples
- Is it time for a refresh?
  - Understand the underlying architecture
  - Learn to monitor CPU load & Memory usage
- Transitioning from ISR to C8k
  - Architectural differences
  - Transition recommendations
  - C8k DNA Licensing – How it works in practice
- Debunking Myths & Misperceptions:
  - C8k's are only for SDWAN & more expensive than ISR4k
  - DNA licensing is super complicated
  - DNA licensing gets me stuck in subscription

Stefan Mansson

Product Manager ISR4000 & Cat8300/8200

GRUMPY OLD FART

38 years in Network Business

33 years exclusively with Cisco Branch Routers and Routing Solutions

CISCO CERTIFIED CCIE 20 YEARS

CCIE #3516 25 years, since -98

Distinguished Speaker Cisco live!

CCSI #20145 Cisco Instructor 24 years

Start with the Basics

Before you start

How much WAN bandwidth do I actually require

- Is our traffic really utilizing the bandwidth we're paying for?
- What does my traffic pattern look like?

?

Do I really know the impact of my services?

- Are they impacting Throughput, DRAM, Storage?
- …or all of them?

?

We're transitioning to Cisco SD-WAN

How much more horsepower and memory will we require?
Should I design for containerized applications?
How many of our present platforms can be carried over?

Cat8k are using DNA licensing

How does DNA licensing work in our environment?
Are we getting stuck in license renewals?
What DNA BW Tier will we need?
Can we switch to SD-WAN mid-term?

Do I fully understand performance data?

- How do I compare this data from one vendor to another?
- Is it tested the same way?

?

Is it time to refresh?

- How much load am I putting on my routers today?
- How much horsepower & memory do they have left?
- How do I know?

?

What about lifespan?

- For my existing platforms and for the chosen replacement platforms
- How much longer do we have HW & SW support?
- How do I make sure I get full ROI ?
- Will Cat8000 routers work with my existing ISR4000?

?

Understand Performance Collaterals

Are you comparing Apples to Apples?

Why Cisco Uses the Term ”Aggregate”

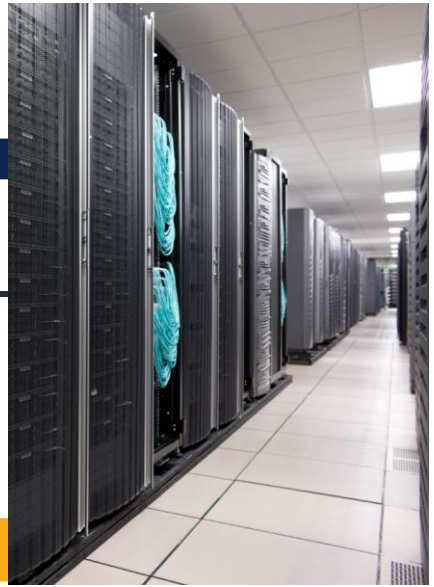
So…C8200 collateral says 3.8Gbps IP CEF…..Is that Bidirectional?

Is this 3.8Gbps Bidirectional?

1.9Gbps UP

\+

1.9Gbps DOWN



3.8Gbps UP

\+

3.8Gbps DOWN

…or is this 3.8Gbps Bidirectional?

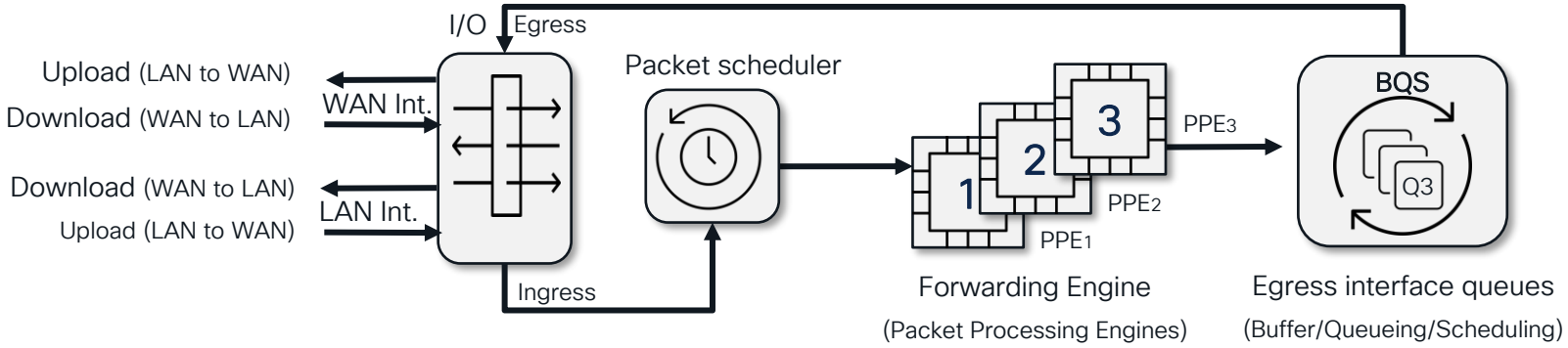
?????

Why Cisco Uses the Term ”Aggregate”

Ehh…Wrong!!!

”Reported performance numbers should be cut in half to show true throughput”

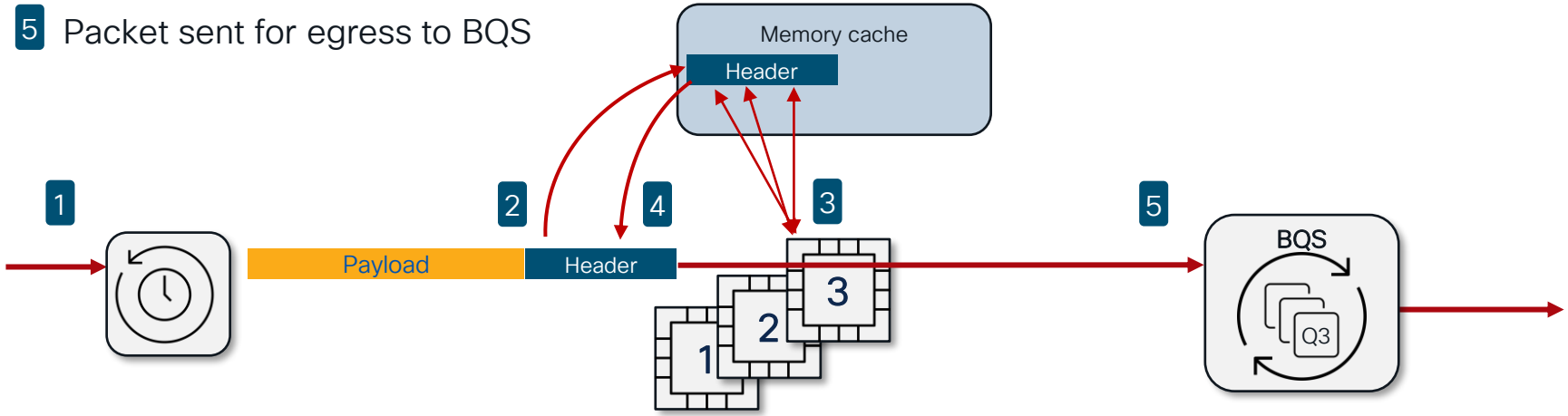
- Aggregate = Total capacity of Forwarding engine, regardless of direction
- Forwarding engine doesn’t distinguish between Up or Download



- Using RFC 2544 NDR Methodology – Highest possible Non-drop rate

Cisco Express Forwarding ”CEF”

1. Packet comes in from Packet Scheduler
2. Packet header copied to memory cache – Main Payload generally not copied
3. PPE invokes Data Plane features based on header information
4. Header bolted back on to original packet waiting in buffer
5. Packet sent for egress to BQS



How packet sizes can skew performance data

Test case: SD-WAN IQDF (IPSec + QoS + DPI + FNF)		
Report #1 246 Mbps	Report #2 1.4 Gbps	Report #3 5 Gbps

Confused?

Let’s look at what’s behind these test results

Test case: SD-WAN IQDF (IPSec + QoS + DPI + FNF)

Report #1
246 Mbps

Report #2
1.4 Gbps

Report #3
5 Gbps

SD-WAN w. Heavy features	Mbps		
Platform	64	IMIX	1400
4461	246	1,389	5,052

Let’s look at what’s behind these test results

Test case: SD-WAN IQDF (IPSec + QoS + DPI + FNF)

Report #1
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Report #2
1.4 Gbps

Report #3
5 Gbps

SD-WAN w. Heavy features	Mbps			PPS		
Platform	64	IMIX	1400	64	IMIX	1400
4461	246	1,389	5,052	454,200	446,700	444,700

Packet Per Second = Indisputable routing capacity

Beware of misleading data

Twisting the truth

Skewing performance data with packet sizes

Just for kicks & giggles: Here's a "Drag race" test we once did with ISR G2

Max throughput
2.8+ Gbps

Cisco 1941
Recommended 25-40Mbps

Cisco 3945E
Recommended 350-500Mbps

Max throughput
8+ Gbps

Believe it or not...all were perfectly accurate test results

- No services enabled
- Same IPv4 destination for all packets
- Stateless UDP with ONLY maximised L2 frame size

Awesome numbers, right? But...

Max throughput
2.8+ Gbps

Cisco 1941
Recommended 25-40Mbps

Max throughput
8+ Gbps

Cisco 3945E
Recommended 350-500Mbps

Will this ever hold in a real environment?

Believe it perfectly accurate test results

enabled

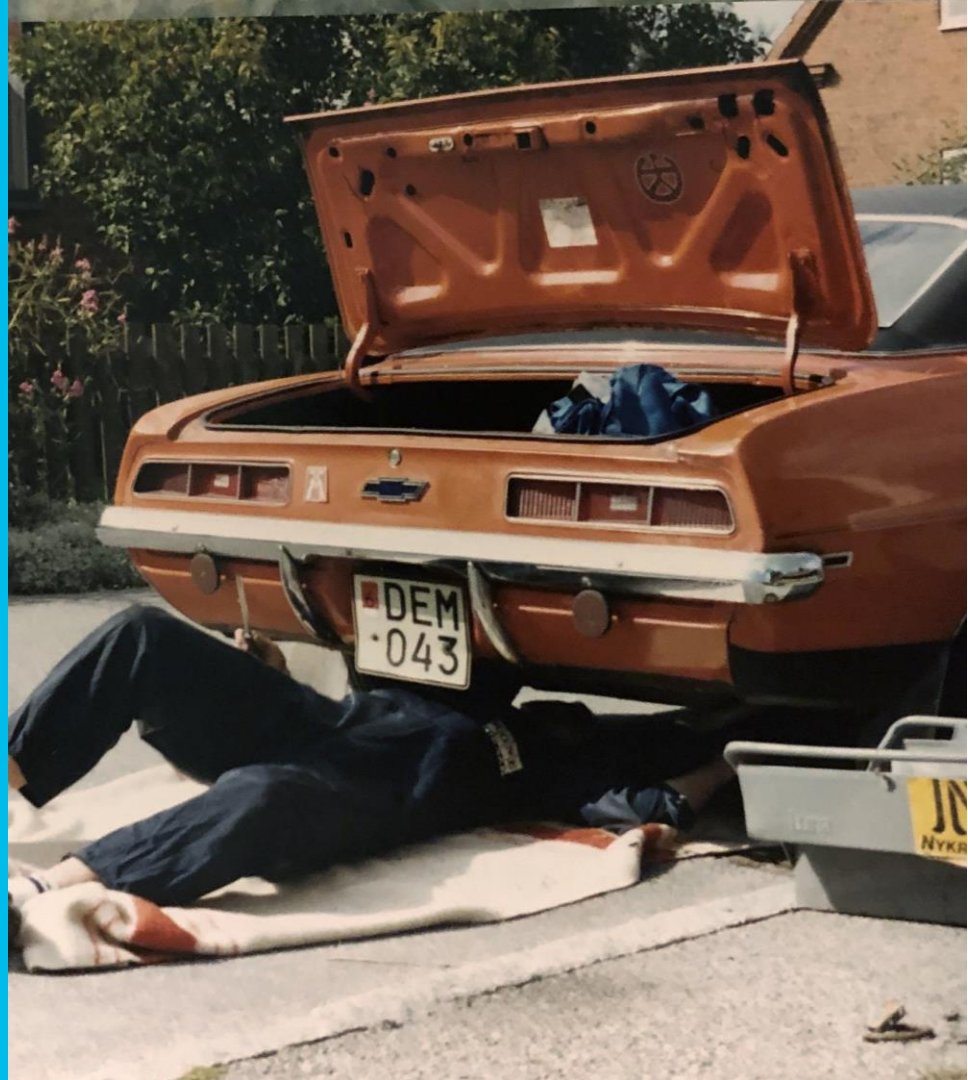
Same IPv4 destination for all packets

Not just no...

- Stateless UDP with ONLY maximised L2 frame size

Is it time for a CPE refresh?

Let’s take a look under the hood and find out



Monitor your CPU Resources

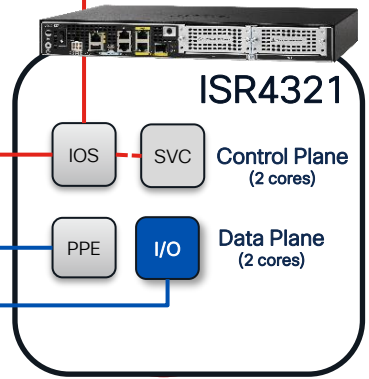
Looks at the IOSd process only

```
Stefs_Dagger#sh processes cpu
CPU utilization for five seconds: 3% one minute: 3%; five minutes: 3%
```

Shows individual load for all processors

```
Stefs_Dagger#sh processes cpu platform sorted
CPU utilization for five seconds: 18%, one minute: 18%, five minutes: 18%
Core 0: CPU utilization for five seconds:  3%, one minute:  3%, five minutes:  3%
Core 1: CPU utilization for five seconds:  2%, one minute:  3%, five minutes:  3%
Core 2: CPU utilization for five seconds:  8%, one minute:  7%, five minutes:  7%
Core 3: CPU utilization for five seconds: 100%, one minute: 100%, five minutes: 100%

 Pid    PPid    5Sec    1Min    5Min   Status      Size  Name
-----------------------------------------------------------------------
28331  25742   100%    100%    100%   S      1093480448  qfp-ucode-utah
22816  22582   1%      1%      1%     S        27967488  ngiolite
13314  12505   1%      1%      1%     S      1752436736  linux_iosd-imag
23760  23754   0%      0%      0%     S       144998400  nginx
```



Don't panic!
This is I/O scheduler core
100%, or very high = Normal

"Looking for work" process.
High % up to 100% = Normal

Monitor Data Plane Forwarding state

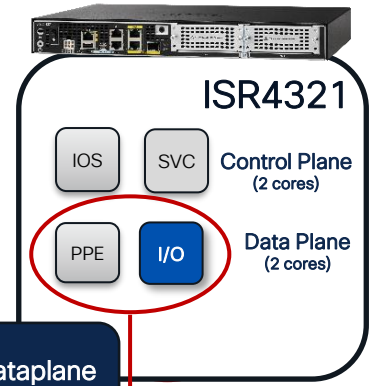
Show summary of Dataplane load in Packets & Percentage

Good for checking if a Boost license on your ISR4k will move the performance needle

…or if it's time for an upgrade to a C8k platform with a **much** more powerful dataplane.

Stefs_Dagger#**show platform hardware qfp** active datapath utilization

CPP 0: Subdev 0	5 secs	1 min	5 min	60 min
Input: Priority (pps)	0	0	0	0
(bps)	0	0	0	0
Non-Priority (pps)	4	2	2	2
(bps)	1792	896	896	896
Total (pps)	4	2	2	2
(bps)	1792	896	896	896
Output: Priority (pps)	0	0	0	0
(bps)	0	0	0	0
Non-Priority (pps)	4	2	2	2
(bps)	15392	7760	7760	7760
Total (pps)	4	2	2	2
(bps)	15392	7760	7760	7760
Processing: Load (pct)	1	1	1	1



Total load of your Dataplane in % (pct)

Taken from my idling lab router, hence the low DP-load

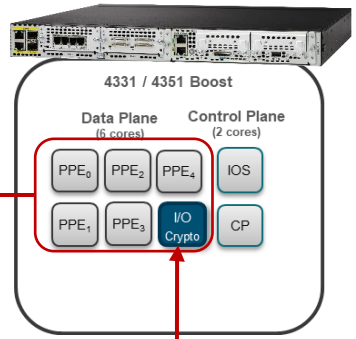
Look for bottlenecks in your installed routers

`show platform hardware qfp active datapath infra sw-cio`

- Packet Processing load: Look at PPE cores packet processing (% PP)
- Packet Scheduling load: Look at the I/O core's In-Out load (% RX & % TX)
- Crypto Load: Look at the I/O core's % Crypto load


```
stefs_Sword# show platform hardware qfp active datapath infra sw-cio

  Core Utilization
-----------------
       ID:      0      1      2      3      4      5
    % PP:   42.15  41.55  41.76  41.71  41.97   0.00
    % RX:    0.00   0.00   0.00   0.00   0.00  43.02
    % TM:    0.00   0.00   0.00   0.00   0.00  30.00
% CRYPTO:    0.00   0.00   0.00   0.00   0.00  26.98
  % IDLE:   57.85  58.45  58.24  58.29  58.03   0.00
```



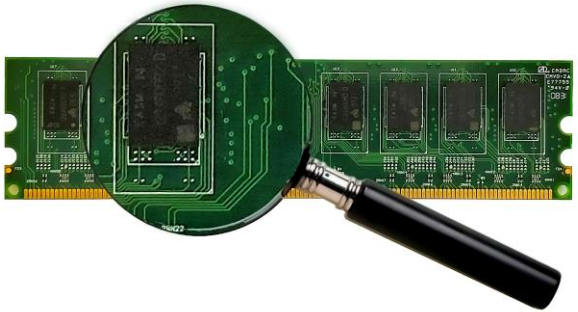
STOP **Uh-oh!**
Throughput just tanked
What happened?

Ah!...I/O core out of capacity
No more packets being handled
But...why??

Well...Whaddaya know...
Crypto maxed it out

Did You bring enough Memory to the Party?

Understand Memory usage

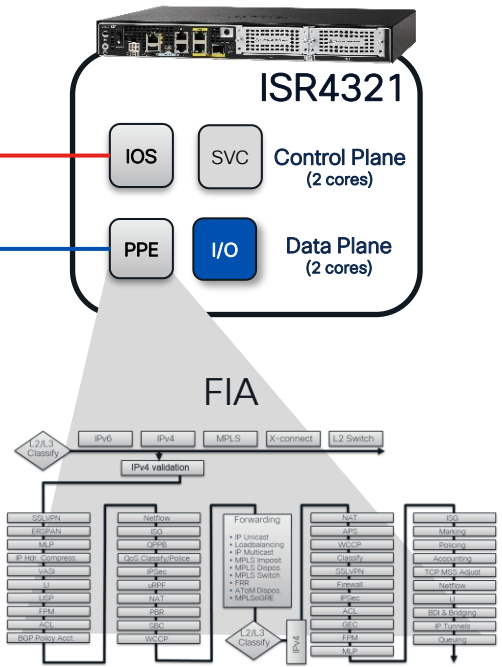


Control Plane & Data Plane memory

Control Plane Memory

#show memory

- Only shows memory used by IOS
- Holds IOS as well as Databases (RIBs, VLAN etc.)
- CP memory holds both IOS daemon & Linux kernel
  - Linux mem. allocation grows with IOS mem. allocation
- Control Plane memory is what you want to keep an eye on



Data Plane Memory – Fixed partition memory

#show platform hardware qfp active infrastructure exmem [xx]

- Separate set of Cli cmds required to monitor data plane resources
- Used exclusively for data plane services & Packet Buffering
- Fixed size partitions – Will NOT change with a DRAM upgrade
- Holds Dataplane Microcode – Runs forwarding process (FIA)
  - FIA (Feature Invocation Array) … Adding services to packets
  - Grows when scalable features are configured (MPLS FIB, NAT Table, ZBFW etc.).

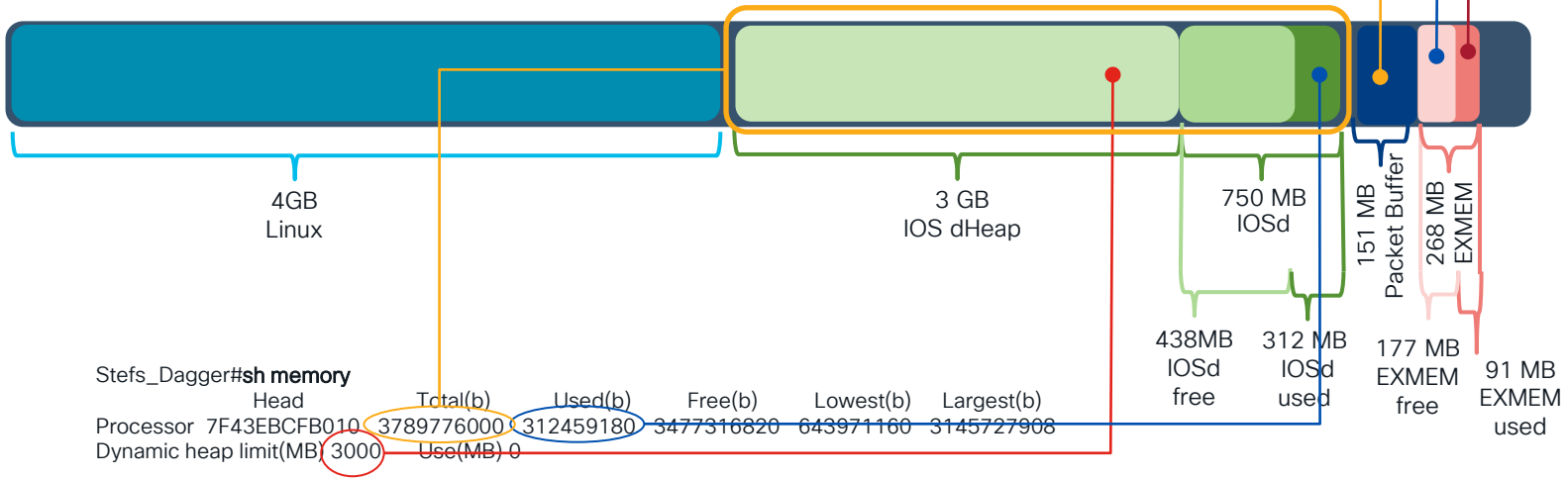
Monitoring Memory – ISR4321, 8GB DRAM

```
Stefs_Dagger#show memory platform information
   Architecture    : x86_64
 Memory (kB)
   Physical        : 8008036
   Total           : 8008036
   Used            : 2854172
   Free            : 5153864
   Active          : 1827884
   Inactive        : 1434452

 Buffers (kB)      : 151140
```

```
Stefs_Dagger#show platform hardware qfp active infrastructure exmem statistics
QFP exmem statistics

Type: Name: DRAM, QFP: 0
  Total: 268435456
  InUse: 90986496
  Free: 177448960
  Lowest free water mark: 177446912
```




```
Stefs_Dagger#sh memory
                Head                Total(b)     Used(b)     Free(b)      Lowest(b)    Largest(b)
Processor  7F43EBCFB010     3789776000   312459180   3477316820   643971160    3145727908
Dynamic heap limit(MB) 3000          Use(MB) 0
```

Monitor DRAM usage – Example from a 4300, 4GB Default

IPv4 BGP Routes	show platform resources		show memory			show platform software status control-processor brief	show platform hardware qfp active infrastructure exmem statistics	
	Reserved CP	Reserved DP	Total used	Total Free	Heap Used	committed	InUse	Free
0	3773MB(97%)	22MB(8%)	229MB	1498MB	0MB	2302MB (58%)	23MB	244MB
100000	3830MB(99%)	49MB(18%)	366MB	1362MB	0MB	2457MB (62%)	50MB	218MB
200000	3830MB(99%)	59MB(22%)	507MB	1220MB	0MB	2609MB (66%)	60MB	207MB
300000	3830MB(99%)	67MB(25%)	641MB	1087MB	0MB	2762MB (70%)	69MB	199MB
400000	3829MB(99%)	77MB(29%)	782MB	946MB	112MB	3030MB (77%)	79MB	188MB
500000	3828MB(99%)	86MB(33%)	919MB	808MB	240MB	3313MB (84%)	88MB	179MB
600000	3828MB(99%)	96MB(36%)	1056MB	671MB	368MB	**3648MB (91%)**	98MB	170MB

1 x Internet RIB (600k+ prefixes) = 91% Committed Memory = Upgrade to at least 8GB ...NOW!

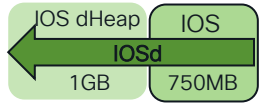
Committed Memory: IOS + Heap + Linux Memory earmarked for processes

Closely monitor this when using large databases like Internet RIBs

EXMEM / QFP (data plane) memory

- Marginally impacted by Control plane tasks
- EXMEM will increase with complex configurations (no actual traffic needed)

Upgrading DRAM
How much can I use for my IOS?



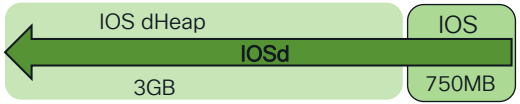
4GB DRAM Default
1.75 GB for IOS use

Remember....

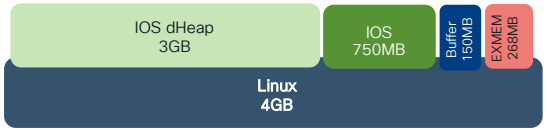
- Linux memory grows at about the same rate as IOSd memory
- Linux will hence need the same amount of memory as IOSd

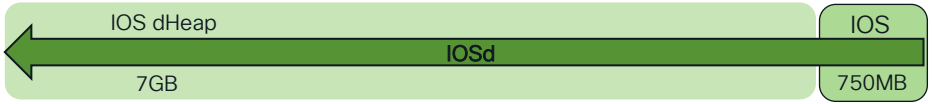
Why?

- Linux assigns processes to accommodate all IOS operations

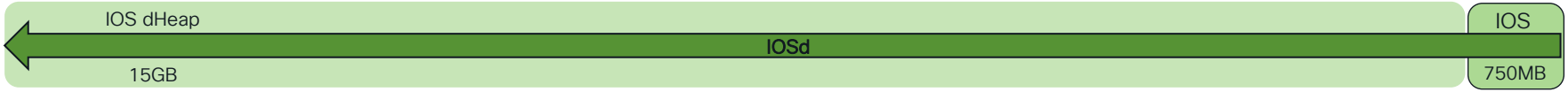


8GB DRAM Upgrade
3.75 GB for IOS use





16GB DRAM Upgrade
7.75 GB for IOS use



32GB DRAM Upgrade
15.75 GB for IOS use

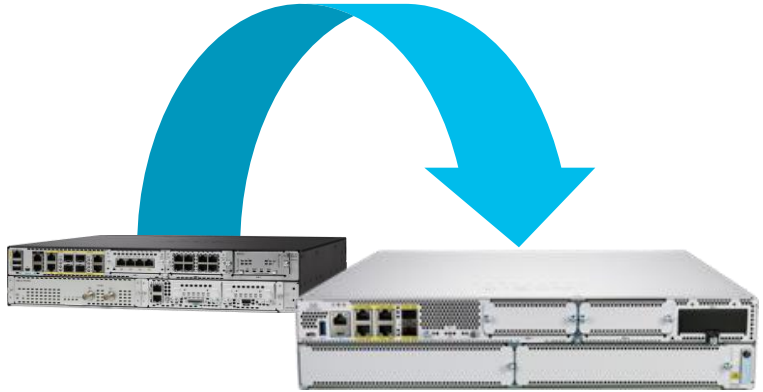
Memory Bottlenecks to be aware of

These are three main possible memory bottlenecks:

1. IOSd Memory
   - Even including dHeap there is a limit to how big IOSd can grow
2. Linux Memory
   - Linux memory grows at about the same rate as IOSd memory
   - You can protect Linux by restricting IOS memory

     C1101(config)#platform memory set 1000 (750MB + 250MB) = IOS + a limited HEAP of 250MB
3. EXMEM (Data Plane memory)
   - Fixed in size
   - Could in extreme cases pose a limitation as it can't be increased
     - 4400 series have up to 5x the EXMEM size than C1100

ISRG2 & ISR4000 to Cat8300/8200 Migration



ISR4k
Time to say goodbye and start migrating

- End of Sale announcement: Nov 7th , 2022
- EoS date: Nov 7th , 2023
  - HW support until Nov 30th , 2028

- Platforms affected: ISR4221, 4321, 4331, 4351, 4431 & 4451, with peripherals
- Not included in this EoS: ISR4461, ISR4k-only modules & ISR4k spares

- Last supported IOS releases for affected ISR4k platforms: IOS 17.9.x & 17.12.x *
  - 17.9 + 17.12 – EoSW Maintenance Support Aug 31st , 2025
  - 17.9 + 17.12 – EoSecurity Vulnerability Support Aug 31st , 2028
  - 17.10 & 17.11 – Not supported

* IOS Release trains 17.10 & 17.11 will not be supported

Recommended replacements: C8300 & C8200

https://www.cisco.com/c/en/us/products/collateral/routers/4000-series-integrated-services-routers-isr/select-isr4k-series-platform-eol.html

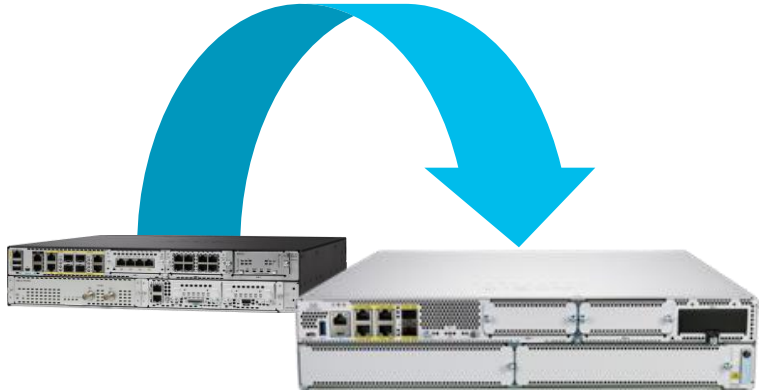
Migrating to Catalyst 8000 platforms

- ✓ ASR1001-X / ASR1002-X End-of-Sale (EoS) in August 2022
- ✓ ISR4K End-of-Sale (EoS) in November 2023
- ✓ ISRG2 End-of-Support (LDoS) already passed in Dec 2022

- ✓ Catalyst 8000 platforms offer:
  - IOS XE Feature parity with previous-gen ASR1K/ISR4K in both Routing and SD-WAN
  - Cloud scale SD-WAN with security, App. Optimization, Multi-cloud & 5G
  - Superior price-to-performance value
  - Investment protection with ~70% of ISR4k modules supported on C8300/C8200
  - Simplified licensing with **perpetual Network Stack license** for Routing
  - Sustainability Top of mind

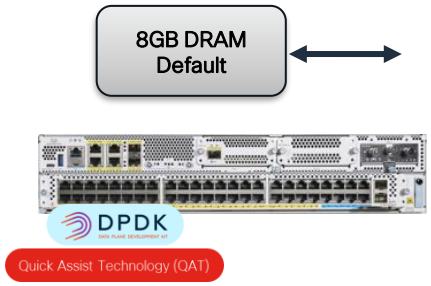
ISR4000 to Cat8300/8200 Migration

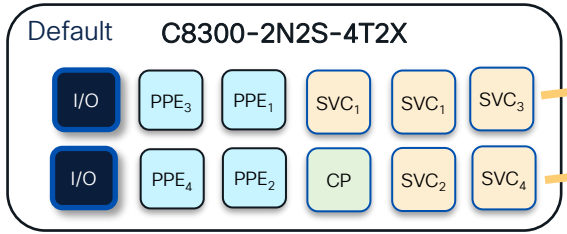
A whole new take on performance

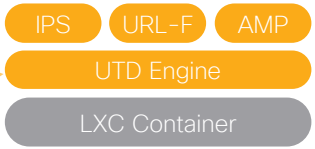


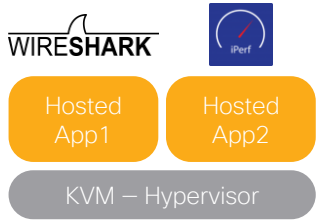
Catalyst C8300, C8200 & C8200L

Single silicon x86 architecture with Dynamic Core Allocation



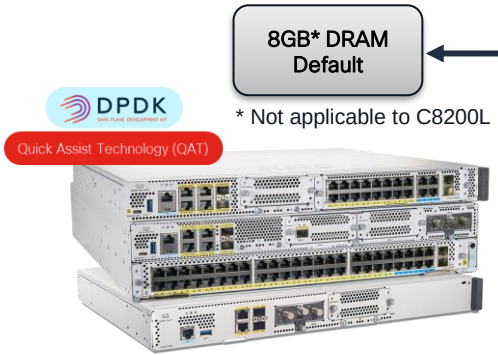




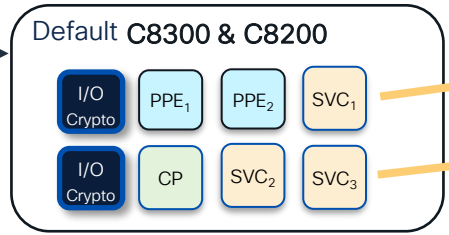


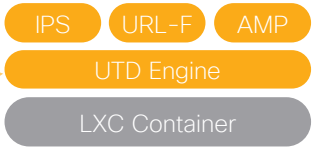
C8300-2N2S-4T2X: 12-core x86 - Dual Scheduler & crypto cores

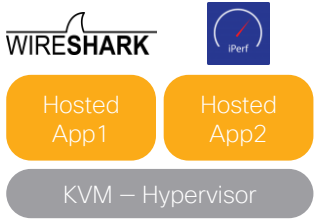
- Up to 12 Gbps CEF, 7.5Gbps SDWAN/IPSsec - 5x cores for Embedded Services



* Not applicable to C8200L







C8300, C8200: 8-core x86 - Dual Scheduler & crypto cores

- Up to 12 Gbps CEF, 5Gbps SDWAN/IPSsec - 3x cores for Embedded Services

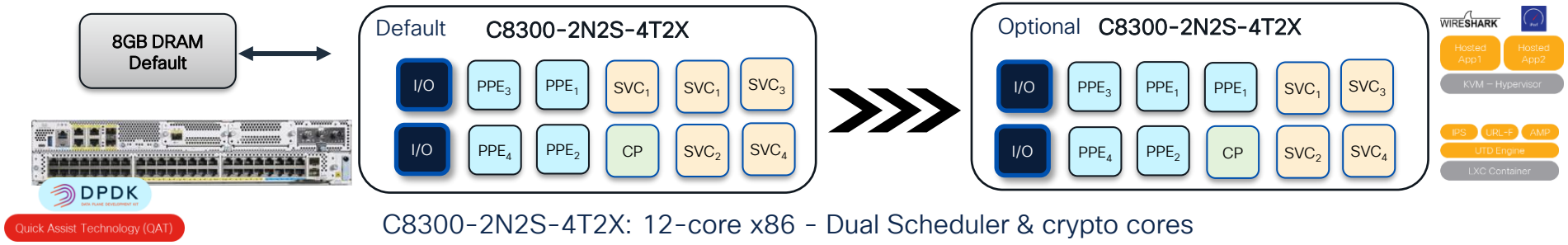
C8200L: 4-core x86 - Single Scheduler & Crypto core

- Up to 3.8 Gbps CEF, 500Mbps SDWAN/IPSsec - 1x core for Thousand Eyes

Catalyst C8300, C8200 & C8200L

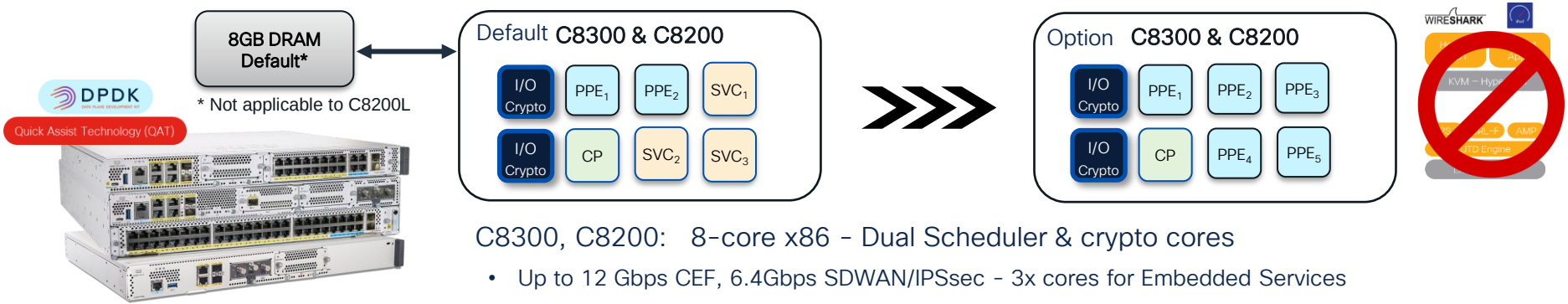
Single silicon x86 architecture with Dynamic Core Allocation

```
(config)#platform resource ?
 data-plane-heavy     Use Data Plane Heavy template
 service-plane-heavy  Use Service Plane Heavy template
```



C8300-2N2S-4T2X: 12-core x86 - Dual Scheduler & crypto cores

- Up to 12 Gbps CEF, 7.5 Gbps SDWAN/IPSsec - 5x cores for Embedded Services



C8300, C8200: 8-core x86 - Dual Scheduler & crypto cores

- Up to 12 Gbps CEF, 6.4Gbps SDWAN/IPSsec - 3x cores for Embedded Services

C8200L: 4-core x86 – Single Scheduler & Crypto core

- Up to 3.8 Gbps CEF, 500Mbps SDWAN/IPSsec - 1x core for Thousand Eyes

Migration map – Performance
ISR 4000 to Catalyst 8000 (2RU)

ISR 4451
Up to 3.8 Gbps CEF, 1.6 Gbps IPsec
1 Gbps Default CEF

C8300-2N2S-4T2X
(12 Gbps CEF, 7.5 Gbps IPsec)

Recommended replacement

12x 4451 Default CEF

ISR 4351
Up to 3.4 Gbps CEF, 900 Mbps IPsec
200 Mbps Default CEF

C8300-2N2S-6T
(10 Gbps CEF, 2 Gbps IPsec)

Recommended replacement

50x 4351 Default CEF

Migration map – Performance
ISR 4000 to Catalyst 8000 (2RU)

ISR 4431
Up to 3.4 Gbps CEF, 900 Mbps IPsec
500 Mbps Default CEF

ISR 4331
Up to 1.8 Gbps CEF, 500 Mbps IPsec
100 Mbps Default CEF

ISR 4321
Up to 1.6 Gbps CEF, 325 Mbps IPsec
50 Mbps Default CEF

ISR 4221/X
Up to 1.2 Gbps CEF, 247 Mbps IPsec
35 Mbps Default CEF

C8300-1N1S-4T2X
(12 Gbps CEF, 6.4 Gbps IPsec)

24x 4431 Default CEF

C8300-1N1S-6T
(10 Gbps CEF, 2 Gbps IPsec)

100x 4331 Default CEF

C8200-1N-4T
(3.8 Gbps CEF, 1 Gbps IPsec)

38x 4331 Default CEF

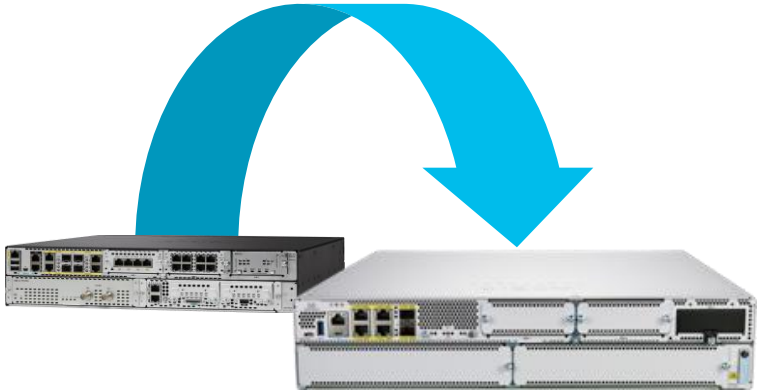
C8200L-1N-4T
(3.8 Gbps CEF, 500 Mbps IPsec)

108x 4221 Default CEF

Recommended replacement
Recommended for comparable modularity

ISR4000 to Cat8300/8200 Migration

Am I paying more for Catalyst 8000?



Migration Map – Price/Performance

Use-case: Routing, for today's WAN speeds – Using 4k PERF license

ISR 4451
2 Gbps CEF
*IPBase, RPS, **PERF***

6x Perf @ $ -30%

C8300-2N2S-4T2X
12 Gbps CEF, RPS
DNA T0 license

ISR 4351
400Mbps CEF
*IPBase, **PERF***

25x Perf @ $ +17%

C8300-2N2S-6T
10 Gbps CEF, RPS
DNA T0 license

ISR 4431
1Gbps CEF
*IPBase, RPS, **PERF***

12x Perf @ $ -16%

C8300-1N1S-4T2X
12 Gbps CEF, RPS
DNA T0 license

10x Perf @ $ -32%

C8300-1N1S-6T
10 Gbps CEF, RPS
DNA T0 license

ISR 4331
300Mbps CEF
*IPBase, **PERF***

17x Perf @ $ -22%

C8200-1N-4T
3.8 Gbps CEF
DNA T0 license

ISR 4321
100Mbps CEF
*IPBase, **PERF***

38x Perf @ $ -11%

C8200L-1N-4T
3.8 Gbps CEF
DNA T0 license

Price calculations made by author on June 7th, 2023

ISR4k DRAM equivalent to C8k Default

Migration Map – Price/Performance

Use-case: Routing, for today's WAN speeds – Using 4k BOOST license

ISR 4451
3.8 Gbps CEF
IPBase, RPS, ***BOOST***

3x Perf @ $ -33%

C8300-2N2S-4T2X
12 Gbps CEF, RPS
DNA T0 license

ISR 4351
1.8Gbps CEF
IPBase, ***BOOST***

5.5x Perf @ $ 0%

C8300-2N2S-6T
10 Gbps CEF, RPS
DNA T0 license

ISR 4431
3.4Gbps CEF
IPBase, RPS, ***BOOST***

3.5x Perf @ $ -25%

C8300-1N1S-4T2X
12 Gbps CEF, RPS
DNA T0 license

3x Perf @ $ -40%

C8300-1N1S-6T
10 Gbps CEF, RPS
DNA T0 license

ISR 4331
1.8 Gbps CEF
IPBase, ***BOOST***

2x Perf @ $ -40%

C8200-1N-4T
3.8 Gbps CEF
DNA T0 license

ISR 4321
1.6 Gbps CEF
IPBase, ***BOOST***

2.4x Perf @ $ -29%

C8200L-1N-4T
3.8 Gbps CEF
DNA T0 license

ISR4k DRAM equivalent to C8k Default

Price calculations made by author on June 7th, 2023

Migration Map – Price/Performance

Use-case: SD-WAN (Assuming 8GB DRAM on all platforms)

ISR4k vs. C8k @ Same DNA Licenses

10% Lower cost

Catalyst 8300
HW + DNA-E/T2
7.5 Gbps SD-WAN

6x Faster

11% Lower cost

Catalyst 8200
HW + DNA-E/T1
1 Gbps SD-WAN

2x Faster

4% Lower cost

Catalyst 8200L
HW + DNA-E/T1
500 Mbps SD-WAN

2x Faster

ISR4451-DNA/4431-DNA
HW + DNA-E/T2
1.2 Gbps SD-WAN

ISR4331-DNA
HW + DNA-E/T1
450 Mbps SD-WAN

ISR4321-DNA
HW + DNA-E/T1
280 Mbps SD-WAN

Modular Access

Price calculations made by author on June 7th, 2023

Migration Map – Price/Performance

Use-case: Non-Fabric (traditional) Routing

Medium Branch

I need:

Traditional routing

- Up to 1G IPSec
- Up to 1G non-encrypted
- One Full Internet RIB

Catalyst 8300-2N2S-6T
HW + DNA-E/T2
10 Gbps CEF
2 Gbps IPSec

5x Faster

35% Lower cost

ISR4451
HW + 8GB + SEC + Perf lic
2 Gbps CEF
1.2 Gbps IPSec

Catalyst 8200L
HW + DNA-E/T0
3.8 Gbps CEF

2x Faster

30% Lower cost

ISR4321
HW + IPBase + Boost lic.
1.8 Gbps CEF

Small Branch

I need a very basic router

Traditional routing

- No encryption
- Just basic routing
- Got a 1Gbps WAN
  - I want to use it all

ISR4k & Cat8k: Perpetual licensing in Autonomous Mode = No license renewals needed

Price calculations made by author on June 7th, 2023

ISR 4300 to Catalyst 8000 Voice Bundles

Transitioning high Voice modularity use cases

NEW

ISR4351-AXV

Up to 3.4 Gbps CEF, 900 Mbps IPsec
200 Mbps Default CEF

Includes Free PVDM 64

50x Perf @ $ -17%

12% Off Hardware!

C8300-2N2S-6T-V

(10 Gbps CEF, 2 Gbps IPsec)

Includes free NIM-PVDM 64

Mandatory subscription : >T0, Adv and premier

ISR4331-AXV

Up to 1.8 Gbps CEF, 500 Mbps IPsec
100 Mbps Default CEF

Includes Free PVDM 32

100x Perf @ $ +10%

44% Off Hardware!

C8300-1N1S-6T-V

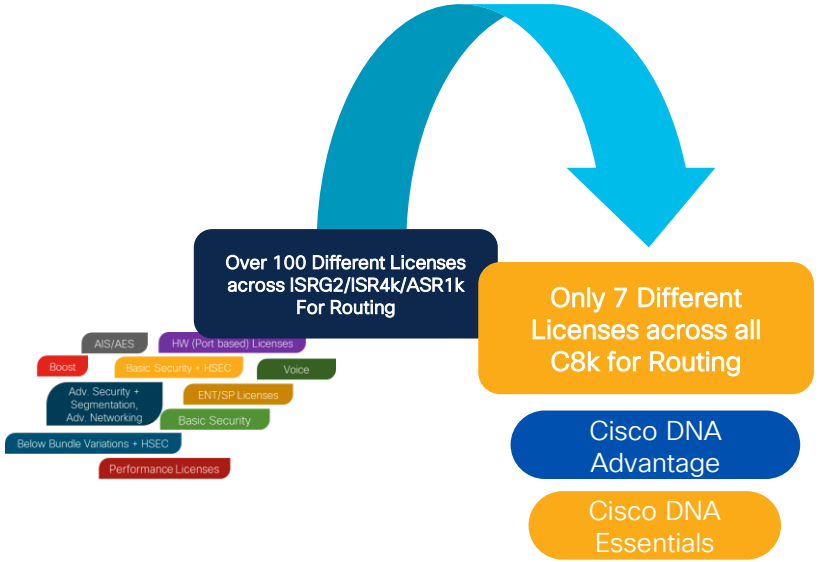
(10 Gbps CEF, 2 Gbps IPsec)

Includes free NIM-PVDM 32

Mandatory subscription : >T0, Adv and premier

DNA Licensing

What it is and how you use it



Common DNA Licensing on Cat8000

Hardware

Catalyst 8300,8200/L

DNA Subscription / Feature pack

- Cisco DNA Advantage
- Cisco DNA Essentials

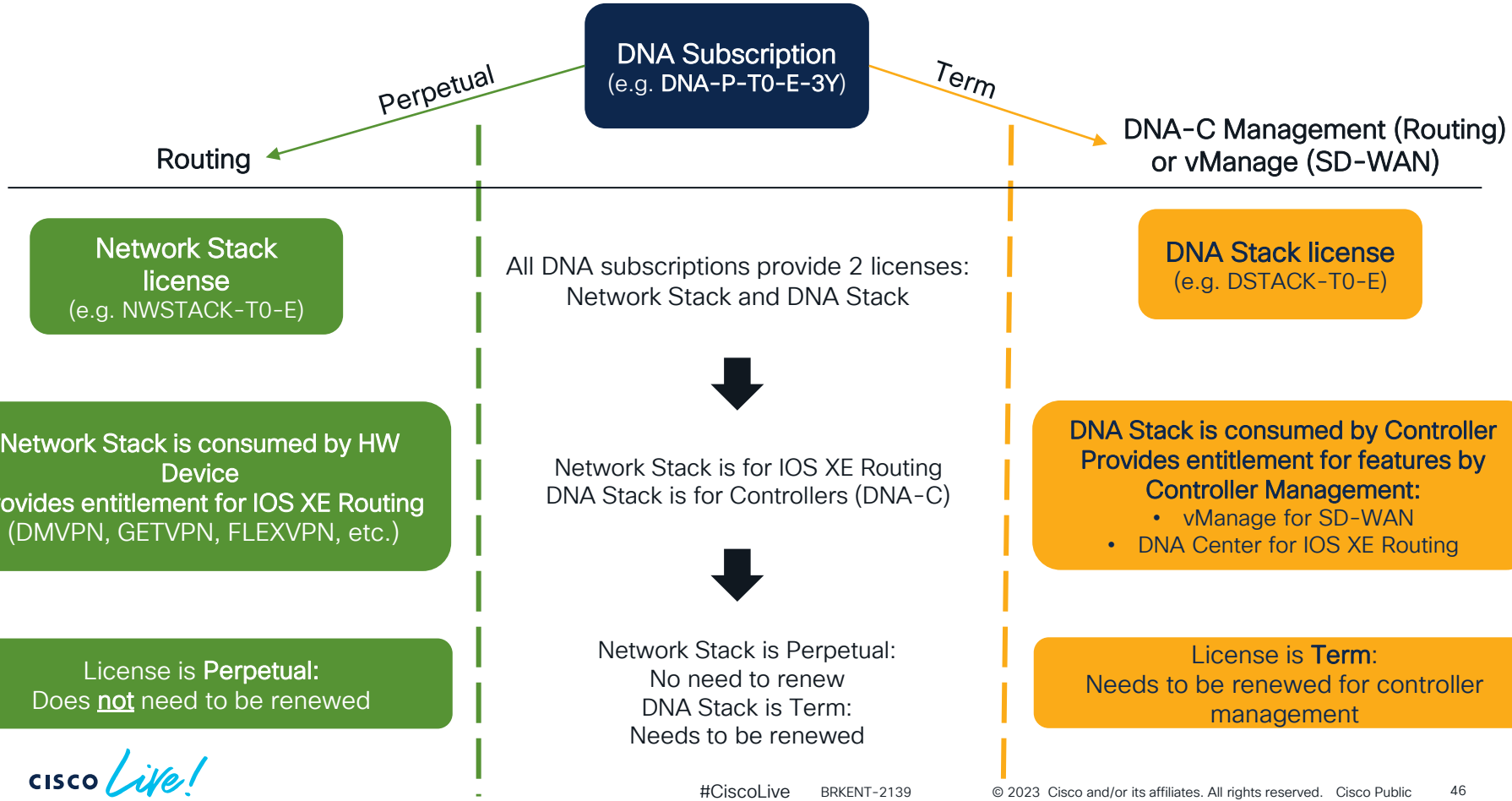
DNA Essentials

- Network Stack (Perpetual)
- DNA Stack Term (3/5Y)

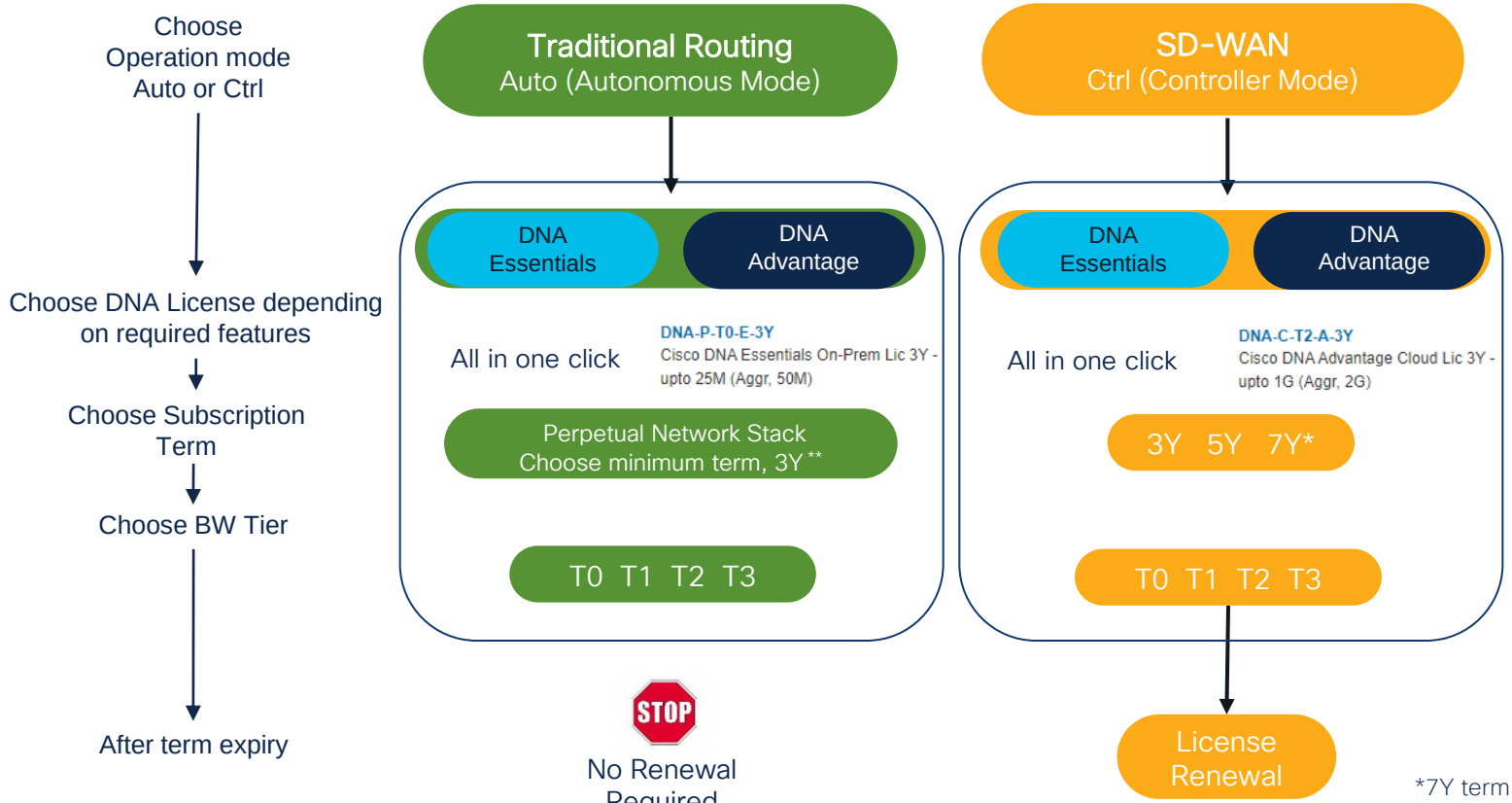
DNA Advantage

- Network Stack (Perpetual)
- DNA Stack Term (3/5/7Y)

What is a DNA License Stack?

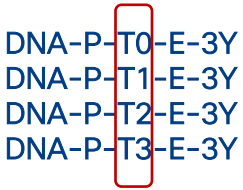


DNA License – Decision Model



*7Y term in Advantage only
**Not applicable for C8000V

What goes into the BW tiers



SDWAN

Choose BW tier based on <u>all</u> WAN Traffic (All traffic using SD-WAN's VPN-0)
- IPsec between SDWAN sites
- IPsec to zScaler, SIG, or any other non-SDWAN IPsec
- GRE Traffic (no Crypto)
- Direct Internet Traffic (no Crypto)

– Any traffic in the Transport VRF going to, or coming from the WAN

Non-SDWAN
Using IPsec

Choose the BW tier based on <u>only</u> the IPsec traffic
- Only IPsec traffic (MACsec and encrypted App-traffic not charged)
- Non-crypto traffic is not charged by license
- HSEC license ($1) required for >250Mbps in one or both directions

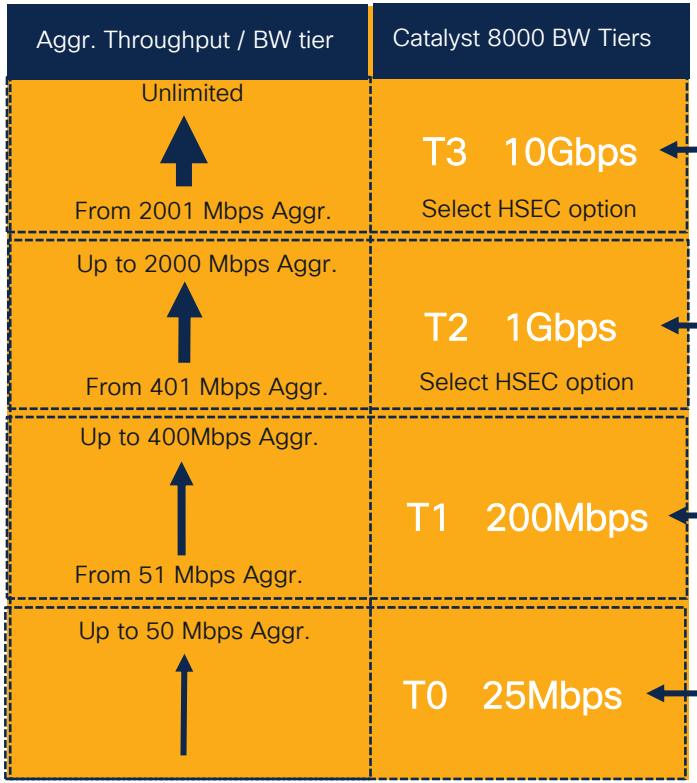
– For T2 & T3: Don't forget to select HSEC option with the HW

Non-SDWAN
Not using IPsec

Choose the lowest applicable BW tier (C8300/C8200-T0, C8500L-T2, C8500-T3)
- Non-IPsec traffic is not charged by license
- Run to max technical capacity

Choosing BW tier

1. Estimate your aggregate IPsec or SD-WAN VPN0 traffic
2. Divide by 2 and choose the DNA BW Tier which will accommodate your result



BW tier compliant Branch examples

C8300-2N2S-4T2X in SD-WAN Mode
Running an estimated aggr. of 7 Gbps, Transport side

C8300-2N2S-6T – SD-WAN
Running an estimated aggr. of 2 Gbps, Transport side

C8300-2N2S-6T in Routing Mode
I'm running aggr. 350 Mbps IPsec + 9 Gbps unencrypted traffic

C8200L-1N-4T in Routing Mode
I'm running 3.8Gbps of unencrypted traffic

⚠ Using a higher BW tier on platform than what's in Smart Account = Unit out of compliance report from Smart Licensing server

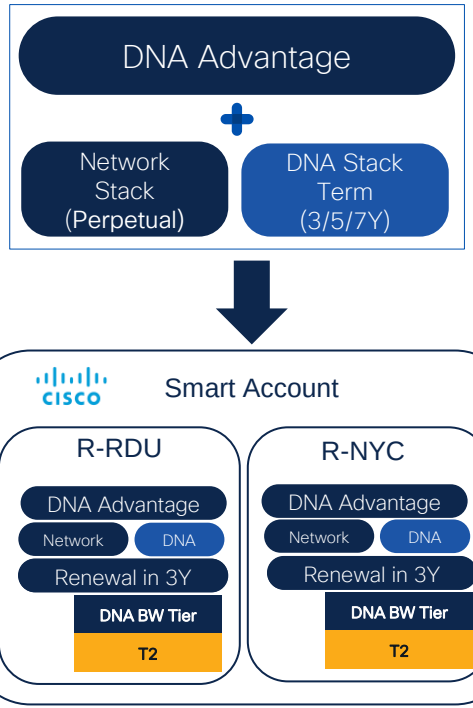
How it works in practice
– Routing (Autonomous Mode)

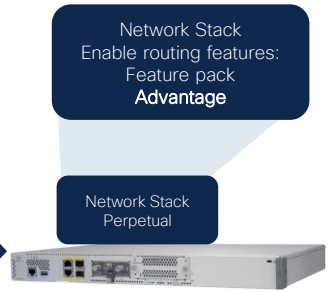
Router R-RDU

We choose:
Good ol' Routing
Advantage features
2Gbps of IPSec aggr.
BW Tier T2

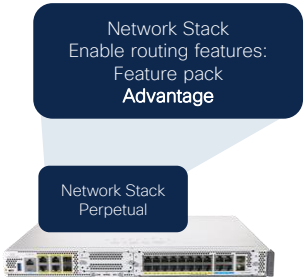
Router R-NYC

We choose:
Good ol' Routing
Advantage features
1Gbps of IPSec aggr.
BW Tier T2





Router R-NYC



Router R-RDU

Term expiry

- DNA Stack expires: Warning message is sent...however...
- ...Network Stack is perpetual. Routing operation continues with chosen subscription and BW Tier

How it works in practice
– Moving to SDWAN after 1 year

Router R-RDU

We're transitioning to SD-WAN
Advantage features
Max 2G Aggr VPN 0 traffic

Router R-NYC

We're transitioning to SD-WAN
Advantage features
Max 2G Aggr VPN 0 traffic

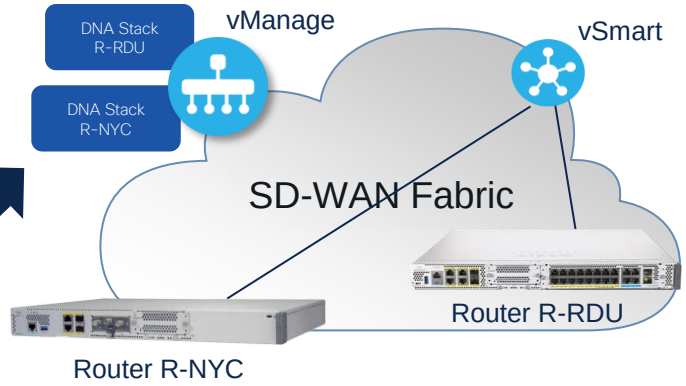
DNA Advantage

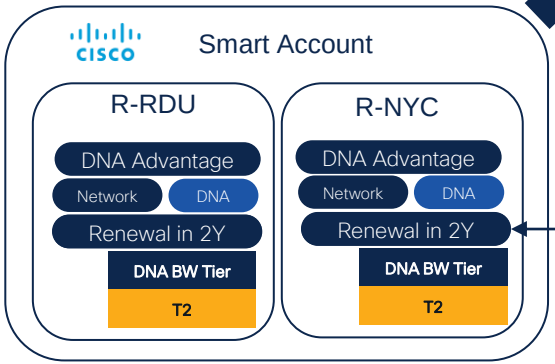
\+

Network Stack (Perpetual)

DNA Stack Term (3/5/7Y)

Network Stacks removed & changed to DNA Stacks on vManage





Term expiry

- DNA Stack expires: License loses entitlement to use vManage Controller
- Customer expected to renew or remove router from SD-WAN fabric

Key Takeaways

No two businesses are alike

Know what your own traffic patterns <u>really</u> looks like

Set your own throughput requirements
….not what marketing collateral is telling you

<u>Never</u> take performance data at face value

Enough said!

Know the workload of your platforms

Make sure your investment is "On the Money"

ISR4k vs. Cat8k Migration

Same IOS – No learning curve, just a ton more throughput and scale

C8k myths & misperceptions:

- C8k's are regular routers and NOT only for SDWAN
- C8k's are generally NOT more expensive than ISR4k
- DNA licensing adds flexibility and is easier than it looks
- DNA licensing will NOT get you stuck in subscription

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The bridge to possible

Thank you

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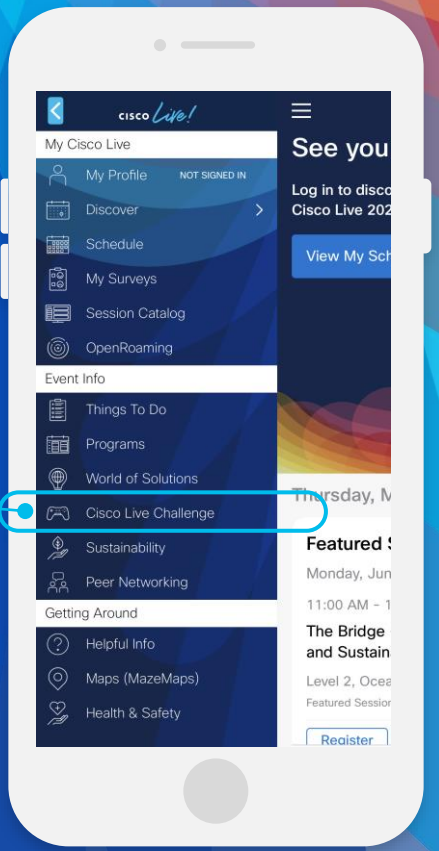


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