



You make **possible**



Cisco 1100 Series Integrated Services Router

Product Overview and architecture

Stefan Mansson
Sr. TME, Enterprise Routing, Cisco Systems

BRKARC-2005

CISCO *Live!*

Barcelona | January 27-31, 2020



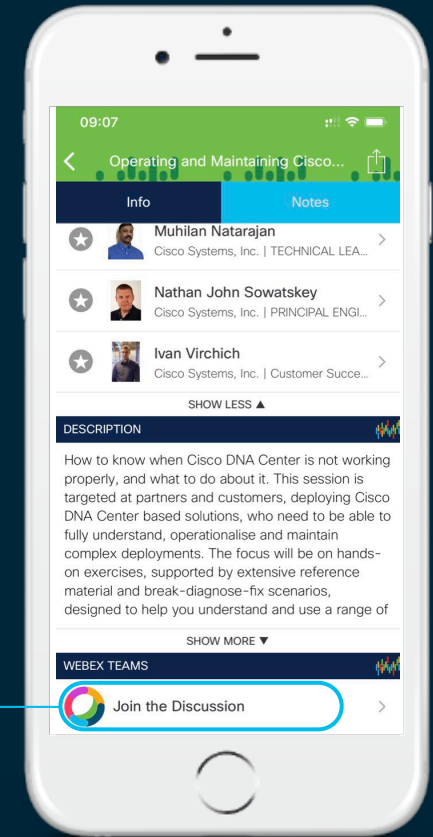
Cisco Webex Teams

Questions?

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

How

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



Stefan Mansson

Sr. Technical Marketing Engineer - SDWAN & Branch Routing

Bay Networks, Inc.

Fibronics International, Inc.
FIBRONIC COMMUNICATIONS



1985

2020



35 years in Network Business

30 years with Cisco Branch Routers and Routing Solutions



10 years as Cisco consultant @ Swedish Gold Partner



20 years @ Cisco, based in 5 countries



CCIE # 3516 22 years since -98

CCSI # 20145 Cisco Instructor 23 years since -97



cisco *Live!*

Agenda

- Introduction
- ISR 1100 Portfolio Overview
- ISR 1100 Platform Architecture
- ISR 1100 SDWAN
 - ISR 1100 – SDWAN Use Cases
 - New ISR 1100 with Viptela OS
 - SDWAN Security – ISR 1100 Capabilities
- Basic Troubleshooting & Monitoring
- Key Takeaways
- Q & A

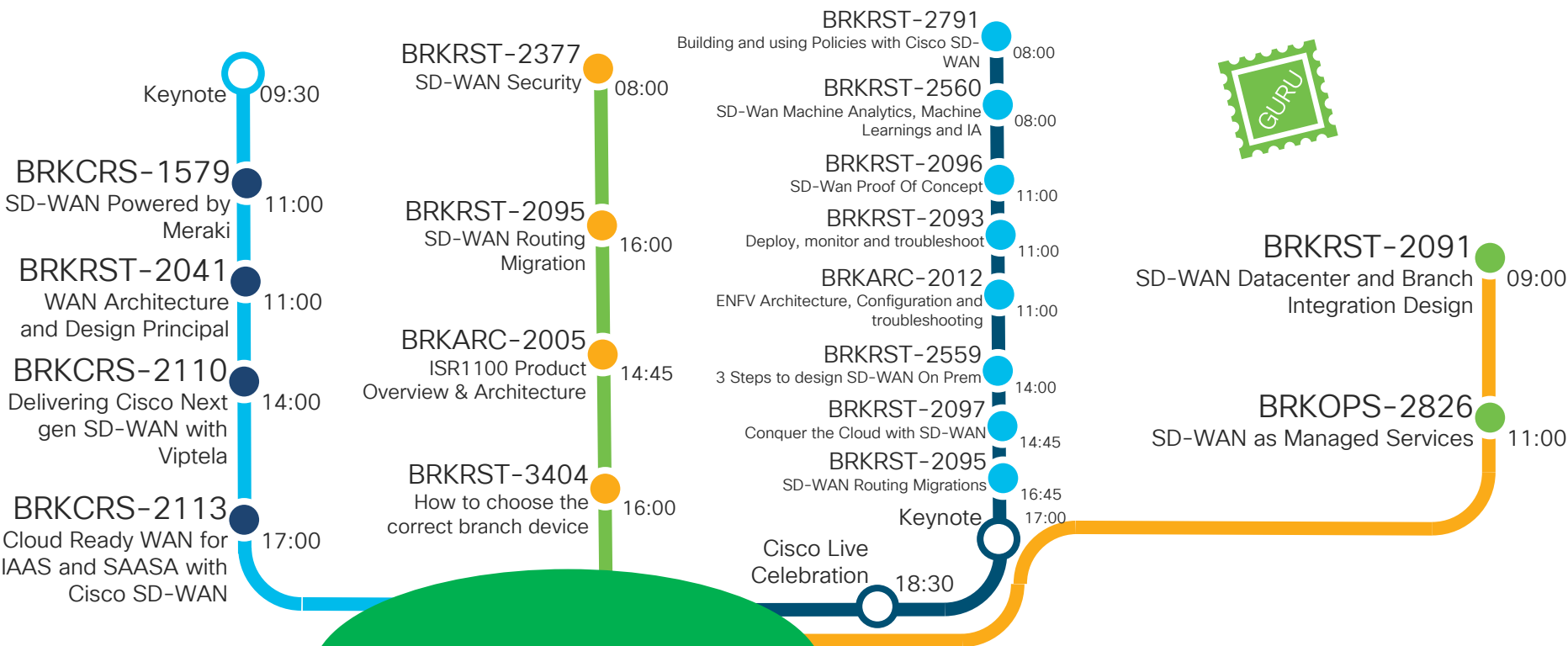
For your reference

– Might or might not be elaborated on

CISCO *Live!*

SD-WAN

Breakouts



Keynote 09:30

BRKCRS-1579
SD-WAN Powered by Meraki 11:00

BRKRST-2041
WAN Architecture and Design Principal 11:00

BRKCRS-2110
Delivering Cisco Next gen SD-WAN with Viptela 14:00

BRKCRS-2113
Cloud Ready WAN for IAAS and SAASA with Cisco SD-WAN 17:00

BRKRST-2377
SD-WAN Security 08:00

BRKRST-2095
SD-WAN Routing Migration 16:00

BRKARC-2005
ISR1100 Product Overview & Architecture 14:45

BRKRST-3404
How to choose the correct branch device 16:00

BRKRST-2791
Building and using Policies with Cisco SD-WAN 08:00

BRKRST-2560
SD-Wan Machine Analytics, Machine Learnings and IA 08:00

BRKRST-2096
SD-Wan Proof Of Concept 11:00

BRKRST-2093
Deploy, monitor and troubleshoot 11:00

BRKARC-2012
ENFV Architecture, Configuration and troubleshooting 11:00

BRKRST-2559
3 Steps to design SD-WAN On Prem 14:00

BRKRST-2097
Conquer the Cloud with SD-WAN 14:45

BRKRST-2095
SD-WAN Routing Migrations 16:45

Keynote 17:00
Cisco Live Celebration 18:30

BRKRST-2091
SD-WAN Datacenter and Branch Integration Design 09:00

BRKOPS-2826
SD-WAN as Managed Services 11:00

ISR 1100 Series

Overview



Traditional WAN, SDWAN,
Comprehensive Security,
Wired and Wireless Access...

...all in a single, high-performance
platform.

Cisco 1100 Series Integrated Services Routers

Your Network Rack in a Box



High Performance

Multi-core hardware architecture

Open and programmable operating system IOS® XE



Connectivity & Advanced Mobility

Gigabit Ethernet WAN, DSL (G.fast),
LTE Advanced Pro

Gigabit Ethernet LAN ,
802.11ac wave2 with
Mobility Express



WAN & Application Assurance

Centralized management and orchestration with Cisco DNA Center and vManage

Zero touch deployment and provisioning



Comprehensive Security

App aware FW, IPS, URL-F, AMP & TG, DNS/web-layer security on SD-WAN

Advanced threat defense with encryption at high-performance

ISR 890 vs ISR 1100

ISR 1100



LTE Advanced Pro PoE+ 10 Wireless Domains 802.11ac Wave 2 IPSec @ 480Mbps Quad Core 100 VLANs IOS XE Cisco SD-SWAN



LTE PoE 2 Wireless Domains 802.11n IPSec @ 100Mbps Dual Core 25 VLANs IOS Classic No SDWAN



ISR 890

CISCO *Live!*

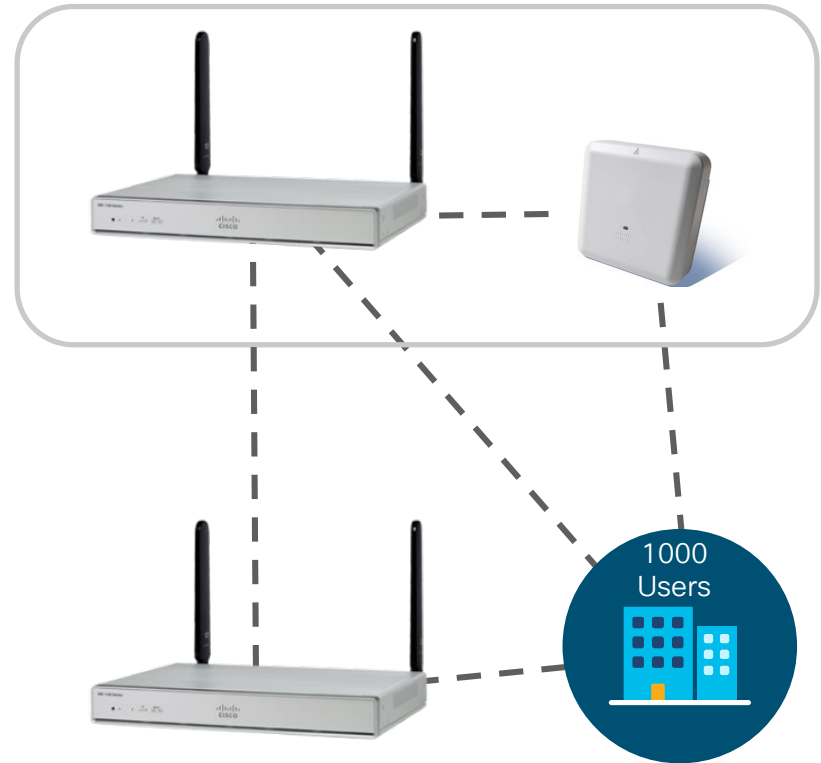
ISR 890 versus ISR 1100

ISR 1100 is an extension to the ISR fixed router portfolio

Branch Needs	Features	ISR 890	ISR 1100	Benefits
Connectivity & Scale w/High Performance	Throughput	100 Mbps	1Gbps	Up to 10 times performance increase
	Separate data and control planes	✘	✔	Minimal performance impact as network services are added and throughput increases
	Next-gen WAN	✘	✔	Faster connectivity with LTE Advanced
	Cisco IOS® XE	✘	✔	Open Programmable operating system
	Wireless	✘	✔	Faster wireless access with 802.11 ac Wave 2 Supports Catalyst 9100 802.11ax APs in ME
Security	VPN acceleration	✘	✔	Higher performance for encrypted traffic Dedicated Crypto off-load
Costs & Business Agility	Pay-as-you-grow	✘	✔	Ability to buy what you need today and upgrade anytime with no equipment upgrades
Cyber Threat Protection	<ul style="list-style-type: none"> • Boot Protections • Runtime Defenses • H/W & S/W Security 	✘	✔	Trustworthy Systems Assurance and peace of mind with hardware and operating system integrity

ISR1100 Use case

Mobility



Mobility Express – Enterprise Class WLAN for Your Branch



Virtual WLAN ME controller in embedded access point



Enables simple and fast initial setup
Less than 10 minutes.



Manages our full suite of Access Points
(Aironet 700, 1540, 1560, 1600, 1700, 1815, 1830, 1850, 2600, 2700,
2800, 3600, 3700, 3800, 4800 + Catalyst 9115, 9117, 9120 & 9130)



Controller supports 802.11ac Wave 2 & 802.11ax technology
Scales up to 50 APs & 1000 clients



Supports WLAN controller features and High Availability
with no price premium

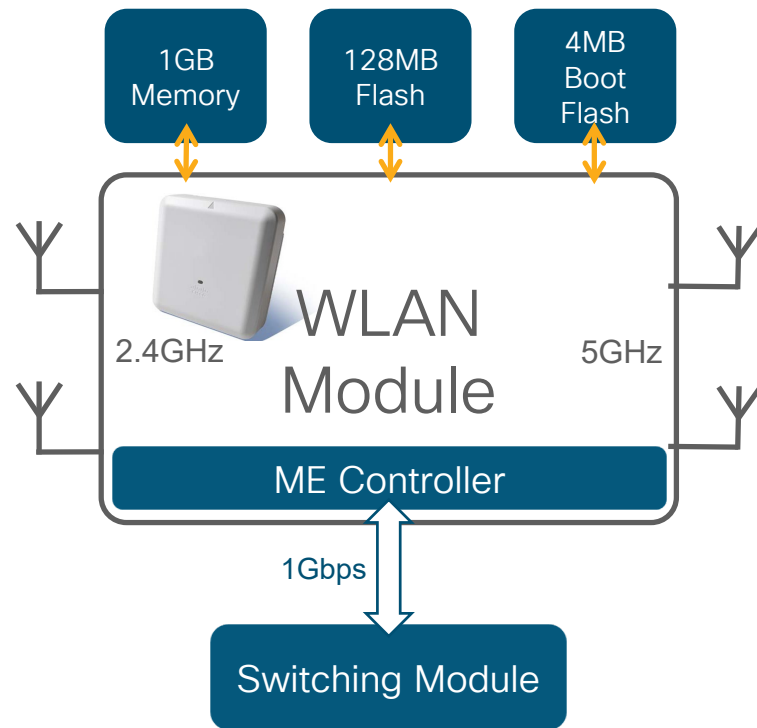
Mobility Express



Simple yet
sophisticated deployment
Enterprise Class HA

Wireless LAN Hardware Overview

- WLAN Module based on the Cisco Aironet 1815i
- 1GB DRAM, 128MB Flash, 4MB Boot Flash
- 802.11ac Wave 2 Dual Radio (2.4GHz & 5GHz)
- 2x2, 2 SS MU-MIMO
- Max throughput of 870Mbps PHY layer
- Internal antenna
- Console access via the router console
- 1Gbps uplink to the host CPU



Mobility Express Setup on PC

Step 1

- 1) Power up the router
- 2) From PC, connect to SSID “CiscoAirProvision”
- 3) Password is “password”



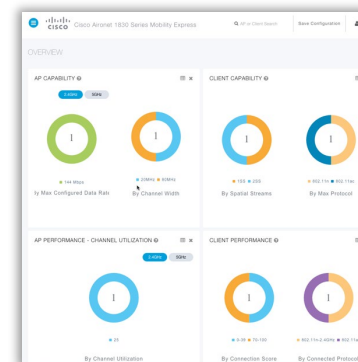
Step 2

- 1) Open a web browser, and access <http://mobilityexpress.cisco/screens/day0-config.html>
- 2) Go through the setup wizard
- 3) Confirm the setting, and Mobility Express Controller will reboot



Step 3

- 1) Connect another AP in the same L2 domain.
- 2) The new AP will join the Master AP as a subordinate AP.
- 3) Monitor and control wirelessly by connecting to the Master AP



Please follow the link for more details:

https://www.cisco.com/c/en/us/td/docs/wireless/controller/technotes/8-8/b_cisco_mobility_express_8_8.html

Concerned about
Threats to Your CPE?
(You should be)

ISR1100 will be your
Bastion

CISCO *Live!*



Trustworthy Systems in an Untrustworthy World

Attack 1 : IPsec decryption Malware (2011 - 2012, Only 2800 and 3800 routers)

Malware installing modified version of IOS file on the host system, Targeting the DH key exchange in IPsec.
Attacker able to easily decrypt IPsec tunnel data.

Solution : Signed Binary and Trust anchor

Attack 2: Accessing unencrypted credentials on NVRAM (ISR G1 and G2)

1-Attacker steals operational device. 2-Analysing NVRAM content in lab (NVRAM content used to be stored in clear text)
3-Gaining access to usernames, passwords and crypto credentials 4-Putting rogue router back into network.
5-Full visibility to EVERYTHING

Solution : Strong Encrypted Secure Storage

Attack 3: SYNful Knock Malware

Changed the image sitting in flash and installed it on the router. Then used TCP for command and control communication hence named SYN(from TCP)ful attack. Reboot or image upgrade had no effect.

Solution : Only allowing signed image from trusted source.

Secure storage

Secure passwords

Secure and signed images

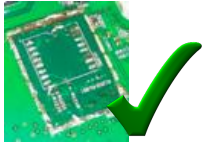
Authentic hardware and Run-time defense

ISR Built-in Cyber Threat Defense



Boot integrity visibility – Protects against...

- Attacker compromises the code that is supposed to protect against compromised code



Secure NVRAM Storage – Protects against...

- Attacker steals device – Uses forensic techniques to read secrets & credentials from non-volatile RAM



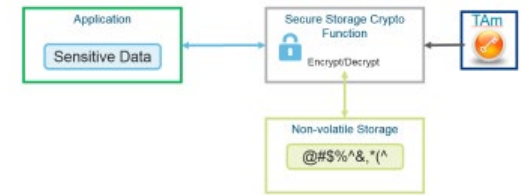
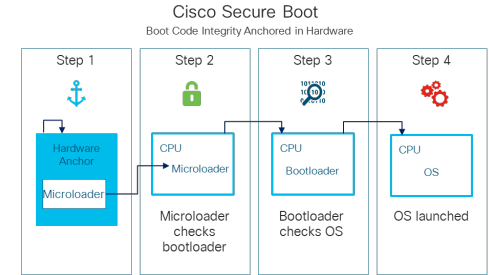
Simplified Factory Reset

- Resets all writable file systems, licenses, ROMMON variables, User credentials etc..



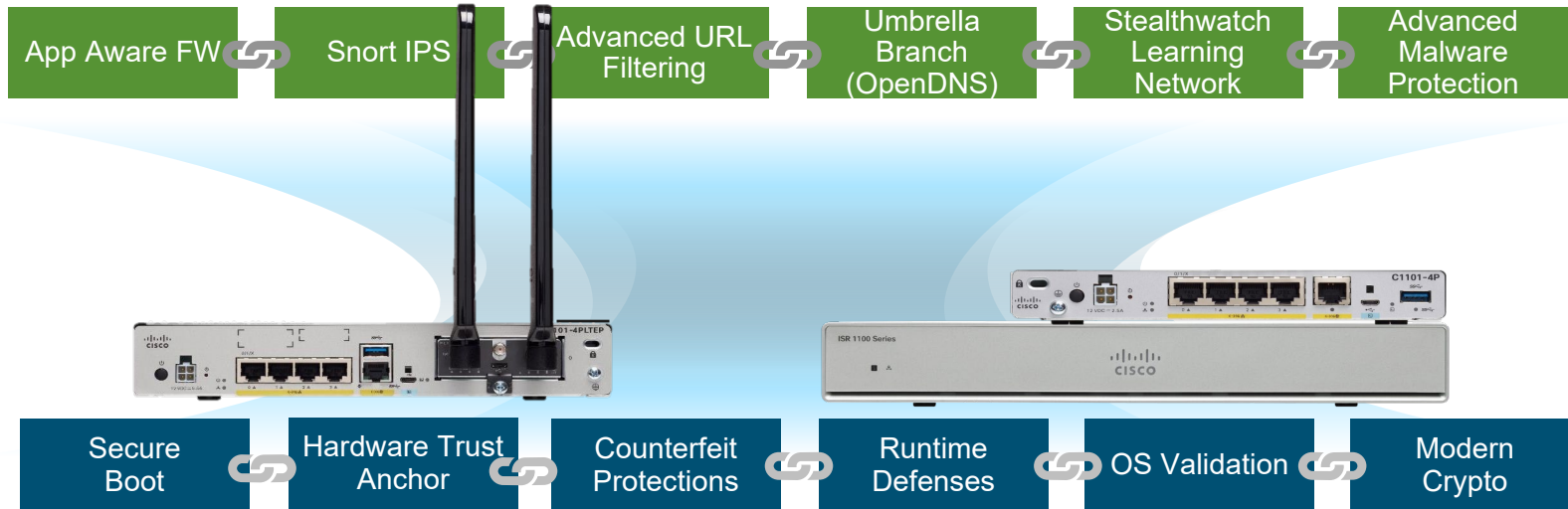
Secure Guest Shell

- Prevents Open Container hosted applications and their users from manipulating underlying Linux system on ISR4k & 1100



ISR1100 Superior Security in One Box

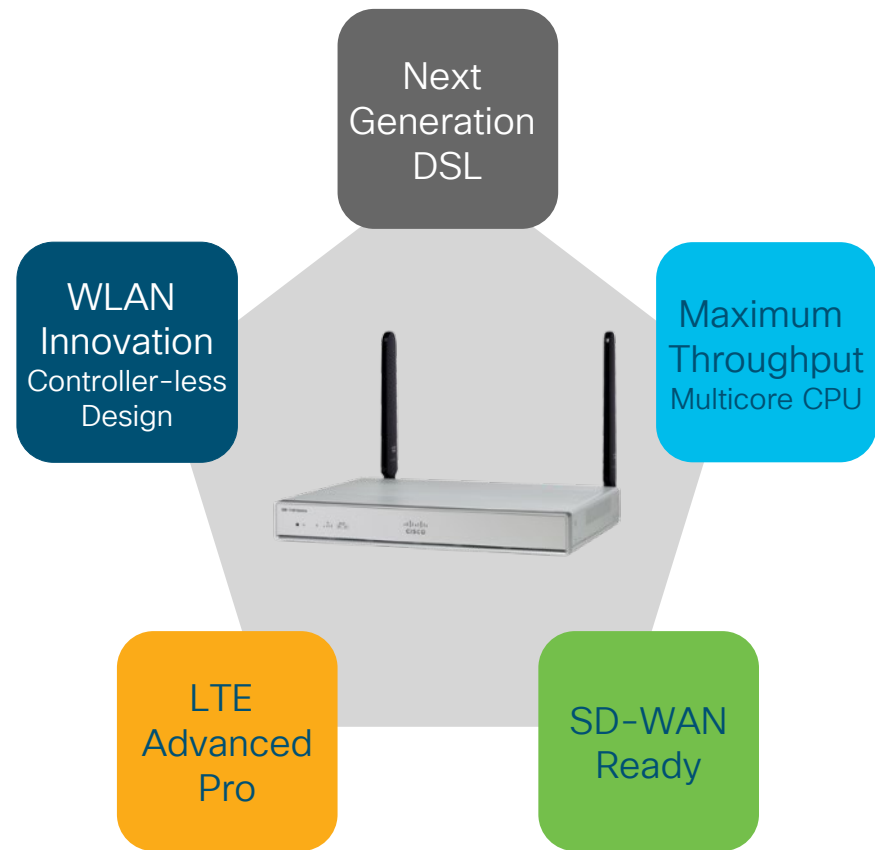
Tools for Protecting Your Branch Assets



ISR1100 – Protecting what’s Protecting Your Branch Assets

All XE based ISR’s & ASR’s ship with built in Cyber Resiliency

ISR1100 Architecture & HW Overview



ISR 1100 Hardware Overview

Two major HW Variations

- C1100-4: 2 WAN + 4 LAN Ports
- C1100-8: 2 WAN + 8 LAN Ports

Quad Core CPU Architecture

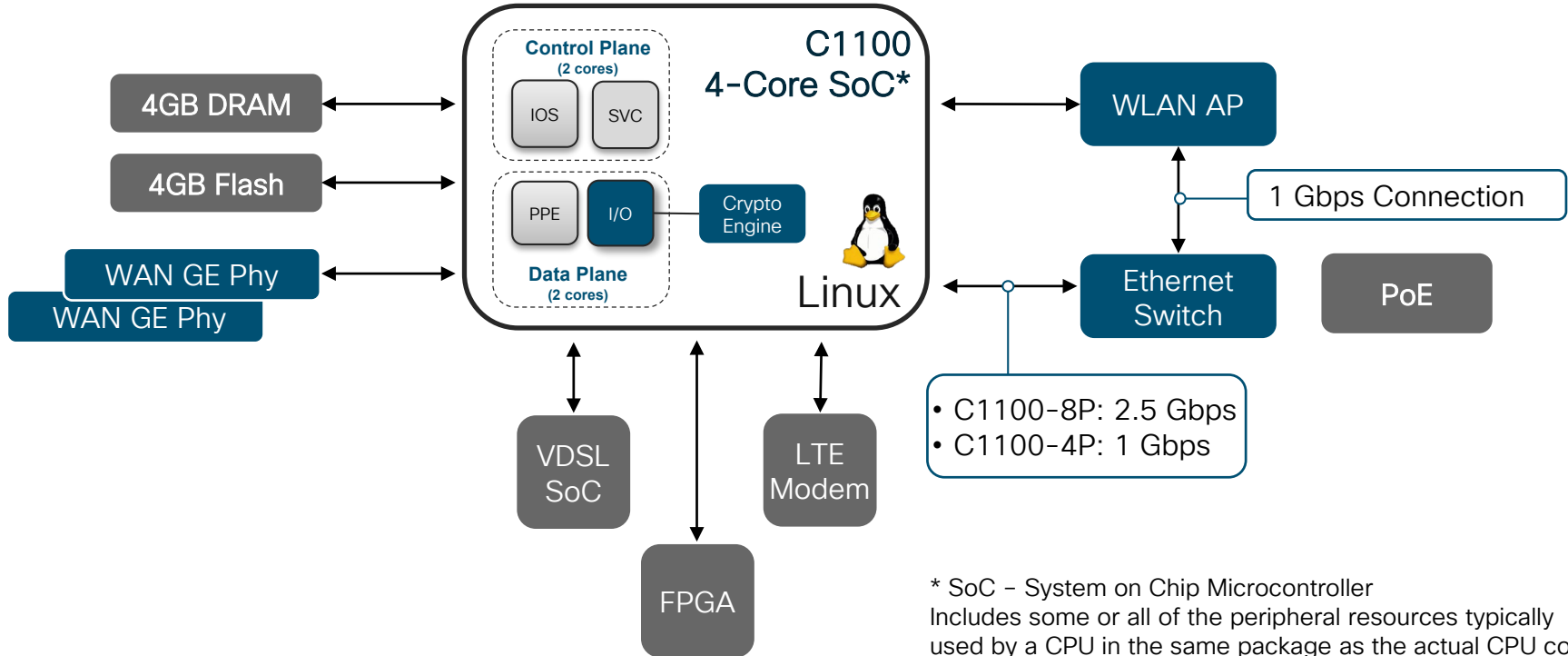
- Dedicated cores for Data Plane and Control Plane
- A separate Crypto Engine for ciphering and hashing operation

PoE

- C1100-4P: 2 PoE or 1 PoE+
- C1100-8P: 4 PoE or 2 PoE+

Fanless

Cisco ISR1100 Family Architecture



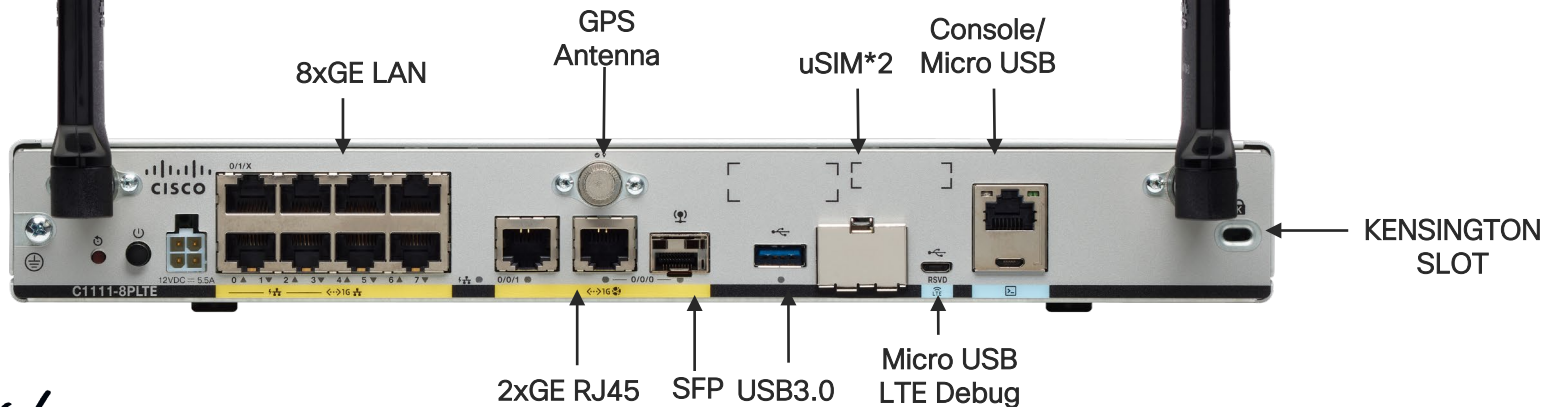
* SoC – System on Chip Microcontroller
Includes some or all of the peripheral resources typically used by a CPU in the same package as the actual CPU core

C1100-8P

Ethernet + LTE + WLAN

LTE Antenna →

← LTE Antenna

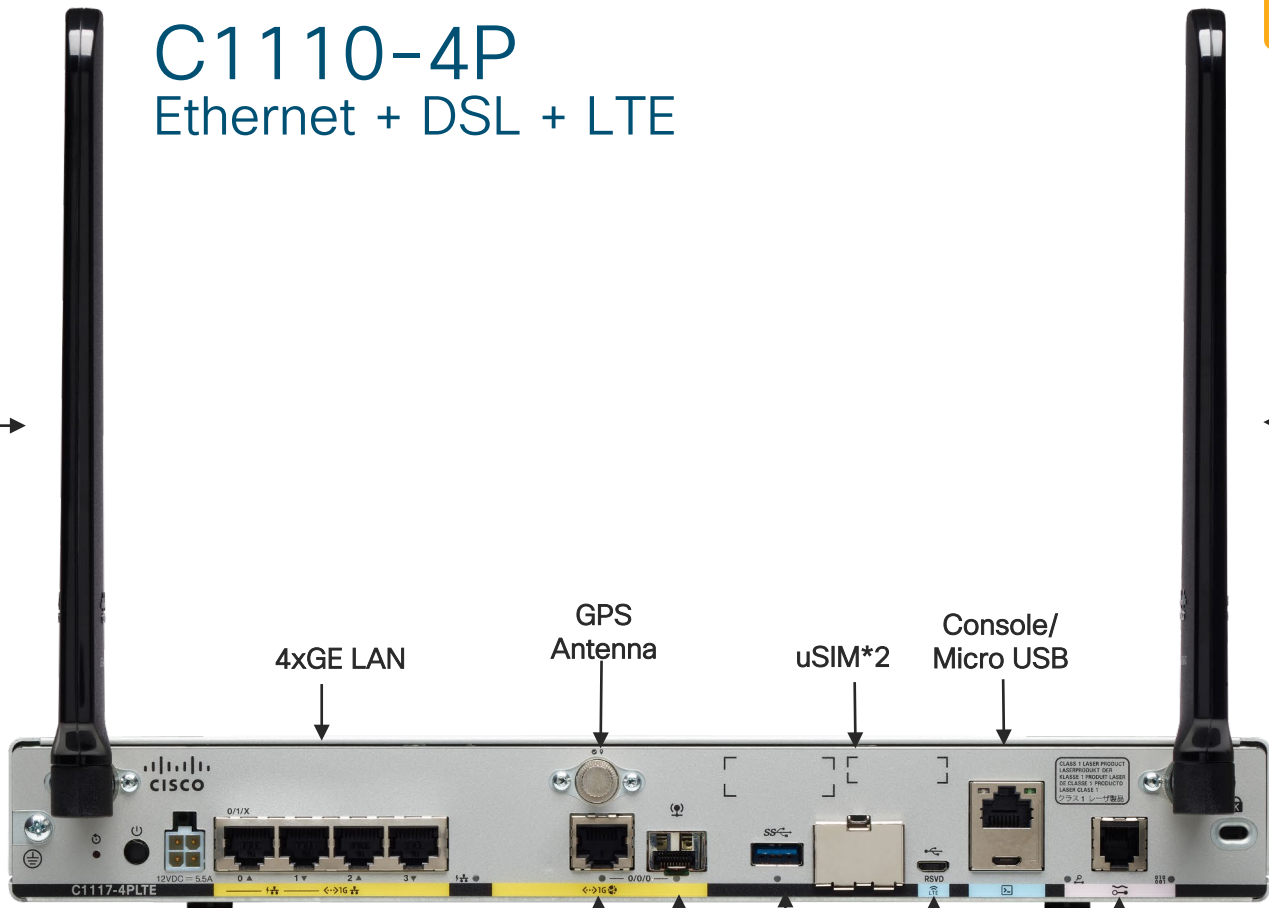


C1110-4P

Ethernet + DSL + LTE

LTE Antenna →

← LTE Antenna



4xGE LAN

GPS Antenna

uSIM*2

Console/
Micro USB

← KENSINGTON
SLOT

1xGE RJ45

SFP

USB3.0

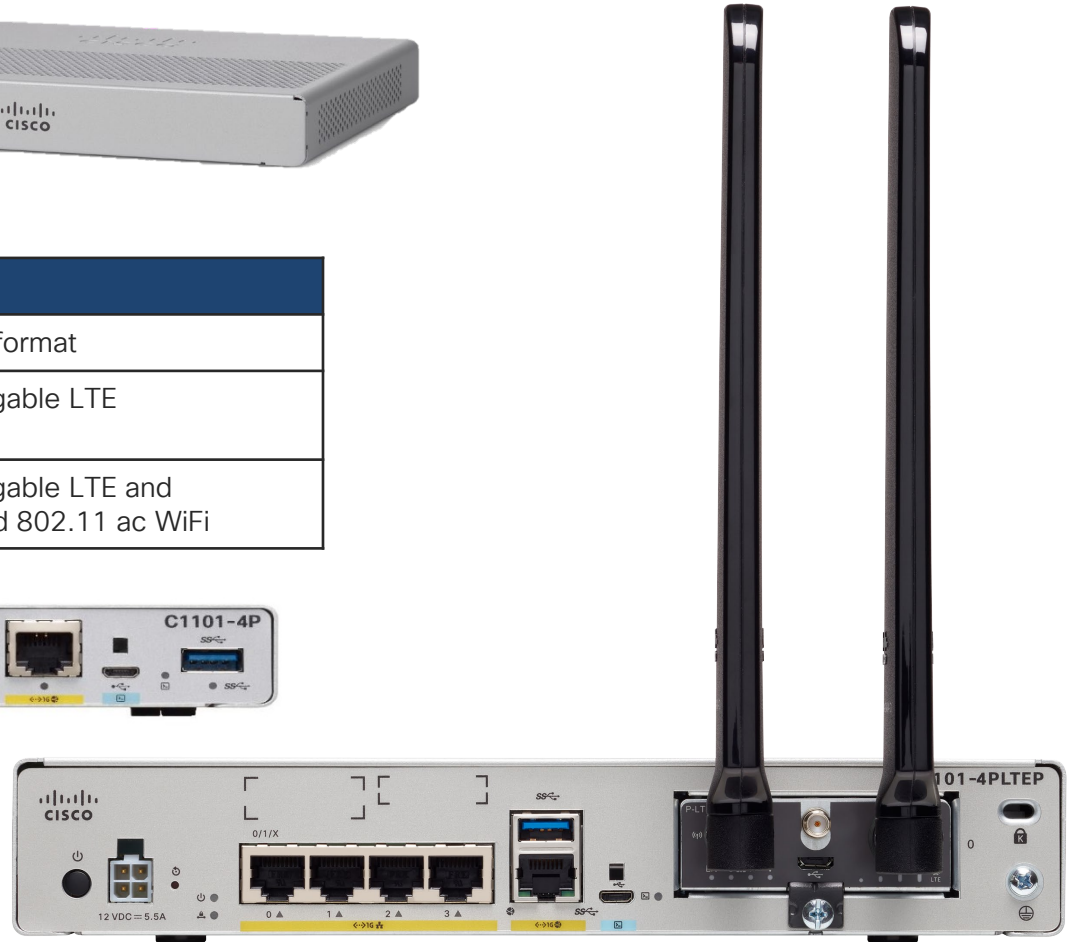
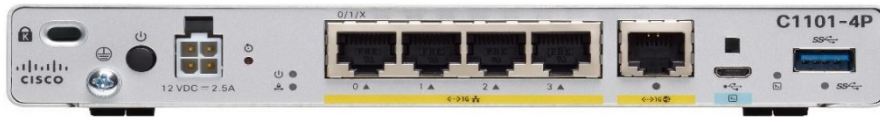
Micro USB
LTE Debug

DSL

C1101-4P



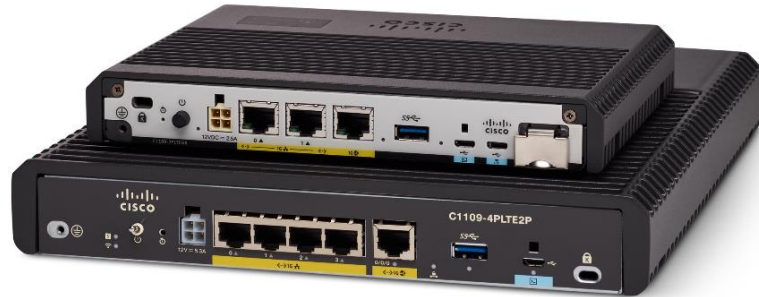
SKU	Detail
C1101-4P	Compact format
C1101-4PLTEP	With pluggable LTE
C1101-4PLTEPWX	With pluggable LTE and embedded 802.11 ac WiFi



C1109 – Hardened Platform



Dual pluggable LTE Modules
=
Active/Active LTE



SKU	Detail
C1109-2PLTEXX	Compact form factor, Embedded LTE Cat4 , temperature range 0-50C
C1109-4PLTE2P	Dual LTE pluggable slots Temp range -15-55C
C1109-4PLTE2PWX	Dual pluggable LTE and embedded 802.11 ac WiFi, Temp range -15-55C

SD-WAN Ready, New, C1120 & C1160



Multi-core CPU



Trustworthy Systems



High IPsec performance



ADSL2/2+/VDSL/G.SHDSL



Pluggable LTE Advanced



802.11ac WAVE2
Mobility Express

ISR 1100 Portfolio

For your reference

New!



	C1161X-8P *	C112xX-8P *	C1111X-8P *	C111x-4P	C1101-4P	C1109-4P	C1109-2P
Crypto	480 Mbps	350 Mbps		250 Mbps		200 Mbps	
Cisco SD-WAN	Yes						
SD-WAN Security	Yes			No			
LTE	CAT18/CAT6/ CAT4	CAT18/CAT6/ CAT4	No	CAT6	CAT18/CAT6/ CAT4	CAT18/CAT6/ CAT4	CAT4
Wi-Fi	No	Yes	No	Yes			No
DSL	No	Yes	No	Yes	No		
PoE	Yes				No		

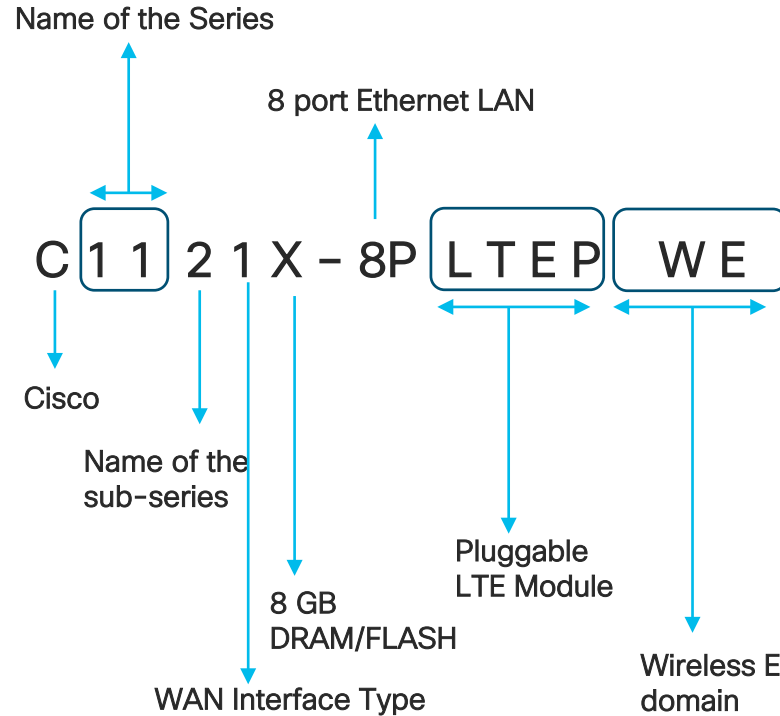
* 4GB DRAM/FLASH variants available – Supports only Ent. FW App aware, DNS/web-layer security on SD-WAN



How to read ISR1100 PIDs*

Supported Wireless Domains for C1121 *	
E	Europe
B	North America
Z	Australia/Brazil New Zealand
Q	Japan

Supported Wireless Domains for C1121X *	
E	Europe
B	North America
Z	Australia/Brazil New Zealand
A	Canada



DSL PIDs	
C1126	DSL Annex B&J
C1127	DSL Annex A&M
C1128	G.SHDSL

Series Variants	
C112x	CPU 1.2 GHz
C1161	CPU 1.6 GHz

*Only for IOS-XE based ISR1100
Doesn't apply to Vipele OS based
ISR1100-4G/6G

Wireless WAN Overview

LTE-Advanced Pro

- 1.2 Gbps Download
- Carrier aggregation
- CBRS – Band 46,48, 66, 71
- Dying gasp



- Auto SIM switching
- Mobile IP – PMIPv6
- 4x4 MIMO

Region	Modem	Maximum Data Rate (DL/UL) Mbps
AT&T, T-Mobile	CAT 4	150/50
Global		
Verizon		
Europe, North America	CAT 6	300/50
Latin America, APAC, ANZ		
Global	CAT 18	1200/150

Category 4 USB Dongle

CAT 4 LTE

75/50 Mbps

LTE Antenna

Single Micro SIM

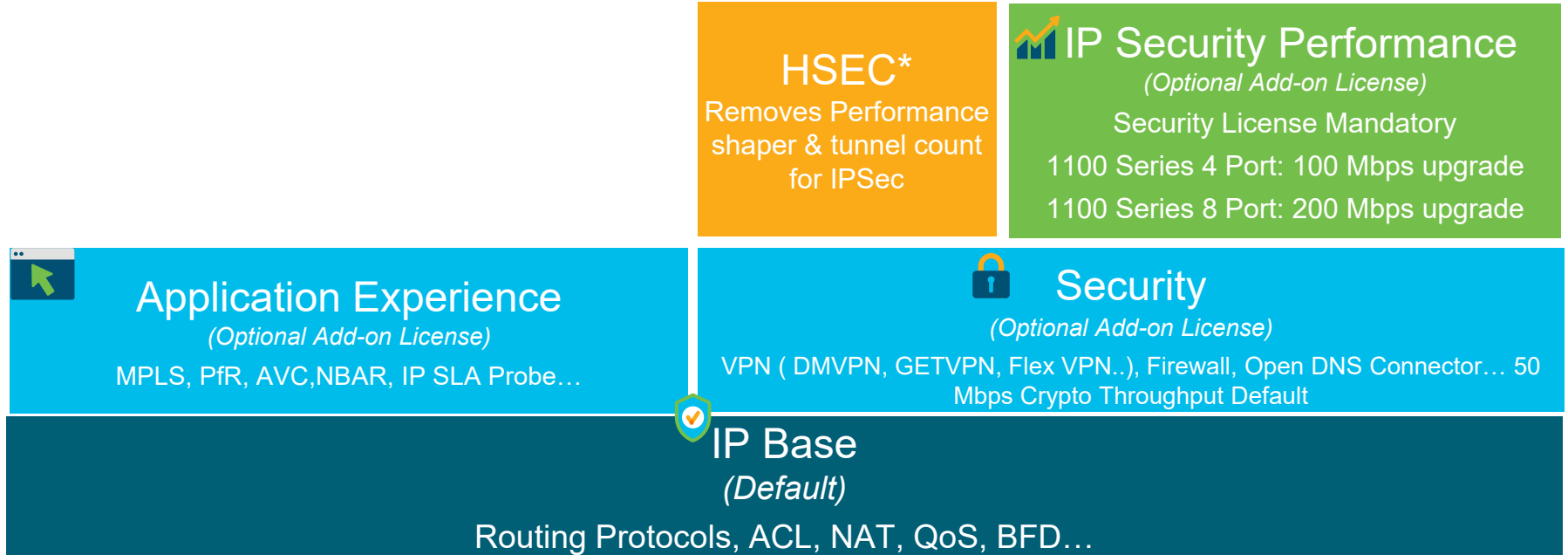
Supported on
ISR 1000 Series
only

Modem Types	Region	Bands
D-LTE-GB	Global	Bands 1,3,7,8,20,28
D-LTE-AS	ASEAN	Bands 1,3,5,8,40,41
D-LTE-NA	North America	Bands 2,4,5,12,13,14,17



ISR 1100 Non SD-WAN

Licensing and packaging model



* Available with IOS XE 16.7.1

References: Software Feature Set Overview

	C1100	Additional License
Routing Protocols	RIPv1/v2	✓
	EIGRP	✓
	BGP	✓
	OSPF	✓
	IPv6	✓
	PfR	✓
Switching	VLANs	✓
	Storm Control	-
	SPAN	✓
	PoE/PoE+	✓
	MAC Filtering	✓
	802.1x	✓
	Port Security	✓
	Protected Port	✓

	C1100	Additional License	
Security	Easy VPN	✓	SEC License
	GETVPN/DMVPN	✓	SEC License
	Firewall	✓	SEC License
	OpenDNS Connector	✓	SEC License
	Snort IPS	-	
	SD-WAN	DMVPN	✓
PfR		✓	AppX License
AVC		✓	AppX License
ZBFW		✓	SEC License
NETCONF/YANG		From IOS XE 16.9	
Snort IPS		-	
WAAS Express / ISR-WAAS		-	

References: Software Feature Set Overview

For your reference

	C1100	Additional License	
Wireless	Autonomous / Unified Mode	✓	
	802.11ac Wave 2	✓	
	Mobility Express	✓	
LTE	Carrier Aggregation	✓	
	PMIPv6	✓	AppX License
Embedded Management	EEM	✓	
	IP SLA Initiator	✓	AppX License
	Flexible NetFlow	✓	
QoS	WFQ/CBWFQ	✓	
	LLQ	✓	
	HQoS	✓	
	RSVP	✓	
	NBAR	✓	AppX License
	DiffServ	✓	

Understanding Cisco 1100 Performance

1100 Non-crypto throughput is **unshaped**

- Performance level in between 4221 and 4321

1100 IPsec Crypto throughput is **shaped**

- 50 Mbps @ Factory default



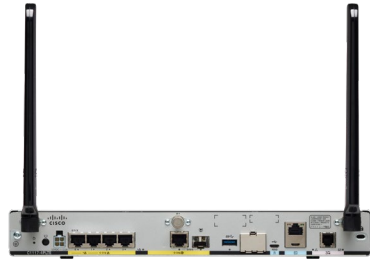
Activating IPsec Performance license

- Up to 250 Mbps with IPsec - 256 AES (C1100-8P)
- Up to 150 Mbps with IPsec - 256 AES (C1100-4P)

HSEC License disables the shaper for crypto throughput

- Up to 480 Mbps with IPsec - 256 AES (C1161-8P)
- Up to 230 Mbps with IPsec - 256 AES (C1100-4P)

ISR 1100 Performance



C1100-4P with HSEC



C1100-8P with HSEC

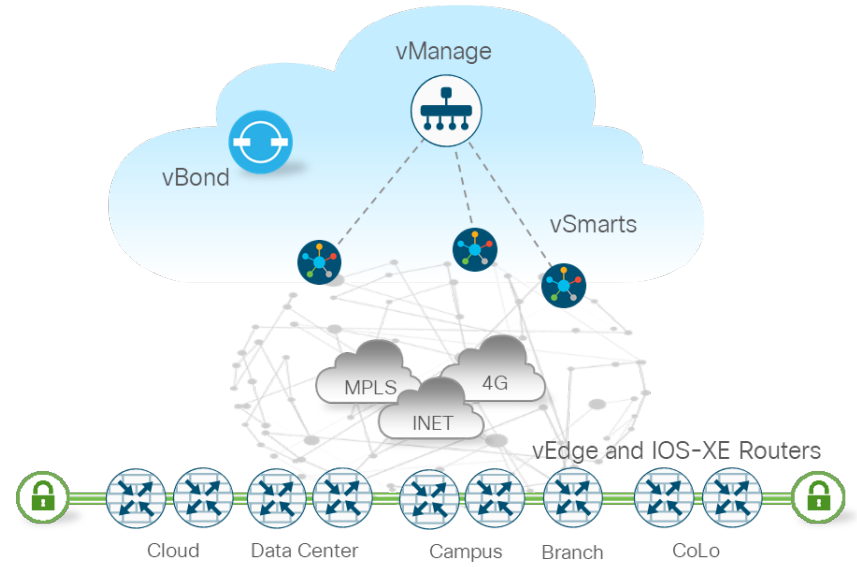


C1161-8P with HSEC

CPU Clocking	800MHz	1.2GHz	1.6GHz
CEF IMIX	1.2 Gbps	1.7 Gbps	1.8 Gbps
IPsec (AES256) IMIX	230 Mbps	335 Mbps	480 Mbps
NAT IMIX	660 Mbps	960 Mbps	1130 Mbps
HQoS IMIX	650 Mbps	910 Mbps	1230 Mbps

ISR 1100

SDWAN Use cases



SD-WAN Cloud Edge Portfolio with New Platforms

Branch

Aggregation

IOS-XE /
XE SD-WAN

ISR 1000



- Integrated wired and wireless access
- LTE Advanced Pro
- VDSL2, ADSL2/2+

ISR1120 / 1160 (New 25 SKUs)



- High Performance
- WWAN pluggable flexibility
- PIM: 4G LTE CAT4/6/18

ISR 4000



- WAN and voice module flexibility
- Compute with UCS E
- Container Architecture
- Slot Modularity, RPS
- 1GE, 10GE options

ASR 1000



- High-performance service with hardware assist
- Modular ASR 1K is not supported

Viptela OS

ISR1100-4G

ISR1100-4GLTE

ISR1100-6G



4 GE WAN ports

4G LTE (CAT4)

6 WAN ports (4GE and 2 SFP)

vEdge 100



4 GE RJ45 WAN ports

vEdge 1000



8 GE SFP WAN ports

vEdge 2000



RPS, PIM options

vEdge5000



Modularity, RPS

Virtualized

vEdge Cloud



- Software Router Platform
- Can be deployed in private, public, and hybrid cloud

Cisco ENCS



- Service chaining virtual functions
- Options for WAN connectivity
- Open for 3rd party services & apps
- NFVIS Hypervisor

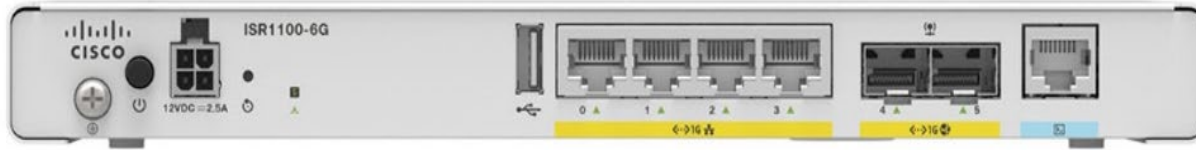
CSR 1000V



- Extend Enterprise routing, security & management to Cloud
- Cisco DNA virtualization

ISR 1100-4G & ISR 1100-6G

ISR1100 routers for SD-WAN with Viptela OS



Robust Performance

- Multicore x86 architecture
- Dedicated core for control plane
- Integrated LTE modem option*

SD-WAN Support

- Powered by Viptela OS
- Central management w/ vManage
- Feature parity with vEdge platforms

Branch Optimized

- Compact form factor
- Unmatched prize/performance
- Fiber Uplinks**

Investment Protection

Planned for future IOS-XE support

* ISR1100-4GLTE models only
** ISR1100-6G only

Platform Evolution for vEdge

Powered by Viptela OS 19.2

vEdge Series

vEdge 100B



vEdge 100M



vEdge 1000



Next-Generation vEdge

ISR 1100-4G



- 4 Ethernet WAN ports

ISR 1100-4GLTExx*



- 4 Ethernet WAN ports
- Integrated LTE (CAT4)

* xx = LTE domain

ISR 1100-6G



- 6 WAN ports (4GE and 2 SFP)

CISCO Live!

Cisco ISR1100-4GLTE

For your reference



Throughput on par with
vEdge 100m

Next Generation
vEdge

4 x 10/100/1000 Ethernet

Fanless design

4GB Memory

Cisco Built Hardware with
TWS*

Cat-4 LTE (4GLTE model)

Viptela OS

* Trust Worthy Systems
Cyber Threat protection

Cisco ISR1100-6G

For your reference



Throughput on par with
vEdge 1000

Next Generation
vEdge

4 x 10/100/1000 Ethernet
2 x 1G SFP Ethernet

Fanless design

4 GB Memory

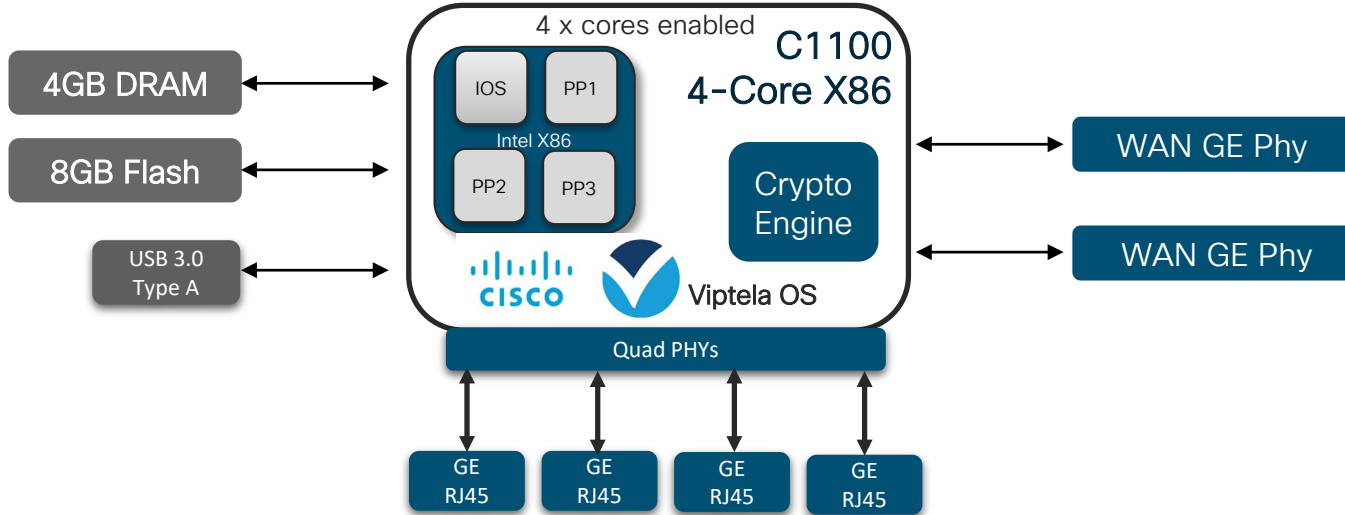
Cisco Built Hardware with
TWS*

Viptela OS

- Supported SFPs
- VIP-SFP-1GE-BASET
 - VIP-SFP-1GE-SX
 - VIP-SFP-1GE-LX



* Trust Worthy Systems
Cyber Threat protection

ISR1100-6G Block Diagram



ISR1100-4/6G Performance and Scale

For your reference

	ISR1100-6G	ISR1100-4G(LTE)
SDWAN: IPSec+QoS+DPI+CFLOWD+NAT Perf., 1400B / IMIX	 845 / 301 Mbps (vEdge 1000 @ IMIX - 345Mbps)	 449 / 125 Mbps (vEdge 100 @ IMIX - 112Mbps)
SD-WAN Tunnel	1500	247*
IPv4 Routes	128,000	10,000*
VPNs	64	64
CFLOWD	65,000	8,000

* Release 19.2 Planned to be improved.

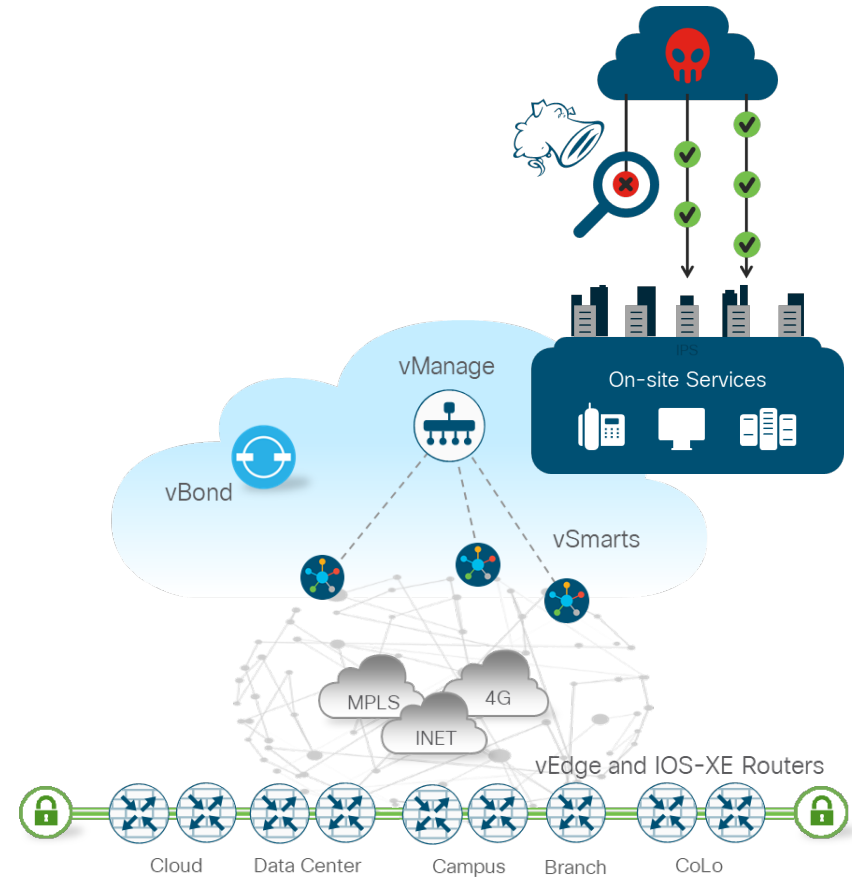
SFP Support on ISR1100-6G

SKU	Description	Standard(s) supported
VIP-SFP-1GE-BASET	Pluggable transceiver 1GE BaseT 10/100/1000	10BASE-T 100BASE-TX 1000BASE-T
VIP-SFP-1GE-SX	Small form-factor pluggable transceiver 1GE SX	1000BASE-SX Multimode 850nm
VIP-SFP-1GE-LX	Small form-factor pluggable transceiver 1GE LX	1000BASE-LX Singlemode 1310nm

Cisco SFPs not planned to be tested for Viptela OS

ISR 1100 SDWAN Security

Capabilities & Requirements



Cisco SD-WAN Security – Platform Support

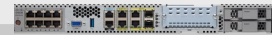
All Services



URL-Filtering
Onboard, using 82+ web categories

Intrusion Protection System
Onboard IPS engine powered by TALOS

Adv. Malware Protection
File Reputation and Sandboxing



ENCS 5400

Enterprise Firewall
+1400 layer 7 apps classified

Simplified Cloud Security
Cisco Umbrella

App Aware FW and
DNS/web-layer security



ASR 1000

DNS/web-layer security



vEdge & ISR1100-4/6G

SD-WAN Security Support on vEdge & ISR1100-4G/6G

Viptela OS 19.2

Platforms/Features	Viptela Ent FW	DPI	DNS/web-layer Monitoring**
ISR1100*, vEdge100, 1000, 2000 and 5000	Y	Qosmos	Y

* Viptela OS ISR1100-4G/6G models only

- Support for IOS-XE planned for 2nd half CY20

** Need Umbrella Subscription for enforcement

SD-WAN Security IOS-XE Routers – 16.10.1

Platforms/Features	Ent App Aware FW	IPS/IDS	URL Filtering	DNS/web-layer Monitoring *
Cisco - CSR	Y	Y	Y	Y
Cisco - ENCS (ISRV)	Y	Y	Y	Y
Cisco - ISR4K (4451, 4431, 4351, 4331, 4321, 4221-X)	Y	Y	Y	Y
Cisco - ISR1K	Y	Y**	Y**	Y
Cisco - ASR1K 1001-HX, 1002-HX, 1001-X, 1002-X)	Y	N/A	N/A	Y

* Need Umbrella Subscription for enforcement

Ent FW App Aware and DNS/web-layer security will work with default 4 GB DRAM

** **1100X 8GB DRAM models only**

Security App Hosting Profile and Resources

App Hosting Profile	Security Profile Features	Memory requirement	Platform Supported
Default	IPS + URLF (Cloud Lookup only)	8GB Bootflash 8GB Memory (X-SKUs only for 1100)	1100X /4221/4321 4/8 vCPU CSR/ISRv 4331/4351/44xx
High	IPS + URLF (On-box DB + Cloud Lookup)	16GB Bootflash & 16GB Memory (Not supported on 1100)	4/8 vCPU CSR/ISRv 4331/4351/44xx

Ent FW App Aware and DNS/web-layer security will work with default 4 GB DRAM

SD-WAN Security ISR4K/1K Throughput

1024K Object Size - 780B

For your reference

	ISR4461 (Mbps)	ISR4451-X (Mbps)	ISR4431 (Mbps)	ISR4351 (Mbps)	ISR4331 (Mbps)	ISR4321 (Mbps)	ISR4221 (Mbps)	C1111X-8P (Mbps)
100%DIA(NAT+FW+DPI)	2490	1029	714	530	440	230	178	240
100%DIA(NAT+FW+DPI+IPS+URLF)	680	310	166*	205	170	83	62	75
100%DIA(NAT+FW+DPI+IPS+AMP+TG)	504	259	144*	195	165	81	60	71

* Security features like IPS/URLF/AMP/TG run in the service plane core

* ISR 4431 service plane core clock rate @1.0GHz, while ISR 4351 service plane core clock rate @2.4GHz, and 4331 service plane core clock rate @2.0GHz, therefore lower throughput.

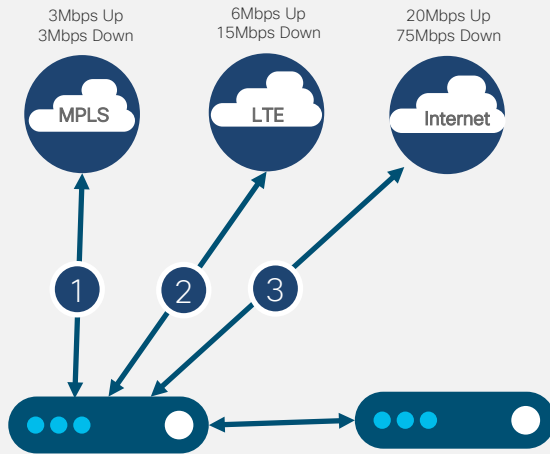
Cisco SDWAN Performance License Matrix

IOS-XE SDWAN ISR 4321/4221/1100 Platforms

Platform	License type	SD WAN	10 Mbps	20 Mbps	50 Mbps	100 Mbps	250 Mbps	500 Mbps	1 Gbps	2.5 Gbps	5 Gbps	10 Gbps	25 Gbps	50 Gbps	100 Gbps
ISR1K	Cisco DNA Premier	✓	✓	✓	✓	✓									
	Cisco DNA Advantage	✓	✓	✓	✓	✓									
	Cisco DNA Essentials	✓	✓	✓	✓	✓									
ISR4K	ISR 4221**	Cisco DNA Premier	✓	✓	✓	✓									
		Cisco DNA Advantage	✓	✓	✓	✓									
		Cisco DNA Essentials	✓	✓	✓	✓									
	ISR 4321**	Cisco DNA Premier	✓	✓	✓	✓	✓								
		Cisco DNA Advantage	✓	✓	✓	✓	✓								
		Cisco DNA Essentials	✓	✓	✓	✓	✓								

Bandwidth Metering

Cisco DNA Subscriptions



With Cisco DNA subscription, bandwidth entitlement is the sum of total bandwidth utilization (either upstream or downstream) across all WAN circuits.

Examples:

For a 100 Mbps license, utilization can be up to 100 Mbps upstream and 100 Mbps downstream

In the example, bandwidth utilization adds to $3+15+75=93$ Mbps (downstream) and to $3+6+20=29$ Mbps (upstream). Considering the maximum utilization, you will need a 100 Mbps license, permitting you to use 100 Mbps up and 100 Mbps down for 200 Mbps of aggregate bandwidth.

Aligned with how service providers sell WAN bandwidth

Cisco SD-WAN Positioning

Pure Play SDWAN

Transport Independence,
Voice Optimization,
Cloud Management & Analytics



Viptela OS: ISR1100-4G, ISR 1100-6G, vEdge 2000

IOS-XE: ISR , ASR



Integrated Services SDWAN

Interface Flexibility,
Rich Application Optimization Services*
Multi-Domain Integrations*

VRF and Tunnel
Scale, Throughput

Cloud Security	Voice Optimization	TCP Flow Optimization	Integrated Voice*	Cloud onramp for Colocation	Multi-Domain*
			On Prem Security	Adv. Cloud Security	AppQoE* Caching, DRE

App-Aware Routing, Full Mesh, Dynamic Routing	CloudOnRamp for IaaS and SaaS	vManage: Multi-tenant Cloud on-prem	vAnalytics
---	-------------------------------	--	------------

* Roadmap

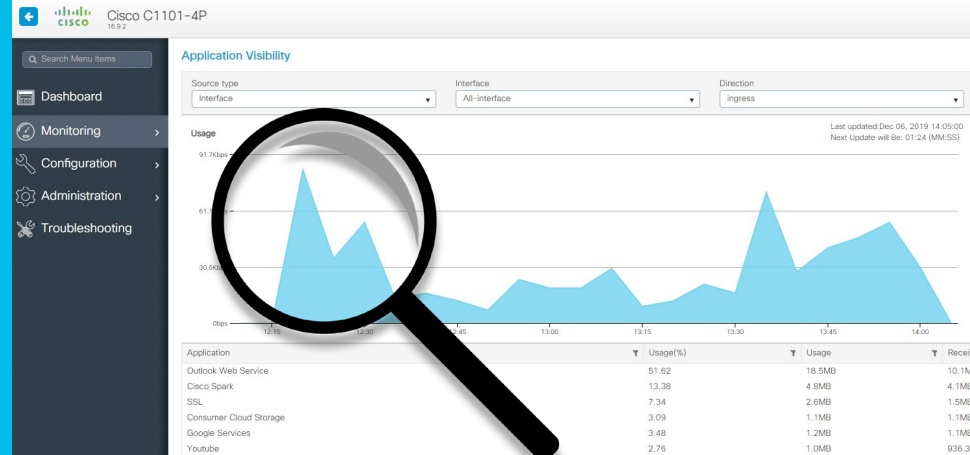


ISR 1100

Troubleshooting & Monitoring

CISCO *Live!*

- WebUI Introduction
- Hardware Utilization
- Monitoring Resources
- Packet Flow
- Dataplane health check



IOS-XE WebUi - Graphical User Interface

Cisco C1101-4P 16.9.2

Welcome cisco

Dashboard

Search Menu Items

- Dashboard
- Monitoring
- Configuration
- Administration
- Troubleshooting

CPU & Memory Pressure Graph

Last Updated: 12/6/2019, 1:23:03 PM

Slot: RP0

CPU Utilization

CPU: 0

Process	CPU (%)
User	2.96
System	0.91
Idle	95.40

[Advanced CPU View](#)

Time	User (%)	System (%)	Idle (%)
18:14	2.96	0.91	95.40
18:15	2.96	0.91	95.40
18:15	2.96	0.91	95.40
18:16	2.96	0.91	95.40

Memory Utilization

Memory Details	Size (KB)
Total	3758800
Used	2384596
Free	1374204
Committed	2202552

[Advanced Memory View](#)

Time	Memory Used (%)
18:14	65
18:15	65
18:15	65
18:16	65

FlashMemory

Last Updated: 12/6/2019, 1:23:02 PM

Category	Percentage
Free	78.53%
Used	21.47%

Free : 2.11(GB)

Top Applications

Last Updated: 12/6/2019, 1:22:51 PM

Last 2 hours trend

Application	Usage (MB)
outlook...	9.5
cisco-sp...	1.8
ssl	1.2
google-s...	1.0
youtube	1.0

[Details](#)

System Information

Last Updated: 12/6/2019, 12:24:05 PM

- Hostname: C1101
- Device Uptime: 5 minutes
- System Time: 17:17:13.539 UTC Fri Dec 6 2019
- Device Type: C1101-4P
- Boot Image: bootflash:c1100-universalk9_jas.16.09.02.SPA.bin
- Last Reload Reason: Reload Command
- Last Configuration Change: 17:16:26 UTC Fri Dec 6 2019 by cisco
- Redundancy Mode: ..

WebUi – Configuration Wizard

WebUi equivalence of Cli config: ip nat inside source list 102 interface GigabitEthernet0/0/0 overload

The screenshot displays the Cisco WebUI configuration wizard for NAT on a Cisco C1101-4P device. The main interface shows the NAT configuration page with the following details:

- NAT Summary:**
 - Translations: :28
 - Hits: :80953
 - Misses: :3960
 - Max allowed: :0
 - Used: :0
 - Missed: :0
- Static:** (No entries)
- Dynamic:** (No entries)

Buttons: + Add, Delete, Associating Interfaces

Table Headers: ACL Name, Pool Name, Start IP, End IP, VRF Name, NAT Direction, Route Map

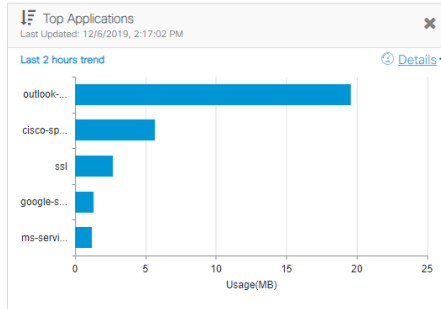
Table Content: No items to display

Legend: 10 Items per page

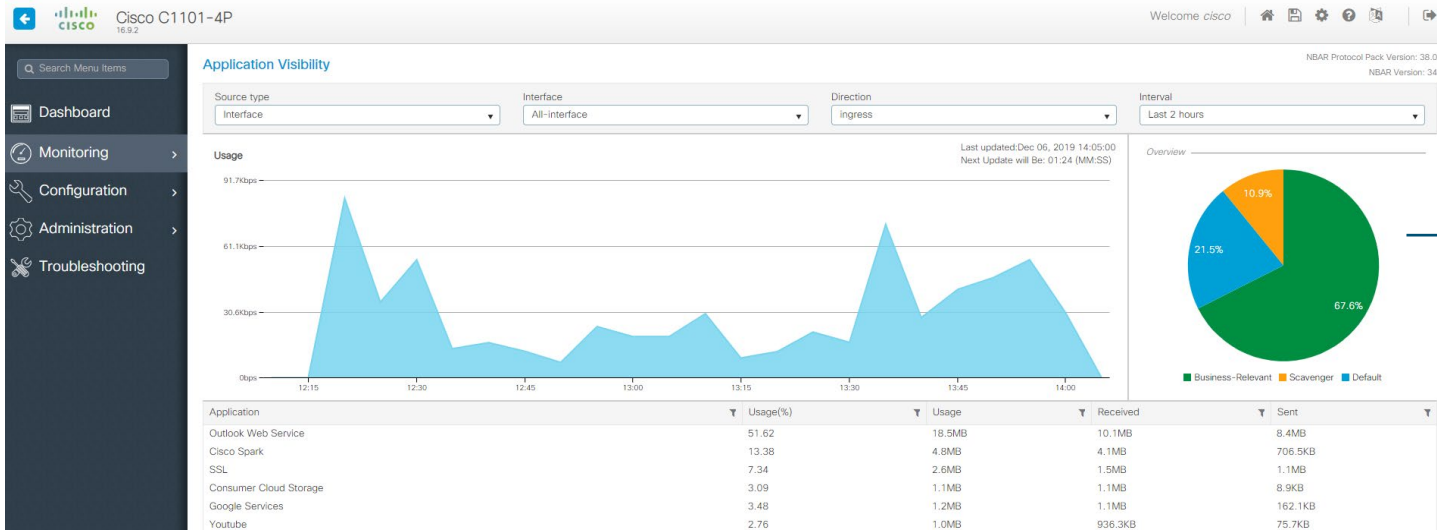
Two modal windows are open:

- Associating Interfaces:**
 - Available Interfaces: (Empty list)
 - Selected Interfaces: GigabitEthernet0/0/0 (Direction: Outside)
 - Legend: up (green), down (grey), administratively down (red)
- Create Dynamic NAT:**
 - Access List: 102
 - NAT Direction*: Inside (selected), Outside
 - Pool Name*: Internet
 - Start IP*: 10.1.1.101
 - End IP*: 10.1.1.200
 - Subnet Mask / Prefix*: 24
 - Enable VRF:
 - Match in VRF:
 - VRF Name: Select a value
 - Route Map: Select a value

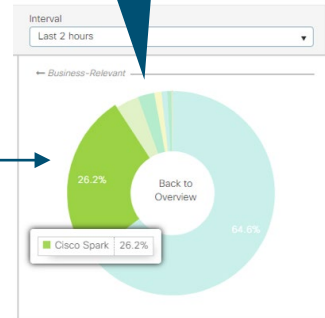
WebUi – Application Visibility



- Requires Appx Feature package
- One additional line of interface configuration required:
ip nbar protocol-discovery



Let's look closer at the Green traffic



WebUi - Troubleshooting Tools

Search Menu Items

- Dashboard
- Monitoring >
- Configuration >
- Administration >
- Troubleshooting**

Troubleshooting : Test Wan Connection

← Back to TroubleShooting Menu

Wan Interfaces: Through WAN Interface Ping:

Primary WAN: *GigabitEthernet0/0/0* Backup WAN: *Not Configured*

[▶ Test](#)

Checking WAN connection:

- ✓ Admin Status is up
- ✓ Line protocol is up and IP Address assigned - 192.168.1.41/26
- ✓ DNS configured - 82.209.169.71, 82.209.169.72
- ✓ Pinged External IP (8.8.8.8) with success rate 100%

Connected to WAN

WebUi - Troubleshooting Tools

The dashboard displays various troubleshooting tools:

- Audit Support:** Check security, hardening, and the best practices aspect of the device config. Needs internet access.
- Core Dump:** View the list of core files captured in the device.
- Debug Bundle:** Capture required info like CLI outputs, logs as a single bundle for error reporting and debugging.
- Packet Capture:** Capture packets with different filter options to feed into Wireshark for debugging.
- Ping and Trace Route:** Check Ping-ability and Trace route info of a target destination through different sources.
- Syslog:** Configure and View Syslog.
- Test WAN Connection:** Check the status of WAN connection, DNS etc.
- Web Server Log:** View and Download Access and Error info of Web User Interface Logs.

Troubleshooting : Ping and Traceroute

Destination: 8.8.8.8 | Source: GigabitEthernet0/0

Ping | **Traceroute**

Source (Device) | Destination

```
#traceroute 8.8.8.8 source GigabitEthernet0/0
Type escape sequence to abort.
Tracing the route to 8.8.8.8 (8.8.8.8)
VRF Info: (vrf for name/ID, vrf out name/ID)
 0 192.168.1.254 0 msec 0 msec 0 msec
 1 104.99.236.1 11gitspeed-igmcc.sbglobal.net (104.99.236.1) 12 msec 4 msec 8 msec
 2 *
 3 12.123.352.74 [MPLS: Label 24246 Exp 0] 28 msec 20 msec 20 msec
 4 stg21ors.lip.att.net (12.122.2.165) [MPLS: Label 0/31457 Exp 0] 16 msec 28 msec
 5 gw1.lmrtel.lip.att.net (12.122.96.89) 12 msec 16 msec 12 msec
 6 12.255.18.4 12 msec
 7 12.255.18.0 12 msec
 8 *
 9 100.170.249.97 912 msec *
 0 dns-google (8.8.8.8) 12 msec
 100.170.229.128 12 msec
 100.170.225.132 16 msec
```

Troubleshooting : Debug Bundle

Back to Troubleshooting Menu

Name of the debug bundle:

This supports user to create a compressed package with required info like CLI outputs, logs etc for reporting and debugging the issues

Enter the CLIs of which output needs to be packaged. Maximum 5 CLIs are allowed.

- sh run
- sh ip route
- sh ip arp
- Web Server log
- Core File

Create Packet Capture

Capture Name*:

Filter*:

Monitor Control Plane*:

Buffer Size (MB)*:

Limit by*: secs ~ 1.00 hour

Available (5) | **Selected (1)**

- GigabitEthernet0/1/0
- GigabitEthernet0/1/1
- GigabitEthernet0/1/2
- GigabitEthernet0/1/3
- Vlan1



Monitoring my HW resources in Cli

```
C1101#sh pla har qf act infrastructure exm stat
```

```
QFP exmem statistics
```

```
Type: Name: DRAM, QFP: 0
```

```
Total: 201326592
```

```
InUse: 82447360
```

```
Free: 118879232
```

```
Lowest free water mark: 118878208
```

```
Type: Name: IRAM, QFP: 0
```

```
Total: 201326592
```

```
InUse: 201326592
```

```
Free: 18879232
```

```
Lowest free
```

```
C1101#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)	13	10	10	9
	(bps)	8952	13976	15136	9824
Total	(pps)	13	10	10	9
	(bps)	8952	13976	15136	9824
Output: Priority	(pps)	0	0	0	0
	(bps)	0	0	0	0

```
C1101#sh platform hardware qfp active datapath infrastructure sw-cio
```

```
Credits Usage:
```

```
Core Utilization
```

```
-----
```

ID:	0	1
% PP:	3.24	0.00
% RX:	0.00	4.09
% TM:	0.00	3.67
% CRYPTO:	0.00	0.00
% IDLE:	96.76	92.24

Monitoring CPU Resources on my C1100

IOSd processor only

```
C1101# show processes cpu
CPU utilization for five seconds: 3% one minute: 3%; five minutes: 3%
```

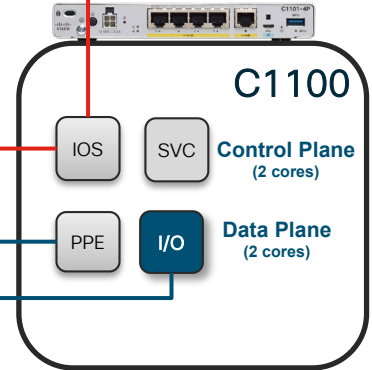
Core 0: Always same as sh process cpu

```
C1101# show 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: 60%, one minute: 61%, five minutes: 61%
```

Pid	PPid	5Sec	1Min	5Min	Status	Size	Name
19866	18993	74%	74%	74%	S	699367424	qfp-ucode-tsn
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

Last core - I/O scheduler core. High % = Normal

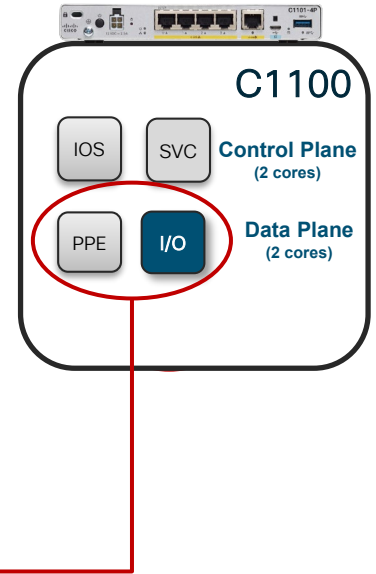
“Looking for work” process. High % = Normal



Monitoring PPE (Data Plane) Forwarding state

Show summary of Dataplane load in Packets & Percentage

```
C1101#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)   13       10       10       9
                  (bps)  8952    13976   15136   9824
    Total      (pps)   13       10       10       9
                  (bps)  8952    13976   15136   9824
Output: Priority  (pps)    0        0        0        0
                  (bps)    0        0        0        0
  Non-Priority  (pps)    1        3        3        2
                  (bps)  2088    15184   15208   15176
    Total      (pps)    1        3        3        2
                  (bps)  2088    15184   15208   15176
Processing: Load (pct)  1        1        1        1
```



Tip: Lowest most line got the total load in %

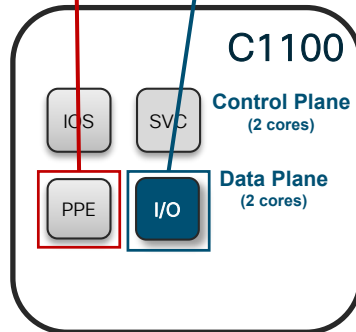
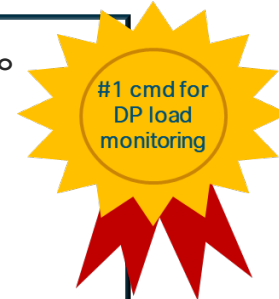
(Taken from my idling lab router, hence the low%)

Monitoring Overall PPE load – C1100

Look at every core assigned to packet forwarding (PPE), regardless of what license you're running

```
C1101# show platform hardware qfp active datapath infrastructure sw-cio
Credits Usage:

Core Utilization
-----
ID:      0      1
% PP:    3.24   0.00
% RX:    0.00   4.09
% TM:    0.00   3.67
% CRYPTO: 0.00   0.00
% IDLE:  96.76  92.24
```



For each PPE core

- look at % used for packet processing (PP)

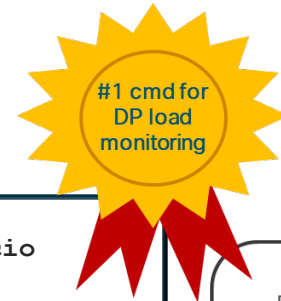
For I/O assigned core look at

- % used for In-Out packet scheduling (RX & TM)
- % used for crypto operation, where applicable

Monitoring PPE Usage

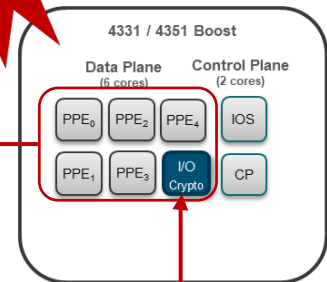
Looking for bottlenecks – 4331 Example

show platform hardware qfp active datapath infra sw-cio



```
stefts_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
```



Uh-oh ! Core 5 (I/O) out of capacity

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

Build an Early Warning System

For your reference

Warn me when my data plane load exceeds 90%

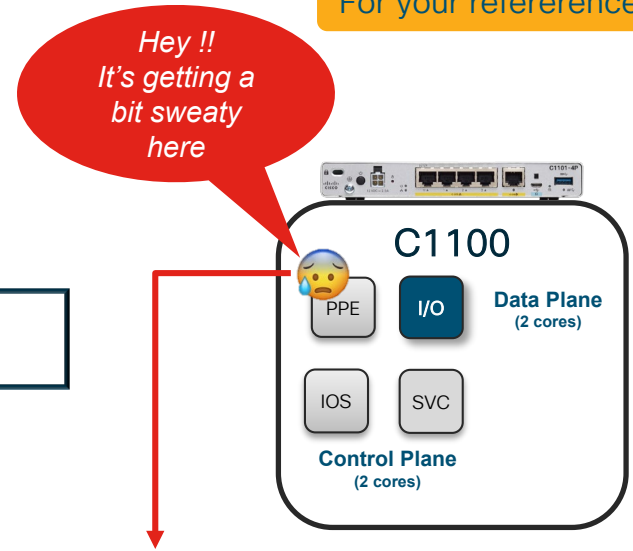
```
C1101(config)# platform qfp utilisation monitor load 90
```

When traffic exceeds 90% load

```
Jan 29 03:28:03.647: %IOSXE_QFP-2-LOAD_EXCEED: Slot: 0, QFP:0, Load 93% exceeds the setting threshold.
```

After traffic is falling back under the limit:

```
Jan 29 01:57:33.591: %IOSXE_QFP-2-LOAD_RECOVER: Slot: 0, QFP:0, Load 54% recovered.
```



Health-Check-Control Plane

For your reference

Router# show platform

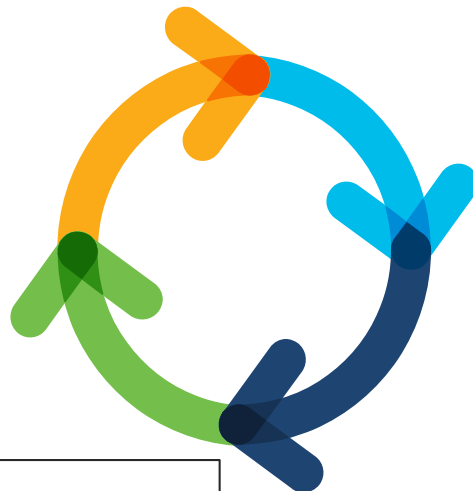
Chassis type: C1111-8P

Slot	Type	State	Insert time (ago)
------	------	-------	-------------------

0	C1111-8P	ok	00:03:16
0/0	C1111-2x1GE	ok	00:01:07
0/1	C1111-ES-8	ok	00:01:07
R0	C1111-8P	ok, active	00:03:16
F0	C1111-8P	ok, active	00:03:16
P0	PWR-12V	ok	00:02:52

Slot	CPLD Version	Firmware Version
------	--------------	------------------

0	17100501	16.6(1r)
R0	17100501	16.6(1r)
F0	17100501	16.6(1r)



Router# show facility-alarm status critical

system Totals Critical: 4 Major: 0 Minor: 0

Source	Time	Severity	Description	[Index]
--------	------	----------	-------------	---------

GigabitEthernet0/1/0	Jul 12 2017 22:27:25	CRITICAL	Physical Port Link Down	[1]
GigabitEthernet0/1/1	Jul 12 2017 22:27:25	CRITICAL	Physical Port Link Down	[1]
GigabitEthernet0/1/2	Jul 12 2017 22:27:25	CRITICAL	Physical Port Link Down	[1]
GigabitEthernet0/1/3	Jul 12 2017 22:27:25	CRITICAL	Physical Port Link Down	[1]

Router#show platform software status control-processor brief

Load Average

Slot	Status	1-Min	5-Min	15-Min
RP0	Healthy	1.56	1.61	0.99

Memory (kB)

Slot	Status	Total	Used (Pct)	Free (Pct)	Committed (Pct)
RP0	Healthy	3446320	2188804 (64%)	1257516 (36%)	1934740 (56%)

CPU Utilization

Slot	CPU	User	System	Nice	Idle	IRQ	SIRQ	IOwait
RP0	0	1.11	1.52	0.00	97.36	0.00	0.00	0.00
	1	0.81	1.52	0.00	97.65	0.00	0.00	0.00
	2	1.58	5.19	0.00	93.22	0.00	0.00	0.00
	3	9.01	29.79	0.00	61.18	0.00	0.00	0.00

Router# show platform diag

Chassis type: C1117-4PLTEEA

Slot: 0, C1117-4PLTEEA

Running state : ok
Internal state : online
Internal operational state : ok

Physical insert detect time : 00:01:52 (09:02:14 ago)

Software declared up time : 00:03:12 (09:00:54 ago)

CPLD version : 17100501

Firmware version : 16.6(1r)RC3

Health Check Continue- Data Plane

For your reference

```
C1100#show platform hardware throughput level
```

```
The current throughput level is unthrottled
```

```
C1100#show platform hardware throughput crypto
```

```
The current crypto level is 50000 kb/s
```



```
C1100#show platform hardware qfp active infrastructure exmem statistics
```

```
QFP exmem statistics
```

```
Type: Name: DRAM, QFP: 0
```

```
Total: 134217728
```

```
InUse: 15271936
```

```
Free: 118945792
```

```
Lowest free water mark: 118556672
```

```
Type: Name: IRAM, QFP: 0
```

```
Total: 2097152
```

```
InUse: 211968
```

```
Free: 1885184
```

```
Lowest free water mark: 1885184
```

```
Type: Name: SRAM, QFP: 0
```

```
Total: 0
```

```
InUse: 0
```

```
Free: 0
```

```
Lowest free water mark: 0
```

```
C1100#sh platform hardware throughput-monitor parameters
```

```
Throughput monitor parameters
```

```
Throughput monitor threshold: 95 percent
```

```
Throughput monitor interval: 300 seconds
```

```
Throughput monitor status: enabled
```

```
C1100#sh platform hardware qfp active statistics drop
```

```
Global Drop Stats
```

```
Packets
```

```
Octets
```

```
L2ESInputInvalidSvi
```

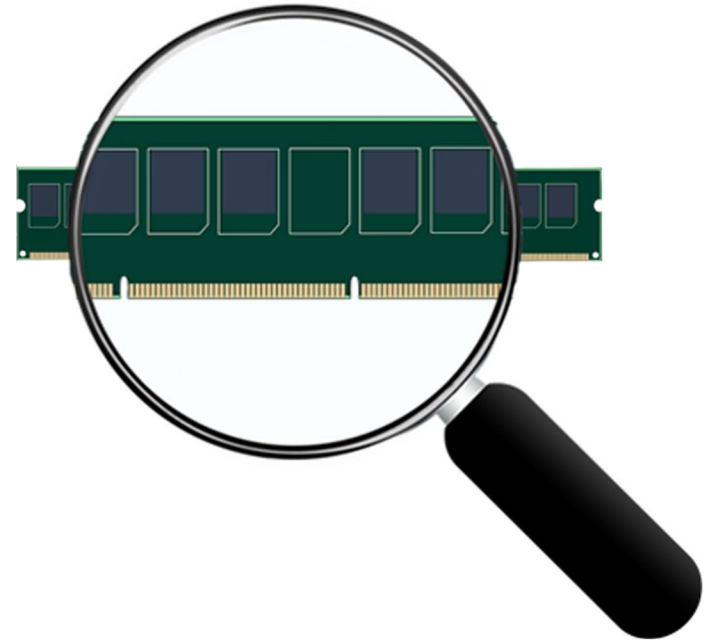
```
1
```

```
90
```

[Session update : Advanced troubleshooting of the ASR1K and ISR \(IOS-XE\) made easy - BRKCRS-3147](#)

Did You bring
enough Memory
to the Party?

Monitoring Your
Memory resources



ISR Memory

Which Partition Does What?

- **Control Plane Memory partition:**

- **IOS:** Holds the IOS daemon
 - This daemon holds the IOS system as well Control Plane Tables (Routing Information Base etc.)
- **Linux:** Holds the Linux kernel
 - Linux also allocates memory for service containers
 - The Linux portion grows when IOS is growing due to information replication into other processes

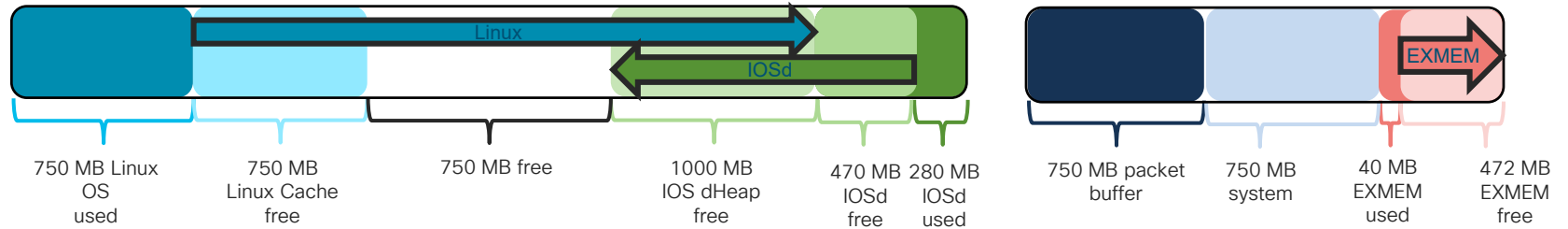
- **Data Plane Memory / Memory partition:**

Used exclusively for data plane services

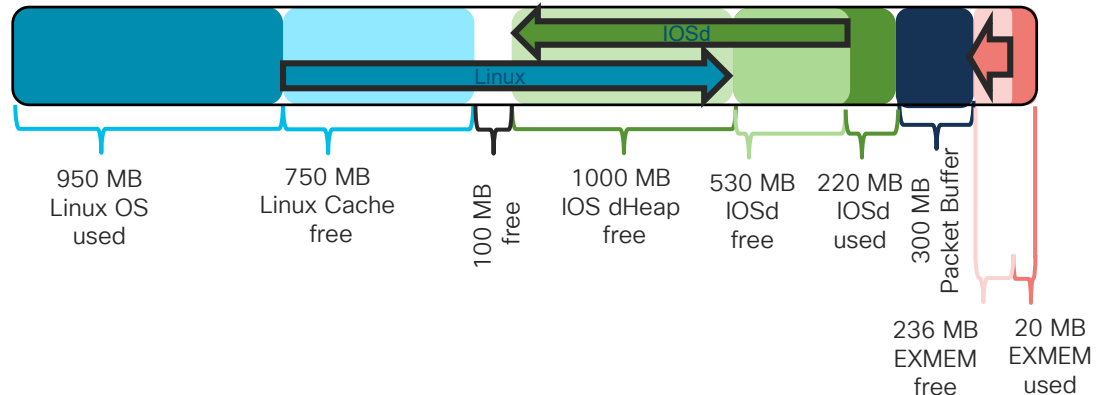
- **Buffer:** Packet Buffering
- **System:** Runs forwarding process - CPP Dataplane internal Microcode on ISR4400
- **EXMEM:** EX Memory, Used for forwarding process
 - Holds FIA (Feature Invocation Array)
 - Grows when scalable features are configured (MPLS FIB, NAT Table, ZBFW etc.).
 - Fixed partition size

ISR Memory allocation Overview

ISR4400 - 4GB CP + 2 GB DP



ISR4300.4200,1100 - 4GB CP + DP



Monitoring C1100 4GB DRAM

C1101#sh memory platform information

```
Memory (kB)
Physical   : 3758800
Total     : 3758800
Used      : 2397200
Free      : 1361600
Active    : 2241576
Inactive  : 709888
```

Buffers (kB) : 292612

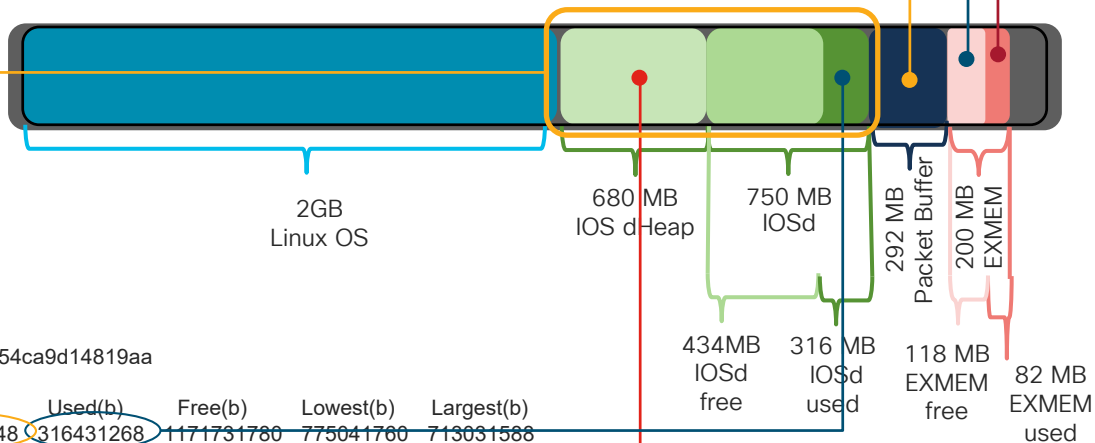
C1101#show platform hardware qfp active infrastructure exmem statistics
QFP exmem statistics

```
Type: Name: DRAM, QFP: 0
Total: 201326592
InUse: 82447360
Free: 118879232
Lowest free water mark: 118878208
Type: Name: IRAM, QFP: 0
Total: 2097152
InUse: 211968
Free: 1885184
Lowest free water mark: 1885184
```

C1101#sh memory

Tracekey : 1#55a11728f207abb2b0754ca9d14819aa

	Head	Total(b)	Used(b)	Free(b)	Lowest(b)	Largest(b)
Processor	7F52DE3010	1488163048	316431268	1171731780	775041760	713031588
lsmpi_io	7F521821A8	6295128	6294304	824	824	412
Dynamic heap limit(MB)	680	Use(MB)	0			



Monitoring C1100 Control Plane Memory (Same on ISR 4000)

```
C1101# show version
Cisco IOS XE Software, Version 16.09.02
< snip>
System image file is "bootflash:c1100-universalk9_ias.16.09.02.SPA.bin"
<snip>
cisco C1101-4P (1RU) processor with 1453284K/6147K bytes of memory.
Processor board ID FGL2302154D
1 Virtual Ethernet interface
5 Gigabit Ethernet interfaces
32768K bytes of non-volatile configuration memory.
4194304K bytes of physical memory.
2863103K bytes of flash memory at bootflash:.
```

**Total CP&DP
Memory**

Reserved IOS Memory

Total Flash Memory

**Total reserved
IOS Memory (includes dHeap)**

**Total used
IOS Memory**

**Total free IOS Memory
(includes dHeap)**

```
C1101# show memory
```

	Head	Total(b)	Used(b)	Free(b)	Lowest(b)	Largest(b)
Processor	7F52DE3010	1488163048	316431268	1171731780	775041760	713031588
lsmapi_io	7F521821A8	6295128	6294304	824	824	412
Dynamic heap limit(MB)	680	Use(MB)	0			

Total available dHeap

dHeap used

Monitoring C1100 Data Plane EXMEM

(Same on 42/43/4400)

Cli output – 4GB DRAM C1101

```
C1101#show platform hardware qfp active infrastructure exmem statistics
QFP exmem statistics
```

```
Type: Name: DRAM, QFP: 0
Total: 201326592
InUse: 82447360
Free: 118879232
```

DP Memory reserved (DRAM + IRAM)*

DP Memory used (DRAM + IRAM)

Free DP Memory (DRAM + IRAM)

- * IRAM = Internal RAM
- Mem allocation used by the system
- ~ 2 MB on ISR1100

```
C1101#show platform resources
```

```
**State Acronym: H - Healthy, W - Warning, C - Critical
```

Resource	Usage	Max	Warning	Critical	State
RP0 (ok, active)					H
Control Processor	7.70%	100%	80%	90%	H
DRAM	2339MB (63%)	3670MB	88%	93%	H
ESP0 (ok, active)					H
QFP					H
DRAM	80515KB (40%)	196608KB	80%	90%	H

Total CP DRAM used - Linux + IOS

Total CP DRAM available – Linux + IOS

80MB DP EXMEM used

197MB Total DP EXMEM Available

Monitoring DP Memory in WebUi

WebUi output – 4GB DRAM C1101

System

Inventory **Memory Utilization** CPU Utilization Redundancy

IOS Daemon Memory Usage

Memory Details	size (B)
Free	1171470432
Used	316692616
Total	1488163048

QuantumFlow Processor External Memory

Memory Type	In Use	Free	Total
DRAM	82447360	118879232	201326592
IRAM	211968	1885184	2097152
SRAM	0	0	0

Slot: RPO

Control Plane Memory (Memory Used (%) vs Device Time)

Device Time	Memory Used (%)
15:02	~65%
15:03	~65%
15:04	~65%
15:05	~65%

■ Healthy ■ Critical (>93%)

DP & EXMEM partition

DP & EXMEM partition

Monitoring DRAM – Looking for bottlenecks

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	3598604 (91%)	98MB	170MB

Example shown: 4300 @ 4GB DRAM

EXMEM / QFP (data plane) memory

- Only marginally impacted by Control plane tasks
- Memory usage will increase with complex configurations (no actual traffic needed)

Should be monitored closely when using large RIBs:

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

Memory Bottlenecks

There are 3 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)

- Could in extreme cases pose a limitation as it can't be increased
- Consider in those cases 4400 series with up to 5x the EXMEM size than C1100

Cisco ISR 1100 Key Takeaways



- Future proof device accommodating current market needs
- A true Branch-in-a-box platform.
- Routing, Comprehensive Security, Switching, Advanced LTE & WLAN - All in one small form factor platform
- Same architecture on all IOS-XE based C1100 platforms
- ISR1100-4G & 6G Available with Viptela OS
- Easy, elaborate Monitoring & Troubleshooting through WebUi



Questions



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