

ASR9K - eXR 'show memory summary' not showing all physical memory

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Introduction

On Aggregation Services Router 9000 (ASR9K) running Enhanced XR (eXR), also known as 64-bit XR, release 6.2.1 and newer the command “show memory summary” doesn’t show all internal memory documented on the corresponding Data Sheet, which might confuse some customers.

Problem Details

Below we will use an ASR9901, running 6.4.2, as an example.

According to the [datasheet](#) the integrated Route Processor (RP) has 32 GigaBytes (GB) of Random Access Memory (RAM).

```
RP/0/RSP0/CPU0:R1#show platform
```

Node	Type	State	Config state
0/RSP0/CPU0	ASR9901-RP(Active)	IOS XR RUN	NSHUT
0/FT0	ASR-9901-FAN	OPERATIONAL	NSHUT
0/FT1	ASR-9901-FAN	OPERATIONAL	NSHUT
0/FT2	ASR-9901-FAN	OPERATIONAL	NSHUT
0/0/CPU0	ASR9901-LC	IOS XR RUN	NSHUT

"Show memory summary" only shows around 27GB, despite the system recognizing the total memory as 32GB under “admin show system resources”.

```
RP/0/RSP0/CPU0:R1#show memory summary
```

```
node:      node0_RSP0_CPU0
```

```
-----  
Physical Memory: 27089M total (22185M available)  
Application Memory : 27089M (22013M available)  
Image: 4M (bootram: 0M)  
Reserved: 0M, IOMem: 0M, flashfsys: 0M  
Total shared window: 133M
```

```
RP/0/RSP0/CPU0:R1#admin show system resources
```

Node	Physical	Application	Boot				
Partition	CPUs	Shmwin	Cached	Total	Available	Cached	Total
Available							
0/RSP0-Host	32415M^	512M^	135M	31655M^	500M^	132	923M
542M	4	N/A					
0/RSP0-Admin	1940M	1072M	144M	1894M	1047M	141	2308M

```

1252M          1          N/A
0/RSP0-XR     27739M   22548M          999M   27089M  22020M          975   N/A
N/A           2          6655M
<snip>

```

The same behavior can be observed on other ASR9K devices, for example: ASR9010 with eXR
6.2.3

Looking at the [datasheet](#) A9K-RSP880-TR should have 16GB of RAM.

```

RP/0/RSP0/CPU0:R1#admin show system resources
Node                               Physical                               Application                               Boot
Partition                           CPUs    Shmwin
Total    Available    Cached    Total    Available    Cached    Total
Available
0/RSP0-Host      32415M^ 512M^          135M    31655M^ 500M^          132    923M
542M             4          N/A
0/RSP0-Admin    1940M    1072M          144M    1894M    1047M          141    2308M
1252M           1          N/A
0/RSP0-XR       27739M   22548M          999M    27089M  22020M          975    N/A
N/A             2          6655M
<snip>

```

"Show memory summary" shows 12.5GB and "admin show system resource shows 16GB

```

RP/0/RSP0/CPU0:R2#show memory summary
node:      node0_RSP0_CPU0
-----
Physical Memory: 12496M total (8465M available)
Application Memory : 12496M (8287M available)
Image: 4M (bootram: 0M)
Reserved: 0M, IOMem: 0M, flashfsys: 0M
Total shared window: 128M

```

```

RP/0/RSP0/CPU0:R2#admin show system resou
Node                               Physical                               Application                               Boot
Partition                           CPUs    Shmwin
Total    Available    Cached    Total    Available    Cached    Total
Available
0/RSP0-Host      16217M^ 276M^          29M     15837M^ 271M^          28    923M
592M             8          N/A
0/RSP0-Admin    1940M    1158M          78M     1894M    1131M          76    2308M
1451M           1          N/A
0/RSP0-XR       12796M   8488M          888M    12496M  8288M          867    N/A
N/A             6          3071M
0/1-Host       24491M   11510M          127M    23917M  11241M          124    923M
592M             6          N/A
0/1-Admin      1008M    471M           90M     984M     460M           88    2308M
1528M           1          N/A
0/1-XR         10948M   5902M          2343M   10691M  5764M          2288    N/A
N/A             5          3071M

```

However, if we check 32-bit XR, it shows the total physical memory as documented in the [datasheet](#):

```

RP/0/RSP0/CPU0:R3#show memory summary
Physical Memory: 16384M total (12600M available)
Application Memory : 16043M (12600M available)
Image: 100M (bootram: 100M)
Reserved: 224M, IOMem: 0, flashfsys: 0

```

Total shared window: 51M

```
RP/0/RSP0/CPU0:R3#show platform
```

Node	Type	State	Config State
0/RSP0/CPU0	A99-RSP-TR(Active)	IOS XR RUN	PWR,NSHUT,MON
0/RSP1/CPU0	A99-RSP-TR(Standby)	IOS XR RUN	PWR,NSHUT,MON
0/1/CPU0	A9K-MOD400-SE	IOS XR RUN	PWR,NSHUT,MON
0/1/0	A9K-MPA-20X10GE	OK	PWR,NSHUT,MON
0/1/1	A9K-MPA-2X100GE	OK	PWR,NSHUT,MON
0/2/CPU0	A99-8X100GE-SE	IOS XR RUN	PWR,NSHUT,MON
0/4/CPU0	A9K-MOD400-TR	IOS XR RUN	PWR,NSHUT,MON
0/4/0	A9K-MPA-8X10GE	OK	PWR,NSHUT,MON
0/4/1	A9K-MPA-2X40GE	OK	PWR,NSHUT,MON

Analysis

From release 6.2.1 onwards, eXR on ASR9K will use the Virtual Machine (VM) virtualisation model, switching from using Linux Container (LXC) model which was used in releases 6.1.2 and 6.1.3.

Containers can pack a lot more applications into a single physical server than a virtual machine (VM) can.

VM's can take up a lot of system resources. Each VM runs not just a full copy of an operating system, but a virtual copy of all the hardware that the operating system (OS) needs to run. This may add upto a lot of memory and CPU cycles. In contrast, all that a container requires is enough of an operating system, supporting programs and libraries, and system resources to run a specific program. However, VM's give much more flexibility to accomodate functions like In-Service Software Upgrade (ISSU).

Since Linux Containers shares the physical resources and kernel of the host, while each VM requires its own OS and virtualized hardware, this would explain why each VM is allocated a specific amount of resources from the overall host which results in the show memory summary not displaying the overall total physical memory on eXR releases 6.2.1 and later. Linux Containers can also have limit for allocated memory as it appears on NCS5000 and NCS5500 platforms and the same behavior for the 'show memory summary' CLI will be observed on these platforms.