

# Troubleshoot ASR1000-ESP10 interface stopped forwarding traffic due to "HAL\_PKTMEM-2-OUT\_OF\_RESOURCES"

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## Introduction

This document describes how to troubleshoot and verify log messages HAL\_PKTMEM-2-OUT\_OF\_RESOURCES in Aggregation Services Routers 1000 (ASR 1000) with Embedded Services Processor 10 (ESP10).

## Prerequisites

### Requirements

Cisco recommends that you have knowledge of these topics:

- ASR1k packet forwarding

### Components Used

The information in this document is based on these software versions:

- ASR1k 15.1(3)S2 and above

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

## Background Information

PAK\_PRIORITY is the mechanism devices use to specify the treatment of a packet while it is transmitted inside the device. Packets that are normally PAK\_PRIORITY tagged would be control protocol packets, for example: RIP, OSPF, EIGRP, ISIS, PPP, HDLC, etc.

Symptom

Normally this issue presents itself as the router not being able to forward traffic out of certain interfaces.

This logs can be seen on the log buffer:

```
.Apr 8 18:56:40.808 GMT: %IOSXE-2-PLATFORM: F0: cpp_cp: QFP:00 Thread:069  
TS:00006374345833820173 %HAL_PKTMEM-2-OUT_OF_RESOURCES:  
.Apr 8 18:57:41.222 GMT: %IOSXE-2-PLATFORM: F0: cpp_cp: QFP:00 Thread:047  
TS:00006374406093385973 %HAL_PKTMEM-2-OUT_OF_RESOURCES:  
.Apr 8 18:58:43.662 GMT: %IOSXE-2-PLATFORM: F0: cpp_cp: QFP:00 Thread:009  
TS:00006374468373382518 %HAL_PKTMEM-2-OUT_OF_RESOURCES
```

This log means that the device ran out of packet buffers, due to oversubscription of pak\_priority traffic.

ASR 1k won't drop PAK\_PRIORITY packets, making it easy for them to fill up the buffers not allowing other kind of traffic to go through.

## Troubleshoot

You start by checking the interfaces default values for the queues for the interface with issues:

### **R1#sh platf hard qfp active infrastructure bqs queue output default interface GigabitEthernet0/0/4**

Interface: GigabitEthernet0/0/4 QFP: 0.0 if\_h: 19 Num Queues/Schedules: 1

Queue specifics:

Index 0 (Queue ID:0x8a, Name: GigabitEthernet0/0/4)

Software Control Info:

(cache) queue id: 0x0000008a, wred: 0x8b670082, qlimit (bytes): 3281312

parent\_sid: 0x278, debug\_name: GigabitEthernet0/0/4

sw\_flags: 0x08000091, sw\_state: 0x00000801, port\_uidb: 0

orig\_min : 0 , min: 105000000

min\_qos : 0 , min\_dflt: 0

orig\_max : 0 , max: 0

max\_qos : 0 , max\_dflt: 0

share : 1

plevel : 0, priority: 0

defer\_obj\_refcnt: 0

Statistics:

tail drops (bytes): 0 , (packets): 0

total enqs (bytes): 969986824 , (packets): 6713421

queue\_depth (bytes): 262736736

You can see that the queue limit is 3281312 but the queue depth is 262736736. The amount of packets is being exceeded. This can only happen when pak\_priority packets are arriving at a high rate on the interface.

Then check drops on the QFP (Quantum Flow Processor) of the ASR 1k, you notice that there are BQSOOR (Buffering Queueing and Scheduling out of resource) drops increasing. The BQS is the Buffering, Queueing and Scheduling ASIC, this would mean that the device is not able to Buffer certain packets that are arriving due to it being saturated.

```
R1#show plat hardw qfp active statistics drop all | e _0_
```

```
-----  
Global Drop Stats Packets Octets  
-----
```

```
BqsOor          62918 8700111
```

```
R1#show plat hardw qfp active statistics drop all | e _0_
```

```
-----  
Global Drop Stats Packets Octets  
-----
```

```
BqsOor          62923 8700966
```

```
R1#show plat hardw qfp active statistics drop all | e _0_
```

```
-----  
Global Drop Stats Packets Octets  
-----
```

```
BqsOor          62942 8703894
```

Now check the bqs packet utilization to see the percentage of buffer used.

```
R1#show platform hardware qfp act bqs 0 packet utilization
```

```
Packet buffer memory utilization details:
```

```
Total: 256.00 MB
```

```
Used : 253.44 MB
```

```
Free : 2620.00 KB
```

```
Threshold Values:
```

```
Out of Memory (OOM) : 255.96 MB, Status: False
```

```
Vital (> 98%) : 253.44 MB, Status: True
```

```
Out of Resource (OOR) : 217.60 MB, Status: True
```

```
Utilization: 99 %
```

The utilization is 99%, so this confirms device is running out of resources for the buffer.

You now need to locate on which group of buffers are the packets in.

There are 4 options:

- QoS queues created via MQC run the command “**Show policy-map int | incl queue depth|limit**”

- Default queues for output interface run the command “**Sho plat hard qfp act inf bqs que out def all | incl queue\_depth**”
- Recycle queues used for infrastructure run the command “**Sho plat hard afp act inf bqs queue out recycle all | incl queue\_depth**”
- IPC (Interprocess Communication Protocol) queues run the command “**Sho plat hard afp act inf bqs queue out ipc | incl queue\_depth**”

R1#**show platform hardware qfp act inf bqs que out def all | i queue\_de**

```
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
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queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 262736736
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
queue_depth (bytes): 0
```

R1#**show platform hardware qfp act inf bqs que out recy all | i queue\_de**

```
queue_depth (packets): 0
queue_depth (packets): 0
queue_depth (packets): 0
queue_depth (packets): 0
queue_depth (packets): 0
queue_depth (packets): 0
queue_depth (packets): 0
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queue_depth (packets): 0
queue_depth (packets): 0
queue_depth (packets): 0
queue_depth (packets): 0
queue_depth (packets): 0
```

R1#**show platform hardware qfp act inf bqs que out ipc | i queue\_de**

```
queue_depth (bytes): 0
```

queue\_depth (bytes): 0  
queue\_depth (bytes): 0

You see that the packets are in the default queue.

Normally this issue can be associated with a storm of PAK\_PRIORITY marked packets or DDOS attacks that might be sent marked as PAK\_PRIORITY in order to interrupt packet forwarding, for this CoPP(Contro Plane Policing) might be needed to drop packets that are not coming from a valid source.

Flow-control can also cause this in which case, you would also see pause inputs increase on the interface.

#### R1#show int gi0/0/4

```
GigabitEthernet0/0/4 is up, line protocol is up
Hardware is SPA-10X1GE-V2, address is 74de.eeee.cccc (bia 74de.eeee.cccc)
Description: inmumt005rtwn01-G0/2 Airtel 7779861 300Mbps/1Gbps
Internet address is 10.1.1.1/30
MTU 9000 bytes, BW 300000 Kbit/sec, DLY 10 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation ARPA, loopback not set
Keepalive not supported
Full Duplex, 1000Mbps, link type is force-up, media type is LX
output flow-control is on, input flow-control is on
ARP type: ARPA, ARP Timeout 04:00:00
Last input 00:00:02, output 00:00:01, output hang never
Last clearing of "show interface" counters 8w5d
Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 11
Queueing strategy: Class-based queueing
Output queue: 0/40 (size/max)
30 second input rate 0 bits/sec, 0 packets/sec
30 second output rate 0 bits/sec, 0 packets/sec
16653945560 packets input, 6397725725851 bytes, 91 no buffer
Received 339 broadcasts (0 IP multicasts)
0 runts, 0 giants, 0 throttles
52 input errors, 52 CRC, 0 frame, 0 overrun, 0 ignored
0 watchdog, 2095792 multicast, 166107198 pause input
12240362564 packets output, 3785983938723 bytes, 0 underruns
```