Call Admission Control

Call Admission Control (CAC) is a deterministic and informed decision that is made before a network session is established and is based on whether the required network resources are available to provide suitable quality of service (QoS) for the new session.

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Overview of Call Admission Control for IP Sessions

In Service Provider WiFi deployments, the mobility of subscribers contributes to more dynamics when compared to wireline broadband deployments. This mobility translates into a high-average session churn rate and potential session count peaks during busy periods. For the Intelligent Wireless Access Gateway (iWAG) to function effectively under such conditions, the Call Admission Control (CAC) feature must be configured to help control IPoE session establishment.

Note In this document, a Forwarding Processor (FP) corresponds to the Embedded Services Processor (ESP) component on the ASR 1000 Series Aggregation Services Routers.

The following CAC features are implemented from Cisco IOS XE Release 3.11S onwards:

- A threshold is set for the maximum number of authenticated subscribers on the router, including the Point-to-Point Protocol over Ethernet (PPPoE) and IP over Ethernet (IPoE) sessions, but not the walk-by sessions.
- To prevent low-memory conditions, the router stops accepting a session when the committed memory from a route processor (RP) or a FP is above a specific percentage value. This also enables you to upgrade the hardware and memory with ease.
- To prevent low-memory conditions from occurring, the router stops accepting a session when the used memory from the Cisco Quatum Flow Processor (QFP) is above a specific percentage value.
- To prevent high Buffer, Queue, and Scheduler (BQS) active queue usage, the router stops accepting new sessions when the BQS active queue usage is above a specific percentage value.
- To prevent high CPU load conditions, the router stops accepting new sessions when the per-core CPU utilization per active FP or RP is above a specific percentage value.

Note After the configured session limit under CAC is attained, single-stack sessions cannot be converted into dual-stack sessions.

Call Admission Control-Supported IP Session Initiators on a Data Plane

The following IP session initiators are supported by the Call Admission Control (CAC) on a data plane:

- Unclassified MAC address IPv4 initiator
- Unclassified IPv4 initiator
- Dynamic Host Configuration Protocol v4 (DHCPv4) initiator
- Unclassified MAC address IPv6 initiator types:
  - IPv6 Neighbor Discovery (ND) packets (RS/NS/NA) that are dropped by the control plane (i.e. RP)
  - IPv6 data packets that are dropped at the data plane (i.e. FP)

Platform System Resource Monitor

A platform system resource monitor process is created when any of the CAC features listed in the following table are configured on the Cisco ASR 1000 Aggregated Services Router platform using the corresponding command:

Table 1: CAC Features and their Platform System Resource Monitor Commands

CAC Feature	Command
CPU	**platform subscriber cac cpu**

CAC Feature	Command
MEM	**platform subscriber cac mem**
BQS	**platform subscriber cac bqs**

The platform resource monitor process is disabled when all of the above CAC features are disabled on the platform.

The platform resource monitor process periodically monitors system resources such as CPU, memory, and Buffer, Queue, and Scheduler (BQS). You can set the periodic monitoring interval using the following command:

platform subscriber cac timer *interval*

The timer value specifies the frequency at which the CAC process is polled to check platform resources. The valid interval value is in the range of 1 to 10 seconds with a granularity of 1 second. The default value is 5 seconds.

Note Committed Memory is used for monitoring subscriber CAC memory resource utilization. It provides an estimate of the percentage of RAM that is needed to ensure a 99.99 percent guarantee that there is never an Out Of Memory (OOM) condition during worst-case conditions. Normally, the kernel will over commit memory by sharing the memory between several processes. A problem with the actual memory availability can be seen only when the memory is being used. While the Committed Memory is a good indicator of the memory status, the value is less dynamic. That is, if you use the **platform subscriber cac mem** command as part of CAC, a session may stay rejected for a long period of time if it reaches the memory limit. While this may be a good indicator of the decreasing memory resources, it may not be useful in production environments. We recommend that if you are using the **platform subscriber cac mem** command, ensure that the values are at least at the 95 percent threshold to enable additional troubleshooting.

Example: Configuring CAC to monitor platform specific resources, such as forwarding processor (FP) CPU, FP memory, and Quantum Flow Processor (QFP) memory.

```
platform subscriber cac timer 5      #configures the frequency at which the CAC process
polls or monitors the PD resources
platform subscriber cac bqs active-queues 95
platform subscriber cac mem rp 95
platform subscriber cac mem fp 95
platform subscriber cac mem cc 95
platform subscriber cac mem qfp 95
platform subscriber cac cpu rp 95
```

Example: Configuring CAC to monitor IOS CPU load, maximum number of sessions, and session charges (or calls per second).

```
call admission new-model
call admission limit 1580
call admission cpu-limit 90
call admission session-limit 128000
call admission ip 10 1
```

CAC is applicable to any initiator for IP sessions such as unclassified MAC or DHCP-initiated sessions. To enable CAC, the **call admission new-model** command must always be configured.

The **call admission limit** command specifies the total session charge the system will accept before it starts rejecting incoming calls. In the above example, the cpu-limit of 90 means incoming calls will be dropped when the measured 5-second CPU utilization is 90% or higher.

Depending on which condition occurs first, cpu-limit or call admission limit (charge limit), the IP sessions will be rejected. The **call admission ip** command specifies the charge for a single IP session. In the example given above, the charge for a single session is 10 is and lifetime of the fixed charge (2s) is 1.

In the example above, CAC will accept 79 CPS based on the following calculation:

```
Approximate CPS = (Call admission limit)/(Single session charge * Charge lifetime)
                = 1580/(10 * (1*2))
                = 79 CPS
```

Examples

The following examples show how to enable the Call Admission Control (CAC) feature, and how to display the CAC statistics.

Enabling the Call Admission Control Feature

The **platform subscriber cac cpu rp** *value* command enables the CAC feature based on the per-core average CPU load on the active RP:

```
Router# config t
Router#(config)# platform subscriber cac cpu rp 95
Router#(config)# end
```

No new IP session will be allowed in the system if the CPU on the active RP is greater than 95 percent; also, the FSOL packet is immediately dropped at the data plane layer.

Displaying the Call Admission Control Feature Statistics in Detail

The **show call admission statistics detailed** command displays the CAC statistics in detail. It also provides packet drop statistics for each CAC type.

Note The **show call admission statistics detailed** command only displays the details of platform resources, which are already configured. For example, the detail for the MEM_RP field is displayed in the output, only if it has been configured. Otherwise, it is not displayed in the output.

```
Router# show call admission statistics detailed

CAC New Model (SRSM) is ACTIVE
CAC statistics duration:  1873(seconds)
Total calls rejected 29, accepted 1749
Current hardware CAC status is: Not Dropping
Total call Session charges: 0, limit 0

CPU utilization: Five Sec Average CPU Load, Current actual CPU: 1%, Limit: 2%
Total count of session 1659, Limit: 128000

CAC Events:
```

```
        Reject reason          Times of activation   Duration of activation(secs)
Rejected calls
        CPU-limit:                      9                     42
 9
        SessionCharges:                 18                    42
 18
        LowPlatformResource:            8                     832
 1
        Session Limit:                  1                     47
 1

Total dropped FSOL packets at data plane: 4581  # total packets dropped at PD is 4581
  IOSD_CPU_OVERLIMIT_DROPS:     2381    # 2381 packets dropped due to IOS CPU overload
  CPS_OVERLIMIT_DROPS:          1892    # 1892 packets dropped due to CPS over limit
  TOTAL_SESSION_OVERLIMIT_DROPS:189     # 189 packets dropped due to total session limit
  CPU_RP_OVERLIMIT_DROPS:       20      # 20 packets dropped due to RP CPU overload
  CPU_FP_OVERLIMIT_DROPS:       20      # 20 packets dropped due to FP CPU overload
  MEM_RP_OVERLIMIT_DROPS:       20      # 20 packets dropped due to RP memory over limit
  MEM_FP_OVERLIMIT_DROPS:       20      # 20 packets dropped due to FP memory over limit

  MEM_QFP_OVERLIMIT_DROPS:      20      # 20 packets dropped due to QFP memory over limit
  MEM_CC_OVERLIMIT_DROPS:       19      # 19 packets dropped due to CC memory over limit

platform resource low: FALSE
platform resource polling interval: 5 seconds
    BQS_QUEUE       : current:  0%,  limit: 95%,  overlimit: FALSE, overlimit_seconds: 0
    MEM_RP          : current: 67%,  limit: 95%,  overlimit: FALSE, overlimit_seconds: 251
    MEM_FP          : current:  8%,  limit: 95%,  overlimit: FALSE, overlimit_seconds: 494
    MEM_CC          : current: 52%,  limit: 95%,  overlimit: FALSE, overlimit_seconds: 829
    MEM_QFP         : current: 11%,  limit: 95%,  overlimit: FALSE, overlimit_seconds: 778
    CPU_RP          : current:  7%,  limit: 95%,  overlimit: FALSE, overlimit_seconds: 383
    CPU_FP          : current: 11%,  limit: 95%,  overlimit: FALSE, overlimit_seconds: 697
```

Reference

Related Documents

Related Topic	Document Title
Cisco IOS commands	*Cisco IOS Master Commands List, All Releases*
iWAG commands	Cisco IOS Intelligent Wireless Access Gateway Command Reference

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature.	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for Call Admission Control

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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Table 2: Feature Information for Call Admission Control

Feature Name	Releases	Feature Information
Call Admission Control	Cisco IOS XE Release 3.11	Call Admission Control (CAC) is a deterministic and informed decision that is made before a network session is established and is based on whether the required network resources are available to provide suitable quality of service (QoS) for the new session.