VSM Configuration Commands

Generic Commands

shutdown

Syntax   [**no**] **shutdown**

Context   config>vsm>ccag

Description   This command controls the administrative state of the *ccag-id* the command is executed under. Upon creation, the default state of a CCAG is to be administratively up which corresponds to the no shutdown form of the command. If the CCAG must be forced to be operationally down, the **shutdown** command will place the CCAG into an administratively down state causing the operational state to also be down.

When a CCAG is shutdown, all SAPs associated with the CCAG will be operationally down. An operationally down SAP cannot be used for forwarding packets. If the SAP is part of the VPLS service, all MAC entries associated with the SAP will be removed from the VPLS FDB and the SAP will be removed from the flooding domain of the VPLS. If the SAP is part of an IES service, the associated IP interface will be set to an operationally down state. Network IP interfaces bound to a shutdown CCAG will be operationally down as well.

Executing the no shutdown command sets the CCAG to the default up administrative state. As long as at least one member CCA in the CCAG is active, all SAPs and network IP interfaces associated with the CCAG will be allowed to enter the operationally up state.

Default   **no shutdown**

description

Syntax   **description** *description-string*
no description

Context   config>vsm

Description   This command defines an informational string associated with the CCAG. The description string may be up to 80 characters long and contain only printable ASCII characters. Each time this command is successfully executed, any previous description string will be overwritten. If the command fails due to improper string definition, a previously successful description string will remain.

The **no** form of the command removes any current description string from the CCAG.

Default   **None** (A description string must be explicitly defined)

Parameters   *description-string* — Defines the string of printable ASCII characters, up to 80 characters that will be stored and displayed as a description for the *ccag-id* that the **description** command is executed under. The string must be entered in double quotation marks if the string contains spaces.

VSM CLI Tree Node Commands

vsm

Syntax   [**no**] **vsm**

Context   config

Description   This command changes the current CLI context to the CCA nodal context. The CCA nodal context is where CCAGs are created and maintained.

The CCA nodal context always exists and cannot be removed.

ccag

Syntax   **ccag** *ccag-id* [**create**]
no ccag *ccag-id* [**force**]

Context   config>vsm

Description   This command creates a Cross Connect Aggregation Group (CCAG). A CCAG represents a group of CCAs as a common forwarding entity. Objects requiring a CCA cross connect function are mapped to a CCAG, not the individual CCAs within the CCAG. The CCAG treats each active member CCA as a possible destination when forwarding packets between the cross connected objects mapped to the CCAG. The system uses both conversation hashing functions and direct service mappings to determine the load sharing distribution between the active CCAs. All packets for a given conversation flow through the same CCA to preserve packet order. Packet ordering may be momentarily affected during convergence events when CCAs are dynamically added or removed from the active list.

The CCAG context is used to manage the following functions per CCAG instance:

- Informational description of the CCAG
- Administrative state of the CCAG
- Alpha path bandwidth and weight parameters
- Beta path bandwidth and weight parameters
- CCA total bandwidth limit
- CCA membership in the CCAG

The **no** form of the command removes an existing *ccag-id* from the system. Once the specified *ccag-id* is removed from the system, it may not be referenced by any cross connect objects. If the **force** keyword is not specified, the **no ccag** *ccag-id* command will fail if the specified *ccag-id* has one or more *cc-ids* associated with it. In the event that the specified *ccag-id* does not exist, the **no ccag** *ccag-id* command will return to the current CLI context without any change to the system.

Default   **None** (each CCAG context must be explicitly created to be used)

Parameters   *ccag-id* — Identifies the CCAG instance that the system is creating or editing. Up to eight CCAGs may be created within the system. A *ccag-id* must be created on the system prior to creating cross connect object associations.

After a *ccag-id* is created, a CCAG SAP may be created with an association with the *ccag-id*. A CCAG SAP is identified by a concatenation of an existing *ccag-id* and a *cc-id*. The *cc-id* must match the *cc-id* of the other object the CCAG SAP is paired with on the *ccag-id*. The created *ccag-id* may also be associated with a network IP interface. A network IP interface is bound to the *ccag-id* through the port command in the config router interface ip-interface context and references the *ccag-id* and a *cc-id*. Again, the *cc-id* must match the other object the IP interface is paired with on the *ccag-id*.

Once created, the **ccag** *ccag-id* command may be executed to enter the *ccag-id* instance for the purpose of editing the CCAG parameters or operational state.

Values   1 through 8

create — The **create** keyword explicitly indicates that the specified *ccag-id* is being created. Handling the inclusion or exclusion state of the create keyword is dependent on the system environment variable create.

When the system environment variable create is enabled, the system requires the explicit use of the create keyword when creating objects such as a CCAG. If the keyword is not included and the *ccag-id* has not already been created, an error will occur and the CLI will remain at the current CLI context. This is designed to prevent the inadvertent creation of a CCAG instance in the event where the wrong *ccag-id* is specified during an attempt to edit an existing CCAG instance. If the create keyword is specified, the *ccag-id* will be created given the *ccag-id* is within the proper range for CCAG identifiers.

When the system environment variable create is disabled (using the no create command), the system will not require the create keyword when creating a CCAG instance. In the event that the ccag command is issued with a *ccag-id* that previously had not been created, that *ccag-id* will be considered available for cross connect associations and bindings.

Once a *ccag-id* has been created, the create keyword is ignored when a ccag command is executed with that *ccag-id*. The **ccag** *ccag-id* create command will only result in a CLI context change to the specified CCAG instance for a pre-existing *ccag-id*.

force — The **force** keyword removes the specified *ccag-id* regardless of the presence of one or more *cc-id*. If a SAP exists on the *ccag-id*, the force keyword will cause the SAP to be removed from the configuration. If a network IP interface is bound to the *ccag-id*, the interface will be silently unbound from the *ccag-id*. The force keyword is intended as a time saving feature, preventing the need to first remove all service and network associations with the *ccag-id*.
It is not required to first remove all CCAs from the CCAG prior to deleting the CCAG from the system. When the CCAG is removed, association with all member CCAs is automatically removed.

access

Syntax   **access**

Context   config>vsm>ccag *ccag-id*

Description   This command changes the current CLI context to the CCAG access nodal context. The access nodal context contains the qos adaptation command used to control the SAP QoS distribution across the active member CCAs within the CCAG.

The CCAG access nodal context always exists and cannot be removed.

adapt-qos

Syntax   **adapt-qos {link | distribute}**
no adapt-qos

Context   config>vsm>ccag *ccag-id*>access

Description   This command controls how the CCAG SAP queue and virtual scheduler buffering and rate parameters are adapted over multiple active CCAs. Two adaptation modes are supported; link and distributed.

The **no** form of the command returns the CCAG access QoS adaptation rule to the default setting of distribute.

Parameters   **link** — The **link** keyword is mutually exclusive with the **distributed** keyword. When **link** is specified, the CCAG will create the SAP queues and virtual schedulers on each CCA with the actual parameters defined in the QoS and scheduler policies. This mode is useful when conversation hashing places all or most traffic over a single CCA.

    Values   link or distribute

    Default   **distribute**

distribute — The **distribute** keyword is mutually exclusive with the **link** keyword. When **distribute** is specified, the CCAG SAP queues and schedulers on each CCA will receive a portion of the defined parameters in the QoS and scheduler policies. The portion is decided on an IOM basis with the ratio determined by the number of active CCA members on the IOM relative to the total number of active members within the CCAG. The following equation may be used to determine the actual ratio:

IOM-parameter-value = (IOM-active-CCA / total-active-CCA) * policy-parameter-value

    Values   link or distribute

    Default   **distribute**

cca-rate

Syntax	**cca-rate** *kilobits-per-second* **no cca-rate**
Context	config cca>ccag *ccag-id*
Description	This command defines a maximum forwarding rate for each CCA member within the CCAG. Support of setting a maximum CCA forwarding rate is provided to prevent overrunning the ingress forwarding plane when sub-line rate ingress features are enabled. The primary ingress feature requiring this support is dual ingress access queuing. When dual ingress queuing is enabled on cross connect SAPs, the CCA forwarding rate should be limited to a rate that prevents packet loss due to ingress forwarding congestion. The specified limit is applied to the aggregate alpha and beta path bandwidth. The **no** form of the command removes CCA bandwidth rate limiting.
Parameters	*kilobits-per-second —* Defines the maximum CCA rate in kilobits per second. The actual Kilobits per second rate is rounded up to the nearest 50Mbps increment.

> **Values** 0 — 100000000, max
>
> **Default** **max**

member-cca

Syntax	[**no**] **member-cca** *card-slot/mda-number*
Context	config>vsm>ccag *ccag-id*
Description	This command adds and deletes provisioned CCAs from the CCAG. The only requirement to defining a CCA member is that the defined MDA position be provisioned as type cca. A CCA does not need to be populated in the defined MDA position prior to membership definition. A non-populated CCA member is considered inactive from a CCAG perspective. A populated CCA member will become active once it has been initialized by the system. A CCA member may be removed from the CCAG or depopulated from MDA slot at any time. At least one member CCA must be active on the CCAG for the CCAG to be placed in the operational state. Up to 8 member CCAs can be configured per CCAG. The **no** form of the command removes a CCA member from the CCAG. If the CCA does not exist or is not currently a member of the CCAG, no error is returned. Once removed from the CCAG, all forwarding through the specified CCA stops.
Parameters	*card-slot/mda-number —* Identifies the system MDA slot that is will be added as a member CCA for the CCAG. The specified MDA slot must have been pre-provisioned as type cca for the membership command to be successful.
	card-slot — Defines the IOM slot the provisioned CCA is or will be populated. It is separated from the following mda-position portion of the parameter by a forward slash (/).

> **Values** 1 through 10 (chassis type dependent)

mda-position — The mda-position portion of the parameter defines the MDA slot number on the IOM the CCA is or will be populated. It must be separated from the preceding card-slot portion of the parameter by a forward slash (/).

Values   1 or 2 (IOM type dependent)

VSM Path Commands

path

Syntax   **path {a | b}**

Context   config>vsm>ccag *ccag-id*

Description   This command changes the current CLI context to the path nodal context. The CCA path nodal context is where each CCA path bandwidth, buffer and accounting parameters are maintained. The path context command must be specified with either the a or b keyword specifying the CCA path context to be entered.

Each CCA is divided into two distinct paths for bandwidth management purposes. One path is identified as alpha (a) and the other beta (b). The significance of each path for bandwidth distribution is dependent on the relative path weights each path is given in relationship to the other. A maximum path rate may also be defined allowing the provisioning of a maximum cap on the aggregate bandwidth allowed to the SAP or IP interface queues associated with the path. Each path is separated into three other contexts; SAP-2-SAP (sap-sap), SAP-2-Net (sap-net) and Net-2-SAP (net-sap). Each path context allows for the definition of the features that are usually associated with physical ports on other MDAs in the system. These include buffer pool management, ingress network queue definitions and accounting policy control.

The CCA path nodal contexts always exist and cannot be removed.

Parameters   **a** — The **a** keyword is mutually exclusive to the **b** keyword and defines the CLI CCA path context to be the alpha path. Either the **a** or **b** path must be specified. If the **a** or **b** keyword is not present, the path command will fail without changing the current CLI context.

b — The **b** keyword is mutually exclusive to the **a** keyword and defines the CLI CCA path context to be the beta path. Either the **a** or **b** path must be specified. If the **a** or **b** keyword is not present, the path command will fail without changing the current CLI context.

rate

Syntax   **rate** *kilobits-per-second* [**aggregate** | **cca**]
no rate

Context   config>vsm>ccag *ccag-id*>path {a | b}

Description   This command defines a specific bandwidth rate limitation for the alpha or beta paths on each member CCA in the CCAG. Use of the rate command is optional. When the rate command is not executed or the no rate command is executed, bandwidth allocated to the path is not limited to a specific rate.

Path limiting on a CCA prevents the aggregate bandwidth for the path from exceeding a certain rate. If the rate is exceeded, the CCA will backpressure all active egress queues sending on that path.

Access to the available bandwidth is dependent on the various parameters associated with each object egress queue.

The specified rate may be defined as an aggregate path rate for all CCAs in the CCAG or it may be defined as a per CCA path rate.

The **no** form of the command removes path rate limiting from all CCAs in the CCAG membership list for the path.

Default   **None** (rate limiting the alpha path must be explicitly defined)

Parameters   *kilobits-per-second —* Defines the path rate in kilobits per second. The **aggregate** and **cca** keywords specify how the defined rate is applied on a per CCA basis. The actual rate at each CCA is rounded up to the nearest 50Mbps.

   Values   0 — 100000000, max

   Default   **max**

aggregate — The **aggregate** keyword is optional and mutually exclusive to the **cca** keyword. When **aggregate** is specified, the defined rate is divided among the CCAs in the CCAG member list based on the number of active CCAs. If three CCAs are active, the rate is divided by three and the result is applied to each active CCA. If a fourth CCA becomes active on the CCAG, the defined rate is then divided by four with the result applied to each CCA member on the CCAG. The actual rate at each CCA is implemented in 50Mbps increments. The system will adapt the specified rate to the best rate available per CCA.

   Default   When the kilobits-per-second parameter is specified, the default keyword is aggregate.

cca — The **cca** keyword is optional and mutually exclusive to the **aggregate** keyword. When **cca** is specified, the defined rate is applied to all CCAs in the CCAG member list. The actual rate at each CCA is implemented in 50Mbps increments. The system will adapt the specified rate to the best rate available per CCA.

weight

Syntax   **weight** *path-weight*
         no weight

Context   config cca>ccag ccag-id>path {a | b}

Description   This command defines a scheduling weight to the aggregate output of the alpha and beta paths. The specified weight is used to calculate a scheduling percentage for each path. The percentage for each path is based on:

   Alpha scheduling percentage = alpha-path-weight / (alpha-path-weight + beta-path-weight)
   Beta scheduling percentage = blue-path-weight / (alpha-path-weight + beta-path-weight)

Based on the above calculation, the sum of the alpha and beta scheduling percentage always equals 100 percent. When one path is not using all of its available scheduling bandwidth, the other path may use the remainder.

The **no** form of the command returns the path-weight for the path to the default value of 50.

Parameters   *path-weight —* The path-weight parameter is required and is used by the system to determine the scheduling percentage for both paths. Changing the path-weight for one path affects both paths scheduling percentage. The resulting scheduling percentage changes are applied to all CCAs in the CCAG membership list.

     Values   1 to 100

     Default   **50**

sap-sap

Syntax   **sap-sap**

Context   config cca>ccag ccag-id>path {a | b}

Description   This command changes the current CLI context to the path SAP-SAP nodal context. This context contains the ingress and egress buffer pool configuration commands. The sap-sap>path context is associated with all SAPs defined on the CCAG path (alpha or beta depending on the path context) that cross connect to a SAP on the other path.

The CCA path SAP-SAP nodal context always exists and cannot be removed.

mac

Syntax   [**no**] **mac** *mac-address*

Context   config>vsm>ccag *ccag-id*>path {a | b}
config>vsm>ccag *ccag-id*>path {a | b}>sap-net
config>vsm>ccag *ccag-id*>path {a | b}>net-sap

Description   This command overrides the default MAC address for the path's context.

The **no** form of the command returns the in-use MAC address for the path's context to the default MAC from the chassis MAC pool.

Parameters   *mac-address —* Defines the IEEE MAC address that is to be associated with the path's context.

     Values   Any valid IEEE MAC source MAC address
                 (6 byte address expressed in hexadecimal notation with each byte separated by a dash (-)).

     Default   The path's default sap-sap MAC address is derived from the chassis MAC address pool.

mtu

Syntax   **mtu** *mtu-size*
no mtu

Context   config>vsm>ccag *ccag-id*>path {a | b}>sap-sap
config>vsm>ccag *ccag-id*>path {a | b}>sap-net
config>vsm>ccag *ccag-id*>path {a | b}>net-sap

Description   This command overrides the default port level MTU for the path's context.

The **no** form of the command returns the MTU for the path's sap-sap context to the default MTU.

Parameters   *mtu-size —* Defines the Ethernet MTU that is to be associated with the path's context.

Default   **1518** - sap-sap
1518 - sap-net
9212 - net-sap

Values   512 — 9212 bytes

egress

Syntax   **egress**

Context   config>vsm>ccag *ccag-id*>path {a | b}>sap-sap
config>vsm>ccag *ccag-id*>path {a | b}>sap-net
config>vsm>ccag *ccag-id*>path {a | b}>net-sap

Description   This command changes the current CLI context to the path's context. This context contains the egress buffer pool configuration commands.

The CCA path's egress nodal context always exists and cannot be removed.

pool

Syntax   **pool**

Context   config>vsm>ccag *ccag-id*>path {a | b}>sap-sap>egress
config>vsm>ccag *ccag-id*>path {a | b}>sap-sap>ingress
config>vsm>ccag *ccag-id*>path {a | b}>sap-net>egress
config>vsm>ccag *ccag-id*>path {a | b}>sap-net>ingress
config>vsm>ccag *ccag-id*>path {a | b}>net-sap>egress

Description   This command changes the current CLI context to the path's nodal context. This context contains the egress buffer pool configuration commands. The CCA path's egress or ingress pool nodal context always exists and cannot be removed.

resv-cbs

Syntax   [no] **resv-cbs percentage-of-pool**

Context   config>vsm>ccag *ccag-id*>path {a | b}>sap-sap>egress>pool
config>vsm>ccag *ccag-id*>path {a | b}>sap-sap>ingress>pool
config>vsm>ccag *ccag-id*>path {a | b}>sap-net>egress>pool
config>vsm>ccag *ccag-id*>path {a | b}>sap-net>ingress>pool
config>vsm>ccag *ccag-id*>path {a | b}>net-sap>egress>pool

Description   This command defines the percentage of the buffer pool that is considered reserved for the CBS buffer allocation for queues created in the path's pool context.

The **no** form of the command returns the reserved portion of the buffer pool to the default percentage.

Parameters   *percentage-of-pool* — The percentage-of-pool parameter defines the percentage of the buffer pool that is not considered shared. The shared portion of the pool is used by queues that have crossed their CBS buffer threshold and is subject to the WRED slope functions. The reserved portion of the pool is used by queues that have not crossed their CBS threshold. The aggregate CBS on the queues associated with the pool may oversubscribe the resv-cbs percentage. If the reserved portion is oversubscribed and the in-use reserved buffers exceed the defined percentage, buffers are removed from the shared portion of the pool.

> **Values**   1 to 100 (percent)
>
> **Default**   **30**

slope-policy

Syntax   **slope-policy slope-policy-name**
no slope-policy

Context   config>vsm>ccag *ccag-id*>path {a | b}>sap-sap>egress>pool
config>vsm>ccag *ccag-id*>path {a | b}>sap-sap>ingress>pool
config>vsm>ccag *ccag-id*>path {a | b}>sap-net>egress>pool
config>vsm>ccag *ccag-id*>path {a | b}>sap-net>ingress>pool
config>vsm>ccag *ccag-id*>path {a | b}>net-sap>egress>pool

Description   This command defines the slope policy used to mange the shared portion of the buffer pools WRED slopes. The commands in the policy control the administrative state of the slopes, the start and knee points of each slope and the time-average-factor for the weighted average buffer utilization calculation.

The **no** form of the command configures the default slope policy as the managing policy for the buffer pool.

Parameters   *slope-policy-name* — Defines the name of the WRED slope policy used to manage the WRED slopes in the shared portion of the buffer pool.

> **Values**   Any existing slope policy name.

ingress

Syntax   **ingress**

Context   config>vsm>ccag *ccag-id*>path {a | b}>sap-sap
config>vsm>ccag *ccag-id*>path {a | b}>sap-net

Description   This command changes the current CLI context to the path's context. This context contains the ingress buffer pool configuration commands.
The CCA path's ingress nodal context always exists and cannot be removed.

sap-net

Syntax   **sap-net**

Context   config>vsm>ccag *ccag-id*>path {a | b}

Description   This command changes the current CLI context to the path sap-net nodal context. This context contains the ingress and egress buffer pool configuration commands. The sap-net>path context is associated with all SAPs defined on the CCAG path (alpha or beta depending on the path context) that cross connect to a network IP interface on the other path.
The CCA path sap-net nodal context always exists and cannot be removed.

slope-policy

Syntax   **slope-policy** *slope-policy-name*
no slope-policy

Context   config>vsm>ccag *ccag-id*>path {a | b}>sap-net>ingress>pool

Description   This command defines the slope policy used to mange the shared portion of the buffer pools WRED slopes. The commands in the policy control the administrative state of the slopes, the start and knee points of each slope and the time-average-factor for the weighted average buffer utilization calculation.

The **no** form of the command configures the default slope policy as the managing policy for the buffer pool.

Parameters   *slope-policy-name —* The slope-policy-name parameter defines the name of the WRED slope policy used to manage the WRED slopes in the shared portion of the buffer pool.

        Values   Any existing slope policy name.

net-sap

Syntax   **net-sap**

Context   config>vsm>ccag *ccag-id*>path {a | b}>net-sap

Description   This command changes the current CLI context to the path net-sap nodal context. The net-sap nodal context contains the network accounting and queue policies and the egress buffer pool configuration commands. The net-sap path context is associated with all network IP interfaces bound to the CCAG path (alpha or beta depending on the path context) that cross connects to a SAP on the other path. The CCA path net-sap nodal context always exists and cannot be removed.

mtu

Syntax   **mtu** *mtu-size*
         no mtu

Context   config>vsm>ccag *ccag-id*>path {a | b}>

Description   This command overrides the default port level MTU for the path's net-sap context.

    The **no** form of the command returns the MTU for the path's net-sap context to the default MTU.

Parameters   *mtu-size* — The mtu-size, in bytes, defines the Ethernet MTU that is to be associated with the path's net-sap context.

        Default   **1522**

accounting-policy

Syntax   **accounting-policy** *accounting-policy*
         no accounting-policy

Context   config>vsm>ccag *ccag-id*>path {a | b}>net-sap

Description   This command defines the network accounting policy that will be used to define which statistics will be collected when the **collect-stats** command is enabled in the path's net-sap context.

    The **no** form of the command reverts the path's net-sap context statistics billing collection to the statistics defined in the default network accounting policy.

Parameters   *accounting-policy* — The accounting-policy parameter is required and identifies which set of statistics will be collected for billing output.

        Values   Any existing network accounting policy in the system.

        Default   **The default network accounting policy**

collect-stats

Syntax [**no**] **collect-stats**

Context config>vsm>ccag *ccag-id*>path {a | b}>net-sap

Description This command enables collecting stats on the path's net-sap context. When enabled the statistics defined in the accounting-policy accounting-policy command will be collected according to the specifications in the policy.

The **no** form of the command disables network billing statistics collection on the net-sap context.

Default Network statistics are not collected by default on the net-sap context.

queue-policy

Syntax **queue-policy** *queue-policy-name*
no queue-policy

Context config>vsm>ccag *ccag-id*>path {a | b}>net-sap

Description This command defines the egress network queues used by IP interfaces bound to the path's net-sap context. The specified *queue-policy-name* defines the number of queues, the rate and buffering parameters for the queues and the forwarding class mappings to the queues.

The **no** form of the command reverts the path's net-sap network IP interface queues to the systems default queue policy.

Parameters *queue-policy-name* — Specifies which existing Queue Policy will define the queuing structure for network IP interfaces bound to the path's net-sap context.

> **Values** Any existing queue policy on the system.

> **Default** The default queue policy is used when another is not specified.

egress

Syntax **egress**

Context config>vsm>ccag *ccag-id*>path {a | b}>net-sap

Description This command changes the current CLI context to the path>net-sap>egress nodal context. This context contains the egress buffer pool configuration commands.

The CCA path net-sap egress nodal context always exists and cannot be removed.

pool

Syntax **pool**

Context config>vsm>ccag *ccag-id*>path {a | b}>net-sap>egress

Description This command changes the current CLI context to the path>net-sap>egress pool>nodal context. This context contains the egress buffer pool configuration commands.

The CCA path net-sap egress pool nodal context always exists and cannot be removed.

Related Commands

Refer to the 7750 SR OS Interface Configuration Guide for more card, MDA, and port command information. Refer to the 7750 SR OS Services Guide for details about configuring specific service parameters.

mda

Syntax **mda** *mda-slot*
no mda *mda-slot*

Context config>card

Description This command provisions an adaptor into an MDA position on an IOM slot. The provisioned MDA may or may not exist in the system at the time of provisioning. If the provisioned MDA does not currently exist in the specified MDA position number, it is considered to be a 'ghost' MDA. Ports and other resources on a ghost MDA may be configured once the MDA is provisioned. When a proper MDA matching the provisioned MDA type is inserted into the IOM MDA position, forwarding though the MDA based on configured services or network interface will be available once the MDA has been properly initialized.

A Versatile Service Module (VSM) is provisioned into the system in the same manner as all other adaptors using MDA slots. Once a VSM is provisioned, independent of it actually existing in the system on the specified slot and MDA position, the VSM may be defined as a member of a CCAG (Cross Connect Adaptor Group). A VSM inserted into the system prior to provisioning is not available for CCAG membership and will be treated as an unprovisioned MDA.

Once a VSM is provisioned and populated in the system, it cannot be used until it has been defined membership into a CCAG. When the CCAG membership has been defined for the VSM, the various internal resources of the VSM will be configured according to the CCAG bandwidth control parameters. This includes the alpha and beta path weights, the alpha and beta path maximum rates and the aggregate alpha and beta maximum rate. A VSM-CCA-XP may be configured as either a VSM-CCA MDA or a VSM-CCA-XP MDA. When configured as a VSM-CCA-XP it is not a member of a CCA Group (ref VSM-CCA-XP).

The **no** form of the command unprovisions an MDA from the system. For a VSM to be unprovisioned, the VSM must not be a member of a CCAG. If the VSM is a member of a CCAG, the **no cca** *slot-number/mda-number* command must be used in the CCAG member-list context. Once a CCA is unprovisioned from the system; it cannot be made a member of a CCAG until it has been reprovisioned.

Default **None** (An MDA position number must be explicitly specified.)

Parameters *mda-slot —* Defines the position on the card slot-number the CCA will be populated into. On the iom-20g IOM module, two MDA positions are available. Future IOMs will support a different number of MDA positions.

   Values 1 or 2

port

Syntax	**port ccag**-*ccag-id*.{**a** | **b**}[.*net-sa*p]:*cc-id* **no port**
Context	config>router>interface *ip-interface-name*
Description	This command cross connects a network IP interface to a CCAG SAP using the referenced *ccag-id*. A CCAG network IP interface binding is identified by four items; the *ccag-id*, the CCAG path, the pairing type and the *cc-id*. A network IP interface CCAG port binding supports all the available features as port binding using a Dot1Q virtual interface.

To support cross connection between services and network IP interfaces, the network interface port command allows the binding of the IP interface to a *ccag cc-id*. Similar to service CCAG SAPs, the network IP interface port binding command must reference the *ccag-id*, the CCA path (.a or .b) and the *cc-id* used by the service CCAG SAP on the other CCA path. The pairing type is optional as only *.net-sap* is supported.

The **no** form of the command removes the CCAG binding from the network IP interface.

Parameters	**ccag** — The ccag portion of the port binding is required and specifies that the network IP interface is binding to a **ccag** *cc-id*.

ccag-id — The *ccag-id* portion of the port binding is required and specifies which *ccag-id* the network IP interface must be bound to. The specified *ccag-id* must exist on the system or the port binding will fail. The leading dash must be included as a separator between ccag and the *ccag-id*.

> **Values** -1 (dash 1) to -8 (dash 8)
>
> **Default** None

.a \| **.b** — The .a and .b portion of the port binding is required and is used to define the CCA bandwidth path the network IP interface will be associated with. The path association must be specified and .a and .b are mutually exclusive. The .a designation identifies the network IP interface as being on the Alpha path and the .b designation identifies the network IP interface as being on the Beta path. The paired SAP using the same *cc-id* as the bound network IP interface must be associated with the opposite path. The leading period must be included as a separator between the *ccag-id* and the path designator.

> **Values** .a or .b
>
> **Default** None

.net-sap — The .net-sap portion of the network IP interface CCAG binding is optional and is used to explicitly define the pairing type as Net-2-SAP. A cross connection between two network IP interfaces is not currently allowed. The .net-sap pairing type is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

> **Default** **.net-sap**

:cc-id — The :cc-id portion of the port binding is required and specifies the unique *cc-id* in use by the CCAG network IP interface port binding and the cross connect SAP on the other path.

> **Values** 1 to 4094

Services Commands

Service CCAG SAP Provisioning

Services are provisioned onto a CCAG using a special CCAG SAP definition. CCAG SAPs must reference a *ccag-id*, a CCA path (a or b), a pairing type (sap-sap or sap-net) and a unique *cc-id*. The *ccag-id* identifies the group of CCAs that will be used for forwarding packets associated with the SAP. The path identifies the bandwidth control grouping used to manage CCA egress bandwidth. The pairing type helps the system identify which buffering resources will be used to manage egress queuing of packets. Finally, the *cc-id* is used to explicitly cross connect the SAP to another SAP or network IP interface configured with the same *cc-id*.

sap

Syntax **sap ccag**-*ccag-id*.{**a** | **b**}[.*sap-net* | .*sap-sap*]:*cc-id* [**create**]
no sap ccag-*ccag-id*.{**a** | **b**}[.*sap-net* | .*sap-sap*]:*cc-id*

Context config>service>epipe

Description This command creates a cross connect SAP on the *ccag-id* referenced in the Epipe service. A CCAG SAP is identified by four items; the *ccag-id*, the CCAG path, the pairing type and the *cc-id*. An Epipe CCAG SAP supports all the available QoS, filtering and accounting features as an Epipe Dot1Q SAP.

The **no** form of the command removes a SAP from a service context. Once removed, all information and resources concerning the SAP is deleted from the system including the CCAG *cc-id* in use on the CCA path.

Parameters **ccag** — The ccag portion of the SAP identifier is required and specifies that the Epipe SAP is of the CCAG type.

-*ccag-id* — The *ccag-id* portion of the SAP identifier is required and specifies which *ccag-id* on which the SAP must be created. The specified *ccag-id* must exist on the system or the SAP creation will fail. The leading dash must be included as a separator between **ccag** and the *ccag-id*.

Values -1 (dash 1) to -8 (dash 8)

Default None

.a | **.b** — The .a and .b portion of the CCAG SAP identifier is required and is used to define the CCA bandwidth path with will be associated with the SAP. The path association must be specified and .a and .b are mutually exclusive. The .a designation identifies the SAP as being on the Alpha path and the .b designation identifies the SAP as being on the Beta path. The paired SAP or network

IP interface using the same *cc-id* as the SAP must be associated with the opposite path. The leading period must be included as a separator between the *ccag-id* and the path designator.

> **Values**   .a or .b
>
> **Default**   **None**

.sap-net — The .sap-net portion of the CCAG SAP identifier specifies that the SAP is of the SAP-2-Net pairing type and is required when the *cc-id* is paired with a network IP interface. The pairing type .sap-net is mutually exclusive with pairing type .sap-sap. If .sap-net is not specified, .sap-sap is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

> **Values**   .sap-net or .sap-sap
>
> **Default**   **.sap-sap**

.sap-sap — The .sap-sap portion of the CCAG SAP identifier is mutually exclusive to .sap-sap and is used to define the pairing type as SAP-2-SAP. The .sap-sap pairing type is only used when the cross connect object sharing the same *cc-id* on the opposite path is a CCAG SAP. If the other cross connect object is a network IP interface, the pairing type must be defined as .sap-net. If .sap-net is not specified, .sap-sap is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

> **Values**   .sap-net or .sap-sap
>
> **Default**   **.sap-sap**

:cc-id — The :cc-id portion of the CCAG SAP identifier is required and specifies the unique *cc-id* in use by the CCAG SAP and the cross connect object on the other path.

> **Values**   1 to 4094
>
> **Default**   **None**

create — Explicitly indicates that the specified CCAG SAP is being created by the **sap** command. Handling the inclusion or exclusion state of the create keyword is dependent on the system environment variable create.

When the system environment variable create is enabled, the system requires the explicit use of the **create** keyword when creating objects such as SAPs. If the keyword is not included and the specified CCAG SAP has not already been created, an error will occur and the CLI will not change context to the specified CCAG SAP instance. This is designed to prevent the inadvertent creation of a CCAG SAP in the event where the wrong CCAG SAP identifier is specified during an attempt to edit an existing CCAG SAP. If the **create** keyword is specified, the CCAG SAP will be created if it does not already exist or if it does exist, the CLI context will change to the specified CCAG SAP.

When the system environment variable create is disabled (using the **no create** command), the system will not require the **create** keyword when creating a CCAG SAP. In the event that the **sap** command is issued with a CCAG SAP identifier that previously had not been created, that CCAG SAP will be created.

Once a CCAG SAP has been created, the **create** keyword is ignored when a **sap** command is executed with that CCAG SAP identifier and the CLI context will change to the specified CCAG SAP.

vsm-cca-xp — In addition to supporting all the features of the existing VSM-CCA, the new VSM-CCA-XP MDA offers a new hybrid mode for simplified provisioning and a higher capacity VSM when inserted on IOM3-XP cards. As with the CSM-CCA MDA, the complete forwarding path bandwidth (in this case 25G) is available allowing single coversations up to 25G on a single MDA.

The use cases for VSM-CCA-XP are nearly identical to the VSM-CCA. When configured as a VSM-CCA-XP port x/x1 and port x/x/2 are interally connected. Therefore, configuration is very similar to a physical loop back port using Ethernet with dot1Q encapsulation. THe use of hybrid port removes the requirement to configure net and sap parameters and simplifies provisioning. The use of the Ethernet VLAN tag is used to connect the SAPs.

VSM-CCA-XP Exceptions:

While LAG is available, LACP is not allowed.

Ethernet CFM is only available when Eth-Rings are configured on the VSM (Ethernet rings use Ethernet MEPS for control).

The new VSM-CCA-XP can be configured as a VSM-CCA MDA to support CCA functions on IOM1, IOM2 and IOM3. On IOM3, the VSM-CCA MDA supports a loop back mode that uses LAG and two ports using Ethernet as the internal connection. The LAG feature also conversations hashing just as the original VSM-CCA. The hybrid port mode eliminates the need to specify network or access modes.

sap

Syntax	**sap ccag**-*ccag-id*.{**a** | **b**}[.*sap-net* | .*sap-sap*]:*cc-id* [**create**] **no sap ccag**-*ccag-id*.{**a** | **b**}[.*sap-net* | .*sap-sap*]:*cc-id*
Context	config>service>vpls
Description	This command creates a cross connect SAP on the *ccag-id* referenced in the VPLS service. A CCAG SAP is identified by four items; the *ccag-id*, the CCAG path, the pairing type and the *cc-id*. A VPLS CCAG SAP supports all the available QoS, filtering and accounting features as a VPLS Dot1Q SAP. The **no** form of the command removes a SAP from a service context. Once removed, all information and resources concerning the SAP is deleted from the system including the CCAG *cc-id* in use on the CCA path.
Parameters	**ccag** — The ccag portion of the SAP identifier is required and specifies that the vpls SAP is of the CCAG type.

-*ccag-id* — Specifies which *ccag-id* on which the SAP must be created. The specified *ccag-id* must exist on the system or the SAP creation will fail. The leading dash must be included as a separator between **ccag** and the *ccag-id*.

Values -1 (dash 1) to -8 (dash 8)

Default None

.a | **.b** — The **.a** and **.b** portion of the CCAG SAP identifier is required and is used to define the CCA bandwidth path with will be associated with the SAP. The path association must be specified and .a and .b are mutually exclusive. The .a designation identifies the SAP as being on the Alpha path

and the .b designation identifies the SAP as being on the Beta path. The paired SAP or network IP interface using the same *cc-id* as the SAP must be associated with the opposite path. The leading period must be included as a separator between the *ccag-id* and the path designator.

Values   .a or .b

Default   **None**

.sap-net — The .sap-net portion of the CCAG SAP identifier specifies that the SAP is of the SAP-2-Net pairing type and is required when the *cc-id* is paired with a network IP interface. The pairing type .sap-net is mutually exclusive with pairing type .sap-sap. If .sap-net is not specified, .sap-sap is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

Values   .sap-net or .sap-sap

Default   **.sap-sap**

.sap-sap — The .sap-sap portion of the CCAG SAP identifier is mutually exclusive to .sap-sap and is used to define the pairing type as SAP-2-SAP. The .sap-sap pairing type is only used when the cross connect object sharing the same *cc-id* on the opposite path is a CCAG SAP. If the other cross connect object is a network IP interface, the pairing type must be defined as .sap-net. If .sap-net is not specified, .sap-sap is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

Values   .sap-net or .sap-sap

Default   **.sap-sap**

:cc-id — The :cc-id portion of the CCAG SAP identifier is required and specifies the unique *cc-id* in use by the CCAG SAP and the cross connect object on the other path.

Values   0 1 to 4094

Default   **None**

create — Explicitly indicates that the specified CCAG SAP is being created by the **sap** command. Handling the inclusion or exclusion state of the create keyword is dependent on the system environment variable create.

When the system environment variable create is enabled, the system requires the explicit use of the **create** keyword when creating objects such as SAPs. If the keyword is not included and the specified CCAG SAP has not already been created, an error will occur and the CLI will not change context to the specified CCAG SAP instance. This is designed to prevent the inadvertent creation of a CCAG SAP in the event where the wrong CCAG SAP identifier is specified during an attempt to edit an existing CCAG SAP. If the **create** keyword is specified, the CCAG SAP will be created if it does not already exist or if it does exist, the CLI context will change to the specified CCAG SAP.

When the system environment variable create is disabled (using the **no create** command), the system will not require the **create** keyword when creating a CCAG SAP. In the event that the **sap** command is issued with a CCAG SAP identifier that previously had not been created, that CCAG SAP will be created.

Once a CCAG SAP has been created, the **create** keyword is ignored when a **sap** command is executed with that CCAG SAP identifier and the CLI context will change to the specified CCAG SAP.

sap

Syntax **sap ccag**-*ccag-id*.{**a** | **b**}[.*sap-net* | .*sap-sap*]:*cc-id* [**create**]
no sap ccag-*ccag-id*.{**a** | **b**}[.*sap-net* | .*sap-sap*]:*cc-id*

Context config>service>ies>interface

Description This command creates a cross connect SAP on the *ccag-id* referenced in the IES service. A CCAG SAP is identified by four items; the *ccag-id*, the CCAG path, the pairing type and the *cc-id*. A CCAG SAP on an IES IP interface supports all the available QoS, filtering and accounting features as an IES IP interface Dot1Q SAP.

The **no** form of the command removes a SAP from the IES service IP interface context. Once removed, all information and resources concerning the SAP is deleted from the system including the CCAG *cc-id* in use on the CCA path.

Parameters **ccag —** The **ccag** portion of the SAP identifier is required and specifies that the ies SAP is of the CCAG type.

ccag-id — The *ccag-id* portion of the SAP identifier is required and specifies which *ccag-id* on which the SAP must be created. The specified *ccag-id* must exist on the system or the SAP creation will fail. The leading dash must be included as a separator between ccag and the *ccag-id*.

Values -1 (dash 1) to -8 (dash 8)

Default None

.a | .b — The .a and .b portion of the CCAG SAP identifier is required and is used to define the CCA bandwidth path with will be associated with the SAP. The path association must be specified and .a and .b are mutually exclusive. The .a designation identifies the SAP as being on the Alpha path and the .b designation identifies the SAP as being on the Beta path. The paired SAP or network IP interface using the same *cc-id* as the SAP must be associated with the opposite path. The leading period must be included as a separator between the *ccag-id* and the path designator.

Values .a or .b

Default None

.sap-sap — The .sap-sap portion of the CCAG SAP identifier is optional and is used to explicitly define the pairing type as SAP-2-SAP. The .sap-sap pairing type is only used when the cross connect object sharing the same *cc-id* on the opposite path is a CCAG SAP. A cross connection between an IES CCAG SAP and a network IP interface is not currently allowed. If .sap-sap is not specified, .sap-sap is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

Default .sap-sap

:cc-id — The :*cc-id* portion of the CCAG SAP identifier is required and specifies the unique *cc-id* in use by the CCAG SAP and the cross connect object on the other path.

Values   1 to 4094

Default   **None**

create — Explicitly indicates that the specified CCAG SAP is being created by the **sap** command. Handling the inclusion or exclusion state of the create keyword is dependent on the system environment variable create.

When the system environment variable create is enabled, the system requires the explicit use of the **create** keyword when creating objects such as SAPs. If the keyword is not included and the specified CCAG SAP has not already been created, an error will occur and the CLI will not change context to the specified CCAG SAP instance. This is designed to prevent the inadvertent creation of a CCAG SAP in the event where the wrong CCAG SAP identifier is specified during an attempt to edit an existing CCAG SAP. If the **create** keyword is specified, the CCAG SAP will be created if it does not already exist or if it does exist, the CLI context will change to the specified CCAG SAP.

When the system environment variable create is disabled (using the **no create** command), the system will not require the **create** keyword when creating a CCAG SAP. In the event that the **sap** command is issued with a CCAG SAP identifier that previously had not been created, that CCAG SAP will be created.

Once a CCAG SAP has been created, the **create** keyword is ignored when a **sap** command is executed with that CCAG SAP identifier and the CLI context will change to the specified CCAG SAP.

sap

Syntax   **sap ccag**-*ccag-id*.{**a** | **b**}[.*sap-net* | .*sap-sap*]:*cc-id* [**create**]
                  no sap ccag-*ccag-id*.{**a** | **b**}[.*sap-net* | .*sap-sap*]:*cc-id*

Context   config>service>vprn>interface

Description   This command creates a cross connect SAP on the *ccag-id* referenced in the VPRN service. A CCAG SAP is identified by four items; the *ccag-id*, the CCAG path, the pairing type and the *cc-id*. A CCAG SAP on a VPRN IP interface supports all the available QoS, filtering and accounting features as a VPRN IP interface Dot1Q SAP.

The **no** form of the command removes a SAP from the VPRN service IP interface context. Once removed, all information and resources concerning the SAP is deleted from the system including the CCAG *cc-id* in use on the CCA path.

Parameters   **ccag** — The ccag portion of the SAP identifier is required and specifies that the vprn SAP is of the CCAG type.

         -*ccag-id* — Specifies which *ccag-id* on which the SAP must be created. The specified *ccag-id* must exist on the system or the SAP creation will fail. The leading dash must be included as a separator between **ccag** and the *ccag-id*.

             Values   -1 (dash 1) to -8 (dash 8)

             Default   **None**

.a | .b — The **.a** and **.b** portion of the CCAG SAP identifier is required and is used to define the CCA bandwidth path with will be associated with the SAP. The path association must be specified and .**a** and .**b** are mutually exclusive. The .a designation identifies the SAP as being on the alpha path and the .**b** designation identifies the SAP as being on the beta path. The paired SAP or network IP interface using the same *cc-id* as the SAP must be associated with the opposite path. The leading period must be included as a separator between the *ccag-id* and the path designator.

> **Values**   .a or .b

> **Default**   None

.sap-net — Specifies that the SAP is of the SAP-2-Net pairing type and is required when the *cc-id* is paired with a network IP interface. The pairing type .sap-net is mutually exclusive with pairing type *.sap-sap*. If *.sap-net* is not specified, *.sap-sap* is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

> **Values**   .sap-net or .sap-sap

> **Default**   **.sap-sap**

.sap-sap — The *.sap-sap* portion of the CCAG SAP identifier is mutually exclusive to *.sap-net* and is used to define the pairing type as SAP-2-SAP. The *.sap-sap* pairing type is only used when the cross connect object sharing the same *cc-id* on the opposite path is a CCAG SAP. If the other cross connect object is a network IP interface, the pairing type must be defined as *.sap-net*. If *.sap-net* is not specified, *.sap-sap* is assumed and does not need to be included in the SAP identification. When specified, the leading period must be used as a separator between the path designator and the pairing type.

> **Values**   .sap-net or .sap-sap

> **Default**   **.sap-sap**

:cc-id — The :*cc-id* portion of the CCAG SAP identifier is required and specifies the unique *cc-id* in use by the CCAG SAP and the cross connect object on the other path.

> **Values**   1 to 4094

> **Default**   None

create — Explicitly indicates that the specified CCAG SAP is being created by the **sap** command. Handling the inclusion or exclusion state of the **create** keyword is dependent on the system environment variable create.

When the system environment variable create is enabled, the system requires the explicit use of the **create** keyword when creating objects such as SAPs. If the keyword is not included and the specified CCAG SAP has not already been created, an error will occur and the CLI will not change context to the specified CCAG SAP instance. This is designed to prevent the inadvertent creation of a CCAG SAP in the event where the wrong CCAG SAP identifier is specified during an attempt to edit an existing CCAG SAP. If the create keyword is specified, the CCAG SAP will be created if it does not already exist or if it does exist, the CLI context will change to the specified CCAG SAP.

When the system environment variable create is disabled (using the no create command), the system will not require the create keyword when creating a CCAG SAP. In the event that the sap

command is issued with a CCAG SAP identifier that previously had not been created, that CCAG SAP will be created.

Once a CCAG SAP has been created, the **create** keyword is ignored when a **sap** command is executed with that CCAG SAP identifier and the CLI context will change to the specified CCAG SAP.