

vCSCF Network Impact Report from 1.6.0 to 1.8.2

Call Session Control Function

NETWORK IMPACT REPORT

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1 Introduction

This Network Impact Report (NIR) describes how the Virtual Call Session Control Function (vCSCF) 1.8.2 with new and enhanced commercial features affects the vCSCF 1.6.0. The NIR also describes the impact on the overall network, including all affected products and functions.

In this document, the term “vCSCF” refers to the product and the term “CSCF” refers to the CSCF application, independent of being deployed in a native or virtual environment.

Note: The vCSCF product is a software-only product. It is not bundled with any hardware platform or virtualization software.

This document covers the following enhanced features:

- Emergency Call Handling
- Graceful Shutdown
- Implicit Registration
- Load Regulation
- OAM Management (virtualized)
- SIP Request Handling
- Traceability and Troubleshooting
- Transit Support
- VNF Scaling





2 General Impact

This section describes the general impact owing to the introduction of the vCSCF 1.8.2.

2.1 Backward Compatibility

The vCSCF is backward compatible.

2.2 Capacity and Performance

The subscriber capacity is not affected by the introduction of the vCSCF 1.8.2 if the same version of cloud environment is used.

The performance improves by the introduction of the vCSCF 1.8.2.

2.3 Hardware and Platform

The vCSCF is a software-only product.

The demands on the hardware and platform are specified in [Virtual CSCF Infrastructure Requirements](#).

2.4 Upgrade Impact

Smooth upgrade is supported for the vCSCF 1.6.0 – vCSCF 1.8.2 upgrade.

2.5 Deprecated Features

There are no deprecated features.

2.6 Obsolete Features

There are no obsolete features.

2.7 Other Network Elements

The Northbound Interface (NBI) is modified, which may affect external management systems, for example the Operation and Support System Radio and Core (OSS-RC).





3 Interfaces

This section describes interface changes between the existing and new revisions of the product. The changes to interfaces described here can require changes to the operator systems, technical plans, training of operator personnel, and so on.

No impact indicates that no changes are needed.

3.1 Inter-Node Interface

The changes to the inter-node interfaces are listed in Table 1.

The description of impact is as follows:

- **No Impact** means that the new version can be installed without affecting other nodes.
- **Minor Impact** means that there are changes, but with extra configuration the previous behavior can be kept.
- **Major Impact** implies that the change has made an interface backward incompatible.
- **New Interface** indicates that the interface did not exist in the previous revision.
- **Obsolete** means that the interface no longer exists.

Table 1 Inter-node Interfaces

Interface	Protocol	Impact	Description of Change Compared To vCSCF 1.6.0
Gm and Mw	SIP	No Impact	The Public User Identities can be sorted in different orders. The sorting depends on the configuration of parameter <code>scscfPAssociatedUriBehavior</code> in the S-CSCF, see also Table 3.

3.2 Operation and Maintenance

This section describes changes to attributes, alarms, and counters.

3.2.1 Provisioning and Configuration

This section lists changed, deleted, and new attributes.



Further information on attributes can be found in the following documents:

- Managed Object Model (MOM)
- CSCF Configuration Management

3.2.1.1 Changed Attributes

The changed attributes are described in Table 2.

Table 2 Changed Attributes

Attribute Name	Description In vCSCF 1.6.0	Description In vCSCF 1.8.2
Graceful Shutdown		
scscfRegisteredUsersThreshold	<p>scscfRegisteredUserThreshold is set to 0, the CSCF automatically enters the administrative state Locked when the threshold is reached. For non-zero values, the CSCF automatically enters the administrative state Unlocked when the threshold is reached. This attribute is not access-aware.</p> <p>Default value: 0</p>	<p>If scscfRegisteredUserThreshold is set to 0, the CSCF automatically enters the administrative state LOCKED when the threshold is reached. For non-zero values, the CSCF automatically enters the administrative state UNLOCKED when the threshold is reached. This attribute is not access-aware.</p> <p>This attribute must not be set with a value larger than 0 when scscfShuttingdownBehavior is FORCED_TO_LOCKED.</p> <p>Default value: 0</p>
Load Regulation		
cscfSipOverloadControlReactingTrafficPriorities	<p>This attribute is used to map the outgoing SIP requests to SIP overload control reacting internal priority levels. 16 priority levels are supported, where value 0 is the highest one. This attribute is only applicable when cscfSipOverloadControlReactingEnabled is true. This attribute is not access-aware.</p> <p>This attribute can be configured as a string, where the priority is provided first and then a list of SIP request groups. The possible groups are Emergency, RphWps0, RphWps1, RphWps2, RphWps3, RphWps4, Inside, and Default.</p> <p>Default value is 0:RphWps0, RphWps1;1:RphWps2, RphWps3;2:RphWps4;3:Emergency;6:Inside;15:Default.</p>	<p>This attribute is used to map the outgoing SIP requests to SIP overload control reacting internal priority levels. 16 priority levels are supported, where value 1 is the highest priority and 15 is the lowest. All SIP requests with priority 0 are never redirected or rejected. This attribute is only applicable when cscfSipOverloadControlReactingEnabled is true. This attribute is not access-aware.</p> <p>This attribute can be configured as a string, where the priority is provided first and then a list of SIP request groups. The possible groups are Emergency, RphWps0, RphWps1, RphWps2, RphWps3, RphWps4, Inside, and Default.</p> <p>Default value is 0:Inside, RphWps0, RphWps1;1:RphWps2, RphWps3;2:RphWps4;3:Emergency;15:Default.</p>
cscfSipOverloadControlReportingFairnessBehavior	<p>This attribute controls if the CSCF rejects a volume of incoming traffic from a node that does not support SIP overload control. The volume of incoming traffic is corresponding to the percentage level of how much traffic that a node supporting SIP overload control reduces traffic towards the CSCF node.</p> <p>This attribute is only applicable when cscfSipOverloadControlReportingEnabled is set to true. This attribute is not access-aware.</p> <p>Default value is Sip503Response.</p>	<p>This attribute controls if the CSCF rejects a volume of incoming traffic from a node that does not support SIP overload control. The volume of incoming traffic is corresponding to the percentage level of how much traffic that a node supporting SIP overload control reduces traffic towards the CSCF node.</p> <p>This attribute is only applicable when cscfSipOverloadControlReportingEnabled is set to true. This attribute is not access-aware.</p> <p>Default value is NoFairness.</p>



Table 2 Changed Attributes

Attribute Name	Description In vCSCF 1.6.0	Description In vCSCF 1.8.2
cscfSipOverloadOnset	<p>This attribute is used to configure the average cluster resource utilization level that must be exceeded to activate the SIP overload control reporting function. This attribute is only applicable when cscfSipOverloadControlReportingEnabled is set to true. This attribute is not access-aware.</p> <p>This attribute can be configured with a value between 0–100.</p> <p>Default value is 75.</p>	<p>This attribute is used to configure the average cluster resource utilization level that must be exceeded to activate the SIP overload control reporting function. This attribute is only applicable when cscfSipOverloadControlReportingEnabled is set to true. This attribute is not access-aware.</p> <p>This attribute can be configured with a value between 0–100.</p> <p>Default value is 85.</p>
OAM Management (virtualized)		
cscfAdministrativeState	<p>This attribute indicates the current administrative state of the CSCF. This attribute is used to set the node state to 0 (Locked), 1 (Unlocked), or 2 (Shutting down).</p> <p>A short description of the behavior of CSCF at different states of cscfAdministrativeState is given here.</p> <p>When the node is in state: 0 (Locked), the CSCF is to be taken out of service as soon as possible. Established sessions, except emergency sessions, are released, users are deregistered, and new SIP requests are rejected.</p> <p>When the node is in state: 1 (Unlocked), the CSCF node handles requests and performs functions normally.</p> <p>When the node is in state: 2 (Shutting down), the CSCF is gracefully taken out of service with minimal traffic disturbance. As long as users are registered, non-register traffic is processed as when in Unlocked state. Users are de-registered/re-distributed when handling registration traffic. When all users are de-registered/re-distributed and all sessions are terminated, the CSCF automatically transits from Shutting down to Locked state.</p> <p>The default value is 0 (Locked).</p>	<p>This attribute indicates the current administrative state of the CSCF. This attribute is used to set the node state to 0 (Locked), 1 (Unlocked), or 2 (Shutting down).</p> <p>A short description of the behavior of the CSCF at different states of cscfAdministrativeState is given here.</p> <p>When the node is in state: 0 (Locked), the CSCF is to be taken out of service as soon as possible. cscfAdministrativeState is not allowed to change from Locked to Unlocked when cscfLockedbehavior is FORCED and still in active state. It is also not allowed to change cscfAdministrativeState from Locked to Shutting down.</p> <p>When the node is in state: 1 (Unlocked), the CSCF node handles requests and performs functions normally.</p> <p>When the node is in state: 2 (Shutting down), the CSCF is gracefully taken out of service with minimal traffic disturbance and the CSCF automatically transits from Shutting down to Locked or Unlocked, depending on the configuration.</p> <p>The default value is 0 (Locked).</p>
Transit Support		



Table 2 Changed Attributes

Attribute Name	Description In vCSCF 1.6.0	Description In vCSCF 1.8.2
extNetSelPoolMode	<p>This attribute defines if the pool is considered to be in allocated number mode.</p> <ul style="list-style-type: none">• Prerequisite for changing extNetSelPoolMode to 0 is a configured extNetSelPoolURI.• Prerequisite for changing extNetSelPoolMode to 1 is a configured ExtNetSelUnallocatedNrResponseCode. <p>When changing pool mode, all data in the pool that is not used in the new pool mode is automatically erased.</p> <p>Possible Values and Meanings:</p> <ul style="list-style-type: none">• 0 – allocated number• 1 – unallocated number	<p>This attribute defines the result type of the External Network Selection analysis.</p> <ul style="list-style-type: none">• Prerequisite for setting extNetSelPoolMode to ALLOCATED_NUMBER is a configured ExtNetSelPoolURI.• Prerequisite for setting extNetSelPoolMode to UNALLOCATED_NUMBER is a configured ExtNetSelUnallocatedNrResponseCode.• No prerequisite for setting extNetSelPoolMode to TRANSIT or NON_TRANSIT. <p>When changing pool mode, all data in the pool that is not used in the new pool mode automatically is erased.</p> <p>Possible Values and Meanings:</p> <ul style="list-style-type: none">• 0: ALLOCATED_NUMBER - means that the received SIP request is routed.• 1: UNALLOCATED_NUMBER - means that the received SIP request is rejected.• 2: TRANSIT - means that the received request is identified to be a transit call.• 3: NON_TRANSIT - means that HSS is queried before routing the SIP request.
tcscfBehavior	<p>This attribute controls if HSS (LIR) Lookup(s) are performed or not, on the terminating side of I-CSCF.</p> <p>The attribute cscfISPBehavior must be configured to 1 (standalone I-CSCF) when tcscfBehavior is enabled. This attribute is preparing to introduce a new Transit Function CSCF (also referred to T-CSCF).</p> <p>Possible Values and Meanings:</p> <ul style="list-style-type: none">• 0: DISABLED - HSS (LIR) lookups are performed in the I-CSCF for terminating traffic.• 1: ENABLED - HSS (LIR) lookups are NOT performed in the I-CSCF for terminating traffic.	<p>This attribute controls if HSS (LIR) lookups are performed, not performed, or transit verification is done on the terminating side of the I-CSCF.</p> <p>The attribute cscfISPBehavior must be configured to 1 (standalone I-CSCF) when tcscfBehavior is ENABLED.</p> <p>Possible Values and Meanings:</p> <ul style="list-style-type: none">• 0: DISABLED - HSS (LIR) lookups are performed in the I-CSCF for terminating traffic.• 1: ENABLED - HSS (LIR) lookups are NOT performed in the I-CSCF for terminating traffic.• 2: TRANSIT_VERIFICATION - transit verification is done before HSS (LIR) lookups in the I-CSCF for terminating traffic to avoid HSS lookups.



Table 2 Changed Attributes

Attribute Name	Description In vCSCF 1.6.0	Description In vCSCF 1.8.2
VNF Scaling		
cscfProcessBehaviourAtClusterReconfiguration	<p>This parameter is used to indicate the CSCF process termination behavior during Cluster Reconfiguration.</p> <p>Cluster Reconfiguration occurs during:</p> <ul style="list-style-type: none"> • CSCF software upgrade • CSCF Cluster Instance Lock (Virtual deployment locking of VM instance) • CSCF Scale-In and Scale-Out (Virtual deployment only) <p>Possible Values and Meanings:</p> <ul style="list-style-type: none"> • IMMEDIATE = The CSCF application processes are terminated directly. This behavior is preferable for CSCF software upgrade as it reduces the upgrade time. A SIP session that has not been established when reconfiguration happens, fails since the CSCF loses all SIP state information because of the terminated processes. <p>The default value is IMMEDIATE.</p>	<p>This parameter is used to indicate the CSCF process termination behavior during Cluster Reconfiguration.</p> <p>Cluster Reconfiguration occurs during:</p> <ul style="list-style-type: none"> • CSCF software upgrade • CSCF Cluster Instance Lock (Virtual deployment locking of VM instance) • CSCF Scale-In and Scale-Out (Virtual deployment only) <p>Possible Values and Meanings:</p> <ul style="list-style-type: none"> • DELAYED = The CSCF application processes get some extra time, up to 55 seconds, to be terminated gracefully. • IMMEDIATE = The CSCF application processes are terminated directly. A SIP session that has not been established when reconfiguration occurs, fails since the CSCF loses all SIP state information because of the terminated processes. <p>The default value is DELAYED.</p>

3.2.1.2 Deleted Attributes

There are no deleted attributes.

3.2.1.3 Deprecated Attributes

There are no deprecated attributes.

3.2.1.4 Obsolete Attributes

There are no obsolete attributes.

3.2.1.5 New Attributes and Environment Variables

The new attributes are described in Table 3.

Table 3 New Attributes

Attribute Name	Description
Graceful Shutdown	

Table 3 New Attributes

Attribute Name	Description
scscfShuttingdownBehavior	<p>This attribute configures when the S-CSCF automatically sets <code>cscfAdministrativeState</code> from SHUTTINGDOWN to LOCKED. The configured value takes effect when <code>cscfAdministrativeState</code> is set to SHUTTINGDOWN and is valid for the whole shutting down period. This attribute is not access-aware.</p> <p>Do not configure the attribute <code>scscfShuttingdownBehavior</code> to FORCED_TO_LOCKED when the threshold value for number of registered users <code>scscfRegisteredUsersThreshold</code> is larger than 0 and the other way around.</p> <p>Default value: GRACEFUL.</p>
scscfShuttingdownPhasePeriodTimer	<p>This attribute configures the phase length in minutes during which a percentage of the registered users is redirected when the S-CSCF is in shutting down mode. The configured value takes effect when <code>cscfAdministrativeState</code> is set to SHUTTINGDOWN and is valid for during the whole shutting down period. Changing <code>cscfRegistrationRefreshMax</code> during the shutting down period does not affect the shutting down phase period. This attribute is not access-aware.</p> <p>When the parameter <code>scscfShuttingdownPhasePeriodTimer</code> is set to 0, the phase length is set to the maximum registration period <code>cscfRegistrationRefreshMax</code>.</p> <p>Default value: 0.</p>
scscfShuttingdownPhases	<p>This attribute configures the number of phases that are used to redirect registered users when the S-CSCF is in shutting down mode. The length of one phase is set in <code>scscfShuttingdownPhasePeriodTimer</code> or <code>cscfRegistrationRefreshMax</code>. The configured value takes effect when <code>cscfAdministrativeState</code> is set to SHUTTINGDOWN and is valid for the whole shutting down period. This attribute is not access-aware.</p> <p>Default value: 0.</p>



Table 3 New Attributes

Attribute Name	Description
Implicit Registration	
scscfPAssociatedUriBehavior	<p>This parameter configures the behavior of the S-CSCF to determine the sorting order of unbarred public identities in the list of P-Associated-URI that is added to the REGISTER response. The sorting order is applied on public identities (IMPUs) in the Service Profile that is associated with the public identity and is presented in the To header in the registration request. In the sorting, the first non-barred SIP URI in the Service Profile is added as the first entry in the list of URIs in the P-Associated-URI header. The first non-barred tel URI in the Service Profile is added as the second entry. Other non-barred public identities in the Service Profile are added to the header in a random way.</p> <p>The following are possible parameter values:</p> <ul style="list-style-type: none"> • 0: There is no sorting done based on the Service Profile. The default IMPU is placed first, and all rest of IMPUs in the IRS in a nonspecific order. • 1: There is sorting for emergency registration. The IMPUs from the Service Profile that do not belong to an emergency registration are not included. For normal registrations, the behavior is as described for value 0. • 2: For normal registrations, the IMPUs in the Service Profile are added first. The other IMPUs in the Implicit Registration Set (IRS) are added afterward in a random way. Emergency registrations are sorted as described for value 1. <p>The default value is 0.</p>
Load Regulation	



Table 3 New Attributes

Attribute Name	Description
cscfSipOverloadAbatement	<p>This attribute defines the threshold of the average cluster resource utilization percentage that triggers the decrement of the oc parameter value. The CSCF periodically decreases the reported oc parameter value, while the average cluster resource utilization level value is smaller than this threshold.</p> <p>This attribute is only applicable when <code>cscfSipOverloadControlReportingEnabled</code> is true. This attribute is not access-aware.</p> <p>This attribute is an integer between 0–100. The value must not be larger than the value of <code>cscfSipOverloadOnset</code>.</p> <p>The default value is 75.</p>
cscfSipOverloadDecrementStep	<p>The attribute defines the value of the step with which the oc parameter value is decreased. This attribute is only applicable when <code>cscfSipOverloadControlReportingEnabled</code> is true. This attribute is not access-aware.</p> <p>This attribute is an integer between 0–100.</p> <p>The default value is 1.</p>
cscfSipOverloadIncrementStep	<p>The attribute defines the value of the step with which the oc parameter value is increased. This attribute is only applicable when <code>cscfSipOverloadControlReportingEnabled</code> is true. This attribute is not access-aware.</p> <p>This attribute is an integer between 0–100.</p> <p>The default value is 2.</p>
OAM Management (Virtualized)	
cscfLockedBehavior	<p>This attribute describes the behavior of the CSCF during the Locked state. The configured value takes effect when <code>cscfAdministrativeState</code> is set to 0 (LOCKED). This attribute is not access-aware.</p> <p>Possible values are GRACEFUL, IGNORE_REQUESTS, and FORCED.</p> <p>The default value is GRACEFUL.</p>
SIP Request Handling	



Table 3 New Attributes

Attribute Name	Description
cscfBlacklistingThresholdInterval	<p>This attribute defines the measurement period, in seconds, for blacklisting thresholds.</p> <p>This attribute applies to the following SIP blacklisting reasons:</p> <ul style="list-style-type: none"> • SIP 503 Response with Retry-After • SIP 503 Response without Retry-After • SIP transaction time-out • Fatal transport error (socket error) <p>Accepted range: 0 – 86400</p> <p>When it is set to 0, only CscfDestinationUnavailabilityTimer (or the Retry-After header for SIP 503 responses with Retry-After) is used as measurement period for blacklisting thresholds and blacklisting period.</p>
cscfBlacklistingThresholdIntervalDest	<p>This attribute defines the measurement period, in seconds, for blacklisting thresholds for specific destinations in the network.</p> <p>This attribute applies to the following SIP blacklisting reasons:</p> <ul style="list-style-type: none"> • SIP 503 Response with Retry-After • SIP 503 Response without Retry-After • SIP transaction time-out • Fatal transport error (socket error) <p>Possible values: default or [0–9]{1,10}</p> <p>Accepted length: 1–7</p> <p>When it is set to default, there is no specific configuration for the destination.</p>



Table 3 New Attributes

Attribute Name	Description
Transit Support	
extNetSelectionInitialTransitTableName	<p>This parameter must be configured with the name of the ENS table to indicate where to start a navigating table for transit verification. The referenced table must be configured before this parameter can be changed.</p> <p>A defined ENS navigation and matching for transit verification. For example: SipMessage:[tableName], calling:[tableName], P-Asserted-Identity:[tableName], CIC:[tableName], RN:[tableName] or called:[tableName].</p> <p>Default value: None.</p>

There are no new environment variables.

3.2.2 Fault Management

This section describes alarms that have been changed, deleted, or added.

3.2.2.1 Changed Alarms

The new alarms are described in Table 4.

Table 4 Changed Alarms

Alarm Name	Description of Change
Transit Support	



Table 4 Changed Alarms

Alarm Name	Description of Change
CSCF External Network Selection Initial Table Incorrectly Configured	<p>The alarm also is raised when the <code>extNetSelectionInitialTransitTableName</code> parameter is set to an empty table that does not contain any entries, or when some other configuration error is discovered in the ENS tables.</p> <p>For the initial table <code>extNetSelectionInitialTableName</code>, the Additional Text field states Configured Initial Table <table type>:<tablename> is empty.</p> <p>For the initial transit table <code>extNetSelectionInitialTransitTableName</code>, the Additional Text field states Configured Initial Transit Table <table type>:<tablename> is empty.</p>
CSCF External Network Selection Memory Limit Reached	When this alarm is raised, any transit verification causes all SIP messages to be handled as non-transit.
CSCF External Network Selection Table Loop Detected	<p>This alarm indicates if a loop was detected in the transit verification analysis or in the External Network Selection analysis.</p> <p>The Additional Info field is extended as <code>R:SipMessage=[INVITE tel:+468000000000 SIP/2], SdpMediaType=[]</code> or <code>T:SipMessage=[INVITE tel:+468000000000 SIP/2], SdpMediaType=[]</code>, where R stands for External Network Selection and T stands for transit verification.</p>

3.2.2.2 Deleted Alarms

There are no deleted alarms.

3.2.2.3 Deprecated Alarms

There are no deprecated alarms.

3.2.2.4 Obsolete Alarms

There are no obsolete alarms.



3.2.2.5 New Alarms

There are no new alarms.

3.2.3 Events and Notifications

This section describes events and notifications that have been changed, deleted, or added.

3.2.3.1 Changed Events and Notifications

There are no changed events and notifications.

3.2.3.2 Deleted Events and Notifications

There are no deleted events and notifications.

3.2.3.3 Deprecated Events and Notifications

There are no deprecated events and notifications.

3.2.3.4 Obsolete Events and Notifications

There are no obsolete events and notifications.

3.2.3.5 New Events and Notifications

There are no new events and notifications.

3.2.4 Counters

This section describes counters that have been changed, deleted, or added.

3.2.4.1 Changed Counters

The changed counters are described in Table 5.

Table 5 Changed Counters

Counter Name	Description of Change
Graceful Shutdown	
cscfConcurrentRegistrations	The description and condition of counter <code>cscfConcurrentRegistrations</code> are changed to reflect the use of this counter in a better way. There is no functional change of this counter.



Table 5 Changed Counters

Counter Name	Description of Change
cscfConcurrentRegisteredUserProfiles	<p>The condition of counter <code>cscfConcurrentRegisteredUserProfiles</code> is changed to reflect the use of this counter in a better way.</p> <p>There is no functional change of this counter.</p>
cscfPeakConcurrentRegistrations	<p>The description and condition of counter <code>cscfPeakConcurrentRegistrations</code> are changed to reflect the use of this counter in a better way.</p> <p>There is no functional change of this counter.</p>
cscfPeakConcurrentRegisteredUserProfiles	<p>The condition of counter <code>cscfPeakConcurrentRegisteredUserProfiles</code> is changed to reflect the use of this counter in a better way.</p> <p>There is no functional change of this counter.</p>
scscfConcurrentUnregisteredUserProfiles	<p>The condition of counter <code>scscfConcurrentUnregisteredUserProfiles</code> is changed to reflect the use of this counter in a better way.</p> <p>There is no functional change of this counter.</p>
scscfPeakConcurrentUnregisteredUserProfiles	<p>The condition of counter <code>scscfPeakConcurrentUnregisteredUserProfiles</code> is changed to reflect the use of this counter in a better way.</p> <p>There is no functional change of this counter.</p>

3.2.4.2 Deleted Counters

There are no deleted counters.

3.2.4.3 Deprecated Counters

There are no deprecated counters.

3.2.4.4 Obsolete Counters

There are no obsolete counters.

3.2.4.5 New Counters

The new counters are described in Table 6.



Table 6 New Attributes

Attribute Name	Description
Load Regulation	
cscfSipReportingOverloadControlDuration	This counter shows the number of seconds that the node spent in the overload condition during a Granularity Period.
cscfSipReportingOverloadControlPeriods	This counter shows the number of times when the node entered the overload operation mode during a Granularity Period.



4 Summary of Impacts per Feature

This section summarizes the impact per feature when the feature is turned off, as listed in Table 7.

The description of impact is as follows:

- **Major Impact** means that the feature has done an incompatible change so that another node requires an update.
- **Minor Impact** means that the feature has caused changes that affect other nodes, but with extra configuration, the previous behavior can be kept.
- **No Impact** means that the feature has no impact on the system.

Table 7 Impacts per Feature

Feature	Impact			Basic or Optional New or Enhanced	Included in Value Packs	Relation to Other Features or Nodes
	Major	Minor	No			
Emergency Call Handling			X	Optional Enhanced	Voice. Service Identity SIP Trunking Dynamic User	
Graceful Shutdown			X	Basic Enhanced	Voice Messaging Service Identity SIP Trunking Transit Dynamic User	S-CSCF AS HSS
Implicit Registration			X	Basic Enhanced	Voice Messaging Service Identity SIP Trunking Dynamic User	P-CSCF UE
Load Regulation			X	Basic Enhanced	Voice Messaging Service Identity SIP Trunking Transit Dynamic User	SIP nodes supporting the Reporting Role for SIP Overload Control (RFC7339) HSS



Table 7 Impacts per Feature

OAM Management (virtualized)			X	Basic Enhanced	Voice Messaging Service Identity SIP Trunking Transit Dynamic User	NeLS
SIP Request Handling			X	Basic Enhanced	Voice Messaging Service Identity SIP Trunking Transit Dynamic User	SIP Nodes
Traceability and Troubleshooting			X	Basic Enhanced	Voice Messaging Service Identity SIP Trunking Transit Dynamic User	Core Networks Operations Manager
Transit Support			X	Optional Enhanced	Transit	
VNF Scaling		X		Basic Enhanced	Voice Messaging Service Identity SIP Trunking Transit Dynamic User	



5 Impact on CSCF Features

This section shows the impact on the CSCF features when the feature is turned on.

5.1 Emergency Call Handling

This section describes the enhanced feature Emergency Call Handling.

5.1.1 Description

If an emergency call is rejected by the last Public Safety Answering Point (PSAP) assigned by the Location Repository Function (LRF), and the default PSAP is not configured or the call is a service test call, the Emergency Call Session Control Function (E-CSCF) forwards the SIP error response that it received from the last failed PSAP to the caller. This behavior applies to an E-CSCF with a SIP-based MI interface.

5.2 Graceful Shutdown

This section describes the enhanced feature Graceful Shutdown.

5.2.1 Description

Redirection Distribution of Re-REGISTER Requests

When a standalone S-CSCF or a collocated S-CSCF enters in shutting down state, the S-CSCF distributes the redirection of re-REGISTER requests registered users over the number of phases as configured in `scscfShuttingdownPhases`. The phase length is set to the maximum registration refresh time as configured in `cscfRegistrationRefreshMax` or `scscfShuttingdownPhasePeriodTimer`.

When `scscfShuttingdownPhases` is 0, the user redistribution function is triggered without considering the value of `scscfShuttingdownPhasePeriodTimer` and `scscfShuttingdownBehavior`.

When the limit intensity of redirected register requests is triggered, the behavior of the S-CSCF can be configured by setting `scscfShuttingdownBehavior` to one its two options, see [CSCF Configuration Management](#)

Unregistered Users In Shutting Down State

To get a faster graceful shutdown behavior and not prevent the Serving Call Session Control Function (S-CSCF) to automatically transit from Shutting Down to Locked state, a new behavior for the unregistered users is introduced.

When `cscfAdministrativeState` is set to **SHUTTINGDOWN**, unregistered users are started to be deregistered by the S-CSCF. Any new session establishment attempt related to services for unregistered or not-registered users are rejected through a SIP 480 response when `scscfRedundantScscfEntry` is empty. When `scscfRedundantScscfEntry` is configured, they are rejected through a SIP 305 response.

When all registered users are deregistered, the S-CSCF automatically sets `cscfAdministrativeState` to **LOCKED**, even when any unregistered users remain in the S-CSCF.

5.3 Implicit Registration

This section describes the enhanced feature Implicit Registration.

5.3.1 Description

Through Implicit Registration, the S-CSCF is able to sort the IP Multimedia Public Identities (IMPUs) in the list of the P-Associated-URI that is added to the REGISTER response. The sorting is done based on the Home Subscriber Server (HSS) Service Profile that the IMPU belongs to at registration: the registration Service Profile.

To support multi-SIM service for emergency calls, a secondary device must not get the IMPU of the primary device as its top IMPU. Therefore, the S-CSCF allows the IMPUs that are found in the Service Profile of the registering IMPU to return in the top of the P-Associated-URI list.

In the sorting, the first non-barred SIP URI in the Service Profile is added as the first entry in the list of URIs in the P-Associated-URI header. The first non-barred tel URI in the Service Profile is added as the second entry. Other non-barred public identities in the Service Profile are added to the header in a random way. The value of `scscfPAssociatedUriBehavior` determines if the S-CSCF sorts only the IMPUs from emergency registrations or the IMPUs from all registrations.

5.4 Load Regulation

This section describes the enhanced feature Load Regulation.

5.4.1 Description

Reporting Role for SIP Overload Control

The calculation of the percentage level of the value of the `oc` parameter is based on the average cluster Resource Utilization Information (RUI) and the previous `oc` value.



The oc value is adjusted according to the following rules:

- At the initial phase, the oc value is set to 0. This indicates no SIP server overload.
- The oc value is increased and decreased as follows (see also Figure 1):
 - The oc value increases when the resource utilization level is larger than the Overload Onset (OO) threshold.
 - The oc value remains unchanged when the resource utilization level is between the Overload Onset (OO) threshold and Overload Abatement (OA) threshold.
 - The oc value decreases when the resource utilization level is lower than the Overload Abatement (OA) threshold.

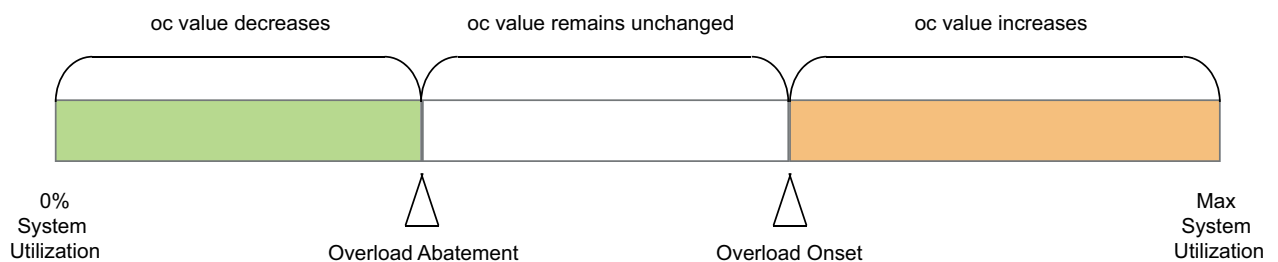


Figure 1 Scenario of the Increase and Decrease of the oc Parameter Value

The following Configuration Management parameters can be used to adjust the oc value:

- `cscfSipOverloadOnset`

When the RUI reaches the Overload Onset threshold, the CSCF increases oc value.

- `cscfSipOverloadAbatement`

When the RUI falls below the Overload Abatement (OA) threshold, the CSCF decreases oc value.

- `cscfSipOverloadIncrementStep`

The step value with which the CSCF increases the value of oc.

- `cscfSipOverloadDecrementStep`

The step value with which the CSCF decreases the value of oc with.

When upgrading from an older CSCF version that supports SIP Overload Control, some existing CM parameter values are overwritten with new default values.

If the parameter `cscfSipOverloadOnset` is already configured in the system, evaluate its value considering the modified calculation of the `oc` value. The new default value provides a better behavior in general.

Reacting Role for SIP Overload Control

All SIP requests with priority level 0 in the Configuration Management parameter `cscfSipOverloadControlReactingTrafficPriorities` are never redirected or rejected.

5.5 OAM Management (Virtualized)

This section describes the enhanced feature OAM Management (Virtualized).

5.5.1 Description

When the CSCF is in the Administrative State Locked, the new parameter `cscfLockedBehavior` defines the behavior of the CSCF.

The parameter `cscfLockedBehavior` has the following settings:

— GRACEFUL

When `cscfAdministrativeState` is set to 0 (LOCKED), the Serving Call Session Control Function (S-CSCF) responds with a 480 (Temporarily Unavailable) response for initial registration, re-registration, and registration of a new contact. All other SIP requests are rejected by 503 (Service Unavailable) responses that are enhanced with the value 5 mins (300 sec) in the Retry-After header. This triggers the client nodes to redirect or blacklist the CSCF in the state LOCKED, so it disconnects all sessions and deregisters all users. The updated 503 (Service Unavailable) response message is applicable for all other CSCF node types.

— IGNORE_REQUESTS

When `cscfAdministrativeState` is set to 0 (LOCKED), the S-CSCF does not respond to any incoming initial SIP requests; it does not send 480 (Temporarily Unavailable) to REGISTER requests or 503 (Service Unavailable) to other requests. The S-CSCF still sends BYE messages to terminate all sessions, SAR, 3rd party REGISTER, and NOTIFY requests to de-REGISTER all users.

All other CSCF node types ignore the incoming initial SIP requests when `cscfAdministrativeState` is set to 0 (LOCKED).

— FORCED

When `cscfAdministrativeState` is set to 0 (LOCKED), all CSCF nodes immediately close the SIP ports. This means that all external signalling stops.



The S-CSCF silently terminates all sessions and removes all registered and unregistered users.

For the License Management, the allowed period in Autonomous Mode is increased from 7 to 90 days.

5.6 SIP Request Handling

This section describes the enhanced feature SIP Request Handling.

5.6.1 Description

Network-Initiated De-Registration

At network-initiated de-registration, the S-CSCF releases early dialogues that are associated to the de-registered contact by sending CANCEL in the downstream direction. The CANCEL procedure is managed through the non-INVITE transaction failover timer and can generate a SIP 408 (Timeout) response for the INVITE dialog if there is a transaction time-out of the CANCEL transaction.

Time Period for Accumulating the Blacklisting Thresholds

It is possible to configure the time period for accumulating the blacklisting thresholds interval separately from the blacklisting duration period. The threshold interval can be configured per Fully Qualified Domain Name (FQDN), next to the global configuration.

It applies to the following SIP blacklisting reasons:

- SIP 503 with Retry-After header
- SIP 503 without Retry-After header
- Transaction time-out
- Fatal transport error

If the threshold for one of these reasons is exceeded during the measurement period, the blacklisting period starts. During the blacklisting period, received requests are not forwarded to the blacklisted destination.

5.7 Traceability and Troubleshooting

This section describes the enhanced feature Traceability and Troubleshooting.

5.7.1 Description

The CSCF is enhanced to align the CSCF Health Check output format structure and use with other IP Multimedia Subsystem (IMS) Virtual Network Functions (VNFs). The new XML[®] output format enables using the results in a networking monitoring tool. The CSCF also supports new command line options for the Health Check script.

5.8 Transit Support

This section describes the enhanced feature Transit Support.

5.8.1 Description

The transit function in a terminating Interrogating Call Session Control Function (I-CSCF) is enhanced with a transit verification function that enables determination if SIP requests must be transited based on configurable criteria. All SIP requests that fulfill the configured criteria are handled as transit requests for which Home Subscriber Server (HSS) queries are suppressed. All SIP requests that do not fulfill the configured criteria are handled as non-transit requests.

For example, when a terminating I-CSCF receives a SIP request with a telephone number in its Request-URI, the transit verification function compares the originating network information in the received Via header and the called number in the received Request-URI with the configured criteria. If `extNetSelectionInitialTransitTableName` is not configured or the referenced table is misconfigured, all SIP requests are handled as non-transited requests.

The transit verification function is configurable for a standalone I-CSCF and a collocated IS-CSCF.

5.9 VNF Scaling

This section describes the enhanced feature VNF Scaling.

5.9.1 Description

The configuration attribute `cscfProcessBehaviourAtClusterReconfiguration` can be set to a new value: **DELAYED**. This new value delays the process termination so the traffic disturbance during Cluster Reconfiguration is reduced.