

# MTAS SIP Upstream Overload Control Management Guide

MTAS

USER GUIDE

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# 1 Introduction

This document describes how to configure the SIP Upstream Overload Control (OC) function in the MTAS.

## 1.1 Prerequisites

This section describes the prerequisites that must be fulfilled. It is assumed that the user of this document is familiar with the Operation and Maintenance (O&M) area, in general.

### 1.1.1 Licenses

No License required for SIP Upstream Overload Control.

### 1.1.2 Documents

Before starting any procedure in this document, ensure that the following documents are available:

- Managed Object Model (MOM)
- Ericsson Command-Line Interface User Guide

### 1.1.3 Conditions

Before starting any of the procedures described in this document, ensure that the following condition is met:

- An Ericsson Command-Line Interface (ECLI) session in Exec mode is in progress.





## 2 Overview

The SIP Upstream Overload Control in MTAS implements the reporting or server role of the RFC 7339 “SIP Overload Control”, which describes the exchange of the overload information between the SIP servers and the SIP clients, so that the SIP clients can reduce the volume of traffic sent towards the overloaded SIP servers, avoiding congestion collapse and increasing useful throughput.

### 2.1 Content of OC Parameters

OC parameters are added by reacting node (CSCF) in the topmost *Via* header of an out of dialog request, which indicates that the OC is supported.

OC parameters added by CSCF are shown in Example 1.

```
Via: SIP/2.0/TLS p1.example.net
    ;branch=z9hG4bK2d4790.3;
    ;oc;oc-algo="loss";
```

#### Example 1 OC Parameters Added by CSCF

When feature is enabled and OC parameters are in the request, MTAS adds OC parameters to the topmost *Via* header of the response.

OC parameters added by MTAS are shown in Example 2.

```
Via: SIP/2.0/TLS p1.example.net
    ;branch=z9hG4bK2d4790.3;received=192.0.2.111
    ;oc=20;oc-algo="loss";oc-validity=1500
    ;oc-seq=1456387313.187
```

#### Example 2 OC Parameters Added By MTAS

When the feature is disabled and OC parameters are in the request, MTAS adds OC parameters to the topmost *Via* header of the response.

OC parameters added by the MTAS are shown in Example 3.

```
Via: SIP/2.0/TLS p1.example.net
    ;branch=z9hG4bK2d4790.3;received=192.0.2.111
    ;oc;oc-algo="loss"
```

#### Example 3 OC Parameters Added By MTAS

Details of each parameter are described in Table 1



Table 1 OC Parameters of RFC 7339

OC Parameter	Content
oc	<p>A value to indicate the level of traffic reduction to apply, that is, <code>oc=0</code> if no traffic reduction is required (because the reporting node is not overloaded, for example, <code>oc=20</code> when overload control active and requesting 20% traffic reduction).</p> <p>The value is calculated by MTAS based on current system overload status.</p>
oc-algo	<p>It is used to indicate the supported traffic reduction algorithms, where <code>loss</code> currently is the only supported one.</p>
oc-validity	<p>It indicates for how long duration in milliseconds the sent oc parameter can be used by the reacting or client node. The default value can be configured by CM attribute <code>mtasSipOcValidity</code>.</p>
oc-seq	<p>It is used to differentiate two oc parameter values generated by an overload control algorithm at two different instants in time.</p> <p>MTAS generated oc-seq is based on “epoch time” and have the following format: [epoch seconds].[epoch milliseconds]</p>

## 2.2 SIP Upstream Overload Control in MTAS

MTAS uses OC parameters to report its overload status towards the reacting node (CSCF).

The concept of overload in this document is not the same as O&M load regulation. This means that when monitored resource use reaches the configured value, MTAS treats this as overload state and asks the reacting node to reduce traffic to avoid call rejection by load regulation.

If MTAS operates in normal condition, thus, the node is not overloaded then the same OC parameters with `oc=0`; `oc-algo=loss`; `oc-validity=0`; `oc-seq=xxx` are reported in each response. In this case, the oc-seq here is not changed until the system enters the overload status.

If MTAS uses SIP upstream overload control, the oc value changes between 1-100 and reported in a configurable interval. The oc value is calculated from the current monitored resource use level and from the previous oc status. The oc-validity can be configured by the operator and the oc-seq indicates the time stamp when the oc value has been calculated.





## 2.3 Limitations in Supported Functionality

MTAS does not report the OC status in the following cases to avoid system complexity and to decrease the latency in overload condition:

- The system load regulation rejects an out-of-dialog request in local overload condition.
- The transaction layer rejects the malformed or faulty requests, for example, if the Max-Forwards header value is less than 1.
- The early Priority check rejects the request if the Resource-Priority Header (RPH) is invalid.
- All the responses for in-dialog SIP requests.

## 2.4 SIP Message Examples for Overload Control Negotiation

Consider a SIP client, P1, which is sending requests to a downstream SIP server, P2.

The following snippets of SIP messages demonstrate how the overload control parameters work.

### INVITE Request from P1, a SIP Client (for Example, CSCF)

```
INVITE sips:user@example.com SIP/2.0
Via: SIP/2.0/TLS p1.example.net
    ;branch=z9hG4bK2d4790.1
    ;oc; oc-algo="loss"
```

P1 supports Overload control Algorithm LOSS.

### INVITE Response from P2, a SIP Server (for Example, MTAS)

```
SIP/2.0 100 Trying
Via: SIP/2.0/TLS p1.example.net
    ;branch=z9hG4bK2d4790.1
    ;oc=0;oc-algo="loss"
    ;oc-validity=0
    ;oc-seq=201602011634.45
```

P2 supports Overload control Algorithm LOSS, and does not require any overload control by P1 since `oc=0` and `oc-validity=0`.

When the P2 starts to experience overload, it sends the following SIP message indicating that P1 decreases the messages arriving to P2 by 20% for 1.5 seconds.



### INVITE Response from P2, a SIP Server (for Example, MTAS)

```
SIP/2.0 180 Ringing
Via: SIP/2.0/TLS p1.example.net
    ;branch=z9hG4bK2d4790.3
    ;oc=20;oc-algo="loss"
    ;oc-validity=1500
    ;oc-seq=201602011635.45
```

After some time, the overload condition at P2 subsides. It then changes the parameter values in the response it sends to P1 to allow P1 to send all messages destined to P2.

### INVITE Response from P2, a SIP Server (for Example, MTAS)

```
SIP/2.0 182 Queued
Via: SIP/2.0/TLS p1.example.net
    ;branch=z9hG4bK2d4790.4
    ;oc=0;oc-algo="loss"
    ;oc-validity=0
    ;oc-seq=201602011636.45
```

## 2.5 System Use

For MTAS, there are several resource types available on system level, see Section 3.3 on page 11. A user can configure which resource to be monitored by CM `mtasSipOcResource`. The CPU use is always considered no matter whether it is configured or not.

However, for the sake of simplicity, the Sip upstream overload control feature needs a single parameter which indicates the node overall use level. The term of system use has been introduced for that purpose, which indicates the normalized utilization level of the most critical resource (the use value which is closest to the load regulation limit).

The normalized here means, the system use equals to  $100 * \text{utilization\_level} / \text{limit\_value}$ .

The SIP Upstream Overload control implements a mechanism which periodically (set by CM `mtasSipOcRegulationInterval`) collects the current aggregated use values of the monitored resources and calculates the actual system utilization.

## 2.6 OC Calculation Algorithm

The OC value is dynamically recalculated based on the system use level in each regulation period (configured by CM `mtasSipOcRegulationInterval`, default 1s).



The OC value is adjusted according to the following rules:

- At the initial phase, the OC value is  $\emptyset$ , indicating no restriction (no SIP server overload).
- The following are the specific OC increase and decrease rules:
  - The OC value is increased in intervals not shorter than OC regulation timer if the system use is greater than overload onset (OO) threshold.
  - The OC value remains unchanged if the system use is between overload onset (OO) threshold and overload abatement (OA) threshold.
  - The OC value is decreased in intervals not shorter than OC regulation timer if the system use is below the overload abatement (OA).

Figure 1 shows the OC increase and decrease rules.

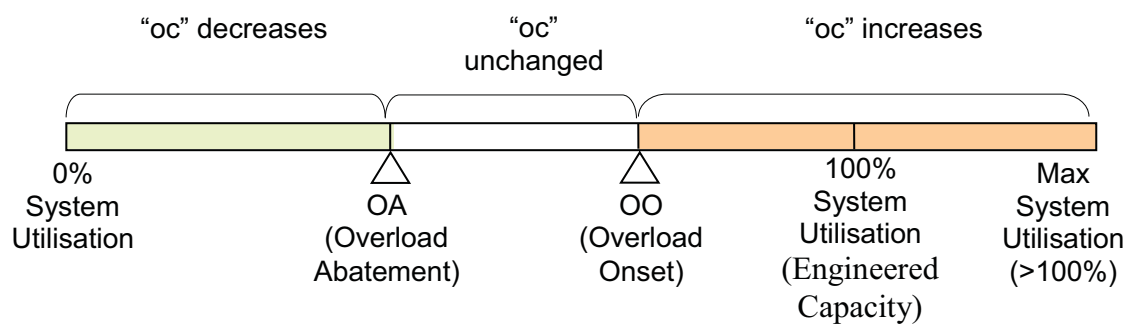


Figure 1 OC Management Rules





## 3 SIP Upstream Overload Control Configuration

An overview of the MO structure related to the SIP Upstream Overload Control is shown in Figure 2.

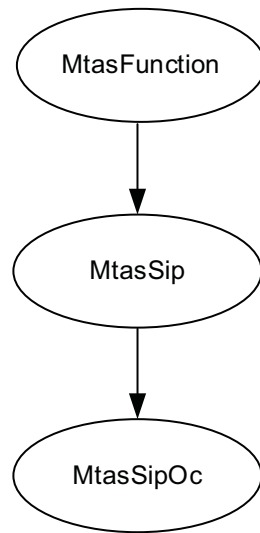


Figure 2 MO Structure Related to SIP Upstream Overload Control

For definition of configurable MOs and attributes related to the SIP Upstream Overload Control, refer to [Managed Object Model \(MOM\)](#).

### 3.1 SIP Upstream OC Administrative State Configuration

The SIP upstream overload control is enabled by setting the `mtasSipOcAdministrativeState` attribute in the `MtasSipOc` MO to 1 (Unlocked).

If the `mtasSipOcAdministrativeState` is set to 0 (Locked), the SIP upstream overload control feature becomes inactive.

### 3.2 SIP Upstream OC Parameter Configuration

The configuration of system use thresholds, increase or decrease OC steps, default OC validity and OC Regulation Interval are shown in Table 2.



Table 2 SIP Upstream OC Parameter Configuration

Attribute	Activity
mtasSipOcOnset	The attribute designates the threshold which triggers the increase of the oc value. MTAS increments the reported oc value periodically while the system use level is above this threshold.
mtasSipOcAbatement	The attribute designates the threshold which triggers the decrease of the oc value. MTAS decrements the reported oc value periodically while the system use level is below this threshold.
mtasSipOcDefIncrStep	The attribute indicates the default step value by which the oc is increased.
mtasSipOcDefDecrStep	The attribute indicates the default step value by which the oc is decreased.
mtasSipOcValidity	The attribute indicates the OC validity in milliseconds which set as oc-validity in Via header.
mtasSipOcRegulationInterval	The attribute indicates the OC regulation period in milliseconds.

The SIP upstream overload control feature can be fine-tuned and adapted to the traffic behavior of the target network through these parameters. A few examples about their recommended use are provided as follows:

### Overload Onset, Overload Abatement

The `mtasSipOcOnset` (OO) and `mtasSipOcAbatement` (OA) indicate the threshold to increase or decrease OC value.

For example, if the CPU is monitored and the O&M load regulation limit is 85, the OO 85 here means that when system use is above 72.25 (85% of the load regulation limit), the OC value starts to increase and the OA 75 here means that when system use is below 63.75 (75% of the load regulation limit), the OC value starts to decrease.

The default values of the OO and OA can be adjusted depending on the nature of the traffic in the target network.

### Default OC Increase or Decrease Steps

`mtasSipOcDefIncrStep` and `mtasSipOcDefDecrStep` indicate how much the default step of the OC value increases or decreases. Default values are 12 and 8. The mechanism that calculates the OC is not only based on the default oc increase or decrease step values. It is also based on the distance between the system use and the OO, OA thresholds, and the previous OC value.



However, these default values are only guidelines and the optimal values are to be determined by the measurements in the target network.

### OC Regulation Interval

Current MTAS platforms support update resource use levels every 1 second (set the CM to 1000), therefore, the OC regulation interval cannot be shorter than the default value of 1 second.

It takes time for the reacting node to update traffic based on the OC value, and the update traffic load does not affect the use level immediately, so this duration provides enough time to learn the effect of the previously reported OC value.

If the traffic delays and the modifications of the server offered traffic volume within the client or both take longer time (>250–300 ms), then the OC regulation interval is to be prolonged to avoid the oscillations.

### OC Validity

The `oc-validity` is to be 1.5 times longer than the OC regulation interval by default.

If there is a risk in the client side that the new OC value cannot be received and evaluated within this interval, then the `oc-validity` period is to be prolonged for scheduling a proper restriction level towards the server until the next OC value is processed.

## 3.3 SIP Upstream OC Resource Configuration

The supported resources are:

```
VS.LPM.LoadReg.CPUCoreUsage.LT
VS.LPM.LoadReg.CPUCoreUsage.ST
VS.LPM.LoadReg.CPUMaxUsage.LT
VS.LPM.LoadReg.CPUMaxUsage.ST
VS.LPM.LoadReg.CPUUsage.LT
VS.LPM.LoadReg.CPUUsage.ST
VS.LPM.LoadReg.HeapUsage.LT
VS.LPM.LoadReg.HeapUsage.ST
VS.LPM.LoadReg.MemUsage.LT
VS.LPM.LoadReg.MemUsage.ST
VS.LPM.LoadReg.MultiMMapUsage.LT
VS.LPM.LoadReg.MultiMMapUsage.ST
VS.LPM.LoadReg.TipcUsage.In.LT
VS.LPM.LoadReg.TipcUsage.In.ST
VS.LPM.LoadReg.TipcUsage.Out.LT
VS.LPM.LoadReg.TipcUsage.Out.ST
```



The `VS.LPM.LoadReg.CPUUsage.ST` is always monitored even if it is removed from the configuration. The operator can override only its use limit value used by the OC calculation algorithm – although it is not recommended.

The attribute `mtasSipOcResource` allows the operator to configure additional system resources and their use limits which are considered in overload situation.

The attribute `mtasSipOcResource` allows the operator to configure additional system resources and optionally their use limits which are considered in overload situation, for example:

- The empty configuration means that only the `VS.LPM.LoadReg.CPUUsage.ST` is considered in the OC calculation and the limit value 85 is used.
- The configuration of “`VS.LPM.LoadReg.CPUUsage.ST&85`”, “`VS.LPM.LoadReg.MemUsage.ST&95`”, “`VS.LPM.LoadReg.MultiMMapUsage.ST&85`” specifies that the CPU load, the Memory consumption, and map usage resources are to be regarded as using the use limit values of 85, 95, and 85 respectively.

The resource utilization level of the most critical resource is used by the OC calculation algorithm. In this case, the system monitors three resources and if, for example, the resource utilization level of the CPU is determined to be the most critical resource, then this utilization level is used as an input to the OC calculation algorithm. The `mtasSipOcOnset` (OO) and `mtasSipOcAbatement` (OA) thresholds, as described in Section 3.2 SIP Upstream OC Parameter Configuration on page 9, are used by the OC calculation algorithm for the most critical resource.

**Note:** Be cautious by overriding the default values.

The configuration of the monitored resources significantly affects the behavior of the SIP upstream overload control feature.





## 4 Performance Management

### 4.1 SIP Upstream Overload Control Measurements

For measurements related to the SIP upstream overload control, refer to [MTAS Performance Measurements](#).

### 4.2 Configure Performance Measurement Reporting Period

If the SIP Upstream OC feature is enabled, it is recommended to change the value of the vDicos variable `PM_COLLECTOR_FLUSH_PERIOD` to 1 [second] instead of the default of 5. This is to reduce the propagation delay of measurements and to prevent hysteresis of the measurement function. The side effect of this change is a higher idle load and slightly decreased capacity of the vMTAS node. The following steps describe how to modify the value:

#### Steps

1. Log on to the SC:

```
ssh <username>@<OAM-MIP>
```

2. Run the `modifyFlushPeriod.sh` script with parameters:

```
sudo /cluster/home/mtas_smf/scripts/modifyFlushPeriod.sh -m 1  
-s
```

3. Verify the new value:

```
sudo immlist -a lpmsvCfgAttrVal lpmsvCfgAttr=PM_COLLECTOR_FLUSH  
_PERIOD,lpmsv=LPMsvSite
```





## 5 Fault Management

There is no alarm for SIP upstream overload control.