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Approved BICPAARM [Vara Prasad KS]	Checked	Date 2017-06-28	Rev B	Reference

MTAS Performance Indicators

Abstract

This document covers MTAS performance indicators intended for PM reports supporting IMS.

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1 Revision history

Revision	Date	Responsible	Description
A	2017-04-10	EVARAKS	Aligned the document according to IMCN Performance Indicators 1/154 43-HSC 113 10 Rev D1
B	2017-05-10	EVARAKS	Updated 3.10.2 Equation 30

2 Introduction

2.1 Purpose

This document defines performance measures and formulas, R-KPI:s based on available counters in MTAS with the intention to support the making of PM reports for for IP Multimedia Core Network (IMCN) system and nodes .

2.2 Scope

Performance management is the process to produce, transfer, collect, store and present data, which can be used to verify the physical and logical configuration of the network and to locate potential problems as early as possible. Performance management is also used for monitoring of the network characteristics so that Quality of Service (QoS) and Service Level Agreements (SLA) may be supervised. MTAS provides measurement data for the IMS domain contribution to end to end service management, in the form of Resource Service Key Performance Indicators (R-KPI). The R-KPI concept and R-KPIs themselves are defined in ,ref. [3]. Another source for selection of KPIs to be supported is , ref. [5] and corresponding measurement definitions TS 32.409 IMS performance measurements, ref.[4]).

The following performance management areas are supported:

- Quality of service; accessibility and retainability of IMS services.
- Service uptake; Number of IMS subscribers, number of registered IMS subscribers, number of active users per mobile IMS service

Thus IMS and Node Key Performance Indicators (KPI) and Performance Indicators (PI) are listed in the document.

This document covers the Multi Media Telephony (MMTel) services.

The signalling traffic aspects of performance management support for MTAS is published in an own document, MTAS Signalling Traffic Performance Indicators, ref.[2]. This document covers the areas:

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- Licensing based on capacity parameters. Performance Indicators for monitoring of capacity based licenses.
- Resource utilization; CPU, Memory and Disk utilization
- Signaling traffic; Signaling traffic performance indicators and formulas are reported to support the dimensioning process

2.3 General information

2.3.1 Formula naming

General information about formulas, for example:

Equation X. IMS Registration Success Ratio

$$IMS\ RegSuccRatio = \frac{cscfAcceptedRegistrations}{cscfAcceptedRegistrations + cscfRejectedRegistrations}$$

Equation name, in this case IMS Registration Setup Success Ratio, is used as label for the KPI presentation and therefore needs to be unique.

The formula end result, in this case *IMSRegSuccRatio* is not presented and used as placeholder in the formula.

2.3.2 Service and node availability

The accessibility formulas in this document cover the accessibility of a system service as such. If the complete accessibility with the node availability is considered, then the system service accessibility shall be multiplied with the availability of the node.

Example:

$$IMS\ RegSuccRatio_{Total} = IMSRegSuccRatio * nodeAvailability$$

2.3.3 Aggregation on system level

The node measurements are delivered on a per node basis. The performance indicators have an interest both on node level and system level. It is not stated in the formulas whether they cover node or system level, it is an assumption that both levels are available in a PM report package.

2.3.4 Trend analysis

The performance indicators and formulas specified in this document are mainly intended for trend analysis. Due to the nature of the the subnetwork manager performance manager application collection, storage and presentation mechanisms, real time graphs are not supported.

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2.3.5 Busy hour performance indicators

The busy hour performance indicators are calculated from measurements reported per granularity period over a one hour sliding window, obtaining the busy hour values. The busy hour calculation is not indicated in the formulas, it is assumed to be a generic function of the subnetwork manager performance manager application. The busy hour performance indicators are assumed to be calculated in the Operations Support System (OSS) layer.

2.3.6 General for formulas on intensities

In this document, formulas on intensities, meaning events per time unit are generally expressed as events per second or in some few cases, events per hour. A reporting tool may select any time resolution, where events per second and events per hour are the most prioritized.

2.3.7 Formula and measurement names and the formula editor

The formula editor used for this document uses presentation conventions in formula and measurement names that introduce possible confusions. Reserved function names, for example $\tan()$, Re is presented with a specific format also for formula and measurement names. These function presentations shall be neglected. Example, the formula name IMSRegSuccRatio is presented as *IMS Re gSuccRatio*. The intended formula name is IMSRegSuccRatio.

2.3.8 Node document versions

Node documents versions are not stated in the references. Node documents with correct versions may be obtained from the same library as this document is published.

3 IMS MTAS

3.1 IMS MTAS Registration Accessibility

3.1.1 Definition

IMS MTAS Registration Accessibility is defined as the probability of being able to successfully register, re-register and de-register into the IMS MTAS.

3.1.2 Formula

Equation 1. IMS MTAS Initial Registration Success Ratio

$$IMSMTASInit Re gSuccRatio[\%] = 100 * \frac{MtasSubsDataInitialRegOk}{(MtasSubsDataInitialRegOk + MtasSubsDataInitialRegNOkE + MtasSubsDataInitialRegNOKI)}$$

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This formula covers the MMTel specific initial registrations setup success ratio, measured at the MTAS node.

Reference: , ref. [3] Section 3.1.2 Accessibility: IMS Initial Registration Success Ratio [%].

Equation 2. IMS MTAS Automatic Registration Success Ratio

$$IMSMTASAutoRegSuccRatio[\%] = 100 * \frac{MtasSubsDataAutoRegOk}{(MtasSubsDataAutoRegOk + MtasSubsDataAutoRegNOkE + MtasSubsDataAutoRegNOkI)}$$

Equation 3. IMS MTAS Re-registration Success Ratio

$$IMSMTASReRegSuccRatio[\%] = 100 * \frac{MtasSubsDataReregOk}{(MtasSubsDataReregOk + MtasSubsDataReregNOkE + MtasSubsDataReregNOkI)}$$

Counter Name	Definition
MtasSubsDataInitialRegOk	The number of initial registration procedures that were completed successfully. Counter on MTAS node.
MtasSubsDataInitialRegNOkE	The number of initial registration procedures that could not be completed successfully because of external reasons. Counter on MTAS node.
MtasSubsDataInitialRegNOkI	The number of initial registration procedures that could not be completed successfully because of internal reasons. Counter on MTAS node.
MtasSubsDataAutoRegOk	The number of automatically performed registrations that were completed successfully. Counter on MTAS node.
MtasSubsDataAutoRegNOkE	The number of automatically performed registrations that could not be completed successfully because of external reasons. Counter on MTAS node.
MtasSubsDataAutoRegNOkI	The number of automatically performed registrations that could not be completed successfully because of internal reasons. Counter on MTAS node.
MtasSubsDataReregOk	The number of reregistration procedures that were completed successfully. Counter on MTAS node.

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Counter Name	Definition
MtasSubsDataReregNOkE	The number of reregistration procedures that could not be completed successfully because of external reasons. Counter on MTAS node.
MtasSubsDataReregNOkI	The number of reregistration procedures that could not be completed successfully because of internal reasons. Counter on MTAS node.

Reference: [1].

3.2 IMS MTAS Registration Retainability

3.2.1 Definition

IMS MTAS Registration Retainability is defined as the probability of being able to successfully re-register and successfully complete (normally terminate) an active registration in the IMS MTAS.

3.2.2 Formula

Equation 4. IMS MTAS Re- and De-registration Completion Ratio

$$IMSMTASDeAndReRegCompRatio[\%] = 100 * \frac{(MtasSubsDataDeregOk + MtasSubsDataReregOk)}{(MtasSubsDataDeregOk + MtasSubsDataDeregNOkE + MtasSubsDataDeregNOkI + MtasSubsDataReregOk + MtasSubsDataReregNOkE + MtasSubsDataReregNOkI)}$$

This formula covers the MMTel specific re- and de-registrations completion ratio, measured at the MTAS node.

Reference: , ref. [3] Section 3.2.2 Retainability: IMS Registration Completion Ratio [%].

Counter Name	Definition
MtasSubsDataDeregOk	The number of deregistration procedures that were completed successfully. Counter on MTAS node.
MtasSubsDataDeregNOkE	The number of deregistration procedures that could not be completed successfully because of external reasons. Counter on MTAS node.
MtasSubsDataDeregNOkI	The number of deregistration procedures that could not be completed successfully because of internal reasons. Counter on MTAS node.

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Counter Name	Definition
MtasSubsDataReregOk	The number of reregistration procedures that were completed successfully. Counter on MTAS node.
MtasSubsDataReregNOkE	The number of reregistration procedures that could not be completed successfully because of external reasons. Counter on MTAS node.
MtasSubsDataReregNOkI	The number of reregistration procedures that could not be completed successfully because of internal reasons. Counter on MTAS node.

Reference: [1].

3.3 IMS MMTEL AS Session Setup Accessibility

3.3.1 Definition

IMS MMTEL AS Session Accessibility is defined as the probability of being able to successfully initiate a session into the IMS MMTEL AS.

3.3.2 Formula

Session accessibility for registered and un-registered PUI:s, these R-KPIs are also called Network Efficiency Ratio (NER) because they characterize the network performance. It is the percentage of calls where the called user was alerted for a new call and where user behavior is eliminated.

Equation 5. IMS MMTEL AS Originating Session Set-up Success Ratio

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$$IMSMMTelASOrgSessSetupSuccRatio[\%] = 100 * \frac{(\sum_{respCode=18m}^{respCode=20n} (MtasMmtOrigNetworkSuccessSessionEstablish + MtasMmtOrigUnregNetworkSuccessSessionEstablish) + \sum_{Cscf=1}^{Cscf=n} (MtasMmtOrigSessEarlyCancel + MtasMmtOrigUnregSessEarlyCancel) + MtasMmtOrigFailedAttemptCause.403 + MtasMmtOrigUnregFailedAttemptCause.403 + MtasMmtOrigFailedAttemptCause.404 + MtasMmtOrigUnregFailedAttemptCause.404 + MtasMmtOrigFailedAttemptCause.407 + MtasMmtOrigUnregFailedAttemptCause.407 + MtasMmtOrigFailedAttemptCause.484 + MtasMmtOrigUnregFailedAttemptCause.484)}{(\sum_{respCode=18m}^{respCode=20n} (MtasMmtOrigNetworkSuccessSessionEstablish + MtasMmtOrigUnregNetworkSuccessSessionEstablish) + \sum_{Cscf=1}^{Cscf=n} (MtasMmtOrigSessEarlyCancel + MtasMmtOrigUnregSessEarlyCancel + MtasMmtOrigFailedAttempt + MtasMmtOrigUnregFailedAttempt + MtasMmtInitOrigSessNokI + MtasMmtInitOrigUnregSessNokI))}$$

Reference: , ref. [1] Section 3.1.1 Accessibility: IMS Session Set-up Success Ratio [%]. These KPIs are also called Network Efficiency Ratio (NER) because they characterize the network performance where user behavior is eliminated.

Session accessibility for registered and un-registered PUI:s, Answer to Seizure Ratio (ASR). It is the percentage of answered telephone calls with respect to the total call volume.

Equation 6. IMS MMTEL AS Terminating Session Set-up Success Ratio

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$$\begin{aligned}
 IMSMMTelASTermSessSetupSuccRatio[\%] &= 100 * \\
 & \left(\sum_{\text{respCode}=18m}^{\text{respCode}=20n} (MtasMmtTermNetworkSuccessSessionEstablish + \right. \\
 & \quad \left. MtasMmtTermUnregNetworkSuccessSessionEstablish) + \right. \\
 & \quad \sum_{Cscf=1}^{Cscf=n} (MtasMmtTermSessEarlyCancel + \\
 & \quad \quad MtasMmtTermUnregSessEarlyCancel) + \\
 & \quad MtasMmtTermFailedAttemptCause.403 + \\
 & \quad MtasMmtTermUnregFailedAttemptCause.403 + \\
 & \quad MtasMmtTermFailedAttemptCause.404 + \\
 & \quad MtasMmtTermUnregFailedAttemptCause.404 + \\
 & \quad MtasMmtTermFailedAttemptCause.407 + \\
 & \quad MtasMmtTermUnregFailedAttemptCause.407 + \\
 & \quad MtasMmtTermFailedAttemptCause.484 + \\
 & \quad \left. MtasMmtTermUnregFailedAttemptCause.484) \right) \\
 & \div \left(\sum_{\text{respCode}=18m}^{\text{respCode}=20n} (MtasMmtTermNetworkSuccessSessionEstablish + \right. \\
 & \quad \left. MtasMmtTermUnregNetworkSuccessSessionEstablish) + \right. \\
 & \quad (MtasMmtTermSessEarlyCancel + MtasMmtTermUnregSessEarlyCancel + \\
 & \quad \sum_{Cscf=1}^{Cscf=n} MtasMmtTermFailedAttempt + MtasMmtTermUnregFailedAttempt + \\
 & \quad \left. MtasMmtInitTermSessNOkI + MtasMmtInitTermUnregSessNOkI) \right)
 \end{aligned}$$

These R-KPIs are also called Network Efficiency Ratio (NER) because they characterize the network performance where user behavior is eliminated.

The session setup is considered as successful from network performance perspective for the following responses caused by user behaviour:

- User cancelled in early dialog
- User is not registered, Forbidden (403)
- User is Not Found or Called User Unknown (404)
- Proxy Authentication Required (407)
- Address Incomplete (484)

User is busy (486) and Busy Everywhere (600) are not included in formula, since these factors may induce double counting as these comes in parallel with 18x responses. Request Terminated (487) is not included in formula, since it covers both pre-alerting and alerting session states.

Session accessibility for registered and un-registered PUI:s, Answer to Seizure Ratio (ASR). It is the percentage of answered telephone calls with respect to the total call volume.

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Equation 7. IMS MMTEL AS Originating Answer to Seizure Ratio (ASR)

$$IMSMMTelASOrgAnswerToSeizureRatioASR[\%] = 100 * \frac{(MtasMmtOrigAnswered + MtasMmtOrigUnregAnswered)}{(MtasMmtOrigAnswered + MtasMmtOrigUnregAnswered + MtasMmtOrigFailedAttempt + MtasMmtOrigUnregFailedAttempt)}$$

Equation 8. IMS MMTEL AS Terminating Answer to Seizure Ratio (ASR)

$$IMSMMTelASTermAnswerToSeizureRatioASR[\%] = 100 * \frac{(MtasMmtTermAnswered + MtasMmtTermUnregAnswered)}{(MtasMmtTermAnswered + MtasMmtTermUnregAnswered + MtasMmtTermFailedAttempt + MtasMmtTermUnregFailedAttempt)}$$

The counters in ASR formulas are keyed on CSCF IP address, which means that formulas are presented per CSCF. It is possible to make a sum for the system for all CSCFs.

Traffic indicators/Causes for failed attempts

Equation 9. IMS MMTEL AS Failed Originating Sessions, per cause code

$$IMSMMTelASFailedOrgSessions = MtasMmtOrigFailedAttemptCause.cause$$

Equation 10. IMS MMTEL AS Failed Terminating Sessions, per cause code

$$IMSMMTelASFailedTermSessions = MtasMmtTermFailedAttemptCause.cause$$

Equation 11. IMS MMTEL AS Failed Originating Sessions for unregistered PUI, per cause code

$$IMSMMTelASFailedOrgUnregSessions = MtasMmtOrigUnregFailedAttemptCause.cause$$

Equation 12. IMS MMTEL AS Failed Terminating Sessions for unregistered PUI, per cause code

$$IMSMMTelASFailedTermUnregSessions = MtasMmtTermUnregFailedAttemptCause.cause$$

Note: These measurements are presented separately per cause code. The notation '.cause' is the key (part of MOID) to the cause code.

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Equation 13. IMS MMTEL AS Rejected Parlay-X requests, per cause code

$$IMSMMTELASParlayX Re j Re quests = \\ MtasPxRejectedRequests.cause$$

Note: These measurements are presented separately per cause code. The notation '.cause' is the key (part of MOID) to the cause code.

Equation 14. IMS MTAS DNS Failover [per second]

$$IMSMTASDNSFailover = \frac{MtasFuncFailover}{T}$$

IMSMTASDNSFailover is the number of DNS based failover attempts to other external servers, when an initial request to the previous one failed due to connection error, time out or server error message is received

Counter Name	Definition
MtasMmtOrigNetworkSuccessSessionEstablish	The counter is incremented when sending 18x message or when sending 2xx (INVITE) if no 18x message has been sent, related to an initial INVITE, received by an originating MTAS. The response code (18xor 2xx) is used as key. Counter on MTAS node.
MtasMmtTermNetworkSuccessSessionEstablish	The counter is incremented when sending 18x message or when sending 2xx (INVITE) if no 18x message has been sent, related to an initial INVITE, received by a terminating MTAS. The response code (18xor 2xx) is used as key. The counter is incremented when sending 18x message or when sending 2xx (INVITE) if no 18x message has been sent. Counter on MTAS node.
MtasMmtOrigUnregNetworkSuccessSessionEstablish	The total number of sending 180 Ringing message or sending 2xx (INVITE) if no 180 Ringing message has been sent, related to an initial INVITE, by an originating unregistered MTAS. The Status-code (180 or 2xx) is used as key. Counter on MTAS node.
MtasMmtTermUnregNetworkSuccessSessionEstablish	The counter is incremented when sending 18x message or when sending 2xx (INVITE) if no 18x message has been sent, related to an initial INVITE, received by a terminating MTAS. The response code (18xor 2xx) is used as key. Counter on MTAS node.

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Counter Name	Definition
MtasMmtOrigFailedAttempt	The accumulated number of failed MMTEL INVITES, counted by the originating MTAS. The CSCF IP address is used as key. The counter is incremented when receiving 3xx/4xx/5xx/6xx messages. Counter on MTAS node.
MtasMmtOrigFailedAttemptCause	The accumulated number of failed MMTEL INVITES made to registered PUIs, counted by the originating MTAS. The cause code and reason is used as key. The counter is incremented when receiving 3xx/4xx/5xx/6xx messages. Counter on MTAS node.
MtasMmtOrigUnregFailedAttempt	The total number of received 3xx/4xx/5xx/6xx messages, by the originating unregistered MTAS. The counter is keyed with CSCF IP address. Counter on MTAS node.
MtasMmtTermFailedAttempt	The accumulated number of failed MMTEL INVITES made to registered PUIs, counted by the terminating MTAS. The CSCF IP address is used as key. The counter is incremented when receiving 3xx/4xx/5xx/6xx messages. Counter on MTAS node.
MtasMmtTermFailedAttemptCause	The accumulated number of failed MMTEL INVITES made to registered PUIs, counted by the terminating MTAS. The cause code and reason is used as key. The counter is incremented when receiving 3xx/4xx/5xx/6xx messages. Counter on MTAS node.
MtasMmtOrigUnregFailedAttemptCause	Number of received 3xx/4xx/5xx/6xx messages, by the originating unregistered MTAS. The counter is keyed with Status-code from 3xx-6xx response and Reason phrase. Counter on MTAS node.
MtasMmtTermUnregFailedAttempt	The accumulated number of failed MMTEL INVITES made to unregistered PUIs, counted by the terminating MTAS. The CSCF IP address is used as key. The counter is incremented when receiving 3xx/4xx/5xx/6xx messages. Counter on MTAS node.
MtasMmtTermUnregFailedAttemptCause	The accumulated number of failed MMTEL INVITES made to unregistered PUIs, counted by the terminating MTAS. The cause code and reason is used as key. The counter is incremented when receiving 3xx/4xx/5xx/6xx messages. Counter on MTAS node.

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Counter Name	Definition
MtasMmtOrigAnswered	The accumulated number of MMTEL INVITES answered, counted by the originating MTAS. The CSCF IP address is used as key. The counter is incremented when receiving the 200 OK message. Counter on MTAS node.
MtasMmtOrigUnregAnswered	The total number of received 2xx (INVITE), by the originating unregistered MTAS. The counter is keyed with CSCF IP address. The counter is incremented when receiving the 200 OK message. Counter on MTAS node.
MtasMmtTermAnswered	The accumulated number of MMTEL INVITES answered by registered PUIs, counted by the terminating MTAS. The CSCF IP address is used as key. The counter is incremented when receiving the 200 OK message. Counter on MTAS node.
MtasMmtUnregTermAnswered	The accumulated number of MMTEL INVITES answered by unregistered PUIs, counted by the terminating MTAS. The CSCF IP address is used as key. The counter is incremented when receiving the 200 OK message. Counter on MTAS node.
MtasPxRejectedRequests	The counter is incremented when rejecting a received Parlay X Request in MTAS. The cause code is used as key. Counter on MTAS node.
MtasFuncFailover	The number of DNS based failover attempts to other external servers, when the request to the previous one failed due to connection error, time out or server error message is received. Counter on MTAS node.

Reference: [1].

3.4 IMS MTAS (MMTEL AS and SCC AS) Session Retainability

3.4.1 Definition

IMS MTAS (MMTEL AS and SCC AS) Session Retainability is defined as the probability of being able to successfully complete (normally terminate) an active IMS MTAS Session.

For formulas Equation 15 to Equation 22, an SBG SMM rule must be applied. The SMM rule in SBG P-CSCF and I-BCF shall add a reason header in BYE requests with cause 487 response code as first reason header in access networks (from UE) and foreign networks.

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SBG SMM rule to be applied:

Ruleset "Add a new Reason with cause 487 response code first in BYE"

If

is_request and
SIP:cseq.method == "BYE"

Do

add first SIP:reason := "SIP;cause=487;text=\"Session cancelled\""

End

End

This SMM rule shall be applied for "Incoming SMM Filter" fields of all access and foreign networks.

3.4.2

Formula

Equation 15. IMS MMTel AS Originating Session Completion Ratio

$$\begin{aligned}
 IMSMMTelASOrgSessCompRatio[\%] &= 100 * \\
 &\frac{(MtasMmtTermOrigSessOk.SIP; cause = 487 + \\
 &\quad MtasMmtTermOrigSessOk.Q.850; cause = 16)}{ \\
 &(MtasMmtTermOrigSessOk.SIP; cause = 487 + \\
 &\quad MtasMmtTermOrigSessOk.Q.850; cause = 16 + \\
 &\quad \sum_{Cscf=1}^{Cscf=n} (MtasMmtTermOrigSessNOkI + MtasMmtTermOrigSessNOkE))}
 \end{aligned}$$

Equation 16. IMS MMTel AS Terminating Session Completion Ratio

$$\begin{aligned}
 IMSMMTelASTermSessCompRatio[\%] &= 100 * \\
 &\frac{(MtasMmtTermTermSessOk.SIP; cause = 487 + \\
 &\quad MtasMmtTermTermSessOk.Q.850; cause = 16)}{ \\
 &(MtasMmtTermTermSessOk.SIP; cause = 487 + \\
 &\quad MtasMmtTermTermSessOk.Q.850; cause = 16 + \\
 &\quad \sum_{Cscf=1}^{Cscf=n} (MtasMmtTermTermSessNOkI + MtasMmtTermTermSessNOkE))}
 \end{aligned}$$

Equation 17. IMS MMTel AS Originating Dropped Sessions Ratio

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$$IMSMMTelASOrgDroppedSessRatio[\%] = 100 * \frac{\sum_{Cscf=1}^{Cscf=n} (MtasMmtTermOrigSessNOkI + MtasMmtTermOrigSessNOkE)}{(MtasMmtTermOrigSessOk.SIP; \text{cause} = 487 + MtasMmtTermOrigSessOk.Q.850; \text{cause} = 16 + \sum_{Cscf=1}^{Cscf=n} (MtasMmtTermOrigSessNOkI + MtasMmtTermOrigSessNOkE))}$$

Equation 18. IMS MMTel AS Terminating Dropped Sessions Ratio

$$IMSMMTelASOrgDroppedSessRatio[\%] = 100 * \frac{\sum_{Cscf=1}^{Cscf=n} (MtasMmtTermTermSessNOkI + MtasMmtTermTermSessNOkE)}{(MtasMmtTermTermSessOk.SIP; \text{cause} = 487 + MtasMmtTermTermSessOk.Q.850; \text{cause} = 16 + \sum_{Cscf=1}^{Cscf=n} (MtasMmtTermTermSessNOkI + MtasMmtTermTermSessNOkE))}$$

$$IMSMMTelASOrgDroppedSessRatio[\%] = 100 * \frac{\sum_{Cscf=1}^{Cscf=n} (MtasMmtTermTermSessNOkI + MtasMmtTermTermSessNOkE)}{(MtasMmtTermTermSessOk.SIP; \text{cause} = 487 + MtasMmtTermTermSessOk.Q.850; \text{cause} = 16 + \sum_{Cscf=1}^{Cscf=n} (MtasMmtTermTermSessNOkI + MtasMmtTermTermSessNOkE))}$$

Reference: , ref. [1] Section 3.2.1 Retainability: IMS Session Completion Ratio [%].

Equation 19. IMS SCC AS Originating CS Session Completion Ratio

$$IMSSCCASOrgCsSessCompRatio[\%] = 100 * \frac{(MtasSccTermOrigCsSessOk.SIP; \text{cause} = 487 + MtasSccTermOrigCsSessOk.Q.850; \text{cause} = 16)}{(MtasSccTermOrigCsSessOk.SIP; \text{cause} = 487 + MtasSccTermOrigCsSessOk.Q.850; \text{cause} = 16 + \sum_{Cause=1}^{Cause=n} (MtasSccTermOrigCsSessNOk + MtasSccTermOrigCsSessNOkECause + MtasSccTermOrigCsSessNOkServiceCause) + \sum_{Cscf=1}^{Cscf=n} (MtasSccTermOrigCsSessNOkI))}$$

$$IMSSCCASOrgCsSessCompRatio[\%] = 100 * \frac{(MtasSccTermOrigCsSessOk.SIP; \text{cause} = 487 + MtasSccTermOrigCsSessOk.Q.850; \text{cause} = 16)}{(MtasSccTermOrigCsSessOk.SIP; \text{cause} = 487 + MtasSccTermOrigCsSessOk.Q.850; \text{cause} = 16 + \sum_{Cause=1}^{Cause=n} (MtasSccTermOrigCsSessNOk + MtasSccTermOrigCsSessNOkECause + MtasSccTermOrigCsSessNOkServiceCause) + \sum_{Cscf=1}^{Cscf=n} (MtasSccTermOrigCsSessNOkI))}$$

Equation 20. IMS SCC AS Terminating CS Session Completion Ratio

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$$\begin{aligned}
 IMSSCCASTermCsSessCompRatio[\%] &= 100 * \\
 &\quad (MtasSccTermTermCsSessOk.SIP; \text{cause} = 487 + \\
 &\quad MtasSccTermTermCsSessOk.Q.850; \text{cause} = 16) \\
 &\quad \frac{(MtasSccTermTermCsSessOk.SIP; \text{cause} = 487 + \\
 &\quad MtasSccTermTermCsSessOk.Q.850; \text{cause} = 16 + \\
 &\quad \sum_{Cause=1}^{Cause=n} (MtasSccTermTermCsSessNok + MtasSccTermTermCsSessNokECause + \\
 &\quad MtasSccTermTermCsSessNokServiceCause) + \\
 &\quad \sum_{Cscf=1}^{Cscf=n} (MtasSccTermTermCsSessNokI))}{}
 \end{aligned}$$

Equation 21. IMS SCC AS Originating PS Session Completion Ratio

$$\begin{aligned}
 IMSSCCASOrgPsSessCompRatio[\%] &= 100 * \\
 &\quad (MtasSccTermOrigPsSessOk.SIP; \text{cause} = 487 + \\
 &\quad MtasSccTermOrigPsSessOk.Q.850; \text{cause} = 16) \\
 &\quad \frac{(MtasSccTermOrigCPsSessOk.SIP; \text{cause} = 487 + \\
 &\quad MtasSccTermOrigPsSessOk.Q.850; \text{cause} = 16 + \\
 &\quad \sum_{Cause=1}^{Cause=n} (MtasSccTermOrigPsSessNok + MtasSccTermOrigPsSessNokECause + \\
 &\quad MtasSccTermOrigPsSessNokServiceCause) + \\
 &\quad \sum_{Cscf=1}^{Cscf=n} (MtasSccTermOrigPsSessNokI))}{}
 \end{aligned}$$

Equation 22. IMS SCC AS Terminating PS Session Completion Ratio

$$\begin{aligned}
 IMSSCCASTermPsSessCompRatio[\%] &= 100 * \\
 &\quad (MtasSccTermTermPsSessOk.SIP; \text{cause} = 487 + \\
 &\quad MtasSccTermTermPsSessOk.Q.850; \text{cause} = 16) \\
 &\quad \frac{(MtasSccTermTermPsSessOk.SIP; \text{cause} = 487 + \\
 &\quad MtasSccTermTermPsSessOk.Q.850; \text{cause} = 16 + \\
 &\quad \sum_{Cause=1}^{Cause=n} (MtasSccTermTermPsSessNok + MtasSccTermTermPsSessNokECause + \\
 &\quad MtasSccTermTermPsSessNokServiceCause) + \\
 &\quad \sum_{Cscf=1}^{Cscf=n} (MtasSccTermTermPsSessNokI))}{}
 \end{aligned}$$

Reference: Key Performance Indicators for IMS System, ref. [3] Section Retainability: IMS Session Completion Ratio [%].

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Counter Name	Definition
MtasMmtTermOrigSessOk	The number of successful call completion in Originating MMTEL AS triggered by UE. The counter is incremented when BYE request with Reason header with SIP;cause = 487 is received or with Q.850;cause=16 is received from network. The counter is keyed on cause in reason header. Counter on MTAS node.
MtasMmtTermOrigSessNOkl	The accumulated number of MMTEL sessions, in the originating MTAS, terminated prematurely by the MTAS due to internal reasons. The counter is keyed on the CSCF IP address. Counter on MTAS node.
MtasMmtTermOrigSessNOkE	The accumulated number of MMTEL sessions, in the originating MTAS, terminated prematurely by the MTAS due to external reasons. The counter is keyed on the CSCF IP address. Counter on MTAS node.
MtasMmtTermTermSessOk	The number of successful call completion in Terminating MMTEL AS triggered by UE. The counter is incremented when BYE request with Reason header with SIP;cause = 487 is received or with Q.850;cause=16 is received from network. The counter is keyed on cause in reason header. Counter on MTAS node.
MtasMmtTermTermSessNOkl	The accumulated number of MMTEL sessions, in the Terminating MTAS, terminated prematurely by the MTAS due to internal reasons. The counter is keyed on the CSCF IP address. Counter on MTAS node.
MtasMmtTermTermSessNOkE	The accumulated number of MMTEL sessions, in the terminating MTAS, terminated prematurely by the MTAS due to external reasons. The counter is keyed on the CSCF IP address. Counter on MTAS node.
MtasSccTermOrigCsSessOk	The number of successful call completion from CS domain in Originating SCC AS triggered by UE. The counter is keyed on cause in Reason Header. The counter is incremented when BYE request with Reason header with SIP;cause = 487 is received or with Q.850;cause=16 is received from network. Counter on SCC AS node.

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MtasSccTermOrigCsSessNOk	The number of unsuccessful call completion from CS domain in Originating SCC AS triggered by network. The counter is keyed on cause of fault in Reason Header. The counter is incremented when BYE request with Reason header other than SIP;cause = 487 is received or with Q.850;cause=16 received from network or BYE request from network without reason header. Counter on SCC AS node.
MtasSccTermOrigCsSessNOkI	The accumulated number of SCC session completion from CS domain due to node internal reasons like crash, in the originating SCC AS. The counter is keyed on the CSCF IP address. Counter on SCC AS node.
MtasSccTermOrigCsSessNOkECause	The number of unsuccessful call completion from CS domain due to external faults in Originating SCC AS. The counter is keyed on cause of fault in Reason Header. The counter is incremented when Service in SCC AS deducts with the external nodes like Charging server, HSS or DNS. Counter on SCC AS node.
MtasSccTermOrigCsSessNOkServiceCause	The number of unsuccessful call completion from CS domain due to service logic in Originating SCC AS. The counter is keyed on cause of fault in Reason Header. The counter is incremented when Service in SCC AS triggers the termination. Counter on SCC AS node.
MtasSccTermTermCsSessOk	The number of successful call completion from CS domain in Terminating SCC AS triggered by UE. The counter is keyed on cause in Reason Header. The counter is incremented when BYE request with Reason header with SIP;cause = 487 is received or with Q.850;cause=16 is received from network. Counter on SCC AS node.
MtasSccTermTermCsSessNOk	The number of unsuccessful call completion from CS domain in Terminating SCC AS triggered by network. The counter is keyed on cause of fault in Reason Header. The counter is incremented when BYE request with Reason header other than SIP;cause = 487 is received or with Q.850;cause=16 received from network or BYE request from network without reason header. Counter on SCC AS node.

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MtasSccTermTermCsSessNOkl	The accumulated number of SCC session completion from CS domain due to node internal reasons like crash, in the Terminating SCC AS. The counter is keyed on the CSCF IP address. Counter on SCC AS node.
MtasSccTermTermCsSessNOkEause	The number of unsuccessful call completion from CS domain due to external faults in Terminating SCC AS. The counter is keyed on cause of fault in Reason Header. The counter is incremented when Service in SCC AS deducts with the external nodes like Charging server, HSS or DNS. Counter on SCC AS node.
MtasSccTermTermCsSessNOkServiceCause	The number of unsuccessful call completion from CS domain due to service logic in Terminating SCC AS. The counter is keyed on cause of fault in Reason Header. The counter is incremented when Service in SCC AS triggers the termination. Counter on SCC AS node.
MtasSccTermOrigPsSessOk	The number of successful call completion from PS domain in Originating SCC AS triggered by UE. The counter is keyed on cause in Reason Header. The counter is incremented when BYE request with Reason header with SIP;cause = 487 is received or with Q.850;cause=16 is received from network. Counter on SCC AS node.
MtasSccTermOrigPsSessNOk	The number of unsuccessful call completion from PS domain in Originating SCC AS triggered by network. The counter is keyed on cause of fault in Reason Header. The counter is incremented when BYE request with Reason header other than SIP;cause = 487 is received or with Q.850;cause=16 received from network or BYE request from network without reason header. Counter on SCC AS node.
MtasSccTermOrigPsSessNOkl	The accumulated number of SCC session completion from PS domain due to node internal reasons like crash, in the originating SCC AS. The counter is keyed on the CSCF IP address. Counter on SCC AS node.

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MtasSccTermOrigPsSessNOkECause	<p>The number of unsuccessful call completion from PS domain due to external faults in Originating SCC AS. The counter is keyed on cause of fault in Reason Header. The counter is incremented when Service in SCC AS deducts with the external nodes like Charging server, HSS or DNS.</p> <p>Counter on SCC AS node.</p>
MtasSccTermOrigPsSessNOkServiceCause	<p>The number of unsuccessful call completion from PS domain due to service logic in Originating SCC AS. The counter is keyed on cause of fault in Reason Header. The counter is incremented when Service in SCC AS triggers the termination.</p> <p>Counter on SCC AS node.</p>
MtasSccTermTermPsSessOk	<p>The number of successful call completion from PS domain in Terminating SCC AS triggered by UE. The counter is keyed on cause in Reason Header. The counter is incremented when BYE request with Reason header with SIP;cause = 487 is received or with Q.850;cause=16 is received from network.</p> <p>Counter on SCC AS node.</p>
MtasSccTermTermPsSessNOk	<p>The number of unsuccessful call completion from PS domain in Terminating SCC AS triggered by network. The counter is keyed on cause of fault in Reason Header. The counter is incremented when BYE request with Reason header other than SIP;cause = 487 is received or with Q.850;cause=16 received from network or BYE request from network without reason header.</p> <p>Counter on SCC AS node.</p>
MtasSccTermTermPsSessNOkl	<p>The accumulated number of SCC session completion from PS domain due to node internal reasons like crash, in the Terminating SCC AS. The counter is keyed on the CSCF IP address.</p> <p>Counter on SCC AS node.</p>
MtasSccTermTermPsSessNOkECause	<p>The number of unsuccessful call completion from PS domain due to external faults in Terminating SCC AS. The counter is keyed on cause of fault in Reason Header. The counter is incremented when Service in SCC AS deducts with the external nodes like Charging server, HSS or DNS.</p> <p>Counter on SCC AS node.</p>

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MtasSccTermTermPsSessNOkServiceCause	The number of unsuccessful call completion from PS domain due to service logic in Terminating SCC AS. The counter is keyed on cause of fault in Reason Header. The counter is incremented when Service in SCC AS triggers the termination. Counter on SCC AS node.
MtasSrvccTransferOk	The number of successful access transfers using Single Radio Voice Call Continuity. Counter on MTAS node.
MtasSrvccTransferNOkE	The number of unsuccessful (due to node external error) access transfers attempts using Single Radio Voice Call Continuity. Counter on MTAS node.
MtasSrvccTransferNOkI	The number of unsuccessful (due to node internal error) access transfers attempts using Single Radio Voice Call Continuity. Counter on MTAS node.
MtasSrvccEAttempt	The number of attempts to initiate access transfer using enhanced Single Radio Voice Call Continuity (Rel. 10-12). Counter on MTAS node.
MtasSrvccETransferNOkE	The number of unsuccessful (due to node external error) access transfers using enhanced Single Radio Voice Call Continuity (Rel. 10-12). Counter on MTAS node.
MtasSrvccETransferNOkI	The number of unsuccessful (due to node internal error) access transfers using enhanced Single Radio Voice Call Continuity (Rel. 10-12). Counter on MTAS node.

Reference: [1]

3.5 IMS MMTEL AS Hold/Resume Service Accessibility

3.5.1 Definition

IMS MMTEL AS Hold/Resume Service Accessibility is defined as the probability of being able to successfully access the Hold/Resume services.

3.5.2 Formula

Equation 23. IMS MMTEL AS Hold Service Success Ratio

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$$IMSMMTelASHoldSuccRatio[\%] = 100 * \frac{MtasHoldInitiatedHoldOk}{MtasHoldInitiatedHold}$$

Equation 24. IMS MMTEL AS Resume Service Success Ratio

$$IMSMMTelASHoldSuccRatio[\%] = 100 * \frac{MtasHoldInitiatedResumeOk}{MtasHoldInitiatedResume}$$

Counter Name	Definition
MtasHoldInitiatedHold	The number of initiated Hold in the MTAS for invoking UA. Counter on MTAS node.
MtasHoldInitiatedHoldOk	The number of successful initiated Hold in the MTAS for the invoking UA. Counter on MTAS node.
MtasHoldInitiatedResume	The number of initiated Resumes in the MTAS for invoking UA. Counter on MTAS node.
MtasHoldInitiatedResumeOk	The number of successful initiated resumes. Counter on MTAS node.

Reference: [1]

3.6 IMS MMTEL AS Communication Diversion Service Accessibility

3.6.1 Definition

IMS MMTEL AS Communication Diversion Service Accessibility is defined as the probability of being able to successfully access the Communication Diversion service.

3.6.2 Formula

Equation 25. IMS MMTEL AS Communication Diversion Success Ratio

$$IMSMMTelASCallDiversionSuccRatio[\%] = 100 * \frac{MtasCDivNumberOfCdivOk}{MtasCDivNumberOfCdivOk + MtasCDivNumberOfCdivNotOk}$$

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The measurements in the formula are keyed by type of diversion, so the formula may be expressed per type of diversion or as a sum of all types of diversion.

Counter Name	Definition
MtasCDivNumberOfCdivOk	A performance measurement (PM) counter that is incremented each time Communication Diversion (CDiv) successfully establishes communication following diversion of an incoming communication. There is one counter for the entire node. The counter is keyed by type of diversion: CFU, CFB, CFNR, CFNL, CDar, CDwr, CFNRc, DNDCF. Counter on MTAS node.
MtasCDivNumberOfCdivNotOk	A performance measurement (PM) counter that is incremented each time Communication Diversion (CDiv) fails for any reason to establish communication following diversion of an incoming communication. There is one counter for the entire node. The counter is keyed by type of diversion: CFU, CFB, CFNR, CFNL, CDar, CDwr, CFNRc, DNDCF.. Counter on MTAS node.

Reference: [1]

3.7 IMS MMTEL AS Conference Service Accessibility

3.7.1 Definition

IMS MMTEL AS Conference Service Accessibility is defined as the probability of being able to successfully initiate the conference services.

3.7.2 Formula

Equation 26. IMS MMTEL AS Conference Creation Success Ratio

$$IMSMMTelASConfCreateSuccRatio[\%] = 100 * \frac{MtasConfCreationOk}{(MtasConfCreationOk + MtasConfCreationNOKI + MtasConfCreationNOkE)}$$

Equation 27. IMS MMTEL AS Joined Conference Participant Success Ratio

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$$IMSMMTelASJoinedConfPartSuccRatio[\%] = 100 * \frac{MtasConfDialOutOk}{(MtasConfDialOutOk + MtasConfDialOutNOkI + MtasConfDialOutNOkE)}$$

Counter Name	Definition
MtasConfCreationOk	The number of successfully created conference sessions. Counter on MTAS node.
MtasConfCreationNOkI	The number of unsuccessful conference creation attempts due to node internal reasons. Counter on MTAS node.
MtasConfCreationNOkE	The number of unsuccessful conference creation attempts due to node external reasons. Counter on MTAS node.
MtasConfDialOutOk	The number of successfully joined conference participants through dial-out. Counter on MTAS node.
MtasConfDialOutNOkI	The number of failed dial-out attempts due to node internal reasons. Counter on MTAS node.
MtasConfDialOutNOkE	The number of failed dial-out attempts due to node external reasons, for example an MRFP failure. Counter on MTAS node.
MtasConfSchedAttempt	The number of dial-in attempts to a scheduled conference. Counter on MTAS node.
MtasConfSchedDialInNOkE	The number of failed dial-in attempts to a scheduled conference due to node external reasons. Counter on MTAS node.
MtasConfSchedDialInNOkI	The number of failed dial-in attempts to a scheduled conference due to node internal reasons. Counter on MTAS node.

Reference: [1].

3.8 IMS Conference AS Scheduled Conference Accessibility

3.8.1 Definition

IMS Conference AS Scheduled Conference Accessibility is defined as the probability of being able to successfully initiate the scheduled conference services.

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3.8.2 Formula

Equation 28. IMS Conference AS Scheduled Conference Dial-in Success Ratio

$$IMSConfASSchedConfSuccRatio[\%] = 100 * \frac{MtasConfSchedAttempt - (MtasConfSchedDialInNOkE + MtasConfSchedDialInNOkI)}{MtasConfSchedAttempt}$$

Counter Name	Definition
MtasConfCreationOk	The number of successfully created conference sessions. Counter on MTAS node.
MtasConfTerminatedNOkI	The number of successfully created conference sessions, abnormally terminated due to node internal reasons (faults). A conference is normally terminated by the Conference Creator. Abnormal termination is performed by the Focus due to the occurrence of an unexpected node internal event/fault that means that the conference cannot continue. Counter on MTAS node.
MtasConfTerminatedNOkE	The number of successfully created conference sessions, abnormally terminated due to node external reasons (faults). A conference is normally terminated by the Conference Creator. Abnormal termination is performed by the Conference Focus due to the occurrence of an unexpected node external event/fault that means the conference cannot continue, for example an MRFP failure. Counter on MTAS node.

Reference: [1].

3.9 IMS MTAS Conference Service Retainability

3.9.1 Definition

IMS MTAS Conference Service Retainability is defined as the probability of being able to successfully complete (normally terminate) the active conferences.

3.9.2 Formula

Equation 29. IMS MTAS Conference Termination Success Ratio

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$$IMSMTASConfTerminationSuccRatio[\%] = 100 * \frac{(MtasConfCreationOk - MtasConfTerminatedNOkI - MtasConfTerminatedNOkE)}{MtasConfCreationOk}$$

Counter Name	Definition
MtasConfCreationOk	The number of successfully created conference sessions. Counter on MTAS node.
MtasConfTerminatedNOkI	The number of successfully created conference sessions, abnormally terminated due to node internal reasons (faults). A conference is normally terminated by the Conference Creator. Abnormal termination is performed by the Focus due to the occurrence of an unexpected node internal event/fault that means that the conference cannot continue. Counter on MTAS node.
MtasConfTerminatedNOkE	The number of successfully created conference sessions, abnormally terminated due to node external reasons (faults). A conference is normally terminated by the Conference Creator. Abnormal termination is performed by the Conference Focus due to the occurrence of an unexpected node external event/fault that means the conference cannot continue, for example an MRFP failure. Counter on MTAS node.

Reference: [1].

3.10 IMS MMTEL AS Calling Name Identification Presentation (CNIP) Services Accessibility

3.10.1 Definition

IMS MMTEL AS Calling Name Identification Presentation (CNIP) Services Accessibility is defined as the probability of being able to successfully invoke the Calling Name Identification Presentation (CNIP) services.

3.10.2 Formula

Equation 30. IMS MMTEL AS Calling Name Identification Presentation (CNIP) Success Ratio

$$IMSMMTelASIdPresCnipSuccRatio[\%] = 100 * \frac{MtasIdPresCnipAttempt}{MtasIdPresCnip}$$

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Counter Name	Definition
MtasIdPresCnipAttempt	The number of CNIP external queries to retrieve the caller displayname. Counter on MTAS node.
MtasIdPresCnip	The number of invocations of the CNIP service. Counter on MTAS node.

Reference: [3].

3.11 IMS MMTEL AS Announcement Service Accessibility

3.11.1 Definition

IMS MMTEL AS Announcement Service Accessibility is defined as the probability of being able to successfully initiate the playing of an announcement from MTAS MRFC to an external MRFP.

3.11.2 Formula

Equation 31. IMS MMTEL AS Playing of Announcement Success Ratio

$$IMSMMTelASAnnouncementSuccRatio[\%] = 100 * \frac{MtasMrfcInitiatedAnnOk(key : annCode)}{(MtasMrfcInitiatedAnnOk(key : annCode) + MtasMrfcInitiatedAnnNOkI(key : annCode) + MtasMrfcInitiatedAnnNOkE(key : annCode))}$$

The counters in this formula are indexed with the announcement code (annCode). The formula result may be presented per announcement code or added to a sum for all announcement codes.

Counter Name	Definition
MtasMrfcInitiatedAnnOk	The number of successfully initiated playing of announcement. The counter is keyed on announcement code. Counter on MTAS node.
MtasMrfcInitiatedAnnNOkI	The number of unsuccessfully initiated playing of announcement due to internal error in MTAS. The counter is keyed on announcement code. Counter on MTAS node.
MtasMrfcInitiatedAnnNOkE	The number of unsuccessfully initiated playing of announcement. Due to external error, e.g. in MRFP. The counter is keyed on announcement code. Counter on MTAS node.

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Reference: [1].

3.12 IMS MMTEL AS Abbreviated Dialing Service Accessibility

3.12.1 Definition

IMS MMTEL AS Abbreviated Dialing Service Accessibility is defined as the probability of being able to successfully invoke the Abbreviated Dialing service.

3.12.2 Formula

Equation 32. IMS MMTEL AS Abbreviated Dialing Success Ratio

$$IMSMMTelASAbDiaSuccRatio[\%] = 100 * \frac{MtasAbDialOk}{(MtasAbDialOk + MtasAbDialNOk)}$$

Counter Name	Definition
MtasAbDialOk	Count of the total number of successful invocation of the Abbreviated Dialing function. Counter on MTAS node.
MtasAbDialNOk	Count of the total number of unsuccessful invocations of the Abbreviated Dialing function. Counter on MTAS node.

Reference: [1].

3.13 IMS MMTEL AS Dial Tone Management Service Accessibility

3.13.1 Definition

IMS MMTEL AS Dial Tone Management Service Accessibility is defined as the probability of being able to successfully send a NOTIFY for a dial tone pattern.

3.13.2 Formula

Equation 33. IMS MMTEL AS Playing of Announcement Success Ratio

$$IMSMMTelASDTMSuccRatio[\%] = 100 * \frac{MtasDtmNotifyOk}{(MtasDtmNotifyOk + MtasDtmNotifyNOkI + MtasDtmNotifyNOkE)}$$

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Counter Name	Definition
MtasDtmNotifyOk	MtasDtmNotifyOk contains the count of the total number of NOTIFY messages sent for dial tone pattern. Counter on MTAS node.
MtasDtmNotifyNOKI	MtasDtmNotifyNOKI contains the count of the total number of unsuccessful NOTIFY messages sent for dial tone pattern. Counter on MTAS node.
MtasDtmNotifyNOKE	MtasDtmNotifyNOKE contains the count of the total number of successful NOTIFY (dial-tone-pattern) messages sent, that get no reply or a failure response. If the failure is due to absence of a valid DTM license, the counter is keyed by "LICENSES". Counter on MTAS node.

Reference: [1].

3.14 IMS MMTEL AS Communication Waiting Service Accessibility

3.14.1 Definition

IMS MMTEL AS Communication Waiting Service Accessibility is defined as the probability of a user accepted a communication waiting notification.

Note this formula id for user behaviour; it does not reflect the network function.

3.14.2 Formula

Equation 34. IMS MMTEL AS (User) Communication Waiting Success Ratio

$$IMSMMTelASCWSuccRatio[\%] = 100 * \frac{MtasCwAccepted}{MtasCwUsed}$$

Counter Name	Definition
MtasCwAccepted	Number of waiting communications that have been accepted by Communication Waiting subscribers. Counter on MTAS node.
MtasCwUsed	Number of times the Communication Waiting has been used by Communication Waiting Subscribers. Counter on MTAS node.

Reference: [1].

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3.15 IMS MMTEL AS Advice of Charge Service Accessibility

3.15.1 Definition

IMS MMTEL AS Advice Of Charge (AOC) Service Accessibility is defined as the probability of being able to successfully invoke the AoC Service.

3.15.2 Formula

Equation 35. IMS MMTEL AS Advice of Charge Start (AoC-S) Success Ratio

$$IMSMMTelASAOStartSuccRatio[\%] = 100 * \frac{MtasAocStartOk}{(MtasAocStartOk + MtasAocStartNOkI + MtasAocStartNOkE)}$$

Equation 36. IMS MMTEL AS Advice of Charge During (AoC-D) Success Ratio

$$IMSMMTelASAOCDuringSuccRatio[\%] = 100 * \frac{MtasAocDuringOk}{(MtasAocDuringOk + MtasAocDuringNOkI + MtasAocDuringNOkE)}$$

Equation 37. IMS MMTEL AS Advice of Charge End (AoC-E) Success Ratio

$$IMSMMTelASAOCEndSuccRatio[\%] = 100 * \frac{MtasAocEndOk}{(MtasAocEndOk + MtasAocEndNOkI + MtasAocEndNOkE)}$$

Counter Name	Definition
MtasAocStartOk	The Advice of Charge-Start (AoC-S) service type has been successfully executed at the start of a communication. Counter on MTAS node.
MtasAocStartNOkI	Due to an internal error, MTAS failed provide the required AoC-S tariff data at communication setup. Counter on MTAS node. Counter on MTAS node.

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Counter Name	Definition
MtasAocStartNOkE	MTAS failed to provide the required AoC-S tariff data at communication setup due to an external error. An external error includes the receipt of an incomplete tariff or a missing tariff. Counter on MTAS node.
MtasAocDuringOk	The Advice of Charge-During (AoC-D) service type indicating the cost incurred to date has been successfully executed. Counter on MTAS node.
MtasAocDuringNOkI	The Advice of Charge-During (AoC-D) service type indicating the cost incurred to date, fails to complete, due to an internal error. Counter on MTAS node.
MtasAocDuringNOkE	The Advice of Charge-During (AoC-D) service type indicating the cost incurred to date, fails to complete, due to an external error. Counter on MTAS node.
MtasAocEndOk	The Advice of Charge-End (AoC-E) service type indicating the cost of an event has been successfully executed. Counter on MTAS node.
MtasAocEndNOkI	The Advice of Charge-End (AoC-E) service type indicating the cost, fails to complete, due to an internal error. Counter on MTAS node.
MtasAocEndNOkE	The Advice of Charge-End (AoC-E) service type indicating the cost, fails to complete, due to an external error. Counter on MTAS node.

Reference: [1].

3.16 IMS MMTEL AS Third Party (3PTY) Call Creation Accessibility

3.16.1 Definition

IMS Multimedia Third Party (3PTY) Call Creation Accessibility is defined as the probability of being able to successfully make a Third Party (3PTY) Call Creation.

3.16.2 Formula

Equation 38. IMS MMTEL AS Third Party (3PTY) Call Creation Success Ratio

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$$\frac{IMSMMTelASThirdPartyCallCreationSuccRatio[\%]}{Mtas3ptyCreationOk} = 100 * \\ (Mtas3ptyCreationOk + Mtas3ptyCreationNOkE + \\ Mtas3ptyCreationNOkI)$$

Counter Name	Definition
Mtas3ptyCreationOk	The number of successfully created 3PTY calls.
Mtas3ptyCreationNOkE	The number of failed attempts to create 3PTY calls due to node external reasons.
Mtas3ptyCreationNOkI	The number of failed attempts to create 3PTY calls due to node internal reasons.

Reference: [1]

3.17 IMS MMTEL AS Third Party (3PTY) Call Creation Retainability

3.17.1 Definition

IMS Multimedia Third Party (3PTY) Call Creation Retainability is defined as the probability of being able to successfully complete (normally terminate) a Third Party (3PTY) Call once it was successfully established.

3.17.2 Formula

Equation 39. IMS MMTelAS Third Party (3PTY) Communication Completion Success Ratio

$$\frac{IMSMMTelASThirdPartyCallCompletionSuccRatio[\%]}{Mtas3ptyCreationOk} = 100 * \\ (Mtas3ptyCreationOk - Mtas3ptyTerminationNOkE - \\ Mtas3ptyTerminationNOkI)$$

Counter Name	Definition
Mtas3ptyCreationOk	The number of successfully created 3PTY calls.
Mtas3ptyTerminationNOkE	The number of abnormally terminated 3PTY calls due to node external reasons.
Mtas3ptyTerminationNOkI	The number of abnormally terminated 3PTY calls due to node internal reasons.

Reference: [1]

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3.18 MMTEL AS Communication Completion Service Accessibility

3.18.1 Definition

IMS MMTEL AS Communication Completion Service Accessibility is defined as the probability of being able to successfully invoke the Communication Completion Service. The Communication Completion services are of type Communication Completion Busy Subscriber (CCBS) and Communication Completion No Reply (CCNR)

3.18.2 Formula

3.18.2.1 Communication Completion Busy Subscriber (CCBS)

Equation 40. IMS MMTEL AS Communication Completion Busy Subscriber (CCBS) Invocation Success Ratio

$$IMSMMTelASCCBSInvocationSuccRatio[\%] = 100 * \frac{MtasCcbsInvocationOrigOk}{(MtasCcbsInvocationOrigOk + MtasCcbsInvocationOrigNOkI + MtasCcbsInvocationOrigNOkE)}$$

3.18.2.2 Communication Completion No Reply (CCNR)

Equation 41. IMS MMTEL AS Communication Completion No Reply (CCNR) Invocation Success Ratio

$$IMSMMTelASCCNRInvocationSuccRatio[\%] = 100 * \frac{MtasCcnrInvocationOrigOk}{(MtasCcnrInvocationOrigOk + MtasCcnrInvocationOrigNOkI + MtasCcnrInvocationOrigNOkE)}$$

Counter Name	Definition
MtasCcbsInvocationOrigOk	The total number of successful originating Call Completion Busy Subscriber (CCBS) invocations. Counter on MTAS node.
MtasCcbsInvocationOrigNOkI	The total number of unsuccessful Call Completion Busy Subscriber (CCBS) originating invocations because of an internal error. Counter on MTAS node.
MtasCcbsInvocationOrigNOkE	The total number of unsuccessful Call Completion Busy Subscriber (CCBS) originating invocations because of an external error. Counter on MTAS node.

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Counter Name	Definition
MtasCcnrInvocationOrigOk	The total number of successful originating Call Completion No Reply (CCNR) invocations. Counter on MTAS node.
MtasCcnrInvocationOrigNOkl	The total number of unsuccessful Call Completion No Reply (CCNR) originating invocations because of an internal error. Counter on MTAS node.
MtasCcnrInvocationOrigNOkE	The total number of unsuccessful Call Completion No Reply (CCNR) originating invocations because of an external error. Counter on MTAS node.

Reference: [1]

3.19 IMS MMTEL AS Flexible Communication Distribution Service Accessibility

3.19.1 Definition

IMS MMTEL AS Flexible Communication Distribution (FCD) Service Accessibility is defined as the probability of being able to successfully invoke the Flexible Communication Distribution Service

3.19.2 Formula

Equation 42. IMS MMTEL AS Flexible Communication Distribution (FCD) Success Ratio

$$IMSMMTelASFCDsUccRatio[\%] = 100 * \frac{MtasFcdOk}{MtasFcdNumberOfAttempt}$$

Equation 43. IMS MMTEL AS Flexible Communication Distribution (FCD) Ongoing Sessions

$$IMSMMTelASFCDOngoingSessions = MtasFcdOngoingSessions$$

Counter Name	Definition
MtasFcdOk	The number of successful FCD invocations. The counter is keyed by the conditions of the matching rule or with DEFAULT if no such exist (unconditional case). Counter on MTAS node.

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Counter Name	Definition
MtasFcdNumberOfAttempt	A performance measurement (PM) counter that is incremented each time there is an attempt for creating a Flexible Communication Distribution (FCD) session. It is keyed by the conditions of the matching rule or with DEFAULT if no such exist (unconditional case). Counter on MTAS node.
MtasFcdOngoingSessions	Counter for the number of ongoing Flexible Communication Distribution (FCD) Service Sessions. Counter on MTAS node.

Reference: [1].

3.20 IMS MMTEL AS Short Number Dialing Accessibility

3.20.1 Definition

IMS MMTEL AS Short Number Dialing (SND) Service Accessibility is defined as the probability of being able to successfully invoke the Short Number Dialing Service

3.20.2 Formula

Equation 44. IMS MMTEL AS Originating Short Number Dialing (SND) Success Ratio

$$IMSMMTelASOrgSNDsSuccRatio[\%] = 100 * \frac{MtasSndOrigSuccAttempt}{(MtasSndOrigSuccAttempt + MtasSndOrigFailAttempt)}$$

Equation 45. IMS MMTEL AS Terminating Short Number Dialing (SND) Success Ratio

$$IMSMMTelASTermSNDsSuccRatio[\%] = 100 * \frac{MtasSndTermSuccAttempt}{(MtasSndTermSuccAttempt + MtasSndTermFailAttempt)}$$

Counter Name	Definition
MtasSndOrigSuccAttempt	Number of received 180 Ringing message or received 2xx (INVITE) if no 180 Ringing message has been received, by the originating MTAS. Counter on MTAS node.

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Counter Name	Definition
MtasSndOrigFailAttempt	Number of rejected SND INVITES by the originating MTAS. Incremented when receiving PAI and ReqURI domains don't match on originating MTAS. Counter on MTAS node.
MtasSndTermSuccAttempt	Number of received 180 Ringing message or received 2xx (INVITE) if no 180 Ringing message has been received, by the terminating MTAS. Counter on MTAS node.
MtasSndTermFailAttempt	Number of rejected SND INVITES by the terminating MTAS. Incremented when receiving PAI and ReqURI domains don't match on terminating MTAS. Counter on MTAS node.

Reference: [1].

3.21 IMS SCC AS Centralization and Continuity (SCC) Accessibility

3.21.1 Definition

IMS SCC AS Centralization and Continuity (SCC) Service Accessibility is defined as the probability of being able to successfully invoke the Service Centralization and Continuity (SCC) Service from CS side and PS side.

3.21.2 Formula

ICS Session accessibility, Answer to Seizure Ratio (ASR). It is the percentage of answered telephone calls with respect to the total call volume.

Originating SCC

Equation 46. IMS SCC AS Originating Service from CS Success Ratio

$$IMSSCCASOrigSCCSCCSuccRatio[\%] = 100 * \frac{MtasSccInitOrigSessCsOk}{(MtasSccInitOrigSessCsOk + MtasSccInitOrigSessCsNOkE + MtasSccInitOrigSessCsNokI)}$$

Equation 47. IMS SCC AS Originating Service from PS Success Ratio

$$IMSSCCASOrigSCCPSSuccRatio[\%] = 100 * \frac{MtasSccInitOrigSessPsOk}{(MtasSccInitOrigSessPsOk + MtasSccInitOrigSessPsNOkE + MtasSccInitOrigSessPsNokI)}$$

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Equation 48. IMS SCC AS Originating Unregistered Service from CS Success Ratio

$$IMSSCCASOrigUnregSCCSCSuccRatio[\%] = 100 * \frac{MtasSccInitOrigUnregSessCsOk}{(MtasSccInitOrigUnregSessCsOk + MtasSccInitOrigUnregSessCsNOkE + MtasSccInitOrigUnregSessCsNOkI)}$$

Equation 49. IMS SCC AS Originating Unregistered Service from PS Success Ratio

$$IMSSCCASOrigUnregSCCPSsuccRatio[\%] = 100 * \frac{MtasSccInitOrigUnregSessPsOk}{(MtasSccInitOrigUnregSessPsOk + MtasSccInitOrigUnregSessPsNOkE + MtasSccInitOrigUnregSessPsNOkI)}$$

Terminating SCC

Equation 50. IMS SCC AS Terminating Service CS Success Ratio

$$IMSSCCASTermSCCsuccRatio[\%] = 100 * \frac{MtasSccInitTermSessOk}{(MtasSccInitTermSessOk + MtasSccInitTermSessNOkE + MtasSccInitTermSessNOkI)}$$

Equation 51. IMS SCC AS Terminating Unregistered Service Success Ratio

$$IMSSCCASTermUnregSCCsuccRatio[\%] = 100 * \frac{MtasSccInitTermUnregSessOk}{(MtasSccInitTermUnregSessOk + MtasSccInitTermUnregSessNOkE + MtasSccInitTermUnregSessNOkI)}$$

Session accessibility, these are for Network Efficiency Ratio (NER). They reflect the percentage of calls where the called user was alerted for a new call. Note that user behavior factors are included in the formulas.

Equation 52. IMS SCC AS Terminating Service to VoLTE CS UE Success Ratio

$$IMSSCCASTermSCCSCSuccRatio[\%] = 100 * \frac{MtasSccTermCsSuccAttempt}{(MtasSccTermCsSuccAttempt + MtasSccTermCsFailedAttempt)}$$

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Equation 53. IMS SCC AS Terminating Service to VoLTE PS UE Success Ratio

$$\frac{IMSSCCASTermSCCPSSuccRatio[\%] = 100 *}{(MtasSccTermPsSuccAttempt + MtasSccTermPsFailedAttempt)}$$

Equation 54. IMS SCC AS Terminating Unregistered Service to VoLTE CS UE Success Ratio

$$\frac{IMSSCCASTermUnregSCCCSSuccRatio[\%] = 100 *}{(MtasSccTermUnregCsSuccAttempt + MtasSccTermUnregCsFailedAttempt)}$$

Equation 55. IMS SCC AS Terminating Unregistered Service to VoLTE PS UE Success Ratio

$$\frac{IMSSCCASTermUnregSCCPSSuccRatio[\%] = 100 *}{(MtasSccTermUnregPsSuccAttempt + MtasSccTermUnregPsFailedAttempt)}$$

Originating SCC from CS including CAP signaling

Equation 56. IMS SCC AS Originating Service Centralization and Continuity (SCC) from CS using CAP Registered and Unregistered Success Ratio

$$\frac{IMSSCCASOrigSCCCSSuccRatio[\%] = 100 *}{(MtasSccInitOrigSessCsOk + MtasSccInitOrigUnregSessCsOk) + (MtasSccInitOrigSessCsOk + MtasSccInitOrigSessCsNOkE + MtasSccInitOrigSessCsNOkI + MtasSccInitOrigUnregSessCsOk + MtasSccInitOrigUnregSessCsNOkE + MtasSccInitOrigUnregSessCsNOkI) * MtasSdsCapInitDPOk}$$

$$(MtasSdsCapInitDPOk + MtasSdsCapInitDPNOkE + MtasSdsCapInitDPNOkI)$$

Note: The above formula Equation 56 is a combination of the CAP and SIP signaling for the SCC CS service (registered and unregistered) invocation. It reflects answer to seizure (ASR) accessibility. It is the percentage of answered telephone calls with respect to the total call volume.

Single Radio Voice Call Continuity (SRVCC) Transfers

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Equation 57. IMS SCC AS Single Radio Voice Call Continuity (SRVCC) Transfer Success Ratio

$$IMSSCCASSRVCCTransferRatio[\%] = 100 * \frac{MtasSrvccTransferOk}{(MtasSrvccTransferOk + MtasSrvccTransferNOkE + MtasSrvccTransferNOkI)}$$

Reference: , ref. [1] Section 3.2.3 Retainability: SRVCC Access Transfer Success Ratio (IMS part) [%].

Counter Name	Definition
MtasScclnitOrigSessCsOk	The accumulated number of SCC session attempts from the CS access domain, in the originating MTAS, which was either answered, not answered, or was rejected by a service due to operator policy. The counter is keyed on the CSCF IP address. Incremented by 1 when the INVITE-ACK transaction has concluded after the final response or when the INVITE was rejected by a service due to operator policy. Counter on MTAS node.
MtasScclnitOrigSessCsNOkE	The accumulated number of SCC session attempts from the CS access domain, in the originating MTAS, which was rejected due to node external reasons. The counter is keyed on the CSCF IP address. Incremented by 1 when the INVITE was rejected due to external reasons, for example invalid feature tag, too many media components in SDP.. Counter on MTAS node.
MtasScclnitOrigSessCsNOkI	The accumulated number of SCC session attempts from the CS access domain, in the originating MTAS, which was rejected due to node internal reasons. The counter is keyed on the CSCF IP address. Incremented by 1 when the INVITE was rejected due to internal reasons, for example processor or memory shortage. Counter on MTAS node.
MtasSdsCaplnitDPOk	This counter is the accumulated number of CAMEL Application Part (CAP) InitialDP requests processed successfully. Counter on MTAS node.

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Counter Name	Definition
MtasSdsCapInitDPNOkE	This counter is the accumulated number of CAMEL Application Part (CAP) InitialDP requests that failed because the request message was faulty, for example missing mandatory parameter or parameter having unknown value. Counter on MTAS node.
MtasSdsCapInitDPNOkI	This counter is the accumulated number of CAMEL Application Part (CAP) InitialDP requests that failed because of problems internal to the SCC AS, an IMRN could not be allocated, for example because of no free IMRN. Counter on MTAS node.
MtasScclInitOrigSessPsOk	The accumulated number of SCC session attempts from the PS access domain, in the originating MTAS, which was either answered, not answered, or was rejected by a service due to operator policy. The counter is keyed on the CSCF IP address. Incremented by 1 when the INVITE-ACK transaction has concluded after the final response or when the INVITE was rejected by a service due to operator policy. Counter on MTAS node.
MtasScclInitOrigSessPsNOkE	The accumulated number of SCC session attempts from the PS access domain, in the originating MTAS, which was rejected due to node external reasons. The counter is keyed on the CSCF IP address. Incremented by 1 when the INVITE was rejected due to external reasons, for example invalid feature tag, too many media components in SDP, ICS UE signalling over Gm when attached to CS is not supported. Counter on MTAS node.
MtasScclInitOrigSessPsNOkI	The accumulated number of SCC session attempts from the PS access domain, in the originating MTAS, which was rejected due to node internal reasons. The counter is keyed on the CSCF IP address. Incremented by 1 when the INVITE was rejected due to internal reasons, for example processor or memory shortage. Counter on MTAS node.

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Counter Name	Definition
Mtas ScclnitOrigUnregSessCsOk	<p>The accumulated number of SCC session attempts from an unregistered user in the CS access domain, in the originating MTAS, which was either answered, not answered, or was rejected by a service due to operator policy. The counter is keyed on the CSCF IP address.</p> <p>Incremented by 1 when the INVITE-ACK transaction has concluded after the final response or when the INVITE was rejected by a service due to operator policy.</p> <p>Counter on MTAS node.</p>
Mtas ScclnitOrigUnregSessCsNOkE	<p>The accumulated number of SCC session attempts from an unregistered user on the CS access domain, in the originating MTAS, which was rejected due to node external reasons. The counter is keyed on the CSCF IP address.</p> <p>Incremented by 1 when the INVITE was rejected due to external reasons, for example invalid feature tag, too many media components in SDP. Incremented by 1 when the SCC AS rejects an INVITE unregistered from the CS domain due to external reasons, e.g. request not supported by SCC AS</p> <p>Counter on MTAS node.</p>
Mtas ScclnitOrigUnregSessCsNOkl	<p>The accumulated number of SCC session attempts from an unregistered user in the CS access domain, in the originating MTAS, which was rejected due to node internal reasons. The counter is keyed on the CSCF IP address.</p> <p>Incremented by 1 when the INVITE was rejected due to internal reasons, for example processor or memory shortage.</p> <p>Counter on MTAS node.</p>
Mtas ScclnitOrigUnregSessPsOk	<p>The accumulated number of SCC session attempts from an unregistered user on the PS access domain, in the originating MTAS, which was either answered, not answered, or was rejected by a service due to operator policy. The counter is keyed on the CSCF IP address.</p> <p>Incremented by 1 when the INVITE-ACK transaction has concluded after the final response or when the INVITE was rejected by a service due to operator policy.</p> <p>Counter on MTAS node.</p>

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Counter Name	Definition
MtasScclnitOrigUnregSessPsNOkE	<p>The accumulated number of SCC session attempts from an unregistered user in the PS access domain, in the originating MTAS, which was rejected due to node external reasons. The counter is keyed on the CSCF IP address.</p> <p>Incremented by 1 when the INVITE was rejected due to external reasons, for example invalid feature tag, too many media components in SDP, ICS UE signalling over Gm when attached to CS is not supported.</p> <p>Counter on MTAS node.</p>
MtasScclnitOrigUnregSessPsNOkl	<p>The accumulated number of SCC session attempts from an unregistered user in the PS access domain, in the originating MTAS, which was rejected due to node internal reasons. The counter is keyed on the CSCF IP address.</p> <p>Incremented by 1 when the INVITE was rejected due to internal reasons, for example processor or memory shortage.</p> <p>Counter on MTAS node.</p>
MtasScclnitTermSessOk	<p>The accumulated number of SCC session attempts, in the terminating MTAS, which was either answered, not answered, or was rejected by a service due to operator policy. The counter is keyed on the CSCF IP address.</p> <p>Incremented by 1 when the INVITE-ACK transaction has concluded after the final response or when the INVITE was rejected by a service due to operator policy.</p> <p>Counter on MTAS node.</p>
MtasScclnitTermSessNOkE	<p>The accumulated number of SCC session attempts, in the terminating MTAS, which was rejected due to node external reasons. The counter is keyed on the CSCF IP address.</p> <p>The counter is incremented by 1 in the terminating MTAS if; the INVITE-ACK transaction did not conclude successfully or any signaling transactions to external nodes failed or timed out and the configuration of the MTAS required the interaction with the external node to be successful in order to proceed the session. The counter will only be stepped for one of the reasons (once, that is) for a particular session.</p> <p>Counter on MTAS node.</p>

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Counter Name	Definition
MtasScclnitTermSessNOkl	The accumulated number of SCC session attempts, in the terminating MTAS, which was rejected due to node internal reasons. The counter is keyed on the CSCF IP address. Incremented by 1 when the INVITE was rejected due to internal reasons, for example processor or memory shortage. Counter on MTAS node.
MtasScclnitTermUnregSessOk	The accumulated number of SCC session attempts, in the terminating MTAS to an unregistered user, which was either answered, not answered, or was rejected by a service due to operator policy. The counter is keyed on the CSCF IP address. Incremented by 1 when the INVITE-ACK transaction has concluded after the final response or when the INVITE was rejected by a service due to operator policy. Counter on MTAS node.
MtasScclnitTermUnregSessNOke	The accumulated number of SCC session attempts, in the terminating MTAS to an unregistered user, which was rejected due to node external reasons. The counter is keyed on the CSCF IP address. The counter is incremented by 1 in the terminating MTAS if; the INVITE-ACK transaction did not conclude successfully or any signaling transactions to external nodes failed or timed out and the configuration of the MTAS required the interaction with the external node to be successful in order to proceed the session. The counter will only be stepped for one of the reasons (once, that is) for a particular session. Counter on MTAS node.
MtasScclnitTermUnregSessNOkl	The accumulated number of SCC session attempts, in the terminating MTAS to an unregistered user, which was rejected due to node internal reasons. The counter is keyed on the CSCF IP address. Incremented by 1 when the INVITE was rejected due to internal reasons, for example processor or memory shortage. Counter on MTAS node.

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Counter Name	Definition
MtasSccTermCsSuccAttempt	The accumulated number of terminating INVITE requests from SCC AS that were successfully responded by a VoLTE UE on the CS access domain. The counter is incremented when receiving the 180 Ringing message or when receiving the 200 OK message if no 180 Ringing message has been received. Counter on MTAS node.
MtasSccTermCsFailedAttempt	The accumulated number of terminating registered INVITE requests to VoLTE UE on CS domain that were rejected. The CSCF IP address is used as key. The counter is incremented when receiving 3xx/4xx/5xx/6xx message if MtasSccTermCsSuccAttempt has not previously been incremented for the session. Counter on MTAS node.
MtasSccTermPsSuccAttempt	The accumulated number of terminating INVITE requests from SCC AS that were successfully responded by a VoLTE UE on the PS access domain. The CSCF IP address is used as key. The counter is incremented when receiving the 180 Ringing message or when receiving the 200 OK message if no 180 Ringing message has been received. Counter on MTAS node.
MtasSccTermPsFailedAttempt	This counter is the accumulated number of terminating initial INVITE requests to VoLTE UE on PS domain that were rejected. The CSCF IP address is used as key. The counter is incremented when receiving 3xx/4xx/5xx/6xx message if MtasSccTermPsSuccAttempt has not previously been incremented for the session. Counter on MTAS node.
MtasSccTermUnregCsSuccAttempt	The accumulated number of terminating unregistered INVITE requests from SCC AS that were successfully responded by a VoLTE UE on the CS access domain. The CSCF IP address is used as key. The counter is incremented when receiving the 180 Ringing message or when receiving the 200 OK message if no 180 Ringing message has been received. Counter on MTAS node.

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Counter Name	Definition
MtasSccTermUnregCsFailedAttempt	The accumulated number of terminating unregistered INVITE requests to VoLTE UE on CS domain that were rejected. The CSCF IP address is used as key. The counter is incremented when receiving 3xx/4xx/5xx/6xx message if MtasSccTermUnregCsSuccAttempt has not previously been incremented for the session. Counter on MTAS node.
MtasSccTermUnregPsSuccAttempt	The accumulated number of terminating unregistered INVITE requests from SCC AS that were successfully responded by a VoLTE UE on the PS access domain. The CSCF IP address is used as key. The counter is incremented when receiving the 180 Ringing message or when receiving the 200 OK message if no 180 Ringing message has been received. Counter on MTAS node.
MtasSccTermUnregPsFailedAttempt	The accumulated number of terminating unregistered INVITE requests to VoLTE UE on PS domain that were rejected. The CSCF IP address is used as key. The counter is incremented when receiving 3xx/4xx/5xx/6xx message if MtasSccTermUnregPsSuccAttempt has not previously been incremented for the session. Counter on MTAS node.

Reference: [1].

3.22 IMS SCC AS Centralization and Continuity (SCC) – SRVCC

3.22.1 Definition

IMS SCC AS Centralization and Continuity (SCC) - SRVCC is defined as the probability of being able to successfully maintain an ongoing session using the Single Radio Voice Call Continuity (SRVCC) Transfer service.

3.22.2 Formula

Equation 58. IMS SCC AS Single Radio Voice Call Continuity (SRVCC) Access Transfer Success Ratio

$$IMSSCCASSRVCCAccessTransferRatio[\%] = 100 * \frac{MtasSrvccTransferOk}{(MtasSrvccTransferOk + MtasSrvccTransferNOkE + MtasSrvccTransferNOkI)}$$

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Equation 59. IMS SCC AS Enhanced Single Radio Voice Call Continuity (SRVCC) Access Transfer Success Ratio

$$IMSSCCASEnhSRVCCAccessTransferRatio[\%] = 100 * \frac{MtasSrvccETTransferOk}{MtasSrvccEAttempt}$$

IMSSCCASEnhSRVCCAccessTransferRatio is probability of successfully maintain an ongoing session using enhanced Single Radio Voice Call Continuity (Rel. 10-12).

Equation 60. IMS SCC AS Single Radio Voice Call Continuity (SRVCC) Active Session Access Transfer Success Ratio

$$IMSSCCASSRVCCActiveSessionAccessTransferRatio[\%] = 100 * \frac{(MtasSrvccActiveTransferOk + \sum_{rspCode1}^{rspCodeN} MtasSrvccActiveTransferNOkUser)}{MtasSrvccActiveAttempt}$$

SRVCC access transfer success rate of session in Active state. Note that that failures caused by end users are counted as success.

Equation 61. IMS SCC AS Single Radio Voice Call Continuity (SRVCC) Alerting Access Transfer Success Ratio

$$IMSSCCASSRVCCAlertingAccessTransferRatio[\%] = 100 * \frac{(MtasSrvccAlertingTransferOk + \sum_{rspCode1}^{rspCodeN} MtasSrvccAlertingTransferNOkUser)}{MtasSrvccAlertingAttempt}$$

SRVCC access transfer success rate of session in Alerting state. Note that that failures caused by end users are counted as success.

Equation 62. IMS SCC AS Single Radio Voice Call Continuity (SRVCC) pre-Alerting Access Transfer Success Ratio

$$IMSSCCASSRVCCPreAlertingAccessTransferRatio[\%] = 100 * \frac{(MtasSrvccPreAlertingTransferOk + \sum_{rspCode1}^{rspCodeN} MtasSrvccPreAlertingTransferNOkUser)}{MtasSrvccPreAlertingAttempt}$$

SRVCC access transfer success rate of session in pre-Alerting state. Note that that failures caused by end users are counted as success.

Equation 63. IMS SCC AS Single Radio Voice Call Continuity (SRVCC) Mid Call Access Transfer Success Ratio

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$$IMSSCCASSRVCCPr eAlertingAccessTransferRatio[\%] = 100 * \frac{MtasSrvccMidcallTransferOk + \sum_{rspCode1}^{rspCodeN} MtasSrvccMidcallTransferNOkUser}{MtasMidcallAlertingAttempt}$$

$$(MtasSrvccMidcallTransferOk + \sum_{rspCode1}^{rspCodeN} MtasSrvccMidcallTransferNOkUser)$$

MtasMidcallAlertingAttempt

SRVCC access transfer success rate of session in mid call state (held call or or additional call). Note that that failures caused by end users are counted as success.

Reference: Key Performance Indicators for IMS System, ref. [3] Section 3.2.3 Retainability: SRVCC Access Transfer Success Ratio (IMS part) [%].

Counter Name	Definition
MtasSrvccTransferOk	The number of successful access transfers using Single Radio Voice Call Continuity. Counter on MTAS node.
MtasSrvccTransferNOkE	The number of unsuccessful (due to node external error) access transfers attempts using Single Radio Voice Call Continuity. Counter on MTAS node.
MtasSrvccTransferNOkI	The number of unsuccessful (due to node internal error) access transfers attempts using Single Radio Voice Call Continuity. Counter on MTAS node.
MtasSrvccEAttempt	The number of attempts to initiate access transfer using enhanced Single Radio Voice Call Continuity (Rel. 10-12). Counter on MTAS node.
MtasSrvccETransferOk	The number of successful access transfers using enhanced Single Radio Voice Call Continuity (Rel. 10-12). Counter on MTAS node.
MtasSrvccActiveAttempt	The number of SRVCC access transfer attempts of session in Active state. The counter is incremented when an INVITE due to STN-SR is received and the target session is in active state. Counter on MTAS node.
MtasSrvccActiveTransferNOkNet	The number of SRVCC access transfers of session in Active state that failed or cancelled due to network problems. The counter is incremented after an SRVCC access transfer of session in Active state has been initiated and the access transfer is cancelled by MME/SGSN or failure by UE to transition to CS, or the target CS access leg is released with protocol=Q.850 and cause=31, or the remote side responds with a 5xx on the re-INVITE for media re-negotiation. Counter on MTAS node.

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Counter Name	Definition
MtasSrvccActiveTransferNOkUser	The number of SRVCC access transfers of session in Active state that failed or cancelled due to failure by end-user. The counter is incremented after an SRVCC access transfer of session in Active state has been initiated and the access transfer is cancelled because the target CS access leg is released with reason other than protocol=Q.850 and cause=31, or the remote side responds with 4xx or 6xx on the re-INVITE for media re-negotiation. Keyed on transfer failure cause. Counter on MTAS node.
MtasSrvccActiveTransferOk	The number of successful SRVCC access transfers of session in Active state. The counter is incremented when a 200 OK response is sent to INVITE due to STN-SR for the transferred session in active state, and PS fallback did not happen. Counter on MTAS node.
MtasSrvccAlertingAttempt	The number of SRVCC access transfer attempts of session in Alerting state. The counter is incremented when an INVITE due to ATU-STI is received and the target session is in alerting state. Counter on MTAS node.
MtasSrvccAlertingTransferNOkNet	The number of SRVCC access transfers of session in Alerting state that failed or cancelled due to network problems. The counter is incremented after an SRVCC access transfer of session in Alerting state has been initiated and the access transfer is cancelled by MME/SGSN or failure by UE to transition to CS, or the target CS access leg is released with protocol=Q.850 and cause=31, or the remote side responds with a 5xx on the UPDATE for media re-negotiation. Keyed on transfer failure cause. Counter on MTAS node.
MtasSrvccAlertingTransferNOkUser	The number of SRVCC access transfers of session in Alerting state that failed or cancelled due to failure by end-user. The counter is incremented after an SRVCC access transfer of session in Alerting state has been initiated and the access transfer is cancelled because the target CS access leg is released with reason other than protocol=Q.850 and cause=31, or the remote side responds with 4xx or 6xx on the UPDATE for media re-negotiation. Keyed on transfer failure cause. Counter on MTAS node.

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Counter Name	Definition
MtasSrvccAlertingTransferOk	The number of successful SRVCC access transfers of session in Alerting state. The counter is incremented when a session in alerting state has successfully been transferred (200 OK to SIP INFO received and PS fallback timer expired without PS fallback request). Transfer of additional early sessions due to forking is not counted. Counter on MTAS node.
MtasSrvccPreAlertingAttempt	The number of SRVCC access transfer attempts of session in pre-Alerting state. The counter is incremented when an INVITE due to ATU-STI is received and the target session is in pre-alerting state. Counter on MTAS node.
MtasSrvccPreAlertingTransferNokNet	The number of SRVCC access transfers of session in pre-Alerting state that failed or cancelled due to network problems. The counter is incremented after an SRVCC access transfer of session in pre-Alerting state has been initiated and the access transfer is cancelled by MME/SGSN or failure by UE to transition to CS, or the target CS access leg is released with protocol=Q.850 and cause=31, or the remote side responds with a 5xx on the UPDATE for media re-negotiation. Counter on MTAS node.
MtasSrvccPreAlertingTransferNokUser	The number of SRVCC access transfers of session in pre-Alerting state that failed or cancelled due to failure by end-user. The counter is incremented after an SRVCC access transfer of session in pre-Alerting state has been initiated and the access transfer is cancelled because the target CS access leg is released with reason other than protocol=Q.850 and cause=31, or the remote side responds with 4xx or 6xx on the UPDATE for media re-negotiation. Counter on MTAS node.
MtasSrvccPreAlertingTransferOk	The number of successful SRVCC access transfers of session in pre-Alerting state. The counter is incremented when a session in pre-alerting state has successfully been transferred (200 OK to SIP INFO received and PS fallback timer expired without PS fallback request). Transfer of additional early sessions due to forking is not counted. Counter on MTAS node.

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Counter Name	Definition
MtasSrvccMidcallAttempt	The number of SRVCC Mid-call access transfer attempts. The counter is incremented when an access transfer INVITE is received, SCC AS applies SRVCC Mid-call and transfers a Held call or an additional call. Counter on MTAS node.
MtasSrvccMidcallTransferOk	The number of successful SRVCC Mid-call access transfer attempts. The counter is incremented when an SRVCC Mid-call transfer has successfully been completed. Counter on MTAS node.
MtasSrvccMidcallTransferNOkUser	The number of SRVCC Mid-call access transfers that failed or cancelled due to failure by end-user. The counter is incremented after an SRVCC Mid-call access transfer has been initiated and the access transfer is cancelled because the target CS access leg is released with reason other than protocol=Q.850 and cause=31, or the remote side responds with 403,404,484,486 or 600,603 on the UPDATE for media re-negotiation. Keyed on transfer failure cause. Counter on MTAS node.
MtasSrvccMidcallTransferNOkNet	The number of SRVCC Mid-call access transfers that failed or cancelled due to network problems. The counter is incremented after an SRVCC Mid-call transfer has been initiated and the access transfer is cancelled by MME/SGSN or failure by UE to transition to CS, or the target CS access leg is released with protocol=Q.850 and cause=31, or the remote side responds with a 4xx,5xx or 6xx except the error codes that are counted as user behavior (403,404,484,486 or 600,603) on the UPDATE for media re-negotiation. Keyed on transfer failure cause. Counter on MTAS node.

Reference: [1]

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3.23 IMS MMTEL AS Customized Alerting Tones Service Accessibility

3.23.1 Definition

IMS MMTEL AS Customized Alerting Tones (CAT) Service Accessibility is defined as the probability of being able to successfully invoke the Customized Alerting Tones Service. The formula may be evaluated per CAT server or summed up for the MTAS node.

3.23.2 Formula

Equation 64. IMS MMTEL AS Customized Alerting Tones (CAT) Service Success Ratio

$$IMSMMTelASCATSuccRatio[\%] = 100 * \frac{MtasCatSignalOk}{(MtasCatSignalOk + MtasCatSignalNOkE + MtasCatSignalNOKI)}$$

Counter Name	Definition
MtasCatSignalOk	The number of successful Customized Alerting Tones sending requests to the external CAT server. Counter on MTAS node.
MtasCatSignalNOkE	The number of Customized Alerting Tones sending requests that failed due to external reasons. Counter on MTAS node.
MtasCatSignalNOKI	The number of Customized Alerting Tones sending requests that failed due to internal reasons. Counter on MTAS node.

Reference: [1].

3.24 IMS MMTEL AS Session Transfer to Own Device Service Accessibility

3.24.1 Definition

IMS MMTEL AS Session Transfer to Own Device (STOD) Service Accessibility is defined as the probability of being able to successfully invoke the Telephony Session Transfer to Own Device Service

3.24.2 Formula

Transfer to Own Device (STOD) Call Push Service

Equation 65. IMS MMTEL AS Session Transfer to Own Device (STOD) Service Success Ratio

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$$IMSMMTelASSTODSuccRatio[\%] = 100 * \frac{MtasStodOk}{MtasStodAttempt}$$

Transfer to Own Device (STOD) Call Pull Service

Equation 66. IMS MMTEL AS Session Transfer to Own Device (STOD) Call Pull Service Success Ratio

$$IMSMMTelASSTODCallPullSuccRatio[\%] = 100 * \frac{(MtasStodCallPullOk + MtasStodCallPullFailure)}{(MtasStodCallPullOk + MtasStodCallPullFailure + MtasStodCallPullNOkE + MtasStodCallPullNOkI)}$$

Note: MtasStodCallPullFailure is considered as successful case from MTAS and network perspective, since Call pull policies or unfulfilled preconditions are MTAS expected behavior.

Counter Name	Definition
MtasStodOk	The total number of successful STOD invocations. Counter on MTAS node.
MtasStodAttempt	The total number of STOD invocations. Counter on MTAS node.
MtasStodCallPullOk	The number of successful Call Pull attempts. The counter is incremented by 1 when the Call Pull invocation is successful. Counter on MTAS node.
MtasStodCallPullFailure	The number of unsuccessful Call Pull attempts due to Call pull policies or unfulfilled preconditions. The counter is incremented by 1 when the invocation of Call Pull failed due to enabled Call pull policies or due to service preconditions check. Counter on MTAS node.
MtasStodCallPullNOkE	The number of unsuccessful Call Pull attempts due to system external errors. The counter is incremented by 1 when the invocation of the Call Pull failed due to an error in the interworking node. Counter on MTAS node.
MtasStodCallPullNOkI	The number of unsuccessful Call Pull attempts due to system internal errors. Counter on MTAS node.

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Reference [1]

3.25 IMS MMTEL AS Parlay-X Service Accessibility

3.25.1 Definition

IMS MMTEL AS Parlay-X Service Accessibility is defined as the probability of being able to successfully invoke the Parlay-X Service. The Parlay-X Service is viewed from the MTAS side when defining incoming and outgoing. The formulas may be expressed per Parlay-X server or summed up for all Parlay-X servers. The Parlay-X server key is IP address or FQDN.

3.25.2 Formula

Equation 67. IMS MMTEL AS Incoming Parlay-X Request Success Ratio

$$IMSMMTelASInPxSuccRatio[\%] = 100 * \frac{(MtasPxReceivedRequests - MtasPxRejectedRequests)}{MtasPxReceivedRequests}$$

Equation 68. IMS MMTEL AS Outgoing Parlay-X Request Success Ratio

$$IMSMMTelASOutPxSuccRatio[\%] = 100 * \frac{(MtasPxSentRequests - MtasPxReceivedErrorResponses)}{MtasPxSentRequests}$$

Counter Name	Definition
MtasPxReceivedRequests	The counter is incremented when receiving a Parlay X Request in MTAS. Key is Parlay-X server. Counter on MTAS node.
MtasPxRejectedRequests	The counter is incremented when rejecting a received Parlay X Request in MTAS. Key is Parlay-X server. Counter on MTAS node.
MtasPxSentRequests	The number of times Parlay X requests are sent to the Parlay X application. Key is Parlay-X server. Counter on MTAS node.
MtasPxReceivedErrorResponses	The number of times Parlay X requests are rejected with an error response by the Parlay X application. Key is Parlay-X server. Counter on MTAS node.

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Reference: [1]

3.26 IMS MMTEL AS Polling of Calling Name Information Accessibility

3.26.1 Definition

IMS MMTEL AS Polling of Calling Name Information Accessibility is defined as the probability of being able to successfully retrieve calling name information from a Calling Name Server. This function supports the Calling Name Identification Presentation (CNIP) Service.

3.26.2 Formula

Equation 69. IMS MMTEL AS Polling of Calling Name Information Success Ratio

$$IMSMMTelASPollingCNameSuccRatio[\%] = 100 * \frac{MtasSipCnamePollOk}{(MtasSipCnamePollOk + MtasSipCnamePollNok)}$$

Counter Name	Definition
MtasSipCnamePollOk	The accumulated number of successful interrogations of Calling Name Server (CNS) for calling name information. This counter is incremented by 1 in MTAS when a NOTIFY (Event:calling-name) message is received from the Calling Name Server (CNS), in response to a SUBSCRIBE (Event:calling-name) sent by the MTAS.. Counter on MTAS node.
MtasSipCnamePollNok	The accumulated number of failed interrogations of Calling Name Server (CNS) for calling name information. The counter is incremented by 1 in MTAS when a SUBSCRIBE (Event:calling-name) message sent by this MTAS towards a Calling Name Server (CNS) does not receive a valid NOTIFY (Event:calling-name) response. The counter is incremented when: * MTAS received an error message in response to SUBSCRIBE (Event:calling-name) request. * MTAS has timed out waiting for the NOTIFY (Event:calling-name) against the corresponding SUBSCRIBE (Event:calling-name) request. * MTAS received a malformed NOTIFY (Event:calling-name) against the corresponding SUBSCRIBE (Event:calling-name) request. Counter on MTAS node.

Reference: [1]

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3.27 IMS MMTEL AS Call Return (CR) Service Accessibility

3.27.1 Definition

IMS MMTEL AS Session Call Return (CR) Service Accessibility is defined as the probability of being able to successfully invoke the Call Return Service

3.27.2 Formula

Equation 70. IMS MMTEL AS Telephony Call Return Service Success Ratio

$$IMSMMTelASCRSuccRatio[\%] = 100 * \frac{MtasCrInvAnnOk}{(MtasCrInvAnnOk + MtasCrInvNOkE + MtasCrInvNOkI)}$$

Counter Name	Definition
MtasCrInvAnnOk	This counter is the accumulated number of successful Call Return (CR) with announcement attempts. Counter on MTAS node.
MtasCrInvNOkE	This counter is the accumulated number of unsuccessful Call Return (CR) with no announcement attempts (due to node external error). Incremented by 1 when an INVITE request is NOT sent by MTAS due to a node external error after the caller has invoked the CR service. Counter on MTAS node.
MtasCrInvNOkI	This counter is the accumulated number of unsuccessful Call Return (CR) with no announcement attempts (due to node internal error). Incremented by 1 when an INVITE request is NOT sent by MTAS due to a node internal error after the caller has invoked the CR service. Counter on MTAS node.

Reference: [1]

3.28 IMS MMTEL AS Generic Supplementary Service Code Invocation Service Accessibility

3.28.1 Definition

IMS MMTEL AS Generic Supplementary Service Code (SSC) Invocation Service Accessibility is defined as the probability of being able to successfully invoke the Generic Supplementary Service Code Invocation Service

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3.28.2 Formula

Equation 71. IMS MMTEL AS Generic Supplementary Service Code Invocation Service Success Ratio

$$IMSMMTelASGenSSCInvSuccRatio[\%] = 100 * \frac{MtasGenSscInvOk}{(MtasGenSscInvOk + MtasGenSscInvNOkE + MtasGenSscInvNOkI)}$$

Counter Name	Definition
MtasGenSscInvOk	The number of successful invocations for Generic SSC service. Counter on MTAS node.
MtasGenSscInvNOkE	The number of invocations failed for Generic SSC service due to error in interworking node. Counter on MTAS node.
MtasGenSscInvNOkI	The number of invocations failed for Generic SSC service due to internal MTAS fault. Counter on MTAS node.

Reference: [1]

3.29 IMS MMTEL AS Operator Controlled Transfer (OCT) Service Accessibility

3.29.1 Definition

IMS MMTEL AS Operator Controlled Transfer (OCT) Service Accessibility is defined as the probability of being able to successfully answer the Operator Controlled Transfer Service.

3.29.2 Formula

Equation 72. IMS MMTEL AS Operator Controlled Transfer Service Answered Ratio

$$IMSMMTelASOTCAnsweredRatio[\%] = 100 * \frac{MtasOctTransferorAnswered(key : phone no)}{MtasOctTransferAttempt(key : phone no)}$$

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Counter Name	Definition
MtasOctTransferAttempt	This counter is the accumulated number of call attempt to the target of Operator Controlled Transfer (OCT). The counter is keyed on the phone number to the Operator Transferor. Incremented by 1 when an INVITE request is sent by MTAS to the target of Operator Controlled Transfer (OCT). Counter on MTAS node.
MtasOctTransferorAnswered	This counter is the accumulated number of call established to the Operator Transferor. The counter is keyed on the phone number to the Operator Transferor. Incremented by 1 when operator transferor have answered the call, 200 OK receive by the Operator Controlled Transfer (OCT) service. Counter on MTAS node.

Reference: [1]

3.30 IMS MMTEL AS MtasPriorityCall Accessibility

3.30.1 Definition

IMS MMTEL AS MtasPriorityCall Accessibility is defined as the probability of being able to successfully establish new communication sessions with resource priority setting.

3.30.2 Formula

Equation 73. IMS MMTEL AS Priority Call Successfully Established Ratio

$$IMSMMTelASPr ioCallSuccEstRatio[\%] = 100 * \frac{MtasPriorityCallWpsEstablished(key : wps)}{MtasPriorityCallWpsRequested(key : wps)}$$

$$\frac{MtasPriorityCallWpsEstablished(key : wps)}{MtasPriorityCallWpsRequested(key : wps)}$$

Counter Name	Definition
MtasPriorityCallWpsEstablished	The counter accumulates number of new communication sessions with resource priority setting determined by SIP Resource-priority header 'wps' namespace (RFC 4412). The counter is keyed on wps resource value. The counter is incremented by 1 when a new session with wps resource-priority setting enters 'established' state. Counter on MTAS node.

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Counter Name	Definition
MtasPriorityCallWpsRequested	<p>The counter accumulates number of load regulation requests at dialog setup, using parameter mapped from SIP Resource-priority header 'wps' namespace (RFC 4412). The counter is keyed on wps resource value.</p> <p>The counter is incremented by 1 when an execute permission is requested from load regulation, for processing an incoming INVITE, which has a valid SIP Resource-priority header with wps namespace, and is handled by MTAS Resource Priority Handling function.</p> <p>Counter on MTAS node.</p>

Reference: [1].

3.31 IMS MMTEL AS Ring Back Tone Accessibility

3.31.1 Definition

IMS MMTEL AS Back Tone (RBT) Accessibility is defined as the probability of being able to successfully send Ring Back Tone requests to the MRFP.

3.31.2 Formula

Equation 74. IMS MMTEL AS Ring Back Tone Request Success Ratio

$$IMSMMTelASRBTReqRatio[\%] = 100 * \frac{MtasRbtOk}{(MtasRbtOk + MtasRbtNOkE + MtasRbtNOkI)}$$

Counter Name	Definition
MtasRbtOk	The number of successful Ring Back Tones sending requests to the MRFP. Counter on MTAS node.
MtasRbtNOkE	The number of Ring Back Tones sending requests that failed due to external reasons. Counter on MTAS node.
MtasRbtNOkI	<p>The number of Ring Back Tones sending requests that failed due to internal reasons.</p> <p>The counter is incremented when an initial request to the eMRFP is failed due to MTAS internal failure.</p> <p>Counter on MTAS node.</p>

Reference: [1].

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3.32 IMS SCC AS CAMEL Application Part (CAP) Accessibility

3.32.1 Definition

IMS SCC AS CAMEL Application Part (CAP) Accessibility is defined as the probability of being able to successfully process a InitialDP CAP request.

3.32.2 Formula

Equation 75. IMS SCC AS CAP Request Success Ratio

$$IMSSCCASCAPReqRatio[\%] = 100 * \frac{MtasSdsCapInitDPOk}{(MtasSdsCapInitDPOk + MtasSdsCapInitDPNOkE + MtasSdsCapInitDPNOkI)}$$

Counter Name	Definition
MtasSdsCapInitDPOk	This counter is the accumulated number of CAMEL Application Part (CAP) InitialDP requests processed successfully. Counter on MTAS node.
MtasSdsCapInitDPNOkE	This counter is the accumulated number of CAMEL Application Part (CAP) InitialDP requests that failed because the request message was faulty, for example missing mandatory parameter or parameter having unknown value. Counter on MTAS node.
MtasSdsCapInitDPNOkI	This counter is the accumulated number of CAMEL Application Part (CAP) InitialDP requests that failed because of problems internal to the SCC AS, an IMRN could not be allocated, for example because of no free IMRN. Counter on MTAS node.

Reference: [1].

3.33 IMS MMTEL AS Closed User Group (CUG) Accessibility

3.33.1 Definition

IMS MMTEL AS Closed User Group Accessibility is defined as the probability of being able to successfully invoke the CUG service.

3.33.2 Formula

Equation 76. IMS MMTEL AS Closed User Group Request Success Ratio

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$$\frac{IMSMMTelASCugReqRatio[\%]}{(MtasCugOk + MtasCugRejected)} = 100 * MtasCugOk$$

Counter Name	Definition
MtasCugOk	The number of successful calls in a Closed User Group. The counter is incremented when an initial INVITE towards a Closed User Group member is allowed by the Closed User Group service. Counter on MTAS node.
MtasCugRejected	The number of INVITEs rejected by the Closed User Group (CUG) service. Counter on MTAS node.

Reference: [1].

3.34 IMS ST AS Session Setup Accessibility

3.34.1 Definition

IMS ST AS Session Setup Accessibility is defined as the probability of being able to successfully initiate a session into the SIP Trunking AS node.

3.34.2 Formula

Equation 77. IMS ST AS Originating Session Setup Success Ratio per PBX

$$\frac{IMSSTASOrgSessSetupSuccRatioPerPbx[\%]}{(MtasStOrigNetworkSuccessSessionEstablish.pbxId + MtasStOrigFailedAttempt.pbxId)} = 100 * MtasStOrigNetworkSuccessSessionEstablish.pbxId$$

IMS ST AS Originating Session Setup Accessibility per PBX identity.

Equation 78. IMS ST AS Terminating Session Setup Success Ratio per PBX

$$\frac{IMSSTASTermSessSetupSuccRatioPerPbx[\%]}{(MtasStTermNetworkSuccessSessionEstablish.pbxId + MtasStTermFailedAttempt.pbxId)} = 100 * MtasStTermNetworkSuccessSessionEstablish.pbxId$$

IMS ST AS Terminating Session Setup Accessibility per PBX identity.

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Equation 79. IMS ST AS Originating Session Setup Success Ratio

$$IMSSTASOrigSessSetupSuccRatio[\%] = 100 * \frac{\left(\sum_{pbxId=1}^{pbxId=n} MtasStOrigNetworkSuccessSessionEstablish.pbxD + MtasStOrigFailedAttemptCause.403 + MtasStOrigFailedAttemptCause.404 + MtasStOrigFailedAttemptCause.407 + MtasStOrigFailedAttemptCause.484 \right)}{\sum_{pbxId=1}^{pbxId=n} (MtasStOrigNetworkSuccessSessionEstablish.pbxD + MtasStOrigFailedAttempt.pbxD)}$$

Equation 80. IMS ST AS Terminating Session Setup Success Ratio

$$IMSSTASTermSessSetupSuccRatio[\%] = 100 * \frac{\left(\sum_{pbxId=1}^{pbxId=n} MtasStTermNetworkSuccessSessionEstablish.pbxD + MtasStTermFailedAttemptCause.403 + MtasStTermFailedAttemptCause.404 + MtasStTermFailedAttemptCause.407 + MtasStOrigFailedAttemptCause.484 \right)}{\sum_{pbxId=1}^{pbxId=n} (MtasStTermNetworkSuccessSessionEstablish.pbxD + MtasStTermFailedAttempt.pbxD)}$$

Error indicators for failed attempts per cause, that is, SIP response code

Equation 81. IMS ST AS Failed Originating Sessions, per cause code

$$IMSSTASFailedOrgSessions = MtasStOrigFailedAttemptCause.cause$$

Equation 82. IMS ST AS Failed Terminating Sessions, per cause code

$$IMSSTASFailedTermSessions = MtasStTermFailedAttemptCause.cause$$

Error indicators for failed attempts per PBX Identity

Equation 83. IMS ST AS Failed Originating Sessions, per PBX

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IMSSTASFailedOrgSessionsPerPbx = MtasStOrigFailedAttempt.pbxId

Equation 84. IMS ST AS Failed Terminating Sessions, per PBX

IMSSTASFailedTermSessionsPerPbx = MtasStTermFailedAttempt.pbxId

Counter Name	Definition
MtasStOrigNetworkSuccessSessionEstablish	The counter is incremented when sending 18x message or when sending 2xx (INVITE) if no 18x message has been sent, related to an initial INVITE, received by an originating ST AS. The counter is incremented when sending 18x message or when sending 2xx (INVITE) if no 18x message has been sent. This counter is keyed on Pbx Identity. Counter on MTAS node.
MtasStOrigFailedAttempt	Counters for counting the total number of received 3xx/4xx/5xx/6xx messages in originating ST AS. Counter on MTAS node.
MtasStTermNetworkSuccessSessionEstablish	The counter is incremented when sending 18x message or when sending 2xx (INVITE) if no 18x message has been sent, related to an initial INVITE, received by a terminating ST AS. The counter is incremented when sending 18x message or when sending 2xx (INVITE) if no 18x message has been sent. This counter is keyed on Pbx Identity. Counter on MTAS node.
MtasStTermFailedAttempt	Counters for counting the total number of received 3xx/4xx/5xx/6xx messages in terminating ST AS. Counter on MTAS node.
MtasStCurrentSessions	Gauge for current number of sessions in ST AS. Both initiated and established sessions are included. The counter reflects the measure controlled by the ST AS session capacity license. Counter on MTAS node.
MtasStCurrentOrigSessions	Gauge for current number of originating sessions in ST AS. Both initiated and established sessions are included. The Gauge is incremented by 1 when a PBX originating call session is initiated and decremented by 1 when the call session is terminated. Counter on MTAS node.

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Counter Name	Definition
MtasStCurrentTermSessions	Gauge for current number of terminating sessions in STAS. Both initiated and established sessions are included. The Gauge is incremented by 1 when a PBX terminating call session is initiated and decremented by 1 when the call session is terminated. Counter on MTAS node.
MtasStOrigFailedAttemptCause	Total number of received 3xx/4xx/5xx/6xx messages for PBX originating calls. The cause code and reason is used as key. Counter on MTAS node.
MtasStTermFailedAttemptCause	Total number of received 3xx/4xx/5xx/6xx messages for PBX terminating calls. The cause code and reason is used as key. Counter on MTAS node.

Reference: [1].

3.35 IMS MMTel AS H.248 MRFP Request Accessibility

3.35.1 Definition

IMS MMTel AS H.248 MRFP Request Accessibility is defined as the probability of being able to successfully issue a H.248 request to an MRFP.

3.35.2 Formula

Equation 85. IMS MMTel AS H.248 Request Success Ratio

$$IMSMMTelASH248ReqSuccRatio[\%] = 100 * \frac{MtasMrfpResponse(key : rspCode = 0000)}{\sum_{rspCode1}^{rspCodeN} MtasMrfpResponse(key : rspCode) + MtasMrfpResponse(key : rspCode = 0000)}$$

Note that all requests for all MRFPs needs to be added. Response code 0000 is considered as success case.

Equation 86. IMS MMTel AS H.248 Request Replay Success Ratio

$$IMSMMTelASH248ReqReplaySuccRatio[\%] = 100 * \frac{\sum_{MrfpId1}^{MrfpIdN} (MtasMrfpOkAddReplay + MtasMrfpOkModifyReplay + MtasMrfpOkSubtractReplay + MtasMrfpOkAuditReplay)}{\sum_{MrfpId1}^{MrfpIdN} (MtasMrfpOkAddReq + MtasMrfpOkModifyReq + MtasMrfpOkSubtractReq + MtasMrfpOkAuditReq)}$$

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Counter Name	Definition
H.248 Commands to and Replies from MRFP	
MtasMrfpOkAddReq	Successfully sent AddRequest commands to an external MRFP peer. The counter is keyed on the MRFP peer Id. Counter on MTAS node.
MtasMrfpOkModifyReq	The number of successfully sent ModifyRequest commands to an MRFP peer. The counter is keyed on the MRFP peer Id. Counter on MTAS node.
MtasMrfpOkSubtractReq	The number of successfully sent SubtractRequest commands to an MRFP peer. The counter is keyed on the MRFP peer Id. Counter on MTAS node.
MtasMrfpOkAuditReq	The number of successfully sent AuditRequest commands to an MRFP peer. The counter is keyed on the MRFP peer Id. Counter on MTAS node.
MtasMrfpResponse	The number of MRFP response messages received. The counter is keyed on the received result code, reason phrase.
MtasMrfpOkAddReply	The number of correct AddReply commands received from an external MRFP peer. Counter on MTAS node.
MtasMrfpOkModifyReply	Counters for successful received ModifyReply commands from an MRFP peer. Counter on MTAS node.
MtasMrfpOkSubtractReply	The number of successfully received SubtractReply commands from an MRFP peer. Counter on MTAS node.
MtasMrfpOkAuditReply	The number of successfully received AuditReply commands from an MRFP peer. Counter on MTAS node.
MtasMrfpProtocolErrorFromPeer	The number of commands sent by the MTAS containing a protocol error. Counter on MTAS node.
MtasMrfpResourceUnavailFromPeer	The number of "resource" errors that the peer MRFP has encountered to perform a request. Counter on MTAS node.

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Counter Name	Definition
MtasMrfpRetransmission	The number of retransmissions performed by the MTAS to an MRFP. Counter on MTAS node.
H.248 Commands from and Replies to MRFP	
MtasMrfpOkNotifyReq	The number of correct NotifyRequest commands received from an external MRFP peer. Counter on MTAS node.
MtasMrfpOkNotifyReply	The number of successfully sent NotifyReply commands to an MRFP peer. Counter on MTAS node.
MtasMrfpOkServiceChangeReq	The number of successfully received ServiceChange commands to an MRFP peer. Counter on MTAS node.
MtasMrfpOkServiceChangeReply	The number of successfully sent ServiceChangeReply commands sent to an MRFP peer. Counter on MTAS node.
MtasMrfpProtocolErrorToPeer	The number of commands received by the MTAS containing a protocol error. Counter on MTAS node.

Reference: [1].

3.36 IMS MMTel AS Charging Request Accessibility

3.36.1 Definition

IMS MMTel AS Charging Request Accessibility is defined as the probability of being able to successfully issue charging requests to a charging server.

3.36.2 Formula

Equation 87. IMS MMTel AS Charging Request Success Ratio

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$$\begin{aligned}
 &IMSMMTelASChargingReqSuccRatio[\%] = 100 * \\
 &MtasChargingAcrStartOk + \\
 &MtasChargingBackupStart - MtasChargingBackupStartFail + \\
 &MtasChargingAcrEventOk + MtasChargingCcrInitOk \\
 &MtasChargingRttiOk) \\
 &(MtasChargingAcrStartOk + MtasChargingAcrStartNOkI + \\
 &MtasChargingAcrStartNOkE + MtasChargingBackupStart + \\
 &MtasChargingAcrEventOk + MtasChargingAcrEventNOkI + \\
 &MtasChargingAcrEventNOkE + \\
 &MtasChargingCcrInitOk + MtasChargingCcrInitNOkI + \\
 &MtasChargingCcrInitNOkE + \\
 &MtasChargingRttiOk + MtasChargingRttiNOkI + \\
 &MtasChargingRttiNOkE)
 \end{aligned}$$

Counter Name	Definition
MtasChargingAcrStartOk	The number of successfully initiated accounting sessions. Counter on MTAS node.
MtasChargingAcrStartNOkI	The number of failed initiations of charging sessions due to internal errors. Counter on MTAS node.
MtasChargingAcrStartNOkE	The number of failed initiations of charging sessions due to external errors. Counter on MTAS node.
MtasChargingBackupStart	The number of charging start requests sent to backup. Counter on MTAS node.
MtasChargingBackupStartFail	The number of charging start requests sent to backup that failed. Counter on MTAS node.
MtasChargingAcrEventOk	The number of successfully handled ACR (Event Record) messages.
MtasChargingAcrEventNOkI	The number of failures due to internal errors that occurred when sending ACR (Event Record) messages. Counter on MTAS node.
MtasChargingAcrEventNOkE	The number of failures due to external errors that occurred when sending ACR (Event Record) messages. Counter on MTAS node.

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Counter Name	Definition
MtasChargingCcrInitOk	The number of successfully initiated online charging sessions. The counter is keyed on the charging destination (destination realm or destination host). Counter on MTAS node.
MtasChargingCcrInitNOkE	The number of failed initiations of online charging sessions due to external errors. The counter is keyed on the charging destination (destination realm or destination host). Counter on MTAS node.
MtasChargingCcrInitNOkI	The number of failed initiations of online charging sessions due to internal errors. The counter is keyed on the charging destination (destination realm or destination host). Counter on MTAS node.
MtasChargingRttiOk	Real-Time Transfer of Tariff Information (RTTI) has been signaled backward to MTAS and successfully provided into the Online Charging System (OCS). The counter uses DEFAULT as key. Counter on MTAS node.
MtasChargingRttiNOkI	Real-Time Transfer of Tariff Information (RTTI) has been signaled backward to MTAS which was unable to provide this data into the Online Charging System (OCS) due to an internal error. The counter uses DEFAULT as key. Counter on MTAS node.
MtasChargingRttiNOkE	Real-Time Transfer of Tariff Information (RTTI) has been signaled backward to MTAS which was unable to provide this data into the Online Charging System (OCS) due to an external error. The counter uses DEFAULT as key. Counter on MTAS node.

Reference: [1].

3.37 IMS MMTEL AS Sh Pull Request Accessibility

3.37.1 Definition

IMS MMTEL AS Sh Pull Request Accessibility is defined as the probability of being able to successfully issue a Sh request to HSS.

3.37.2 Formula

Equation 88. IMS MMTEL AS Sh Pull Request Success Ratio

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$$\text{IMSMMTelASShPullSuccessRatio}[\%] = 100 * \frac{\text{MtasShPullOk}(\text{key} : \text{Stack}, \text{Host})}{(\text{MtasShPullOk}(\text{key} : \text{Stack}, \text{Host}) + \text{MtasShPullNOkE}(\text{key} : \text{Stack}, \text{Host}) + \text{MtasShPullNOkI}(\text{key} : \text{Stack}, \text{Host}))}$$

This R-KPI is calculated per Diameter Stack Id and Host. The R-KPI may also be calculated for the node by adding values for all Stack Ids and Hosts

Equation 89. IMS MMTel AS Sh Redirect Request Success Ratio

$$\text{IMSMMTelASShRedirectSuccessRatio}[\%] = 100 * \frac{\text{MtasShRedirect}(\text{key} : \text{Stack}, \text{Host})}{(\text{MtasShRedirect}(\text{key} : \text{Stack}, \text{Host}) + \text{MtasShRedirectFailed}(\text{key} : \text{Stack}, \text{Host}))}$$

This R-KPI is calculated per Diameter Stack Id and Host. The R-KPI may also be calculated for the node by adding values for all Stack Ids and Hosts.

Equation 90. IMS MMTel AS Sh Notification Request Success Ratio

$$\text{IMSMMTelASShRedirectSuccessRatio}[\%] = 100 * \frac{\text{MtasShNotifOk}(\text{key} : \text{Stack}, \text{Host})}{(\text{MtasShNotifOk}(\text{key} : \text{Stack}, \text{Host}) + \text{MtasShNotifNOkE}(\text{key} : \text{Stack}, \text{Host}) + \text{MtasShNotifNOkI}(\text{key} : \text{Stack}, \text{Host}))}$$

This R-KPI is calculated per Diameter Stack Id and Host. The R-KPI may also be calculated for the node by adding values for all Stack Ids and Hosts.

Counter Name	Definition
MtasShPullOk	The number of Sh-Pull operations that were completed successfully. The counter is keyed on the Stack instance and either HSS destination host name (taken from the Request message) or HSS origin host name (taken from the Answer message). The format <Stack_instance>;<Destination_Host> or <Stack_instance>;<Origin_Host>Counter on MTAS node.

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Counter Name	Definition
MtasShPullINoKE	The number of Sh-Pull operations that could not be completed successfully because of an external cause. The counter is keyed on the Stack instance and either HSS destination host name (taken from the Request message) or HSS origin host name (taken from the Answer message). The format <Stack_instance>;<Destination_Host> or <Stack_instance>;<Origin-Host>. Counter on MTAS node.
MtasShPullINoKI	The number of Sh-Pull operations that could not be completed successfully because of internal reasons. The counter is keyed on the Stack instance and either HSS destination host name (taken from the Request message) or HSS origin host name (taken from the Answer message). The format <Stack_instance>;<Destination_Host> or <Stack_instance>;<Origin-Host>. Counter on MTAS node.
MtasShRedirect	The number of Sh-Redirect (Dh) operations that were completed successfully. The counter is keyed on the Stack instance and either HSS destination host name (taken from the Request message) or HSS origin host name (taken from the Answer message). The format <Stack_instance>;<Destination_Host> or <Stack_instance>;<Origin-Host>. Counter on MTAS node.
MtasShRedirectFailed	The number of failed Sh-Redirect (Dh) operations. The counter is keyed on the Stack instance and either HSS destination host name (taken from the Request message) or HSS origin host name (taken from the Answer message). The format <Stack_instance>;<Destination_Host> or <Stack_instance>;<Origin-Host>. Counter on MTAS node.
MtasShNotifOk	The number of Sh-Notif requests that were processed successfully. The counter is keyed on the Stack instance and either HSS destination host name (taken from the Request message) or HSS origin host name (taken from the Answer message). The format <Stack_instance>;<Destination_Host> or <Stack_instance>;<Origin-Host>. Counter on MTAS node.

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Counter Name	Definition
MtasShNotifNOkE	The number of Sh-Notif operations that could not be completed successfully because of external reasons. The counter is keyed on the Stack instance and either HSS destination host name (taken from the Request message) or HSS origin host name (taken from the Answer message). The format <Stack_instance>;<Destination_Host>;<ResultCode> or <Stack_instance>;<Origin-Host>;<ResultCode>. Counter on MTAS node.
MtasShNotifNOkI	The number of Sh-Notif operations that could not be completed successfully because of internal reasons. The counter is keyed on the Stack instance and either HSS destination host name (taken from the Request message) or HSS origin host name (taken from the Answer message). The format <Stack_instance>;<Destination_Host> or <Stack_instance>;<Origin-Host>. Counter on MTAS node.

Reference: [1].

3.38 IMS MMTel AS Subscribe Session Accessibility

3.38.1 Definition

IMS MMTel AS Subscribe Session Accessibility is defined as the probability of being able to successfully setup (create) an out-of-dialog subscription session.

3.38.2 Formula

Equation 91. IMS MMTel AS Subscribe Setup Success Ratio

$$IMSMMTelASSubscribeSetupRatio[\%] = 100 * \frac{MtasMmtSubsSessOk}{MtasMmtSubsSessAttempt}$$

Equation 92. IMS MMTel AS Dialog Event Notifier Subscribe Setup Success Ratio

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$$\frac{IMSMMTelASDENSubscribeSetupRatio[\%]}{MtasDenSubsSessOk} = 100 * \\ (MtasDenSubsSessOk + MtasDenSubsSessNOkE \\ MtasDenSubsSessNOkI)$$

Note: DEN = Dialog Event Notifier service.

Counter Name	Definition
MtasMmtSubsSessAttempt	The accumulated number of out-of-dialog subscription session creation attempts within the MMTel AS. The counter is incremented by 1 in the originating MMTel AS when receiving an initial out-of-dialog SUBSCRIBE. Counter on MTAS node.
MtasMmtSubsSessOk	The accumulated number of successfully created out-of-dialog subscription sessions within the MMTel AS. The counter is incremented by 1 in the originating MMTel AS when responding with 200 OK to a received initial out-of-dialog SUBSCRIBE. Counter on MTAS node.
MtasDenSubsSessOk	The accumulated number of successfully created 'dialog' event package subscription sessions. The counter is incremented by 1 by the Dialog Event Notifier service when 200 OK is sent to the SUBSCRIBE request of a 'dialog' event package subscription. Counter on MTAS node.
MtasDenSubsSessNOkE	The accumulated number of unsuccessfully created 'dialog' event package subscription sessions due to node external reasons. The counter is incremented by 1 by the Dialog Event Notifier service when responding to the SUBSCRIBE request of a 'dialog' event package subscription failed due to node external reasons. Counter on MTAS node.
MtasDenSubsSessNOkI	The accumulated number of unsuccessfully created 'dialog' event package subscription sessions due to node internal reasons. The counter is incremented by 1 by the Dialog Event Notifier service when responding to the SUBSCRIBE request of a 'dialog' event package subscription failed due to node internal reasons. Counter on MTAS node.

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Reference: MTAS, Measurement Data, 1/1553-AVA 90109/9-7, ref. [25] and (vMTAS) Managed Object Model (MOM), 155 54-LZN 765 0163/9-V1 ref. [26].

3.39 IMS Network AS Precondition IWF Service Accessibility

3.39.1 Definition

IMS Network Application Server (NW AS) Precondition Interworking Function (IWF) Accessibility is defined as the probability of being able to successfully perform precondition signaling for terminating UEs.

Precondition Interworking Service supports QoS Precondition negotiation for basic call when remote party does not support Precondition Signalling

3.39.2 Formula

Equation 93. IMS NW AS Precondition IW Setup Success Ratio

$$IMS_{NWAS} Pr_{econdIWSetupRatio}[\%] = 100 * \frac{MtasPrIwOrigSuccess}{(MtasPrIwOrigAttempt + MtasPrIwOrigEarlyAttempt)}$$

$IMS_{NWAS}Pr_{econdIWSetupRatio}$ is the probability of being able to successfully perform precondition signaling for terminating UEs. The formula is network oriented in the sense that failing to reserve MRF resources or license is not included in the formula.

Equation 94. IMS NW AS Precondition External Failure Ratio

$$IMS_{NWAS} Pr_{econdExtFailRatio}[\%] = 100 * \frac{MtasPrIwOrigNOkE}{(MtasPrIwOrigAttempt + MtasPrIwOrigEarlyAttempt + MtasPrIwOrigRenegotiationAttempt)}$$

$IMS_{NWAS}Pr_{econdExtFailRatio}$ is the external failure ratio for factors outside NW AS Precondition IWF like failing to reserve MRF resources or license.

Equation 95. IMS NW AS Precondition IW to Session Setup Ratio

$$IMS_{NWAS} Pr_{econdIWToSessionSetupRatio}[\%] = 100 * \frac{(MtasPrIwOrigAttempt + MtasPrIwOrigEarlyAttempt)}{\sum_{Cscf=1}^{Cscf=n} (MtasMmtOrigSuccAttempt + MtasMmtOrigUnregSuccAttempt)}$$

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IMSNWASPrecondIWTtoSessionSetupRatio is the ratio of precondition signaling to session setup in percentage.

Counter Name	Definition
MtasPrlwOrigAttempt	The number of successful Precondition session attempts requests from the User. The counter is incremented when on receiving 18x or 200 OK for INVITE without precondition support or Number received in R-URI is configured in MtasPrlwBnumRangeWithoutPrecond. Counter on MTAS node.
MtasPrlwOrigEarlyAttempt	The number of successful Precondition session attempts requests from the User configured in the MtasPrlwBnumRangeWithoutPrecond. The counter is incremented when receiving INVITE from Number configured in MtasPrlwBnumRangeWithoutPrecond. Counter on MTAS node.
MtasPrlwOrigNOkE	The count of Precondition IWF sessions are failed due to external reasons. The counter is incremented when failed to reserve MRF resources or License is absent. Counter on MTAS node.
MtasPrlwOrigRenegotiationAttempt	The number attempts to change the media point using UPDATE from calling user while Precondition IWF is in session. The counter is incremented when receiving UPDATE for media end point changes from calling party. Counter on MTAS node.
MtasPrlwOrigSuccess	The count of Precondition IWF sessions which are replied with 200 Ok of INVITE to calling Party. The counter is incremented when sending 200 OK for initial to calling party. Counter on MTAS node.
MtasMmtOrigSuccAttempt	The accumulated number of MMTel INVITEs successfully sent, counted by the originating MTAS. The CSCF IP address is used as key. The counter is incremented when receiving the 180 Ringing message or when receiving the 200 OK message if no 180 Ringing message has been received. Counter on MTAS node.

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Counter Name	Definition
MtasMmtOrigUnregSuccAttempt	<p>The accumulated number of early cancelled MMTEL INVITES, counted by the originating unregistered MTAS. The counter is keyed on the CSCF IP address and the session cancel reason.</p> <p>The counter is incremented when receiving the CANCEL message after a 180 Ringing received.</p> <p>Counter on MTAS node.</p>

Reference: [1]

3.40 Traffic Indicators

Equation 96. IMS MMTEL AS Number of Cached Public User Identity Records

$IMSMMTelASNumCachedPUI = MtasSubsDataCachedPui$

$IMSMMTelASNumRegisteredPUI$ is the number of MTAS Public User Identities (PUI) records currently cached by the MTAS node. This number is updated with the current number of PUI records when information for a PUI is created in, or purged from, the local database. Note that $IMSMMTelASNumRegisteredPUI$ does not correspond to the number of registered users in MTAS. User records are cached for users of unregistered services like re-directed calls, of 2G/3G access services. User records are not removed directly from cache upon de-registration, only after configurable time.

Equation 97. IMS MMTEL AS Number of Active Users

$IMSMMTelASActiveUsers = MtasFuncOngoingSess$

$IMSMMTelASActiveUsers$ is the current number of active users on node level.

Equation 98. IMS MMTEL AS Number of Simultaneous Sessions

$IMSMMTelASSimulSess = MtasFuncOngoingMmtSessAvg$

$IMSMMTelASSimulSess$ is the average number of simultaneous MMTEL AS sessions (half calls) on node level in measurement period.

Equation 99. IMS MMTEL AS Number of Mobile Service Simultaneous Sessions

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$$IMSMMTelASSimulMobileSess = MtasFuncOngoingMobileSessAvg$$

IMSMMTelASSimulMobileSess is the average number of simultaneous mobile service sessions (half calls) on node level in measurement period.

Simultaneous Service Centralization and Continuity Sessions for Originating and Terminating, CS and PS domains

Equation 100. IMS SCC AS Number of Originating SCC from CS Simultaneous Sessions

$$IMSSCCASSimulOrgSCCCSSess = MtasSccCurrentOrigSessionCs$$

Equation 101. IMS SCC AS Number of Originating SCC from PS Simultaneous Sessions

$$IMSSCCASSimulOrgSCCPSSess = MtasSccCurrentOrigSessionPs$$

Equation 102. IMS SCC AS Number of Terminating SCC from CS Simultaneous Sessions

$$IMSSCCASSimultermSCCCSSess = MtasSccCurrentTermSessionCs$$

Equation 103. IMS SCC AS Number of Terminating SCC from PS Simultaneous Sessions

$$IMSSCCASSimulTermSCCPSSess = MtasSccCurrentTermSessionPs$$

Equation 104. IMS MMTel AS Number of Active Subscription Sessions

$$IMSMMTelASActiveSubscriptionSess = MtasFuncOngoingSubsSess$$

IMSMMTelASSimulMobileSess is the number of currently active subscription sessions on node level.

Equation 105. IMS ST AS Number of SIP Trunking Simultaneous Sessions

$$IMSSTASSimulSess = MtasStCurrentSessions$$

IMSSTASSimulSess is the current number of active sessions in ST AS (SIP Trunking AS).

Equation 106. IMS ST AS Number of SIP Trunking Simultaneous Originating Sessions per PBX

$$IMSSTASSimulOrigSessionsPerPbx = MtasStCurrentOrigSessions.pbxId$$

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IMSSTASSimulOrigSess is the current number of active originating sessions in ST AS (SIP Trunking AS) per PBX.

Equation 107. IMS ST AS Number of SIP Trunking Simultaneous Terminating Sessions per PBX

$$IMSSTASSimulTermSessionsPerPbx = MtasStCurrentTermSessions.pbxId$$

IMSSTASSimulTermSess is the current number of active terminating sessions in ST AS (SIP Trunking AS) per PBX.

Equation 108. IMS MMTel AS Number of Currently Active Conferences

$$IMSMMTelASConfActiveConferences = MtasConfActiveConferences$$

Equation 109. IMS MMTel AS Number of Conference Participants

$$IMSMMTelASConfParticipants = MtasConfParticipants$$

Equation 110. IMS Conference AS Number of Currently Active Scheduled Conferences

$$IMSConfASConfActiveSchedConferences = MtasConfSchedActiveConferences$$

Equation 111. IMS Conference AS Number of Scheduled Conference Participants

$$IMSConfASSchedConfParticipants = MtasConSchedfParticipants$$

Equation 112. IMS SCC AS IP Multimedia Routing Numbers (IMRN) in use [%]

$$IMSSCCAS ImrnInUse = MtasSdsCurrentImrnUsage$$

The percentage of IP Multimedia Routing Numbers in use, calculated as (Current number of IMRNs in use / Number of assigned IMRNs)*100.

MTAS Overload Control

Equation 113. IMS MTAS Overload Control Duration [Seconds]

$$IMSMTASOverloadControlDuration[S] = MtasSipOcOvlDuration$$

IMSMTASOverloadControlDuration is the number of seconds which the node spent in overload condition within the measured period.

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Equation 114. IMS MTAS Overload Control Periods

$IMSMTASOverloadControlPeriods =$
 $MtasSipOcOvlPeriods$

$IMSMTASOverloadControlPeriods$ is the number of cases when the node entered the overload operation mode within the measured period.

Equation 115. IMS MTAS Overload Control Values Average

$IMSMTASOverloadControlValuesAvg =$
 $MtasSipOcOvlAvg$

$IMSMTASOverloadControlValuesAvg$ is the average of the reported overload control (oc) values within the measured period.

Equation 116. IMS MTAS Overload Control Values Peak

$IMSMTASOverloadControlValuesPeak =$
 $MtasSipOcOvlPeak$

$IMSMTASOverloadControlValuesPeak$ is the maximum of the reported overload control (oc) values within the measured period.

IMS MMTel Active Users:

The measurement is keyed with the feature tag received in SIP Request message (Accept-Contact header). The feature tag provided in formula is the MTAS delivery configuration, normally set to urn:7:3gpp-service.ims.icsi.mmtel, but may be set to whatever value of the operator choice.

Note that this KPI is dependent of the terminals using the feature tag.

For more traffic indicators, please refer to MTAS Signaling Traffic Performance Indicators, ref. [2]

Counter Name	Definition
MtasSubsDataCachedPui	The number of PUI entries currently cached by the MTAS node. Counter on MTAS node.
TotalNumberOfSipPublicIdsStored	The amount of public identities with SIP URI format stored in HSS. Counter on HSS node.
TotalNumberOfTelPublicIdsStored	The amount of public identities with TEL URL format stored in HSS. Counter on HSS node.

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Counter Name	Definition
TotalNumberOfPsiSipPublicIdsStored	The amount of PSI public identities, both Distinct and Wildcarded, with SIP URI format stored in HSS. Counter on HSS node.
TotalNumberOfPsiTelPublicIdsStored	The amount of PSI public identities, both Distinct and Wildcarded, with TEL URL format stored in the HSS internal database. Counter on HSS node.
MtasFuncOngoingSess	The current number of active users on node level. The counter is incremented when a user becomes active and decremented when a user becomes inactive. Counter on MTAS node.
MtasFuncOngoingMmtSessAvg	The average number of simultaneous Mmt Services sessions (half calls) on node level. Counter on MTAS node.
MtasFuncOngoingMobileSessAvg	The average number of simultaneous Mobile Service sessions (half calls) on node level. The counter is incremented when a user becomes active and decremented when a user becomes inactive. Counter on MTAS node.
MtasSccCurrentOrigSessionCs	Count of the current number of SCC originating sessions from CS domain in setup or progress. This counter is incremented from the one processor where the information is collected from all processors. Counter on MTAS node.
MtasSccCurrentOrigSessionPs	Count of the current number of SCC originating sessions from PS domain in setup or progress. This counter is incremented from the one processor where the information is collected from all processors. Counter on MTAS node.
MtasSccCurrentTermSessionCs	Count of the current number of VoLTE sessions in progress that are connected via the terminating Circuit Switched (CS) access. This counter is incremented from the one processor where the information is collected from all processors. Counter on MTAS node.
MtasSccCurrentTermSessionPs	Count of the current number of VoLTE sessions in progress that are connected via the terminating Packet Switched (PS) access. This counter is incremented from the one processor where the information is collected from all processors. Counter on MTAS node.
MtasFuncOngoingSubsSess	The number of currently active subscription sessions on node level. Counter on MTAS node.

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Counter Name	Definition
MtasStCurrentSessions	Gauge for current number of sessions in ST AS. Both initiated and established sessions are included. The counter reflects the measure controlled by the ST AS session capacity license. The Gauge is incremented by 1 when a PBX originating or terminating call session is initiated and decremented by 1 when the call session is terminated. Counter on MTAS node.
MtasConfActiveConferences	The number of currently active conferences. Counter on MTAS node.
MtasConfParticipants	Contains the number of conference participants involved in conferences with 4 or more participants. Counter on MTAS node.
MtasConfSchedParticipants	Contains the number of conference participants involved in scheduled conferences. Counter on MTAS node.
MtasSdsCurrentImrnUsage	The percentage of IP Multimedia Routing Numbers in use, calculated as (Current number of IMRNs in use / Number of assigned IMRNs)*100. Counter on MTAS node.
MtasSipOcOvIAvg	The average of the reported oc values within the measured period. Only those oc values are counted which belong to an overload condition interval of the node. The gauge is updated when OC value is greater than 0. Counter on MTAS node.
MtasSipOcOMDuration	The number of seconds which the node spent in overload condition within the measured period. Counter on MTAS node.
MtasSipOcOvIPeak	The maximum SIP Overload Control value sent towards upstream nodes within the measured period. Counter on MTAS node.
MtasSipOcOMPeriods	The number of the cases when the node entered the overload operation mode within the measured period. The counter is incremented by 1 when the node entered the overload mode (OC value is changes from 0 to some other value). Counter on MTAS node.

Reference: [1].

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4 IMS Overload Indicators

4.1 MTAS

4.1.1 MTAS MRFC Overload Rejection

4.1.2 Definition

IMS MTAS MRFC Overload Rejection Ratio is defined as the probability of having an overload condition when sending a MRFC request. This performance indicator indicates congestion based on the MRFC buffer towards a particular MRFP.

Equation 117. IMS MTAS MRFC Oveload Rejection Ratio

$$IMSMTASMRFCOverload\ RejectionRatio[\%] = 100 * \frac{MtasMrfcOverloadThresholdReached}{(MtasMrfcInitiatedContextOk + MtasMrfcInitiatedContextNOkI + MtasMrfcInitiatedContextNOkE + MtasMrfcContextTerminatedOk)}$$

Counter Name	Definition
MtasMrfcOverloadThresholdReached	The number of MRFC requests rejected due to the overload. Counter on MTAS node.
MtasMrfcInitiatedContextOk	The number of successfully initiated contexts. Counter on MTAS node.
MtasMrfcInitiatedContextNOkI	The number of unsuccessfully initiated contexts caused by the MTAS due to internal reasons. Counter on MTAS node.
MtasMrfcInitiatedContextNOkE	The number of unsuccessfully initiated contexts caused by the MTAS due to external reasons. Counter on MTAS node.
MtasMrfcContextTerminatedOk	The number of successfully terminated media conversion or handling acknowledgements from the MRFP ordered by the MTAS.

Reference: [1].

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4.1.3 MTAS SIP Overload Rejections

4.1.4 Definition

IMS MTAS SIP Overload Rejection Ratios are defined as the probability of having an overload condition when receiving a SIP request. This performance indicator indicates congestion based on overload in MTAS, either CPU or memory utilization overload. Several overload rejections exist, origination or terminating half calls.

Note that all measurements used are keyed on SIP method, so the formulas given may be used per method or for a sum of all methods.

Equation 118. IMS MTAS SIP PSI Overload Rejection Ratio

$$IMSMTASSIPPSIOverload\ RejectionRatio[\%] = 100 * \frac{MtasSipFuncPsiOverloadRej}{(MtasSipFuncPsiOverloadRej + MtasFuncPsiOk)}$$

Equation 119. IMS MTAS SIP Orig Requests In Overload Rejection Ratio

$$IMSMTASSIPOrg\ ReqInOverload\ RejectionRatio[\%] = 100 * \frac{MtasSipOrigRequestOverloadRej}{MtasSipOrigRequestIn}$$

Equation 120. IMS MTAS SIP Term Requests In Overload Rejection Ratio

$$IMSMTASSIPTerm\ ReqOverload\ RejectionRatio[\%] = 100 * \frac{MtasSipTermRequestOverloadRej}{MtasSipTermRequestIn}$$

Equation 121. IMS MTAS SIP Unreg Term Requests In Overload Rejection Ratio

$$IMSMTASSIPTermUnreg\ ReqOverload\ RejectionRatio[\%] = 100 * \frac{MtasSipTermUnregRequestOverloadRej}{MtasSipTermUnregRequestIn}$$

Equation 122. IMS MTAS SIP Presence Requests In Overload Rejection Ratio

$$IMSMTASSIPPr esenceOverload\ RejectionRatio[\%] = 100 * \frac{MtasSipPresenceRequestOverloadRej}{MtasSipPresenceRequest}$$

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Equation 123. IMS MTAS SIP SCC Orig Requests In Overload Rejection Ratio

$$\frac{IMSMTASSIPSCCOrigReqOverloadRejectionRatio[\%]}{MtasSipSccOrigRequestOverloadRej} = 100 * \frac{MtasSipSccOrigRequestIn}{MtasSipSccOrigRequestIn}$$

Equation 124. IMS MTAS SIP SCC Term Requests In Overload Rejection Ratio

$$\frac{IMSMTASSIPSCCTermReqOverloadRejectionRatio[\%]}{MtasSipSccTermRequestOverloadRej} = 100 * \frac{MtasSipSccTermRequestIn}{MtasSipSccTermRequestIn}$$

Equation 125. IMS MTAS Priority Call In Overload Rejection Ratio

$$\frac{IMSMTASPr ioCallOverloadRejectionRatio[\%]}{MtasPriorityCallWpsRejected(key : wps)} = 100 * \frac{MtasPriorityCallWpsRequested(key : wps)}{MtasPriorityCallWpsRequested(key : wps)}$$

Counter Name	Definition
MtasSipFuncPsiOverloadRej	The total number of received SIP request message destined to a Public Service Identifier (PSI) (including a Request-URI, which is recognized by a PSI Service) is rejected due to overload in MTAS. The counter is keyed on request method. Counter on MTAS node.
MtasFuncPsiOk	The number of received SIP messages destined to a supported Public Service Identifier (PSI). Counter on MTAS node.
MtasSipOrigRequestOverloadRej	The total number of SIP request rejected due to overload in originating MTAS. The counter is keyed on request method. Counter on MTAS node.
MtasSipOrigRequestIn	The total number of SIP requests received in originating MTAS, including retransmissions. The counter is keyed on request method. Counter on MTAS node.
MtasSipTermRequestOverloadRej	The total number of SIP request rejected due to overload in Terminating MTAS. The counter is keyed on request method. Counter on MTAS node.

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Counter Name	Definition
MtasSipTermRequestIn	The total number of SIP requests received in Terminating MTAS, including retransmissions. The counter is keyed on request method. Counter on MTAS node.
MtasSipTermUnregRequestOverloadRej	The total number of SIP request rejected from an unregistered Public User Identity (PUI) due to overload in terminating MTAS. The counter is keyed on request method. Counter on MTAS node.
MtasSipTermUnregRequestIn	The total number of SIP requests received in terminating MTAS to an unregistered Public User Identity (PUI). The counter is keyed on request method. Counter on MTAS node.
MtasSipPresenceRequestOverloadRej	The total number of received SIP presence request rejected due to overload in MTAS. The counter is keyed on request method. Counter on MTAS node.
MtasSipPresenceRequest	The counter is incremented when receiving SIP Presence requests in MTAS. The counter is keyed on the SIP method. Counter on MTAS node.
MtasSipSccOrigRequestOverloadRej	This counter is the total number of SIP requests rejected from an unregistered IMPU due to overload in originating SCC AS. The counter is keyed on request method. Counter on MTAS node.
MtasSipSccOrigRequestIn	This counter is the total number of SIP requests received in originating SCC AS, including retransmissions. The counter is keyed on request method. Counter on MTAS node.
MtasSipSccTermRequestOverloadRej	This counter is the total number of SIP requests rejected from an unregistered IMPU due to overload in terminating SCC AS. The counter is keyed on request method. Counter on MTAS node.
MtasSipSccTermRequestIn	This counter is the total number of SIP requests received in terminating SCC AS, including retransmissions. The counter is keyed on request method. Counter on MTAS node.

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Counter Name	Definition
MtasPriorityCallWpsRejected	<p>The counter accumulates number of rejected load regulation requests at dialog setup, using parameter mapped from SIP Resource-priorityheader 'wps' namespace (RFC 4412). The counter is keyed on wps resource value.</p> <p>The counter is incremented by 1 when an execute permission request for processing an incoming INVITE, which has a valid SIP Resource-priorityheader with wps namespace, and is handled byMTAS Resource PriorityHandling function, is denied by load regulation. Counter on MTAS node.</p>
MtasPriorityCallWpsRequested	<p>The counter accumulates number of load regulation requests at dialog setup, using parameter mapped from SIP Resource-priority header 'wps' namespace (RFC 4412). The counter is keyed on wps resource value.</p> <p>The counter is incremented by 1 when an execute permission is requested from load regulation, for processing an incoming INVITE, which has a valid SIP Resource-priority header with wps namespace, and is handled by MTAS Resource Priority Handling function. Counter on MTAS node.</p>

Reference: [1].

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5 References

- [1] MTAS Performance Measurements, 1/1553-AVA 901 29/9**
- [2] MTAS Signaling Traffic Performance Indicators, 3/154 43-AVA 901 29/9**
- [3] 2/1050-HSC 113 06: "Key Performance Indicators for IMS System"
- [4] TS 32.409 V10.3.0 Performance Measurements IMS
- [5] TS 32.454 V11.0.0 Key Performance Indicators (KPI) for the IP Multimedia Subsystem (IMS)
- [6] Key Performance Indicators (KPI) for the IP Multimedia Subsystem (IMS); Definitions, 3GPP TS 32.454 V10.0.0

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