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| CHANGE REQUEST |
| Meeting ID:\* | ARC 32 |
| Source:\* | Dale Seed, Convida Wireless, Seed.Dale@ConvidaWireless.comCatalina Mladin, Convida Wireless, Mladin.Catalina@ConvidaWireless.com  |
| Date:\* | 2017-10-19 |
| Reason for Change/s:\* | See the introduction  |
| CR against: Release\* | Release 3 |
| CR against: WI\* | [x]  Active - WI-0058 - 3GPP & Cellular IoT Interworking [ ]  MNT maintenance / < Work Item number(optional)>Is this a mirror CR? Yes [ ]  No [x] mirror CR number: (Note to Rapporteur - use latest agreed revision)[ ]  STE Small Technical Enhancements / < Work Item number (optional)>Only ONE of the above shall be ticked |
| CR against: TS/TR\* | TS-0026 Version 0.5.0 |
| Clauses \* | Sections 7.12, 7.4.1, 7.4.2, 7.4.3, 7.4.4 |
| Type of change: \* | [ ]  Editorial change[x]  Bug Fix or Correction[ ]  Change to existing feature or functionality[ ]  New feature or functionalityOnly ONE of the above shall be ticked |
| Impacted other TS/TR(s) | <TS/TR number>, <Version Number>, and <Description on which aspect should be reflected in this TS/TR> |
| Post Freeze checking:\* | This CR contains only essential changes and corrections? YES [x]  NO [ ] This CR may break backwards compatibility with the last approved version of the TS? YES [ ]  NO [x]  |
| Template Version: January 2017 (Do not modify) |

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GUIDELINES for Change Requests:

Provide an informative introduction containing the problem(s) being solved, and a summary list of proposals.

Each CR should contain changes related to only one particular issue/problem.

In case of a correction, and the change apply to previous releases, a separate “mirror CR” should be posted at the same time of this CR

Mirror CR: applies only when the text, including clause numbering are exactly the same.

Companion CR: applies when the change means the same but the baselines differ in some way (e.g. clause number).

Follow the principle of completeness, where all changes related to the issue or problem within a deliverable are simultaneously proposed to be made E.g. A change impacting 5 tables should not only include a proposal to change only 3 tables. Includes any changes to references, definitions, and acronyms in the same deliverable.

Follow the drafting rules.

All pictures must be editable.

Check spelling and grammar to the extent practicable.

Use Change bars for modifications.

The change should include the current and surrounding clauses to clearly show where a change is located and to provide technical context of the proposed change. Additions of complete clauses need not show surrounding clauses as long as the proposed clause number clearly shows where the new clause is proposed to be located.

Multiple changes in a single CR shall be clearly separated by horizontal lines with embedded text such as, start of change 1, end of change 1, start of new clause, end of new clause.

When subsequent changes are made to content of a CR, then the accepted version should not show changes over changes. The accepted version of the CR should only show changes relative to the baseline approved text.

## Introduction

This contribution adds usage of *networkCoordinated* attribute of <schedule> resource in the procedures such as the Network Parameter Configuration and monitoring events with the 3GPP underlying network.

Since the procedures such as the Network Parameter Configuration and Monitoring events deal with the <schedule> resource and also have the <schedule> resource updated based on the response/notification report, this attribute can act as one of the criteria/trigger to perform these procedures with the 3GPP network.

### -----------------------Start of change 1-------------------------------------------

## 7.12 Network Parameter Configuration

The 3GPP SCEF functionality described in 3GPP TS 23.682 [2] supports an API for Network Parameter Configuration which may be used by the IN-CSE to suggest to the 3GPP Mobile Network specific configuration parameters. The procedure may be used by the IN-CSE to influence certain aspects of UE/network behaviour such as the UE's PSM and extended idle mode DRX. For this purpose, parameter values may be suggested for Maximum Latency and Maximum Response Time for a UE. The Mobile Core Network may choose to accept, reject or modify (via the SCEF) the suggested configuration parameter value.

NOTE 1: Once the network provides the SCEF with the configured values, the MME could later change the values. For example, the UE may be roaming and the visited network might not allow certain values. In this scenario, the SCEF can request a reachability notification with the Idle Status Indication set to indicate that it wants to be notified of the UE’s active timer and periodic TAU/RAU timer when the UE enters the idle state.

In the 3GPP interworking architecture of oneM2M, the UE can host an ADN-AE or an ASN/MN-CSE. The UE Monitoring flow in Figure 7.12-1 takes place after the UE has attached to the 3GPP Network and the ADN-AE or ASN/MN-CSE is registered with the IN-CSE.



**Figure 7.12 -1: Network Parameter Configuration flow**

**Step 0: UE Attach and oneM2M Registration Procedures.**

The UE attaches to the 3GPP network and the ADN-AE(s) or ASN/MN-CSE hosted on the UE perform the oneM2M registration procedure, as detailed in clause 6.5. The IN-CSE hosts the corresponding <*AE*> or <*remoteCSE*> resources and an associated <*node*> resource for the registree. During this procedure, a <*schedule*> resource is created as child of the <*node*> resource. The UE hosted ADN-AE(s) or ASN/MN may subscribe to the node <*schedule*> resource. If an IN-AE is interested in the reachability status of the UE, it may also subscribe to the <*schedule*> resources

**Step 1: IN-CSE (SCS) sends to the SCEF a Network Parameter Configuration request.**

This step is triggered by the creation or modification of the node <*schedule*> resource and if the *networkCoordinated* attribute of the <schedule> resource is set to True (step 0b),.

The IN-CSE determines the SCEF based on the *M2M-Ext-ID*’s of the registree ASN/MN-CSE or ADN-AEs (e.g. either a DNS lookup on the *M2M-Ext-ID* or the based on the domain portion of the *M2M-Ext-ID*’s.). The IN-CSE provides the network pattern to the SCEF, the fields of the API are populated as follows.

* + *External Identifier* shall be set to M2M-Ext-ID
	+ *SCS Identifier* shall beset to a value that is prearranged between the Service Provider and MNO.
	+ *TTRI* is used to correlate this request with future responses. It shall be assigned based on internal IN-CSE policies.
	+ *TLTRI* is used to identify the Communication Pattern request. It shall be assigned based on internal IN-CSE policies. Later, when the IN-CSE decides to change the communication pattern, the value will be used to reference the original request. The SCEF will use this information to identify what communication pattern should be modified.
	+ *Maximum Latency* – This value tells the network how long the UE is allowed to sleep. Setting it to 0 will disable PSM, extended idle mode DRX, and S-GW buffering. The IN-CSE shall extract the periodicity of the active periodicity in the *scheduleElement,* if it exists*.* The *IN-CSE* shallset *Maximum Latency* to be approximately the periodicity of the active periods in the *scheduleElement.* If there is no periodicity it is recommended not to utilize this parameter.
	+ *Maximum Response Time* – When the UE uses PSM, Maximum Response Time tells the network how long the UE should stay reachable after a TAU. When the UE uses eDRX, Maximum Response Time is used by the network to determine when to send a reachability notification before a UE’s paging occasion. The IN-CSE extract a duration of activity from the *scheduleElement.* The IN-CSE shall set *Maximum Response Time* to reflect this duration of activity, indicating how long the UE should stay reachable for downlink communications.

**Step 002: -Step 003**: **Network Parameter Configuration Handling in the Underlying Network.**

The SCEF authorizes the request and responds with a cause value that indicates if the request was accepted and with the TTRI that was provided in step 2, so that the IN-CSE can correlate the response with the original request.

The response may also include updated values of Maximum Latency, Maximum Response Time, and Suggested Number of Downlink Packets, if the network chose to use values that were different than the values that were suggested by the IN-CSE. If the values are updated, then the IN-CSE should adjust the <*schedule*> accordingly.

If the SCEF discarded any of the parameters that were provided in step 1 it indicates which values were discarded. The IN-CSE does not need to take any actions to account for discarded values.

**Step 004: Network Parameter Configuration Handling at the IN-CSE (SCS).**

The IN-CSE information received in the Monitoring response may include updated values of Maximum Latency, Maximum Response Time and Suggested Number of Downlink Packets if the network chose to use values that were different than the values that were suggested by the IN-CSE. If the values are updated, then the IN-CSE uses the information provided to update the <*schedule*> child resource of the <*node*> resource.

The IN-CSE changes the node <*schedule>* resource such that the duration of the activity time of the *scheduleElement* reflects the Maximum Response Time and the periodicity of the active periods reflects the Maximum Latency.

 Note: the IN-CSE shall ensure that there are no loops

**Step 005**: (Optional) If IN-AEs have subscribed to changes in the <*schedule*> resources, a notification will be sent to the subscribers. Notifications will also be sent to the UE hosted ADN-AE or ASN-CSE/MN-CSE, if subscriptions to their respective <*schedule*> resources have been created.

### -----------------------End of change 1 --------------------------------------------

### -----------------------Start of change 2-------------------------------------------

### 7.4.1 UE Reachability monitoring

The 3GPP SCEF functionality described in 3GPP TS 23.682 [2] supports APIs for monitoring specific events such as UE Reachability status. This allows M2M Servers to request to receive reports when a device becomes reachable for receiving either SMS or downlink data.

In the 3GPP interworking architecture of oneM2M, the UE can host an ADN with one or more AEs or an ASN/MN-CSE. The UE Monitoring flow in Figure 7.4.1-1 takes place after the UE has attached to the 3GPP Network and the ADN-AE(s) or ASN/MN-CSE register with the IN-CSE.



**Figure 7.4.1 -1: UE Reachability monitoring**

**Step 0: UE Attach and oneM2M Registration Procedures.**

The UE attaches to the 3GPP network and the ADN-AE(s) or ASN/MN-CSE hosted on the UE perform the oneM2M registration procedure, as detailed in clause 6.5. The IN-CSE hosts the corresponding <*AE*> or <*remoteCSE*> resources for the registree, and an associated <*node*> resource. During this procedure, a <*schedule*> resource is created as child of the <*node*> resource. The hosted ADN-AE(s) or ASN/MN-CSE may subscribe to their respective node <*schedule*> resources.

If an AE is interested in the reachability status of the UE, it may also subscribe to the <*schedule*> resource (step 0b, optional).

**Step 1: IN-CSE (SCS) sends a Monitoring Request to SCEF to monitor the UE reachability.**

This step may be triggered by IN-CSE based on implementation options, for example after a certain number of communication failures have occurred. The creation of one or more subscriptions to the node <*schedule*> (step 0b, optional) may also be used to trigger the monitoring request if the *networkCoordinated* attribute of <schedule> resource is set to True.The monitoring request from the IN-CSE to the SCEF contains information as specified in 3GPP TS 23.682 [3]. Such information includes (but is not limited to):

* *SCS Identifier* shall be set to a value that is prearranged between the Service Provider and MNO.
* *T8* Destination Address is set to the IP Address of the IN-CSE.
* *TTRI* is used to correlate this request with future responses. It shall be assigned based on internal IN-CSE policies.
* *TLTRI* is used to identify the monitoring request. It shall be assigned based on internal IN-CSE policies. Later, when reports are received, the value shall be used to associate them to the original request
* *Maximum Number of Reports* or *Monitoring Duration* shall be optionally set according to IN-CSE pre-provisioning if continuous monitoring is supported.
* *Chargeable Party identifier* shall be optionally set according to IN-CSE pre-provisioning
* *External Identifier* shall be set to the M2M-Ext-ID of the UE
* *Monitoring Type* shall be set to “UE Reachability”
* *Reachability Type* shall be set to “Reachability for Data”
* *Idle Status Indication* shall be set according to IN-CSE pre-provisioning. It is recommended that Idle Status Indication set in order to provide a more accurate status via the <schedule> resource.
* *groupReportingGuardTime* shall be set according to IN-CSE pre-provisioning.This indicates time for which the SCEF can aggregate the monitoring event reports detected by the UEs in a group and report them together to the SCEF/SCS/AS.

This information uses the values pre-provisioned at the IN-CSE, attributes of the <*schedule>* resource or is derived from local policies.

**Step 002: -Step 003**: **Monitoring Request Handling in the Underlying Network.**

The SCEF handles the Monitoring Request together with the Mobile Core Network, as described in 3GPP TS23.682[3]. The SCEF sends a Monitoring Response (TLTRI, Cause) message to the IN-CSE (SCS) to acknowledge acceptance of the Monitoring Request of the identified monitoring event configuration.

**Step 004:** **Detection of UE changing from Idle mode and reporting to SCEF.**

Later, the UE changes to connected mode (for a UE using Power Saving Mode or extended idle mode DRX) or the UE becomes reachable for paging (for a UE using extended idle mode DRX). The Underlying Network detects the condition and sends a Monitoring Report (Idle Timestamp, Subscribed Periodic RAU/TAU timer, Active Timer) is sent to SCEF.

**Step 005:** **SCEF** **sends UE Reachability Monitoring Report to IN-CSE (SCS).**

The SCEF sends a Monitoring Report to the IN-CSE when receiving the Monitoring Report from MME that contains information as specified in 3GPP TS 23.682 [3]. Such information includes:

* *External Identifier* (M2M-Ext-ID of the UE)
* *TLTRI* (same as in the request)

If the Idle Status Indication was set, the Monitoring Report also includes:

* *Idle Timestamp* (start time of the ADN-AE or ASN/MN-CSE hosting UE becoming idle)
* *Periodic RAU/TAU timer* (optional)
* *Active Time* (optional)

**Step 006: UE Reachability Monitoring Handling at the IN-CSE (SCS).**

The IN-CSE uses the information provided in the Monitoring Report as follows:

* If the Idle Status Indication was set and the corresponding additional information is provided in the report, the IN-CSE changes the *scheduleElement* the node <*schedule>* resource such that:
	+ the start of the *scheduleElement* is based on the Idle Timestamp, with a periodicity equal to the TAU/RAU Timer.
	+ the duration of the *scheduleElement* indicates the Active Time value.
* If the Idle Status Indication was not set the IN-CSE, and the existing schedule indicates that communications are currently available, then no changes to the *scheduleElement* are made.
* If the Idle Status Indication was not set the IN-CSE, and the existing schedule indicates that communications are not currently available, then the IN-CSE indicates that there are no time-constraints on the UE communications (e.g. by deleting the <*schedule*> resource).

When any traffic is received from the node or a UE Reachability Notification is received for the node, any scheduleElements that were created based on prior Idle Status Indications shall be deleted for the node. A new scheduleElement shall be created that indicates that the node is available for downlink communication starting immediately and will remain available for at least the duration specified by the Maximum Response Time parameter.

**Step 007a and 0007b**: (Optional) Notifications are sent to the entities which subscribed to changes in the <*schedule*> resources. Notifications will also be sent to the UE hosted ADN-AE or ASN/MN, if indicated by subscriptions to their respective <*schedule*> resources.

NOTE: The UE Reachability Monitoring API described by TS 23.682 [2] also supports providing optional parameters for configuration purposes, such as: Maximum Latency, Maximum Response Time and Suggested number of downlink packets, to be used along with the “configuration” Monitoring Type. However, as of v.15.1.0 of TS 23.682, the Network Parameter Configuration API is recommended instead, therefore the use of these parameters is not described here.

### 7.4.2 UE Availability after DDN Failure

The 3GPP SCEF functionality described in 3GPP TS 23.682 [2] supports APIs for monitoring of events such as UE Availability after Downlink Data Notification (DDN) Failure. When communicating with UEs which sleep for a long time, if downlink packets are not delivered, the Underlying Network recognizes that the UE is not available by a lack of a response within a reasonable time.

In this feature, the IN-CSE subscribes once and then gets notified every time the UE becomes reachable after the network fails to deliver a downlink packet. For example, when this option is set and the IN-CSE receives no response to downlink traffic towards a UE, the IN-CSE can assume that if the network failed to deliver the packet because the UE was sleeping and not because of Network Issues. The network later sends an indication to the IN-CSE when the UE becomes reachable.

In the 3GPP Underlying Network this feature involves an entry in the UE subscription, so it is an ongoing event that needs explicit deletion to cancel further reports and it is different than the “UE Reachability” Monitoring Request. The feature is particularly suitable when there is just one IN-CSE.

The IN-CSE may also request Idle Status Indication. If Idle Status Indication is supported by the Underlying Network, when the UE transitions into Idle mode, the report includes the time at which the UE transitioned into Idle mode, the active time and the periodic TAU/RAU time granted to the UE.



**Figure 7.4.2 -1: Availability after DDN Failure monitoring**

**Step 0: UE Attach and oneM2M Registration Procedures.**

The UE attaches to the 3GPP network and the ADN-AE(s) or ASN/MN-CSE hosted on the UE perform the oneM2M registration procedure, as detailed in clause 6.5. The IN-CSE hosts the corresponding <*AE*> or <*remoteCSE*> resources and an associated <*node*> resource for the registrees. During this procedure, a <*schedule*> resource is created as child of the <*node*> resource. The UE hosted ADN-AE(s) or ASN/MN may subscribe to the node <*schedule*> resource.

If an IN-AE is interested in the reachability status of the UE, it may subscribe to the <*schedule*> resource if the *networkCoordinated* attribute of <schedule> resource is set to True.(step 0b, optional).

**Step 1: IN-CSE (SCS) sends a Monitoring Request to SCEF to monitor the UE Availability after DDN Failure**

The monitoring request from the IN-CSE to SCEF contains information as specified in 3GPP TS 23.682 [3]. Such information includes:

* *SCS Identifier* shall be set to a value that is prearranged between the Service Provider and MNO.
* *T8* Destination Address is set to the IP Address of the IN-CSE.
* *TTRI* is used to correlate this request with future responses. It shall be assigned based on internal IN-CSE policies.
* *TLTRI* is used to identify the monitoring request. It shall be assigned based on internal IN-CSE policies. Later, when reports are received, the value shall be used to associate them to the original request.
* *Chargeable Party identifier* shall be optionally set according to IN-CSE pre-provisioning
* *Monitoring type* shall be set to “Availability after DDN Failure"
* *External Identifier* shall be set to the M2M-Ext-ID of the UE
* *Idle Status Indication* shall be set in order for the IN-CSE to be notified of when a UE transitions into idle mode.
* *groupReportingGuardTime* shall be set according to IN-CSE pre-provisioning.This indicates time for which the SCEF can aggregate the monitoring event reports detected by the UEs in a group and report them together to the SCEF/SCS/AS.

Note: It is recommended that Idle Status monitoring is enabled in conjunction with the Availability after DDN Failure monitoring. This enables the IN-CSE to update the <schedule> resource with updated timing information, once the UE transitions to idle again.

**Step 002 -Step 003**: **Monitoring Request Handling in the Underlying Network.**

The SCEF handles the Monitoring Request together with the Mobile Core Network, as described in 3GPP TS23.682[3]. The SCEF sends a Monitoring Response (TLTRI, Cause) message to the IN-CSE (SCS) to acknowledge acceptance of the Monitoring Request of the identified monitoring event configuration.

**Step 004: DL Data is sent to the UE.**

Downlink data is sent to the UE which, in the Underlying Network, involves sending a Downlink Data Notification (DDN) message to the MME, and MME initiates paging of UE.

**Step 005a:** **DDN Failure.**

The Underlying Network diagnoses a DDN Failure when, after DDN, no response to the UE paging is received and if the UE is in PSM mode (not every DDN failure triggers this event.) The UE subscription is updated to reflect that a notification of availability should be sent after this DDN failure.

**Step 005b:** **Request failure handling.**

The IN-CSE may also diagnose the failure when no response to the DL data has been received. It is up to implementation if the IN-CSE changes the node <*schedule*> resource at this point to indicate that communications are not available (e.g. by using a keyword such as “NULL”), or just records it as a one-time response failure. Other alternatives for implementation are, for example, for the IN-CSE to change the node <*schedule*> resource to indicate that communications are not available only after a pre-provisioned number of requests fail. The IN-CSE may also buffer future requests or enlarge its buffer size.

**Step 006:** **Available after DDN Failure**

At a later time, the UE contacts the network, e.g., to perform a TAU, or as it executes a service request. The Underlying Network notes that UE is available and that an availability notification is requested in the subscription. A Monitoring Indication that the UE is available is sent to the SCEF.

**Step 007:** **SCEF** **sends a Monitoring Report to IN-CSE (SCS).**

The SCEF sends a Monitoring Report to the IN-CSE as specified in 3GPP TS 23.682 [3], indicating that the UE is available, including:

* *External Identifier* (M2M-Ext-ID of the UE)
* *TLTRI* (same as in the request)

**Step 008a and b: Availability after DDN Failure Handling at the IN-CSE (SCS).**

The IN-CSE uses the information provided in the Monitoring Report to update the node <*schedule*> to indicate that DL Data services are available.

Note that in Step 5b the IN-CSE might NOT have modified the <*schedule*> resource to indicate that no DL data service is available. However, even if the IN-CSE did not detect the DDN failure event, at this point it can use this indication to make sure that DL Data services are indicated as available by the *scheduleElement* attribute.

Later (step 8b, optional) IN-AE(s) or the IN-CSE may decide to resend data queued for the UE.

**Step 009**: **UE transitions to Idle**

UE transitions to idle mode. If Idle Status Indication was requested during Monitoring Event configuration, and the MCN supports Idle Status Indication, then the SCEF is provided with an indication which includes the time at which the UE transitioned into idle mode, the active time and the periodic TAU/RAU timer values.

**Step 010**: **SCEF** **sends UE Idle mode indication to IN-CSE (SCS).**

The SCEF provides a monitoring indication to the IN-CSE, including:

* *External Identifier* (M2M-Ext-ID of the UE)
* *TLTRI* (same as in the request)
* *Idle Timestamp* (start time of the ADN-AE or ASN/MN-CSE hosting UE becoming idle status)
* *Periodic RAT/TAU timer* (optional)
* *Active Time* (optional)

**Step 011: UE Idle mode indication Handling at the IN-CSE (SCS).**

The IN-CSE uses the UE Idle mode indication information to update the <*schedule*> child resource of the <*node* > resource.

The IN-CSE changes the <*schedule>* resource such that:

* the start of the *scheduleElement* is based on the Idle Timestamp, with a periodicity equal to the TAU/RAU Timer.
* the duration of the *scheduleElement* indicates the Active Time value.

When any traffic is received from the node or a Availability Notification is received for the node, any scheduleElements that were created based on prior Idle Status Indications shall be deleted for the node. A new scheduleElement shall be created that indicates that the node is available for downlink communication starting immediately and will remain available for at least the duration specified by the Maximum Response Time parameter.

### 7.4.3 UE Communication Failure

The IN-CSE enables communications between large numbers of IN-AEs and devices in general and 3GPP UEs in the context of 3GPP Interworking. Informing the IN-CSE that devices have suffered communication failures in the Underlying Network helps optimize communications. For example, the IN-CSE may stop attempting to communicate with the device if it is aware of repeated the communication failures. The SCEF enables Communication Failure monitoring at the IN-CSE according to 3GPP TS 23.682 [2].

The UE Communication Failure Monitoring flow is assumed to take place after the UE has attached to the 3GPP Network and registered with the IN-CSE.



Figure 7.4.3 -1: Communication Failure monitoring

**Step 0: UE Attach and oneM2M Registration Procedures.**

The UE attaches to the 3GPP network and the ADN-AE(s) or ASN/MN-CSE hosted on the UE performs the oneM2M registration procedure, as detailed in clause 6.5. The IN-CSE hosts the corresponding <*AE*> or <*remoteCSE*> resources and an associated <*node*> resource for the registree. During this procedure, a <*schedule*> resource is created as child of the <*node*> resource. The UE hosted ADN-AE(s) or ASN/MN may subscribe to the node <*schedule*> resource.

If an IN-AE is interested in the communication failure status of the UE, it may subscribe to the node <schedule> resource (step 0b, optional).

**Step 1: IN-CSE (SCS) sends a Monitoring Request to SCEF to monitor the UE Communication Failure.**

This step may be triggered by IN-CSE based on implementation options, for example when a type of communication requiring high reliability is scheduled to occur. The creation of one or more subscriptions to the <*schedule*> (step 0b, optional) may also be used to trigger the monitoring request if the *networkCoordinated* attribute of *<schedule>* resource is set to True. The monitoring request from the IN-CSE to SCEF contains information as specified in 3GPP TS 23.682 [3]. Such information includes:

* *SCS Identifier* shall be set to a value that is prearranged between the Service Provider and MNO.
* *T8* Destination Address is set to the IP Address of the IN-CSE.
* *TTRI* is used to correlate this request with future responses. It shall be assigned based on internal IN-CSE policies.
* *TLTRI* is used to identify the monitoring request. It shall be assigned based on internal IN-CSE policies. Later, when reports are received, the value shall be used to associate them to the original request.
* *Maximum Number of Reports* or *Monitoring Duration* shall be optionally set according to IN-CSE pre-provisioning if continuous monitoring is supported.
* *Chargeable Party identifier* shall be optionally set according to IN-CSE pre-provisioning
* *Monitoring type* shall be set to “Communication Failure"
* *External Identifier* shall be set to M2M-Ext-ID of the UE
* *groupReportingGuardTime* shall be set according to IN-CSE pre-provisioning.This indicates time for which the SCEF can aggregate the monitoring event reports detected by the UEs in a group and report them together to the SCEF/SCS/AS.

**Step 002: -Step 003**: **Monitoring Request Handling in the Underlying Network.**

The SCEF handles the Monitoring Request together with the Mobile Core Network, as described in 3GPP TS23.682[3]. The SCEF sends a Monitoring Response (TLTRI, Cause) message to the IN-CSE (SCS) to acknowledge acceptance of the Monitoring Request of the identified monitoring event configuration.

**Step 004:** **Detection of Communication Failure and reporting to SCEF.**

Later, when the UE communication failure occurs the condition is detected in the Underlying Network and the SCEF receives a Monitoring Report.

**Step 005:** **SCEF** **sends a Monitoring Report to IN-CSE (SCS) indicating UE Communication Failure.**

The SCEF sends a Monitoring Report to the IN-CSE as specified in 3GPP TS 23.682 [3], with information such as:

* *External Identifier* (M2M-Ext-ID of the UE)
* *TLTRI* (same as in the request)

**Step 006: Communication Failure Handling at the IN-CSE (SCS).**

The IN-CSE uses the information provided in the Monitoring Report to update the *scheduleElement* of the <*schedule>* resource to indicate that no communications are currently available (e.g by using a keyword such as “NULL”).

Note: Local IN-CSE policies may specify events/ thresholds further defining when the IN-CSE may provide the <*schedule>* resource update. For example, the update may be provided only after repeated communication failures are received within a timespan, or only if high reliability communications are expected.

It is recommended that UE Reachability monitoring is also enabled in conjunction with the Communication Failure monitoring. This enables the IN-CSE to provide updated timing information in the <schedule> resource, once the UE becomes reachable again.

**Step 007**: **(Optional) Notifying subscribers**.

Optionally, notifications are sent to the subscribers to the <*schedule*> resource.

### 7.4.4 UE Loss of Connectivity

The IN-CSE communicates with large numbers of devices, many of which are reachable for short periods of time. The IN-CSE wants to be informed when devices are not reachable to the Underlying Network, in order to better manage its communications. For example, IN-AEs which normally communicate with the device might not attempt communications if neither signalling or user plane communication are available.

3GPP TS 23.682 [2] supports Loss of Connectivity monitoring, via SCEF, by the IN-CSE. The Loss of Connectivity Monitoring Event configuration request allows the IN-CSE to provide to the network a Maximum Detection Time, which indicates the maximum period of time without any communication between the UE and Network after which the IN-CSE is to be informed that the device is considered to be unreachable.

The Maximum Detection Time of loss of connectivity is on the order of 1 minute to multiple hours. A timer with the order of magnitude of a few minutes can only apply to a limited number of devices due to the network signalling cost.

Note: In the 3GPP Network, the Maximum Detection Time of loss of connectivity may be used to determine the order of magnitude of the Periodic Update timer.

The UE Loss of Connectivity Monitoring flow is assumed to take place after the UE has attached to the 3GPP Network and registered with the IN-CSE.



Figure 7.4.4 -1: Loss of Connectivity monitoring

**Step 0: UE Attach and oneM2M Registration Procedures.**

The UE attaches to the 3GPP network and the ADN-AE(s) or ASN/MN-CSE hosted on the UE perform the oneM2M registration procedures, as detailed in clause 6.5. The IN-CSE hosts the corresponding <*AE*> or <*remoteCSE*> resources for the registree, and an associated <*node*> resource. During this procedure, a <*schedule*> resource is created as child of the <*node*> resource and the *networkCoordinated* attribute of the *<schedule>* resource is set to True.

If an IN-AE is interested in the reachability status of the UE, it may subscribe to the <*schedule*> resource (step 0b, optional).

**Step 1: IN-CSE (SCS) sends a Monitoring Request to SCEF to monitor the UE Loss of Connectivity.**

The monitoring request from the IN-CSE to SCEF contains information as specified in 3GPP TS 23.682 [3]. Such information includes:

* *SCS Identifier* shall be set to a value that is prearranged between the Service Provider and MNO.
* *T8* Destination Address is set to the IP Address of the IN-CSE.
* *TTRI* is used to correlate this request with future responses. It shall be assigned based on internal IN-CSE policies.
* *TLTRI* is used to identify the monitoring request. It shall be assigned based on internal IN-CSE policies. Later, when reports are received, the value shall be used to associate them to the original request.
* *Monitoring type* shall be set to “Loss of Connectivity"
* *Maximum Number of Reports* or *Monitoring Duration* shall be optionally set according to IN-CSE pre-provisioning if continuous monitoring is supported.
* *Chargeable Party identifier* shall be optionally set according to IN-CSE pre-provisioning
* *External Identifier* shall be set to the M2M-Ext-ID of the UE
* *Maximum Detection Time* shall be set according to IN-CSE pre-provisioning. This value should be set to a value that is longer than the length of time of inactive communications as configured in the <*schedule>* resource
* *groupReportingGuardTime* shall be set according to IN-CSE pre-provisioning.This indicates time for which the SCEF can aggregate the monitoring event reports detected by the UEs in a group and report them together to the SCEF/SCS/AS.

This information uses the values pre-provisioned at the IN-CSE or is derived from local policies.

**Step 002: -Step 003**: **Monitoring Request Handling in the Underlying Network.**

The SCEF handles the Monitoring Request together with the Mobile Core Network, as described in 3GPP TS23.682[3]. The SCEF sends a Monitoring Response (TLTRI, Cause) message to the IN-CSE (SCS) to acknowledge acceptance of the Monitoring Request of the identified monitoring event configuration.

**Step 004:** **Detection of Loss of Connectivity and reporting to SCEF.**

Later, when the UE losses connectivity, the MME detects the condition and sends a Monitoring Report to SCEF

**Step 005:** **SCEF** **sends a Monitoring Report to IN-CSE (SCS) indicating UE Loss of Connectivity.**

The SCEF sends a Monitoring Report to the IN-CSE as specified in 3GPP TS 23.682 [3]. Such information includes:

* *External Identifier* (M2M-Ext-ID of the UE)
* *TLTRI* (same as in the request)

**Step 006: Loss of Connectivity Handling at the IN-CSE (SCS).**

The IN-CSE uses the information provided in the Monitoring Report to update the <*schedule*> child resource of the <*node*> resourceto indicate that no communications are currently available (e.g by using a keyword such as “NULL”). Updates to the *<schedule>* resource will be performed only if its *networkCoordinated* attribute is set to True.

Note: It is recommended that UE Reachability monitoring is also enabled in conjunction with the Loss of Connectivity monitoring. This enables the IN-CSE to provide updated timing information in the <schedule> resource, once the UE becomes reachable again.

**Step 007**: **(Optional) Notifying subscribers**.

Optionally, if IN-AEs have subscribed to changes in the <*schedule*> resources a notification will be sent to the subscribers.

### 7.4.5 Detecting Change of IMSI-IMEI(SV) Association

The 3GPP SCEF Event Monitoring functionality described in 3GPP TS 23.682 [2] supports an API that allows the IN-CSE to be informed when the SIM card of one physical device is placed in another physical device. This condition is detected by the underlying 3GPP network when the association between the International Mobile Subscriber Identity (IMSI) and International Mobile Equipment Identity (IMEI/IMEISV) changes.

An IN-CSE may request to receive notifications from an underlying 3GPP network when the association between the IMSI and IMEI(SV) changes for a given UE that hosts one or more ASN/MN-CSEs or ADN-AEs registered to the IN-CSE. Based on this notification, the IN-CSE may then ignore incoming requests from these ASN/MN-CSEs or ADN-AEs.

#### 7.4.5.1 Change of IMSI-IMEI(SV) Association Request and Notification



**Figure 7.4.5-1: Change of IMSI-IMEI(SV) Association Monitoring Request and Notification**

**Pre-conditions:**

There is a relationship in place between the IN-CSE and MNO allowing the IN-CSE to request notifications for IMSI-IMEI(SV) association changes

An ASN/MN-CSE or ADN-AE registers with the IN-CSE and configures the *M2M-Ext-ID* attribute of its <*remoteCSE*> or <AE> resource. The IN-CSE examines the *M2M-Ext-ID* and recognizes that it is associated with an MNO that it has a relationship with. The relationship allows the IN-CSE to request notifications when the device’s IMSI-IMEI(SV) association changes.

**Step 1: IN-CSE Requests notification for changes in IMSI-IMEI(SV) association**

The IN-CSE determines whether it wants a notification if the IMSI-IMEI(SV) association of a particular UE hosting one or more ASN/MN-CSEs or ADN-AEs changes. This determination may be based on whether the IN-CSE has an established relationship with the underlying 3GPP network operator that supports this capability and provisioned policies.

**Step 2 (Optional): DNS Query/Response**

The IN-CSE may determine the IP address(es)/port(s) of the proper SCEF to contact by performing a DNS query using the M2M-Ext-ID (M2M External Identifier) assigned to the target ASN/MN-CSE or ADN-AE. Alternatively, an IN-CSE may use a pre-configured SCEF identifier. The method for pre-configuring a SCEF identifier into the IN-CSE is outside the scope of the present document.

**Step 3: Monitoring Request**

The IN-CSE sends a request to be notified when the device’s IMSI-IMEI(SV) association changes. The Monitoring Request contains information as specified in 3GPP TS 23.682 [2] which includes the following:

* *External Identifier* shall be set to the M2M-Ext-ID of the UE hosting an ADN-AE or ASN/MN-CSE, which may have been provided during ADN-AE or ASN/MN-CSE registration.
* *SCS Identifier* shall be set to a value that is prearranged between the Service Provider and MNO.
* *T8 Destination Address* is set to the IP Address of the IN-CSE.
* *TTRI* is used to correlate this request with future responses. It shall be assigned based on internal IN-CSE policies.
* *TLTRI* is used to identify the Change of IMSI-IMEI(SV) Association Request. It shall be assigned based on internal IN-CSE policies. Later, when a report is received, the value will be used to reference the original request so that the IN-CSE knows what *M2M-Ext-ID* the report pertains to.
* *Monitoring Type* shall be set to "Change of IMSI-IMEI(SV) Association".
* *Association Type* shall be set to IMEI or IMEISV. The type that is used is based on IN-CSE policies which may be based on the relationship between the Service Provider and MNO.
* *Maximum Number of Reports* and *Monitoring Duration* shall not be configured; thus indicating that a monitoring request may be cancelled after receiving one report.
* *TLTRI for Deletion* shall not be provided.
* *groupReportingGuardTime* shall be set according to IN-CSE pre-provisioning.This indicates time for which the SCEF can aggregate the monitoring event reports detected by the UEs in a group and report them together to the SCEF/SCS/AS.

**Step 4: Process Monitoring Request**

The SCEF processes the request

**Step 5: Monitoring Response**

The SCEF responds to the request with a *Cause* value that indicates if the request was accepted or not and the *TTRI* that was provided in the Monitoring Request so that the IN-CSE can correlate the response with the original request.

**Step 6: Detect change in IMSI-IMEI(SV) association**

The underlying 3GPP network monitors and detects a IMSI-IMEI(SV) association change.

**Step 7: Monitoring Indication**

The SCEF sends a Monitoring Indication to the corresponding *T8 Destination Address* of the IN-CSE that was configured in the Monitoring Request. The indication includes a report containing a TTRI value that is assigned by the SCEF and that will be provided back to the SCEF when the IN-CSE responds. The report also includes the TLTRI value that was provided by the IN-CSE in the Monitoring Request so that the IN-CSE can correlate the indication with the original request and determine what UE the report pertains to.

**Step 8: Monitoring Indication Response**

The IN-CSE shall acknowledge the Monitoring Indication by returning a Monitoring Indication Response. The response shall include the TTRI that was provided by the SCEF in the Monitoring Indication.

**Step 9: Process Notification**

Using the TLTRI, the IN-CSE shall determine the corresponding M2M-Ext-ID. The IN-CSE shall stop servicing requests from any ASN/MN-CSEs or ADN-AEs having an M2M-Ext-ID matching the one indicated in the report. To block these requests, the IN-CSE may take an action such as tear down any active security associations (e.g. D/TLS sessions) between the IN-CSE and these ADN-AEs or ASN/MN-CSEs. In addition, the IN-CSE may also deny new security association establishment requests from any ADN-AEs or ASN/MN-CSEs that have an M2M-Ext-ID matching the one indicated in the report until the restriction is removed via administrative means which are outside the scope of the present document.

#### 7.4.5.2 Canceling IMSI-IMEI(SV) Association Change Monitoring Requests

If an ASN/MN-CSE or ADN-AE de-registers from the IN-CSE, the IN-CSE should cancel the corresponding Change of IMSI-IMEI(SV) Association Monitoring Request. The IN-CSE shall cancel this request by sending a request to the SCEF’s Monitoring Request API that includes the following:

* *SCS Identifier* shall be set to a value that is prearranged between the Service Provider and MNO.
* *TLTRI for Deletion* shall be set to the value of the *TLTRI* configured in the Monitoring Request that is to be deleted. This value is used by the SCEF and the mobile core network to determine what request should be cancelled.
* *TTRI* is used to correlate this request with the SCEF’s response to the cancellation request. It shall be assigned based on internal IN-CSE policies.

Note, External Identifier, T8 Destination Address, Monitoring Type, Association Type, Maximum Number of Reports and Monitoring Duration shall not be included in this request.

### 7.4.6 Scheduling communication based on Roaming Indications

The 3GPP SCEF Monitoring functionality described in 3GPP TS 23.682 [2] supports an API to allow an IN-CSE to be informed when the roaming status of a UE in the underlying 3GPP network changes.

An IN-CSE may request to receive indications from an underlying 3GPP network when the roaming status of a 3GPP UE hosting an ASN/MN-CSE or ADN-AE changes. Based on these indications, the IN-CSE may buffer requests for ASN/MN-CSEs or ADN-AEs that are hosted on roaming UEs and send these requests when they are no longer roaming. The determination of whether or not to buffer requests may be based on system policies that are outside the scope of the current document. An IN-CSE may also make the roaming status of ASN/MN-CSEs or ADN-AEs available to IN-AEs such that they can use this status to determine whether or not to avoid and or delay communications until they are no longer roaming.



**Figure 7.4.6-1: Request for Roaming Status Indications**

**Pre-conditions:**

There is a relationship in place between the IN-CSE and MNO allowing the IN-CSE to request Roaming Status Reports from the underlying 3GPP network. The method for establishing this relationship is outside the scope of the present document.

An ASN/MN-CSE or ADN-AE registers with the IN-CSE and configures the *M2M-Ext-ID* attribute of its <*remoteCSE*> or <*AE*> resource. The IN-CSE examines the *M2M-Ext-ID* and recognizes that it is associated with an MNO that it has a relationship with.

The ASN/MN-CSE or ADN-AE or IN-CSE creates a <*node*> resource. This <*node*> resource has *roamingStatus* and *networkID* attributes.

An IN-AE may subscribe to the IN-CSE to receive notifications when the roaming status of a ASN/MN-CSE or ADN-AE changes. This subscription is made to the *roamingStatus* and/or *networkID* attributes of the <*node*> resource.

The IN-CSE may be configured with policies to control whether or not to buffer requests targeting ASN/MN-CSEs or ADN-AEs hosted on 3GPP UEs that are roaming. The method for configuring these policies is outside the scope of the present document.

**Step 1: IN-CSE determines to issue Network Status Request**

If the IN-CSE can resolve the *M2M-Ext-ID* to a SCEF and IN-CSE policies allow for it, the IN-CSE issues a Roaming Status Request. Note, these IN-CSE policies are outside the scope of the present document.

**Step 2 (Optional): DNS Query/Response**

To determine which SCEF to contact, an IN-CSE may determine the IP address(es)/port(s) of the proper SCEF by performing a DNS query using the M2M-Ext-ID (M2M External Identifier) of the ASN/MN-CSE or ADN-AE. Alternatively, an IN-CSE may use a pre-configured SCEF identifier. The method for pre-configuring a SCEF identifier into the IN-CSE is outside the scope of the present document.

**Step 3: Roaming Status Request**

The IN-CSE requests roaming status reports for a particular ASN/MN-CSE or ADN-AE hosted on a UE. The fields of the API are populated as follows.

* *External Identifier* shall be set to the M2M-Ext-ID of the UE hosting the targeted ASN/MN-CSE or ADN-AE.
* *SCS Identifier* shall be set to a value that is prearranged between the Service Provider and MNO.
* *T8 Destination Address* shall be set to the IP Address of the IN-CSE.
* *TTRI* is used to correlate this request with future responses. It shall be assigned based on internal IN-CSE policies.
* *TLTRI* is used to identify the Roaming Status Report request. It shall be assigned based on internal IN-CSE policies. Later, when reports are received, the value shall be used to reference the original request so that the IN-CSE knows what request the report pertains to.
* *Maximum Number of Reports* shall be configured with the maximum number of roaming event reports that the SCEF shall generate before stopping.
* *Duration* is used to indicate for how long reports will be sent. For example, if duration is set to “1 day”, reports will be sent every time the roaming status changes within a 1 day period. After the duration expires, the SCEF will stop sending reports.
	+ NOTE 1: If no duration is provided, then only one Roaming Status Report will be provided to the IN-CSE
* *Monitoring Type* shall be set to Roaming Status
* *PLMN Information* shall be set to indicate that the IN-CSE wants to know the identity of the PLMN that the UE is attached to.

*(Editor’s Note – 3GPP has yet to define the format of the PLMN Informaiton that the IN-CSE should provide in this request)*

* *groupReportingGuardTime* shall be set according to IN-CSE pre-provisioning.This indicates time for which the SCEF can aggregate the monitoring event reports detected by the UEs in a group and report them together to the SCEF/SCS/AS.

**Step 4: Process Roaming Status Request**

The SCEF processes the request

**Step 5: Roaming Status Response**

The SCEF responds to the request with a *Cause* value that indicates if the request was accepted and the TTRI that was provided in the Roaming Status Request so that the IN-CSE can correlate the response with the original request.

The message includes the following information.

* *TTRI* is set to the same TTRI value that was provided in the request.
* *TLTRI* is set to the same TLTRI value that was provided in the request.
* *Cause* is set to a value that indicates if the request was accepted or not
* *Monitoring Event Report* includes an indication of whether or not the UE is roaming and the identity of the PLMN that the UE is attached to.

After receiving this response, the IN-CSE shall update the *roamingStatus* and *networkID* attributes of the <*node>* resource that is linked to *<AE*> or *<remoteCSE>* resources having a M2M-Ext-ID attribute that matches the M2M-Ext-ID configured in the Roaming Status Request. The *roamingStatus* indicates if the device is roaming and shall be set to “YES” or “NO”. The *networkID* is configured with the identity of the PLMN. Based on the state of the *roamingStatus* and *networkID* attributes, IN-AEs can better track the location of ASN/MN-CSEs or ADN-AEs hosted on roaming UEs and determine whether or not they want to send requests to them.

**Step 6: Detect Roaming Status Change**

When the UE roams, a report will be sent to the SCEF.

**Step 7: Roaming Status Report**

The SCEF sends a Roaming Report message to the IN-CSE. The message includes a TTRI value that is assigned by the SCEF and that will be provided back to the SCEF when the IN-CSE responds. The message also includes the TLTRI value that was provided by the IN-CSE in the Roaming Status Request so that the IN-CSE can correlate the report with the original request and determine what UE the report is associated with. The message also includes the monitoring event report that indicates if the UE is roaming and the PLMN that the UE attached to.

**Step 8: Roaming Status Acknowledgement**

The IN-CSE shall acknowledge the Roaming Status Report and the acknowledgement shall include the TTRI that was provided by the SCEF in the Roaming Status Report.

Note, When the IN-CSE provides a duration in step 3, Steps 6-8 are repeated until the duration expires or until step 10 is executed

**Step 9: Process Network Status Report**

The IN-CSE shall update the *roamingStatus* and *networkID* attributes of the <*node>* resource that is linked to  *<AE*> or *<remoteCSE*> resources having a M2M-Ext-ID attribute that matches the M2M-Ext-ID configured in the Roaming Status Request.

In addition, the IN-CSE may determine to delay or reject the processing of requests targeting ASN/MN-CSEs or ADN-AEs hosted on roaming UEs via one or more of the following approaches. How the IN-CSE makes this determination is outside the scope of the current document and may be based on policies and agreements with the mobile network operator.

Note, in some use cases the IN-CSE may not want to delay or reject processing of requests if a UE is roaming.

* An IN-CSE may reject requests that target ASN/MN-CSEs or ADN-AEs hosted on roaming UEs. If an IN-CSE rejects a request due to a roaming UE, it shall return a corresponding response code informing the cause of rejection is due to lack of accessibility to a roaming network node.
* An IN-CSE may delay the processing of requests (i.e. buffer) that target ASN/MN-CSEs or ADN-AEs hosted on roaming UEs.
	+ If the request is a blocking request, the IN-CSE should not delay the processing of the request and should instead reject these request with a corresponding response code informing the cause of rejection is due to the destination node is roaming.
	+ If the request includes an Event Category that is set to immediate the IN-CSE should not delay the processing of the request and should instead reject the request with a corresponding response code informing the cause of rejection is due to the destination node is roaming. In this case, the IN-AE may decide to resubmit the request with the Event Category set to “bestEffort” or “latest” to indicate the IN-CSE may buffer the request.

**Step 10: Roaming Status Request Cancellation**

Before the Duration expires, the IN-CSE may request that the SCEF stop sending Roaming Status Reports. The IN-CSE may make this decision, for example, when an ASN/MN-CSE or ADN-AE de-registers.

The IN-CSE sends a Roaming Status Cancellation Request. The request shall include a TTRI value that is generated by the IN-CSE and is used to correlate this request with the response that will come from the SCEF. The request shall also include the TLTRI value of the original Network Status Request.

**Step 11: Process Roaming Status Cancellation Request**

The SCEF processes the cancellation request.

**Step 12: Acknowledge Roaming Status Cancellation Request**

The SCEF acknowledges the request to cancel Roaming Status Reports. The acknowledgement will include the TTRI that was provided by the IN-CSE in the Network Status Cancellation Request

### 7.4.7 Location Reporting

#### 7.4.7.1 Introduction

The 3GPP location monitoring feature supports reporting the current location of a UE as well as the last known location of UE. This clause provides details on how the IN-CSE oneM2M <locationPolicy>, <container> and <contentInstance> resources are used to interwork with the SCEF API and provide location monitoring capability for an ASN/MN-CSE or ADN-AE hosted on a 3GPP UE. To interwork the 3GPP location reporting functionality with oneM2M, the <locationPolicy>, <container> and <contentInstance> resources and corresponding procedures are used.

#### 7.4.7.2 Resource Structure

Refer to the clause 9.6.10 Resource Type *locationPolicy* of TS-0001[1]

#### 7.4.7.3 ServiceFlow

##### 7.4.7.3.1 Location updating triggered by retrieval



Figure 7.4.7.3.1-1: Service Flow of Location updating triggered by retrieving

**Step 001:** The IN-AE sends a < *locationPolicy*> create request to IN-CSE with the following settings:

* *locationSource* shall be set to Network Based.
* *locationUpdatePeriod* shall not be present or set to 0.
* *locationTargetID* shall be set to the **M2M-Ext-ID** of the targeted UE hosting an ASN/MN-CSE or ADN-AE.
* *locationServer* shall not be present.
* *locationContainerID* shall not be present.
* *locationInformationType* shall be set to position fix.
* *retrieveLastKnownLocation* shall be configured with either True or False based on the requirements of the IN-AE.
* *locationUpdateEventCriteria* shall not be present.

**Step 002:** IN-CSE shall create the <*locationPolicy>* resourceand corresponding *<container>* resource forstoring location informationbased on the procedure specified in clause 10.2.9 of oneM2M TS-0001[i.9].

**Step 003:** The IN-AE sends a RETRIEVE request to the *<latest>* child resource of the <*container*> resource created in Step 002.

**Step 004:** The IN-CSE checks the *locationSource* attribute of the <*locationPolicy*> resource that is linked to the <container> targeted by the RETRIEVE request in Step 003. If the *locationSource* attribute is set to Network Based and the *locationUpdatePeriod* attribute is set to zero or NULL, then the IN-CSE shall issue a Location Monitoring Request to the SCEF. The request shall contain the following information as specified in 3GPP TS 23.682 [i.5].

* *External Identifier* shall be set to the *locationTargetID*.
* *SCS Identifier* shall be set to a value that is prearranged between the Service Provider and MNO.
* *SCS Reference ID* shall be configured by the IN-CSE to refer to a specific transaction initiated by the IN-CSE towards the SCEF; SCS Reference ID is stored by the SCEF
* *Monitoring Type* shall be set to “Location Reporting”.
* *Monitoring Destination Address* shall be set to the IP address of the IN-CSE.
* *Location Type* shall be set to*”*Current Location”.
* *Accuracy* shall be set set by the IN-CSE (e.g. based on a pre-provisioned policy setting).
* NOTE: The format of Accuracy has not yet been defined in 3GPP TS 23.682 [i.5])
* *groupReportingGuardTime* shall be set according to IN-CSE pre-provisioning.This indicates time for which the SCEF can aggregate the monitoring event reports detected by the UEs in a group and report them together to the SCEF/SCS/AS.

**Step 005-006:** The Location Monitoring Request is processed by the Underlying 3GPP Network based on the procedure defined in 3GPP TS 23.682 [i.5].

**Step 007:** The SCEF sends the Monitor Indication to the IN-CSE.

**Step 008:** The IN-CSE shall create a new *<contentInstance*> child resource of the <*container*> targeted by the RETRIEVE request in Step 003.

**Step 009b:** If the Monitor Indication in Step 007 indicates a failure, then the IN-CSE shall send a Location Monitoring Request to the SCEF to get the last known location if the *retrieveLastKnownLocation* attribute of the <*locationPolicy*> is set to TRUE. The request shall contain the following information as specified in 3GPP TS 23.682 [i.5].

* *External Identifier* shall be *locationTargetID*.
* *SCS Identifier* shall be set to a value that is prearranged between the Service Provider and MNO.
* *SCS Reference ID* shall be configured by the IN-CSE to refer to a specific transaction initiated by the IN-CSE towards the SCEF; SCS Reference ID is stored by the SCEF
* *Monitoring Type* shall be set to “Location Reporting”.
* *Monitoring Destination Address* shall be set to the IP address of the IN-CSE.
* *Location Type* shall be set to*”* Last Known Location”.
* *Accuracy* shall be set set by the IN-CSE (e.g. based on a pre-provisioned policy setting).

NOTE: The format of Accuracy has not yet been defined in 3GPP TS 23.682 [i.5].

**Step 010b-011b:** The Location Monitoring Request is processed by the Underlying 3GPP Network based on the procedure defined in3GPP TS 23.682 [i.5].

**Step 012b:** The SCEF sends the Monitor Indication to the IN-CSE.

**Step 013b:** The IN-CSE shall create a new *<contentInstance*> child resource of the <*container*> targeted by the RETRIEVE request in Step 003.

**Step 014:** The IN-CSE sends the retrieve response to IN-AE. The response shall include the newly created <*contentInstance*> .

##### 7.4.7.3.2 Locationupdating triggered by location change



Figure 7.4.7.3.2-1: Service Flow of locationupdating triggered by location change

**Step 001:** The IN-AE sends <*locationPolicy*> CREATE request to IN-CSE with the following settings:

* *locationSource* shall be set to Network Based.
* *locationUpdatePeriod* shall not be present or set to 0.
* *locationTargetID* shall be set to the M2M-Ext-ID of the targeted UE hosting an ASN/MN-CSE or ADN-AE.
* *locationServer* shall not be present.
* *locationContainerID* shall not be present.
* *locationInformationType* shall be set to position fix.
* *retrieveLastKnownLocation* shall not be configured.
* *locationUpdateEventCriteria* shall be set to LocationChange

**Step 002:** IN-CSE shall create the <*locationPolicy>* resource and corresponding *<container>* resource forstoring location informationbased on the procedure specified in clause 10.2.9 of oneM2M TS-0001[i.9].

**Step 003:** The IN-CSE sends Monitoring Request to SCEF. The request contains information as specified in 3GPP TS 23.682 [i.5]. Such information includes (but is not limited to):

* *External Identifier* shall be set to the locationTargetID*.*
* *SCS Identifier* shall be set to a value that is prearranged between the Service Provider and MNO*.*
* *SCS Reference ID* shall be configured by the IN-CSE to refer to a specific transaction initiated by the IN-CSE towards the SCEF; SCS Reference ID is stored by the SCEF
* *Monitoring Type* shall be set to “Location Reporting”.
* *Monitoring Destination Address* shall be set to the IP address of the IN-CSE.
* *Location Type* shall be set to”Current Location”.
* *Accuracy* shall be set set by the IN-CSE (e.g. based on a pre-provisioned policy setting).

*NOTE: The format of Accuracy has not yet been defined in 3GPP TS 23.682 [i.5].*

* *groupReportingGuardTime* shall be set according to IN-CSE pre-provisioning.This indicates time for which the SCEF can aggregate the monitoring event reports detected by the UEs in a group and report them together to the SCEF/SCS/AS.

**Step 004-Step 005**: The Location Monitoring Request is processed by the Underlying 3GPP Network based on the procedure defined in 3GPP TS 23.682 [i.5].

**Step 006:** The SCEF sends the Monitor Indication to the IN-CSE to acknowledge acceptance of the Monitoring Request.

**Step 007:** The IN-AE sends the <*subscription*> CREATE request of <*container*> which stores location information to the IN-CSE.

**Step 008:** The IN-CSE sends the response to the IN-AE.

**Step 009:** The Underlying 3GPP Network sends a Monitoring Indication to SCEF when detecting a change in location of the UE hosting an ASN/MN-CSE or ADN-AE.

**Step 010:** The SCEF sends a Monitoring Indication message to the IN-CSE to notify the IN-CSE of a change in location of the UE hosting an ASN/MN-CSE or ADN-AE.

**Step 011:** IN-CSE creates a new *<contentInstance*> child resource within the <*container*> created in Step 002.

**Step 012:** IN-CSE sends NOTIFY request to the IN-AE about the <container> change information.

### -----------------------End of change 2 --------------------------------------------

CHECK LIST

* Does this Change Request include an informative introduction containing the problem(s) being solved, and a summary list of proposals.?
* Does this CR contain changes related to only one particular issue/problem?
* Have any mirror CRs been posted?
* Does this Change Request make **all** the changes necessary to address the issue or problem? E.g. A change impacting 5 tables should not include a proposal to change only 3 tables?Does this Change Request follow the drafting rules?
* Are all pictures editable?
* Have you checked the spelling and grammar?
* Have you used change bars for all modifications?
* Does the change include the current and surrounding clauses to clearly show where a change is located and to provide technical context of the proposed change? (Additions of complete clauses need not show surrounding clauses as long as the proposed clause number clearly shows where the new clause is proposed to be located.)
* Are multiple changes in this CR clearly separated by horizontal lines with embedded text such as, start of change 1, end of change 1, start of new clause, end of new clause.?