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| CHANGE REQUEST |
| Meeting ID:\* | SDS#39 |
| Source:\* | Convida Wireless Catalina Mladin, Convida Wireless, Mladin.Catalina@convidawireless.comConvida Wireless Dale Seed, Convida Wireless, Seed.Dale@convidawireless.com |
| Date:\* | 2019-02-10 |
| Contact:\* | Catalina Mladin, Convida, Mladin.Catalina@convidawireles.com |
| Reason for Change/s:\* | Provides updates on solution to Key Issue for time synchronization  |
| CR against: Release\* | Release 4 |
| CR against: WI\* | [x]  Active <WI-0046> [ ]  MNT / < Work Item number(optional)>Is this a companion CR? Yes [ ]  No [ ] Companion CR number: (Note to Rapporteur - use latest agreed revision)Is this a mirror CR? Yes [ ]  No [ ] 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\* | TR-0026 |
| Clauses/Sub Clauses \* | Clause 10.9 |
| Type of change: \* | [ ]  Editorial change[ ]  Bug Fix or Correction[ ]  Change to existing feature or functionality[x]  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 solution addresses aspects of the Key Issue on Time Synchronization in TR-0026. This contribution is expanding further on the proposed time synchronization solution involving the definition of new request and response parameters that has been accepted into TR-0026.

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

1.

## Solution I: Time Synchronization using request and response parameters

### Solution Description

This solution addresses the time synchronization Key Issue 7 by proposing additional optional message parameters to be added to the oneM2M primitives.

In this proposal new message parameters are defined to advertise as well as compare the local times of a CSE and the entities that communicate with it. The parameters can be used to share current local times, compute local time offsets, and adjust/correct local times such that they remain synchronized with one another. These message parameters can be included in requests as well as in response messages originated by the CSE or the entities that communicate with it.

In this solution a Service Layer Ping message is also proposed, enabling the calculation of network latency for time compensation.

### Solution Applicability

This solution applies to Key Issue 7.

### Solution Details

When an entity creates a <*timeSynchBeacon*> resource on a Hosting CSE and configures the *timeSynchBeaconCriteria* attribute with a value of “Loss of Synchronization”, the entity is requesting that the Hosting CSE monitor the offset between the local time of the entity and the local time of the Hosting CSE to detect if/when it exceeds a certain threshold. To perform this monitoring, the entity must provide its current local time on a regular basis to the <*timeSynchBeacon*> resource Hosting CSE. To facilitate this exchange, the ***Current Local Time*** request and response parameters are defined as described in Table 10.9.3-1 and 10.9.3-2.

Table 10.9.3-1: Current Local Time Request Message Parameter

| Request message parameter | Operation |
| --- | --- |
| Create | Retrieve | Update | Delete | Notify |
| ***Optional*** | ***Current Local Time -*** Local time value captured and inserted into a request when it is sent by the Originator | O | O | O | O | O |

Table 10.9.3-2: Current Local Time Response Message Parameter

| Response message parameter | Operation |
| --- | --- |
| Create | Retrieve | Update | Delete | Notify |
| ***Optional*** | ***Current Local Time -*** Local time value captured and inserted into a response when it is sent by the Receiver | O | O | O | O | O |

Note based on deployment and implementation use case requirements, the ***Current Local Time*** message parameter can be included in all request and response messages originated by an entity targeted towards a <*timeSynchBeacon*> resource Hosting CSE, or only in select messages (e.g. one every n seconds or one in every n messages). This allows providing adequate information for maintaining proper synchronization without introducing unnecessary overhead.

Note, when an entity creates a <*timeSynchBeacon*> resource and configures the *timeSynchBeaconCriteria* attribute with a value of “Periodic”, the exchange of current local timing information and the use of ***Current Local Time*** is not required.

When an entity configures a <*timeSynchBeacon*> resource with the *timeSynchBeaconCriteria* attribute set to a value of “Loss of Synchronization”, the Hosting CSE can optionally compute the transit time (i.e. network latency) of messages that flow between itself and the entity. The Hosting CSE can take this time into account when calculating the offset between the local time of the entity and the local time of the Hosting CSE. This enables the Hosting CSE to calculate the offset with added precision. When receiving messages from the entity with the ***Current Local Time*** parameter configured, the Hosting CSE can first adjust this value by the transit time before comparing the value against its own local current time and computing an offset. To compute the transit time between the entity and the <*timeSynchBeacon*> resource Hosting CSE, the ***Ping Request Timestamp*** and ***Ping Response Timestamp*** parameters defined in Table 10.9.3-3 and 10.9.3-4 can be used. The <*timeSynchBeacon*> resource Hosting CSE can include a ***Ping Request Timestamp*** parameter within messages that it targets towards the entity that created the <*timeSynchBeacon*> resource. When the entity receives the request and returns a response, the entity can include the ***Ping Request Timestamp*** and ***Ping Response Timestamp*** parameters. Upon receiving the response, the <*timeSynchBeacon*> resource Hosting CSE can compute the individual one-way and the round-trip transit times by using the ***Ping Request Timestamp***, ***Ping Response Timestamp*** and the local time that it received the response message.

Note, if the <*timeSynchBeacon*> resource Hosting CSE and entity are not synchronized, the Hosting CSE can rely only on the ***Ping Request Timestamp*** and not use the ***Ping Response Timestamp*** when computing transit times.For example, to compute the one way transit time, the Hosting CSE can compute round-trip time by subtracting the ***Ping Request Timestamp*** and the time the Hosting CSE receives the response and then divide this value in half.

Table 10.9.3-3: Ping Request Timestamp Request Message Parameter

| Request message parameter | Operation |
| --- | --- |
| Create | Retrieve | Update | Delete | Notify |
| ***Optional*** | ***Ping Request Timestamp -*** Local time value captured and inserted into a request when it is sent by the Originator | O | O | O | O | O |

Table 10.9.3-4: Ping Request and Response Timestamp Response Message Parameters

| Response message parameter | Operation |
| --- | --- |
| Create | Retrieve | Update | Delete | Notify |
| ***Optional*** | ***Ping Request Timestamp –*** Value of ***Ping Request Timestamp*** received in the request and echoed back in the response sent by the Receiver | O | O | O | O | O |
| ***Optional*** | ***Ping Response Timestamp -*** Local time value captured and inserted by the Receiver into the response to a request that contains a ***Ping Request Timestamp***  | O | O | O | O | O |

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

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

The following clauses are duplicates of 10.8 and 10.9 and need to be removed from TR-0026.

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-----------------------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.?