**3GPP TSG-CT WG1 Meeting #137-eC1-225161**

**E-Meeting, 18th – 26th August 2022**

Source: CT1

Title: New WID on CT Aspects of Signal Level Enhanced Network Selection

Document for: Approval

Agenda Item: 18.1.1

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: CT aspects of Signal level Enhanced Network SElection

Acronym: SENSE

Unique identifier: TBD

Potential target Release: Rel-18

# 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Affects: | UICC apps | ME | AN | CN | Others (specify) |
| Yes | X | X |  |  |  |
| No |  |  | X |  | X |
| Don't know |  |  |  | X |  |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
|  | Feature |
| X | Building Block |
|  | Work Task |
|  | Study Item |

## 2.2 Parent Work Item

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| SENSE | SA WG 1 | 920033 | Signal level Enhanced Network Selection |

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
|  |  | {optional free text} |

# 3 Justification

The number of IoT devices is growing exponentially and with that also the number of stationary UEs. Such UEs provide connectivity for all kind of sensors in monitoring and warning networks, e.g. water level measurements in high-water warning networks, temperature measurement of high voltage lines or metering devices for power or water. The IoT modules could be located outdoor in very remote locations, in places that cannot be reached easily after the deployment or deep indoor.

The use cases have in common that the local coverage conditions can be very challenging, the UEs do not move and they are often in a permanent roaming situation, either because the modules were deployed in other countries than that of the provided USIMs or because of the use of Global USIMs for IoT use cases.

While most of the UEs work fine, a small percentage of UEs experience unstable conditions. This means, sometimes they select a VPLMN and stay on that VPLMN, where they can barely attach, and due to changing radio conditions (e.g. fading, absorption etc.) setting up a data bearer occasionally or nearly always fails. It is not possible for the operators of the PLMNs to detect such problems and once such cases occur manual intervention on site is needed to identify and fix the problem, i.e. some field engineer of the device manufacturer or the operator of the IoT service needs to intervene on site.

Even if only a small percentage is affected, the problem is significant as a steadily increasing high OPEX for manual intervention greatly hampers mass deployments.

The reason for this kind of problems is related to the current way of how VPLMNs are selected today. During the initial steps of selecting a network after switch on or recovery, from the loss of coverage and during all steps of periodic re-selection, the signal level of available cells is not taken into account, solely the cell selection criteria as broadcast by the PLMN and the priority of networks.

This results in UEs selecting or staying on a network of which the coverage on that particular place is poor, because the PLMN has higher priority, while other PLMNs of lower priority would be available with much better local coverage. For typical consumer UEs this is no problem – due to mobility the conditions are changing quickly and there is a user who recognizes the problems and can react, e.g. by changing the location a bit. It is the desired behavior as part of steering of roaming and avoids frequent changes of networks. But for stationary devices without supervision by a user it can be a problem.

Therefore, an improvement is needed that allows to take the signal level into account during the initial steps of network selection after switch-on or recovery from loss of coverage and during all steps of the periodic re-selection.

TSG SA WG1 studied and introduced a requirement for Rel-18 (i.e., SENSE, [SP-210525](https://portal.3gpp.org/desktopmodules/WorkItem/WorkItemDetails.aspx?workitemId=920033)) that allows to take the signal level into account during the network selection, and the relevant stage-1 normative work is specified in TS 22.011. As the responsible WG of network selection feature, TSG CT WG1 needs to investigate the stage-2 design and stage-3 implementation for the stage-1 requirement on SENSE.

# 4 Objective

The objectives of this work item are to work on the stage-2 and stage-3 aspects for the requirement defined by TSG SA WG1 under their work item SENSE. The following impacts on 3GPP CT working groups are identified.

CT1:

- enable the home operator to configure/update/delete an "Operator controlled signal threshold per access technology" on the USIM;

- enhancing the automatic network selection procedures of a UE supporting NB-IoT, GERAN EC-GSM-IoT and Category M1 or M2 of E-UTRAN, in case the "Operator controlled signal threshold per access technology" is configured on the USIM;

- AT CMD(s) to trigger, collect and report the "Operator controlled signal threshold per access technology" between upper layers and lower layers;

CT6:

- Add the support of the "Operator controlled signal threshold per access technology" configuration in the USIM;

# 5 Expected Output and Time scale

|  |
| --- |
| New specifications {One line per specification. Create/delete lines as needed} |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Rapporteur |
|  |  |  |  |  |  |

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
| 23.122 | * enhancing the automatic network selection procedures of a UE supporting NB-IoT, GERAN EC-GSM-IoT and Category M1 or M2 of E-UTRAN, in case the "Operator controlled signal threshold per access technology" is configured on the USIM.
* Possibly extending CP-SOR procedures to enable the home operator to configure/update/delete an "Operator controlled signal threshold per access technology" on the USIM, if CP-SOR procedures is used for this.
 | CT#98(December 2022) | CT1 responsibility |
| 24.501 | * enable the home operator to configure/update/delete an "Operator controlled signal threshold per access technology" on the USIM (possibly reusing CP-SOR or UPU functionality).
 | CT#98(December 2022) | CT1 responsibility |
| 27.007 | * AT CMD to trigger, collect and report the "Operator controlled signal threshold per access technology" between upper layers and lower layers.
 | CT#98(December 2022) | CT1 responsibility |
| 31.102 | * Add the support of the "Operator controlled signal threshold per access technology" configuration in the USIM
 | CT#98(December 2022) | CT6 responsibility |

# 6 Work item Rapporteur(s)

Reinhard Lauster, Deutsche Telekom, reinhard.lauster@magenta.at

# 7 Work item leadership

CT1

# 8 Aspects that involve other WGs

TBD

# 9 Supporting Individual Members

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| --- |
| Supporting IM name |
| Deutsche Telekom |
| IDEMIA |
| Vodafone |
| China Telecom |
| Charter Communications |
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