**3GPP TSG-SA5 Meeting #156 *S5-244171***

Maastricht, Netherlands, 18 Aug - 23 Aug 2024

**Source: Samsung, Nokia**

**Title: Conflict Management Solutions.**

**Document for: Approval**

**Agenda Item: 6.19.4**

# 1 Decision/action requested

***In this box give a very clear / short /concise statement of what is wanted.***

# 2 References

None

# 3 Rationale

This provides the solution for existing use case of CCL.

# 4 Detailed proposal

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| **First Change** |

## 5.6 Use case 6: CCL conflicts management

### 5.6.1 Description

Multiple CCLs could co-exist and concurrently act within the same environment. The CCLs can affect one another, in the worst cases leading to conflicts. The different kinds of conflicts are summarized by Table 5.6.1-1.

5.6.1-1: Types of potential conflicts among CCL instances for goals g1, g2 and g3

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| Conflict Type | Description | CCL-A | CCL-B | Comments |
| Target Conflict | For CCLs C1 and C2, when same at least 1 target of a goal is present in both CCL asking for different outcomes on that target on same controlled entity (ME1). | Control Scope: ME1  Goal targets:   * Load > 90% (to maximize resource utilization) * latency < 10ms | Control Scope: ME1  Goal target:   * Load < 90% (to avoid congestion) | Conflict among the targets within the goals - due to different required target outcomes |
| Action Conflict | For CCLs C1 and C2, when both C1 and C2 is trying to configure the same characteristics of same target entity (gNB-g1) in contradiction. | **Example 1** | | Conflict due to configuration actions at execution step because both CCL want different contradicting value for a particular characteristic of gNB-g1.  Effect: even when executed at different times, the value may ping-pong continuously. |
| Goals target:   * Throughput > 10gbps   Actions:   * Target Entity: gNB-g1 * Target Change: scale-out virtual resource | Goals target:   * EC is < 10KVA   Actions:   * Target Entity: gNB-g1 * Target Change: scale-in virtual resource |
| **Example 2** | |
| Goal target:   * HO failure is < 2%   Actions:   * Target Entity: gNB-g1 * Target Change: set CIO to a small **positive** value{to guarantee HOs with low chances of HO failure} | Goal target:   * Load < 80%   Actions:   * Target Entity: gNB-g1 * Target Change: set CIO to a small negative value [to advance HOs and move load to other cells] |
| Indirect target conflict | For CCLs C1 and C2, when C1 [optimize handover] and C2 [minimize interference] have different goals but the actions of C1 affect the goals of C2 | Goal target:   * HO failure is < 2%   Actions:   * Target Entity: gNB-g1 * Target Change: reduce CIO {to reduce chances of HO failure} | Goal target:   * SINR > 10dB   Actions:   * Target Entity: gNB-g1 * Target Change: lower antenna tilt | By reducing antenna tilt to minimize interference C2 affect the HO goal target of C1 |
| Action Execution Time Conflict | For CCLs C1 and C2, when both C1 and C2 are trying to configure the same characteristics of same target entity (gNB-g1) in contradiction. | Goals:   * Throughput > 10gbps   Actions:   * Target Entity: gNB-g1 * Target Change: scale-out * Target Time: 04:00 | Goals:   * EC is < 10KVA   Actions:   * Target Entity: gNB-g1 * Target Change: scale-in * Target Time: 04:00 | Conflict due to the time of executing the configuration actions at the execution step |
| Scope conflict | For CCLs C1 and C2, C1 and C2 have different goals and actions but their scopes are overlapping – e.g. C1’s control scope (i.e. the controlled entities in the network) is part of C2’s measurement scope (i.e. the measured entities in the network) | Measurement scope: cells g1  Control Scope: g1  Goal targets:   * EC/bit is < 1WA   Actions:   * Target Entity: gNB-g2 * Target Change: switch off g2 | Measurement scope: cells g1, g2, g3, g4  Control Scope: g2  Goals:   * Load < 80%   Actions:   * Target Entity: gNB-g2 * Target Change: change CIO | By switching off g2, C1 affects the scope which C2 reads for its load distribution measurements |

The CCL may detect or observe events that identify the possibility of any one of the above conflicts. The conflict can be avoided using some information or the policies (e.g., priority) provided by the consumer. If the conflict actually occurs, the CCL MnS producer should support services to inform MnS consumers the confirmed detected conflicts. This may also include informing MnS consumer about the potential conflict.

### 5.6.2 Potential Requirements

REQ-CCL-CONFLICT-1: The MnS Producer for CCL management should support a capability to detect a potential or actual conflict.

Note: A potential conflict is where some events are observed that indicate that there may be a conflict, but the CCL MnS Producer cannot conclude that it is a conflict. So, the CCL can indicate this so that some other entity e.g. the MnS consumer takes responsibility to confirm the conflict.

REQ-CCL-CONFLICT-2: The MnS Producer for CCL management should support a capability to inform an authorized MnS consumer about a potential conflict that has been detected.

REQ-CCL-CONFLICT-3: The MnS Producer for CCL management should support a capability to confirm a detected potential goal, action, indirect target, action execution time, scope conflict.

REQ-CCL-CONFLICT-4: The MnS Producer for CCL management should support a capability to resolve a goal, action, indirect target, action execution time, scope conflict that has been detected.

REQ-CCL-CONFLICT-5: The MnS Producer for CCL management should enable authorized MnS consumers to provide information that can be used to avoid the conflict.

REQ-CCL-CONFLICT-6: The MnS Producer for CCL management should enable authorized MnS consumers to provide information that can be used to resolve the conflict.

5.6.3 Potential Solution

The solution provides a baseline for all conflicts and needs (avoidance, detection and resolution) on which the specific solutions can be added. It involves introducing an IOC or datatype to contain conflict related information and mechanism to mitigate any conflict between CCL that may arise during instantiation of a new CCL or between two existing CCL. This IOC will also support interactions with different CCLs to detect, avoid and resolve all the conflicts defined in table 5.6.1-1.

Extend the ACCL report to be a general report that applies to all types of CCLs. The alternatives are:

* Rename ACCL report to CCLReport and then extend the new CCL report
* Introduce the CCLReport as an abstract IOC from which the ACCL report inherits

To support reporting for conflict,

* Introduce attributes for target conflict information through which the producer provides information about the conflict between an existing CCL and a requested CCL. The producer provided information includes:
  1. For all conflicts:
     + Existing and new CCL identification
  2. For goals/target conflicts
     + Conflict Information (conflicting goals/target)
     + Target CCL: The identification of the CCL that need to be deleted or modified. This will be decided as per the conflict resolution information.
  3. For Action Conflict Information: This provides information about the conflict between two existing CCL.
* Conflicting CCLs identification
* Conflict Information
  + Conflicting Goal
  + Conflicting Execute actions: This provides the set of actions that have been taken by the CCL as part of the Execute step.
* Target CCL: The identification of the CCL that need to be deleted or modified. This will be decided as per the conflict resolution information.

To support resolution of conflicts,

* Introduce on the CCL a datatype for conflict resolution information. Through this, the consumer provides information that may be used by the producer to resolve conflicts. It includes:
  + For all conflicts
    - OverridingCapable: Whether the CCL can override other CCL
    - OverrideProtect: Whether CCL can be overridden.
  + For Action Conflicts
    - In case the priority of both the conflicting CCL is same then i, is breached, thatshould beused to prioritize one of the conflicting CCL.

Procedure flow



1. The CCL(s) are deployed and running.
2. The interactions happens for detection and avoidance of the conflicts.
3. Producer checks for the conflicts that has already happened. This will include checking for both Target Conflict and Action Conflict. Producer will decide which CCL is to be deleted, among the conflicting CCL, as per the conflict resolution logic provided by the consumer..
4. The producer send a notification to the consumer providing details on the conflict. This notification will also identify the CCL which need to be deleted in order to mitigate the conflict.
5. Based on the recommendation the consumer may delete a CCL. Consumer sends a deleteMOI request for the same.
6. Producer sends a reply.
7. Alternative to 6 above, consumer may decide to modify the CCL instead of deleting it. It sends modifyMOIattribute request.
8. Producer sends a response.

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| **Last Change** |