**3GPP TSG-CT WG3 Meeting #118eC3-215267\_r1**

**E-Meeting, 11th – 15th October 2021**

**Source: Huawei**

**Title: Pseudo-CR on resolving the ENs related to the C2 service area**

**Spec: 3GPP TS 29.257**

**Agenda item: 17.30 (UASAPP)**

**Document for: Agreement**

**1. Introduction**

The C2 service area (within which the C2 operation mode management request applies) needs to be defined and included in the ConfigureData data type.

**2. Reason for Change**

Define the C2 service area as per clause 7.4.3.1 of TS 23.255.

**3. Conclusions**

N/A.

**4. Proposal**

It is proposed to agree the following changes to 3GPP TS 29.257 V0.2.0.

\* \* \* First Change \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 29.122: "T8 reference point for Northbound Application Programming Interfaces (APIs)".

[3] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[4] OpenAPI: "OpenAPI Specification Version 3.0.0", <https://spec.openapis.org/oas/v3.0.0>.

[5] 3GPP TR 21.900: "Technical Specification Group working methods".

[6] 3GPP TS 23.255: "Application layer support for Unmanned Aerial System (UAS); Functional architecture and information flows"

[7] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3"

[m] 3GPP TS 29.572: "5G System; Location Management Services; Stage 3"

\* \* \* Next Change \* \* \* \*

##### 5.2.2.2.2 C2 Operation Mode Configuration

Figure 5.2.2.2.2-1 depicts a scenario where a UASS sends a request to the UAE Server to request the provisioning of C2 operation mode configuration information for a UAS (i.e. pair of UAV and UAV-C) (see also clause 7.4 of 3GPP°TS°23.255°[6]).



Figure 5.2.2.2.2-1: C2 Operation Mode Configuration procedure

1. The UASS sends a POST request (custom operation: "configure") to the UAE Server, with the request URI set to "{apiRoot}/uae-c2opmode-mngt/v1/configure" and the request body including the ConfigureData data structure that shall contain:

- the identifier of the UASS that is sending the request, within the "uassId" attribute;

- the identifier of the target UAS (i.e. pair of UAV and UAV-C) to which the provided C2 Operation Mode configuration information is destined, within the "uasId" attribute;

- the allowed C2 communication modes for the UAS (i.e. pair of UAV and UAV-C) identified by the "uasId" attribute, within the "allowedC2CommModes" attribute;

- the C2 Operation Mode switching types to be supported by the UAE server, within the "c2OpModeSwitchReq" attribute;

- the notification URI via which the UASS desires to receive notifications from the UAE Server, within the "notificationUri" attribute;

- the primary C2 communication mode (i.e. either Direct C2 Communication mode or Network-Assisted C2 Communication mode) to be used by the UAS (i.e. pair of UAV and UAV-C) identified by the "uasId" attribute, within the "primaryC2CommMode" attribute;

Editor's note: The definition of the C2 switching policies and the associated attributes and data types is FFS.

and may also contain:

- the secondary C2 communication mode (i.e. either Direct C2 Communication mode or Network-Assisted C2 Communication mode) to be used by the UAS (i.e. pair of UAV and UAV-C) identified by the "uasId" attribute, within the "secondaryC2CommMode" attribute.

- the service area within which the C2 operation mode management request applies (i.e. a geographical area or a topological area), within the "c2ServiceArea" attribute;

2a. Upon success, the UAE Server responds with an HTTP "200 OK" status code with the response body including the C2Result data structure which shall contain a feedback from the UAE Server on whether the request for C2 Operation Mode configuration information provisioning is confirmed (i.e. can be undertaken by the UAE Server) or not.

Editor's note: Error cases and the related responses are FFS.

On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the POST response body.

\* \* \* Next Change \* \* \* \*

#### 6.1.6.1 General

This clause specifies the application data model supported by the API.

Table 6.1.6.1-1 specifies the data types defined for the UAE\_C2OperationModeManagement API.

Table 6.1.6.1-1: UAE\_C2OperationModeManagement specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Clause defined | Description | Applicability |
| ConfigureData | 6.1.6.2.2 | Represents the parameters to request to provision C2 Operation Mode configuration information for a UAS (i.e. pair of UAV and UAV-C). |  |
| SelectedC2CommModeNotif | 6.1.6.2.3 | Represents information on the C2 Communication Mode slected by a UAS (i.e. pair of UAV and UAV-C). |  |
| C2CommModeSwitchNotif | 6.1.6.2.4 | Represents information on the targeted C2 Communication Mode switching for a UAS (i.e. pair of UAV and UAV-C). |  |
| C2Result | 6.1.6.2.5 | Represents the result of an action related to C2 of a UAS. |  |
| C2ServiceArea | 6.1.6.2.v | Represents a C2 service area. |  |
| UasId | 6.1.6.2.6 | Represents the identifier of a UAS (i.e. pair of UAV and UAV-C). |  |
| UavId | 6.1.6.2.7 | Represents the identifier of a UAV (e.g. UAV, UAV-C). |  |
| C2CommMode | 6.1.6.3.3 | Represents C2 Communication Modes. |  |
| C2CommModeSwitching | 6.1.6.3.4 | Represents C2 Communication Mode Switching types. |  |

Table 6.1.6.1-2 specifies data types re-used by the UAE\_C2OperationModeManagement API from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the UAE\_C2OperationModeManagement API.

Table 6.1.6.1-2: UAE\_C2OperationModeManagement re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| ExternalGroupId | 3GPP TS 29.122 [2] | Represents an external group identifier. |  |
| GeographicArea | 3GPP TS 29.572 [m] | Represents a geographical area. |  |
| Ncgi | 3GPP TS 29.571 [7] | Represents an NCGI. |  |
| Gpsi | 3GPP TS 29.571 [7] | Represents a GPSI. |  |
| Tai | 3GPP TS 29.571 [7] | Represents a tracking area identifier. |  |
| Uri | 3GPP TS 29.122 [2] | Represents a URI. |  |

\* \* \* Next Change \* \* \* \*

##### 6.1.6.2.2 Type: ConfigureData

Table 6.1.6.2.2-1: Definition of type ConfigureData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| uassId | Uri | M | 1 | Contains the identity of the UASS communicating the C2 Operation Mode configuration information for a UAS (i.e. pair of UAV and UAV-C). It takes the form of a URI. |  |
| uasId | UasId | M | 1 | Contains the identity of the UAS (i.e. pair of UAV and UAV-C) to which the provided C2 Operation Mode configuration information is destined.  This is either in form of a UAS identifier (e.g. group ID) or individual identifiers (e.g. CAA ID, GPSI) of the UAV and UAV-C constituting the UAS. |  |
| allowedC2CommModes | array(C2CommMode) | M | 1..N | Contains the allowed C2 communication modes for the UAS (i.e. pair of UAV and UAV-C) identified by the "uasId" attribute. |  |
| c2CommModeSwitchReq | array(C2CommModeSwitching) | M | 1..N | Contains the C2 Communication Mode switching types to be supported by the UAE server. This can be:   * from "Direct C2 Communication" to "Network-Assisted C2 Communication"; * from "Network-Assisted C2 Communication" to "Direct C2 Communication"; and/or * from "Direct C2 Communication" to "UTM-Navigated C2 Communication".   from "Network-Assisted C2 Communication" to "UTM-Navigated C2 Communication". |  |
| notificationUri | Uri | M | 1 | Contains the notification URI via which the UASS desires to receive notifications from the UAE Server. |  |
| primaryC2CommMode | C2CommMode | M | 1 | Contains the primary C2 communication mode to be used by the UAS (i.e. pair of UAV and UAV-C) identified by the "uasId" attribute. It shall be set to either "DIRECT\_C2\_COMMUNICATION" or "NETWORK\_ASSISTED\_C2\_COMMUNICATION". |  |
| secondaryC2CommMode | C2CommMode | O | 0..1 | Contains the secondary C2 communication mode to be used by the UAS (i.e. pair of UAV and UAV-C) identified by the "uasId" attribute. When provided, it shall be set to either "DIRECT\_C2\_COMMUNICATION" or "NETWORK\_ASSISTED\_C2\_COMMUNICATION". |  |
| c2ServiceArea | C2ServiceArea | O | 0..1 | Contains the service area within which the C2 operation mode management request applies. This can be a geographical area or a topological area. |  |

Editor's note: The definition of the C2 switching policies and the associated attributes and data types is FFS.

\* \* \* Next Change \* \* \* \*

\* \* \* Next Change \* \* \* \*

##### 6.1.6.2.v Type: C2ServiceArea

Table 6.1.6.2.v-1: Definition of type C2ServiceArea

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ncgiList | array(Ncgi) | O | 0..N | Contains a list of NR cell identifier(s) that constitutes the C2 service area. |  |
| taiList | array(Tai) | O | 0..N | Contains a list of tracking area identifier(s) that constitutes the C2 service area. |  |
| geographicAreaList | array(GeographicArea) | O | 0..N | Contains a list of geographic area(s) that constitutes the C2 service area. |  |

\* \* \* Next Change \* \* \* \*

## A.2 UAE\_C2OperationModeManagement API

openapi: 3.0.0

info:

title: uae-c2opmode-mngt

version: 1.0.0-alpha.1

description: |

UAE Server C2 Operation Mode Management Service.

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externalDocs:

description: 3GPP TS 29.257 V0.2.0; Application layer support for Uncrewed Aerial System (UAS); UAS Application Enabler (UAE) Server Services; Stage 3.

url: http://www.3gpp.org/ftp/Specs/archive/29\_series/29.257/

servers:

- url: '{apiRoot}/uae-c2opmode-mngt/v1'

variables:

apiRoot:

default: https://example.com

description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122

security:

- {}

- oAuth2ClientCredentials:

- uae-c2opmode-mngt

paths:

/configure:

post:

summary: Request the provisioning of C2 Operation Mode configuration information for a UAS (i.e. pair of UAV and UAV-C).

requestBody:

required: true

content:

application/json:

schema:

$ref: '#/components/schemas/ConfigureData'

responses:

'200':

description: The communicated C2 Operation Mode configuration information was successfully received. The response body contains the feedback of the UAE Server on whether this C2 Operation Mode configuration request is confirmed (i.e. can be undertaken by the UAE Server) or not.

content:

application/json:

schema:

$ref: '#/components/schemas/C2Result'

'307':

$ref: 'TS29122\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29122\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29122\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29122\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29122\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29122\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29122\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29122\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29122\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29122\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29122\_CommonData.yaml#/components/responses/500'

'503':

$ref: 'TS29122\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29122\_CommonData.yaml#/components/responses/default'

callbacks:

SelectedC2CommunicationModeNotification:

'{$request.body#/notificationUri}/inform-selec-c2mode':

post:

requestBody:

required: true

content:

application/json:

schema:

$ref: '#/components/schemas/SelectedC2CommModeNotif'

responses:

'204':

description: No Content, Notification was succesfull. The C2 Communication Mode selected by the concerned UAS (i.e. pair of UAV and UAV-C) is successfully received and acknowledged by the UASS.

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

C2CommunicationModeSwitchingNotification:

'{$request.body#/notificationUri}/inform-c2mode-switch':

post:

requestBody:

required: true

content:

application/json:

schema:

$ref: '#/components/schemas/C2CommModeSwitchNotif'

responses:

'200':

description: OK. The targeted C2 Communication Mode switching for the concerned UAS (i.e. pair of UAV and UAV-C) is successfully received. The response body contains the feedback of the UASS on whether this C2 Communication Mode switching is confirmed (i.e. validated) or not.

content:

application/json:

schema:

$ref: '#/components/schemas/C2Result'

'204':

description: No Content. The targeted C2 Communication Mode switching for the concerned UAS (i.e. pair of UAV and UAV-C) is successfully received and acknowledged, and the UASS does not need to confirm (i.e. validate) it.

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{nrfApiRoot}/oauth2/token'

scopes:

<API name in lower letters with underscores>: Access to the <API Name> API

schemas:

ConfigureData:

description: Represents the parameters to request to provision C2 Operation Mode configuration information for a UAS (i.e. pair of UAV and UAV-C).

type: object

properties:

uassId:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/Uri'

uasId:

$ref: '#/components/schemas/UasId'

allowedC2CommModes:

type: array

items:

$ref: '#/components/schemas/C2CommMode'

minItems: 1

c2CommModeSwitchReq:

type: array

items:

$ref: '#/components/schemas/C2CommModeSwitching'

minItems: 1

notificationUri:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/Uri'

primaryC2CommMode:

$ref: '#/components/schemas/C2CommMode'

secondaryC2CommMode:

$ref: '#/components/schemas/C2CommMode'

c2ServiceArea:

$ref: '#/components/schemas/C2ServiceArea'

required:

- uassId

- uasId

- allowedC2CommModes

- c2CommModeSwitchReq

- notificationUri

- primaryC2CommMode

SelectedC2CommModeNotif:

description: Represents information on the C2 Communication Mode slected by a UAS (i.e. pair of UAV and UAV-C).

type: object

properties:

uasId:

$ref: '#/components/schemas/UasId'

selPrimaryC2CommMode:

$ref: '#/components/schemas/C2CommMode'

selSecondaryC2CommMode:

$ref: '#/components/schemas/C2CommMode'

required:

- uasId

- selPrimaryC2CommMode

C2CommModeSwitchNotif:

description: Represents information on the targeted C2 Communication Mode switching for a UAS (i.e. pair of UAV and UAV-C).

type: object

properties:

uaeServerId:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/Uri'

uasId:

$ref: '#/components/schemas/UasId'

c2CommModeSwitchType:

$ref: '#/components/schemas/C2CommModeSwitching'

required:

- uaeServerId

- uasId

- c2CommModeSwitchType

C2Result:

description: Represents the result of an action related to C2 of a UAS.

type: object

properties:

c2OpConfirmed:

type: boolean

required:

- c2OpConfirmed

UasId:

description: Represents the identifier of a UAS (i.e. pair of UAV and UAV-C).

type: object

properties:

groupId:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/ExternalGroupId'

individualUasId:

type: array

items:

$ref: '#/components/schemas/UavId'

UavId:

description: Represents the identifier of a UAV (e.g. UAV, UAV-C).

type: object

properties:

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

caaId:

type: string

C2ServiceArea:

description: Represents Represents a C2 service area.

type: object

properties:

ncgiList:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Ncgi'

taiList:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Tai'

geographicAreaList:

type: array

items:

$ref: 'TS29572\_Nlmf\_Location.yaml#/components/schemas/GeographicArea'

# ENUMS:

C2CommMode:

description: Represents C2 Communication Modes.

anyOf:

- type: string

enum:

- DIRECT\_C2\_COMMUNICATION

- NETWORK\_ASSISTED\_C2\_COMMUNICATION

- UTM\_NAVIGATED\_C2\_COMMUNICATION

- type: string

C2CommModeSwitching:

description: Represents C2 Communication Mode Switching types.

anyOf:

- type: string

enum:

- DIRECT\_TO\_NETWORK\_ASSISTED\_C2

- NETWORK\_ASSISTED\_TO\_DIRECT\_C2

- DIRECT\_TO\_UTM\_NAVIGATED\_C2

- NETWORK\_ASSISTED\_TO\_UTM\_NAVIGATED\_C2

- type: string

\* \* \* End of Changes \* \* \* \*