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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

should indicates a recommendation to do something

should not indicates a recommendation not to do something

may indicates permission to do something

need not indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

can indicates that something is possible

cannot indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document specifies the protocols for application layer support for UAS services as specified in 3GPP TS 23.255 [2] for:

a) UAS application communication between the UE and the UAE server (over the U1-AE interface); and

b) UAS application communication among UEs (over the U1-AE interface using unicast Uu).

The present specification defines the associated procedures for UAS application communication between the UE and the UAE server and among UEs.

The present specification defines the usage and interactions of the UAE layer with SEAL services.

The present specification also defines the message format, message contents, error handling and system parameters applied by the protocols for the UAE layer.

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 23.255: "Application layer support for Unmanned Aerial System (UAS); Functional architecture and information flows".

[3] 3GPP TS 23.256: "Support of Uncrewed Aerial Systems (UAS) connectivity, identification, and tracking; Stage 2".

[4] 3GPP TS 23.434: "Service Enabler Architecture Layer for Verticals (SEAL); Functional architecture and information flows".

[5] IETF RFC 9110:"HTTP Semantics".

[6] 3GPP TS 24.544: "Group Management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification".

[7] 3GPP TS 24.545: "Location Management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification".

[8] 3GPP TS 24.546: "Configuration Management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification".

[9] 3GPP TS 24.547: "Identity Management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification".

[10] 3GPP TS 24.548: "Network Resource Management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification".

[11] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[12] 3GPP TS 24.543: "Data Delivery Management - Service Enabler Architecture Layer for Verticals (SEAL); Protocol specification".

[13] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[14] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

UAV identifier (UAV ID): An unique identifier of a UAV. The UAV ID is in the form of a 3GPP UE ID (e.g. GPSI, External Identifier) or CAA level UAV ID as assigned by civil aviation authorities (e.g. FAA) via USS/UTM.

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.255 [2] apply:

LDGS capability
UAV
UAS Service Supplier (USS)

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.256 [3] apply:

Command and Control (C2) Communication
No-Transmit Zone (NTZ)
Uncrewed Aerial System (UAS)
UAS Traffic Management (UTM)
UAS Services

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.434 [4] apply:

SEAL service

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

C2	Command and Control
DAA	Detect And Avoid
GPSI	Generic Public Subscription Identifier
LDGS	Local DAA Ground Station
LMS	Location Management Server
NTZ	No-Transmit Zone
SCM-S	SEAL Configuration Management Server
SEAL	Service Enabler Architecture Layer for Verticals
SEALDD	SEAL Data Delivery
SLM-S	SEAL Location Management Server
UAE	UAS Application Enabler
UAE-C	UAE Client
UAS	Uncrewed Arial System
UAV	Uncrewed Aerial Vehicle
UAV-C	Unmanned Aerial Vehicle-Controller
USS	UAS Service Supplier
UTM	UAS Traffic Management

4 General description

The UE can contain a UAE client (UAE-C). The UAE-C and the UAE server (UAE-S) are located in the UAE layer. The UAE layer can offer the UAE capabilities to the UAS application specific layer. The UAE layer can utilize SEAL services provided by SEAL, which may include location management, group management, configuration management, identity management, key management and network resource management (see 3GPP TS 23.434 [4]).

The UAE-C communicates with the UAE-S over the U1-AE interface (see 3GPP TS 23.255 [2]). Furthermore, the UAE-C of a UE can communicate with the UAE-C of another UE over unicast Uu interface (including LTE-Uu or NG-RAN-Uu) (see 3GPP TS 23.255 [2]). Both the UAE-C and the UAE-S can act as an HTTP client or an HTTP server (see IETF RFC 9110 [5]). The HTTP protocol interactions are described in detail in clause 6.

By means of using the U1-AE interface:

a) Communications between UAVs within a geographical area using unicast Uu can be provided as defined by clause 6.2;

b) C2 communication mode selection and switching can be provided as defined by clause 6.3;

c) UAS UE registration can be provided as defined by clause 6.4;

d) UAS UE de-registration can be provided as defined by clause 6.5;

e) UAS UE registration update can be provided as defined by clause 6.6;

f) Change of USS during flight can be provided as defined by clause 6.7;

g) DAA support can be provided as defined by clause 6.8;

h) Tracking dynamic UAVs in an application defined area relative to a host UAV as defined by clause 6.9;

i) Real time UAV flight path monitoring assistance as defined by clause 6.10;

j) UAS provided flight routes can be provided as defined by clause 6.11; and

k) NTZ support can be provided as defined by clause 6.12.

5 SEAL services

The UAE layer can utilize following SEAL services to support UAS services:

a) group management as specified in 3GPP TS 24.544 [6];

b) location management as specified in 3GPP TS 24.545 [7];

c) configuration management as specified in 3GPP TS 24.546 [8];

d) identity management as specified in 3GPP TS 24.547 [9];

e) network resource management as specified in 3GPP TS 24.548 [10]; and

f) data delivery management as specified in 3GPP TS 24.543 [12].

Interactions between the UAE layer and the SEAL services are described in detail in clause 6.

6 UAE procedures

6.1 General

This clause provides the procedures for UAS application communication between the UAE-C and the UAE-S and from a UAE-C to other UAE-C.

In order to send UAS signalling and application data for the procedures defined in this clause, the UAE-C and the UAE-S utilize the services defined by 3GPP TS 24.543 [12], e.g. SEALDD enabled signalling transmission connection procedures such as connection establishment, connection release.

6.2 Communications between UAVs within a geographical area using unicast Uu

6.2.1 Client procedure

6.2.1.1 Sending of a UAV application message

In order to send a UAV application message, the UAE-C shall generate an HTTP POST request message according to procedures specified in IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall set the Request-URI to the URI received in the UAE client UE configuration document via the SCM-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAV-application-message-info> element in the <UAE-info> root element:

   1) shall include a <UAV-id> element set to the identity of the UAV which requests the sending of the UAV application message;

   2) shall include an <application-defined-proximity-range-info> element to indicate the range information over which the UAV application message is to be sent; and

   3) shall include an <application-payload> element set to the application payload that is to be delivered to the other UAVs; and

NOTE: The application payload is provided by the UAS application specific client and its contents are out of scope of 3GPP.

d) shall send the HTTP POST request message towards the UAE-S.

6.2.1.2 Reception of a UAV application message

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <UAV-application-message-info> element in the <UAE-info> root element;

the UAE-C:

a) shall store the received <application-payload> information included in the <UAV-application-message-info> element; and

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5] and send the HTTP 200 (OK) response towards the UAE-S.

6.2.2 Server procedure

6.2.2.1 Reception of a UAV application message

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <UAV-application-message-info> element in the <UAE-info> root element;

the UAE-S:

a) shall obtain the other UAV(s) information in the location of the UAV based on the range information indicated in the <application-defined-proximity-range-info> element from the SLM-S as specified in 3GPP TS 24.545 [7];

b) shall send the received <application-payload> information to each of the UAV obtained from step a) via unicast Uu channel as specified in clause 6.2.2.2;

c) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5] and in the HTTP 200 (OK) response:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

   2) may include an application/vnd.3gpp.uae-info+xml MIME body with a <UAV-application-message-info> with an <acknowledgement> child element in the <UAE-info> root element to indicate the acknowledgement of communications between UAVs within a geographical area; and

NOTE: The geographical area is from the perspective of the UAV initiating the communication with other UAVs.

d) shall send the HTTP 200 (OK) response towards the UAE-C.

6.2.2.2 Sending of a UAV application message

In order to send a UAV application message received from a UAV as specified in clause 6.2.2.1 to each of the UAV within a geographical area of the UAV initiating the communication with other UAVs, the UAE-S shall generate an HTTP POST request message according to procedures specified in IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-S:

a) shall set the Request-URI to the URI corresponding to the identity of the UAE-C of UAV obtained in clause 6.2.2.1;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAV-application-message-info> element in the <UAE-info> root element:

   1) shall include a <UAV-id> element set to the identity of the UAV which requests the sending of the UAV application message; and

   2) shall include an <application-payload> element set to the application payload that needs to be delivered to the other UAVs; and

d) shall send the HTTP POST request message towards the UAE-C.

6.3 C2 Communication mode selection and switching

6.3.1 Client procedure

6.3.1.1 C2 communication modes configuration procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <c2-modes-switching-configuration-info> element,

the UAE-C:

a) shall store the received configuration information;

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

   2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAE-info> root element:

      i) shall include a <c2-modes-switching-configuration-info> element with a <result> child element set to the value "positive" or "negative" indicating positive or negative result of reception and storing of the communication mode configuration parameters; and

c) shall send the HTTP 200 (OK) response towards the UAE-S.

6.3.1.2 C2 communication mode selection by UAE Client procedure

UAE Clients (UAV and UAV-C) select a primary and secondary C2 communication mode based on C2 communication mode configuration, then the UAE-C shall generate an HTTP POST request according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall set the Request-URI to the URI received in the UAE client UE configuration document via the SCM-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <C2-communication-mode-notification-info> element in the <UAE-info> root element which:

   1) shall include a <UAS-id> element set to the identifier of the UAS;

   2) shall include a <selected-primary-C2-communication-mode> element indicating the selected primary C2 communication mode; and

   3) may include a <selected-secondary-C2-communication-mode> element indicating the selected secondary C2 communication mode; and

d) shall send the HTTP POST request towards the UAE-S.

6.3.1.3 UAE-layer assisted dynamic C2 mode switching procedure

Upon detecting a condition for switching C2 communication mode based on local conditions (e.g. using the C2 communication mode switching policy) or based on a command from the UAS application specific server, the UAE-C shall generate an HTTP POST request according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall set the Request-URI to the URI corresponding to the identity of the UAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <C2-related-trigger-event-report> element in the <UAE-info> root element which:

   1) shall include a <UAE-client-id> element set to the identifier of the UAE client which indicates the QoS downgrade;

   2) shall include an <application-QoS-related-event> element including the expected or actual application QoS/QoE parameters which were changed (i.e. latency, throughput, reliability, jitter) of Network-Assisted C2 communication link 1;

3) may include an <application-QoS-related-event-2> element including the expected or actual application QoS/QoE parameters which were changed (i.e. latency, throughput, reliability, jitter) of Network-Assisted C2 communication link 2; and

d) shall send the HTTP POST request towards the UAE-S.

Upon receiving an HTTP 200 (OK) message containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <C2-operation-mode-switching> element,

the UAE-C may start C2 communication using the indicated C2 communication mode included in the <C2-operation-mode-switching-requirement> child element and generate an HTTP POST request according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall set the Request-URI to the URI corresponding to the identity of the UAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <C2-operation-mode-switching-performed> element in the <UAE-info> root element which shall include a <result> child element set to the value "positive" or "negative" indicating positive or negative result of the reception; and

d) shall send the HTTP POST request towards the UAE-S.

6.3.2 Server procedure

6.3.2.1 C2 communication modes configuration procedure

Upon receiving an application request from UAS application specific server (which can be the USS/UTM) to manage the C2 operation modes (direct, network-assisted) of C2 communication for a UAS, the UAE-S shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the UAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <c2- communication-modes-configuration-info> element in the <UAE-info> root element which:

1) shall include a <UAS-id> element set to the identification of the UAS for which the C2 QoS management request applies; and

2) may include a <C2-operation-mode-management-configuration> element which:

i) shall include a <C2-operation mode-management-requirement> element set to the identification of the type of the C2 mode switching to be supported by the UAE server;

ii) shall include an <allowed-C2-communication-modes> element indicating the type of the C2 mode switching;

iii) shall include a <primary-C2-communication-mode> element indicating the primary type of the C2 mode switching;

iv) may include a <secondary-C2-communication-mode> element indicating the secondary type of the C2 mode switching; and

v) shall include a <policy-of –C2-switching> element set to the parameters for C2 switching;

vi) may include a <dual-network-assisted-C2-communication-links> element indicating multiple network-assisted C2 communication links which

I) may include a <policy-of-C2-switching-in-case-of-network-assisted-C2-communication-link1> element set to the parameters for C2 switching for Network-Assisted C2 communication link1;

II) may include a <policy-of-C2-switching-in-case-of-network-assisted-C2-communication-link2> element set to the parameters for C2 switching for Network-Assisted C2 communication link2;

III) may include a <C2-service-area-for-network-assisted-C2-communication-link1> element set to the area where the C2 operation mode management request applies and in which the connectivity via subscription/network 1 is active; and

IV) may include a <C2-service-area-for-network-assisted-C2-communication-link2> element set to the area where the C2 operation mode management request applies and in which the connectivity via subscription/network 2 is active; and

d) shall send the HTTP POST request message towards the UAE-C.

6.3.2.2 C2 communication mode selection by UAE Client

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <C2-communication-mode-notification-info> element,

the UAE-S shall store the C2 communication modes and links information received in the <C2-communication-mode-notification-info> element and then forward the C2 communication modes and links information to the UAS application specific server and upon receiving a C2 communication mode notification acknowledgement from the UAS application specific server, the UAE-S shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-S:

a) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAE-info> root element:

1) shall include a <C2-communication-mode-notification-info> element with an <acknowledgement> child element indicating the acknowledgement of selected C2 communication mode(s); and

c) shall send the HTTP 200 (OK) message towards the UAE-C.

6.3.2.3 UAE-layer assisted dynamic C2 mode switching

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <C2-related-trigger-event-report> element,

the UAE-S:

a) shall obtain a location report for the UAE-C by the SLM-S;

b) shall determine the switching of the C2 mode from direct to network assisted or vice versa or to USS/UTM navigated;

c) if the switching of the C2 mode is from direct to network assisted or vice versa, may send a C2 mode switching confirmation request to the UAS application specific server;

d) if the switching of the C2 mode is from direct to USS/UTM navigated, shall send a C2 mode switching confirmation request to the UAS application specific server; and

e) the UAE-S shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-S:

NOTE: If the UAE-S has sent a C2 mode switching confirmation request to the UAS application specific server, the UAE-S shall wait and receive from the UAS application specific server a C2 mode switching confirmation response and then generate the HTTP 200 (OK) response message.

1) shall include a Request-URI set to the URI corresponding to the identity of the UAE-C;

2) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

3) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <C2-operation-mode-switching> element in the <UAE-info> root element which:

   i) shall include a <UAE-server-id> element set to the identifier of the UAE server which instructs the UAS to apply the C2 mode switching;

   ii) shall include a <C2-operation-mode-switching-requirement> element indicating the type of the C2 mode switching to be applied;

   iii) may include a <time-validity> element set to the time validity for the C2 switching requirement; and

   iv) may include a <geographical-area> element indicating the area for which the C2 switching applies; and

4) shall send the HTTP 200 (OK) message towards the UAE-C.

6.4 UAS UE registration

6.4.1 Client procedure

Upon receiving a request from a UAV application to register for receiving UAV application messages from the UAS application specific server, the UAE-C shall generate an HTTP POST request message according to procedures specified in IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall set the Request-URI to the URI received in the UAE client UE configuration document via the SCM-S;

NOTE 1: The provision of the UAE-S information in the UAE client UE configuration document via the SCM-S is out of scope of 3GPP.

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <registration-info> element in the <UAE-info> root element:

   1) shall include a <UAV-id> element set to the identity of the UAV (e.g. UAV, UAV-C, LDGS) which initiates the UAS UE registration procedure;

   2) may include a <UAS-UE-information> element set to the related information (e.g. UAS UE IP address, Multi-USS capability, DAA assist capability, Real time flight path monitoring assistance capability, LDGS capability, Dual Network-Assisted C2 communication link capability, NTZ indication capability) the UAS UE needs to provide to the UAE-S; and

   3) may include a <proposed-registration-lifetime> element set to the time during which the UAS UE wants to stay registered to the UAE-S for receiving UAV application messages from the UAS application specific server; and

NOTE 2: If the <proposed-registration-lifetime> element is not included in the <registration-info> element, the registration lifetime is valid until the explicit UAS UE deregistration is performed as specified in clause 6.5.

d) shall send the HTTP POST request message towards the UAE-S.

6.4.2 Server procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <registration-info> element in the <UAE-info> root element;

the UAE-S:

a) shall store the received registration information for the UAE-C;

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5] and in the HTTP 200 (OK) response:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

   2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <registration-info> element in the <UAE-info> root element:

      i) shall include a <result> element set to the value "success" or "failure" indicating success or failure of the UAS UE registration; and

      ii) may include a <registration-lifetime> element set to the time during which the UAS UE can stay registered to the UAE-S for receiving UAV application messages from the UAS application specific server; and

c) shall send the HTTP 200 (OK) response towards the UAE-C.

6.5 UAS UE de-registration

6.5.1 Client procedure

Upon receiving a request from a UAV application to de-register for receiving UAV application messages from the UAS application specific server, the UAE-C shall generate an HTTP POST request message according to procedures specified in IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall set the Request-URI to the URI of the UAE-S for which the UAS UE has successfully registered (see clause 6.4);

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <de-registration-info> element in the <UAE-info> root element:

   1) shall include a <UAV-id> element set to the identity of the UAV which initiates the UAS UE de-registration procedure; and

d) shall send the HTTP POST request message towards the UAE-S.

6.5.2 Server procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <de-registration-info> element in the <UAE-info> root element;

the UAE-S:

a) shall remove the stored UAS UE information for the UAE-C;

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5] and in the HTTP 200 (OK) response:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

   2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <de-registration-info> element in the <UAE-info> root element:

i) shall include a <result> element set to the value "success" or "failure" indicating success or failure of the UAS UE de-registration; and

c) shall send the HTTP 200 (OK) response towards the UAE-C.

6.6 UAS UE registration update

6.6.1 Client procedure

Upon receiving a request from a UAV application, if the UAE-C needs to update the registration for receiving UAV application messages from the UAS application specific server, the UAE-C shall generate an HTTP POST request message according to procedures specified in IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall set the Request-URI to the URI of the UAE-S for which the UAS UE has successfully registered (see clause 6.4);

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <registration-info> element in the <UAE-info> root element:

1) shall include a <UAV-id> element set to the identity of the UAV (e.g. UAV, UAV-C, LDGS) which initiates the UAS UE registration update procedure;

2) shall include a <UAS-UE-information> element set to the related information (e.g. UAS UE IP address, Multi-USS capability, DAA assist capability, Real time flight path monitoring assistance capability, LDGS capability, Dual Network-Assisted C2 communication link capability, NTZ indication capability) the UAS UE needs to update; and

3) may include a <proposed-registration-lifetime> element set to the time during which the UAS UE wants to stay registered to the UAE-S for receiving UAV application messages from the UAS application specific server; and

NOTE: If the <proposed-registration-lifetime> element is not included in the <registration-info> element, the registration lifetime is not updated.

d) shall send the HTTP POST request message towards the UAE-S.

6.6.2 Server procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <registration-info> element in the <UAE-info> root element;

the UAE-S:

a) shall update the stored registration information with the received registration information for the UAE-C;

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5] and in the HTTP 200 (OK) response:

1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <registration-info> element in the <UAE-info> root element:

i) shall include a <result> element set to the value "success" or "failure" indicating success or failure of the UAS UE registration update; and

ii) may include a <registration-lifetime> element set to the time during which the UAS UE can stay registered to the UAE-S for receiving UAV application messages from the UAS application specific server; and

c) shall send the HTTP 200 (OK) response towards the UAE-C.

6.7 Change of USS during flight

6.7.1 Client procedure

6.7.1.1 Management of multi-USS configuration procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <multi-USS-configuration-info> element,

the UAE-C:

a) shall store the received configuration information;

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAE-info> root element:

i) shall include a <multi-USS configuration-info> element with a <result> child element set to the value "success" or "failure" indicating positive or negative result of reception and storing of the multi-USS configuration parameters; and

c) shall send the HTTP 200 (OK) response towards the UAE-S.

6.7.1.2 USS change procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <USS-change-info> element,

the UAE-C:

a) shall perform change of USS;

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAE-info> root element:

i) shall include a <USS-change-info> element with a <result> child element set to the value "success" or "failure" indicating positive or negative result of reception and storing of the USS change parameters; and

c) shall send the HTTP 200 (OK) response towards the UAE-S.

6.7.1.3 USS change notification

Once the USS change is performed the UAE-C shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the UAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <USS-change-notification-info> element in the <UAE-info> root element which:

   1) shall include a <Reason> element to indicate reason for change of USS;

   1) shall include a <Target-USS-information> element set to an identifier of the new USS that the UAV has connected to (identified e.g. by FQDN); and

d) shall send the HTTP POST request message towards the UAE-S.

6.7.2 Server procedure

6.7.2.1 Management of multi-USS configuration procedure

Upon receiving an application request from UAS application specific server (which can be the USS/UTM) to manage the multi-USS configuration for a UAS, the UAE-S shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the UAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <multi-USS-configuration-info> element in the <UAE-info> root element which:

   1) shall include a <UAS-id> element set to the identification of the UAS for which the multi-USS configuration request applies; and

   2) may include a <Multi-USS-policy-management-configuration> element that contains the Multi-USS policy management configuration information to be configured at the UAS which:

      i) shall include an <Allowed-USS> element indicating the USS that can be the target of a switch;

      ii) shall include a <Serving-USS-information> element set to the serving USS identifier;

      iii) shall include an <Additional-information-for-change-of-USS> element providing information about the serving USS, related with the switch to a particular target USS;

      iv) shall include an <Area-for-change-of-USS> element indicating the area where the Multi-USS management request applies; and

d) shall send the HTTP POST request message towards the UAE-C.

6.7.2.2 USS change procedure

Upon receiving an USS change request from UAS application specific server (which can be the USS/UTM) to manage the USS change for a UAS, the UAE-S shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the UAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <USS-change-request-info> element in the <UAE-info> root element which:

   1) shall include a <UASS-id> element set to the identification of the UAS application specific server for which the USS change request applies;

   2) shall include a <UAS-id> element set to the identification of the UAS for which the USS change request applies;

3) shall include a <USS-change-authorization-information> element set to the authorization token to verify the request;

4) shall include a <Target-USS> element set to the identification of the USS that is the target of a switch (identified e.g. by FQDN); and

5) shall include a <Target-USS-info> element indicating the information of the target USS;

i) shall include an <USS-endpoint> element indicating Endpoint information (e.g. URI, FQDN, IP address) used to communicate with the USS;

ii) may include a <USS-capabilities> element indicating the capabilities supported by the target USS;

iii) may include an <LUN-id> element set to the identity of the LUN where the serving/target USS belongs;

iv) may include an <List-of-USS-DNAI(s)> element indicating DNAI(s) associated with the target USS; and

d) shall send the HTTP POST request message towards the UAE-C.

6.8 DAA support

6.8.1 Client procedure

6.8.1.1 DAA support configuration procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <DAA-support-configuration-info> element,

the UAE-C:

a) shall store the received configuration information;

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAE-info> root element:

i) shall include a <DAA-support-configuration-info> element with a <result> child element set to the value "success" or "failure" indicating positive or negative result of reception and storing of the DAA support configuration parameters; and

c) shall send the HTTP 200 (OK) response towards the UAE-S.

6.8.1.2 DAA support involving UAVs with U2X support procedure

Upon detection of UAVs in proximity by the UAE layer, then the UAE-C shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall set the Request-URI to the URI corresponding to the identity of the UAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <DAA-client-event-info> element in the <UAE-info> root element which:

1) shall include a <UAS-id> element set to the identifier of the UAS (UAV or LDGS) for which the DAA client support information applies;

2) shall include a <UAE-layer-detected-information> element indicating list of UASes where e.g. U2X layer or an LDGS has detected possible flight path conflict;

   i) shall include a <UAS-identity> element set to identification of e.g. a U2X-UAS where U2X layer has detected possible flight path conflict or an LDGS where LDGS has detected possible flight path conflict via U2X or Uu communication;

   ii) shall include a <location-information> element indicating location of e.g. a U2X-UAS where U2X layer has detected possible flight path conflict or an LDGS where LDGS has detected possible flight path conflict via U2X or Uu communication; and

   iii) shall include a <associated-alert> element that consists of an alert, which indicates, e.g. a collision is detected or a collision is resolved by a UAE-C that has LDGS capability;

3) may include a <time-of-arrival> element that consists of a time when a target UAS enters the monitoring range of a UAE-C that has LDGS capability;

4) may include a <time-of-departure> element that consists of a time when a target UAS leaves the monitoring range of a UAE-C that has LDGS capability; and

d) shall send the HTTP POST request towards the UAE-S.

6.8.1.3 DAA support involving UAVs without U2X support procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <DAA-server-event-info> element,

the UAE-C:

a) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-C:

   1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

   2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAE-info> root element:

      i) shall include a <DAA-server-event-info-ack> element with an <acknowledgement> child element indicating the acknowledgement of DAA server event information; and

b) shall send the HTTP 200 (OK) response towards the UAE-S.

6.8.2 Server procedure

6.8.2.1 DAA support configuration procedure

Upon receiving an application request from UAS application specific server (which can be the USS/UTM) to manage the DAA support configuration for a UAS, the UAE-S shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the UAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <DAA-support-configuration-info> element in the <UAE-info> root element which:

   1) shall include a <UAS-id> element set to the identification of the UAS (UAV or LDGS) for which the DAA configuration request applies;

   2) may include a <list-of-UAS-id> element that consists of a list of the identification of UASes that are identified as target UAVs which is included only when UAE-C has LDGS capability; and

3) may include a <DAA-application-policy> element that consists of the DAA application policy to be configured at the UAS;

i) may include a <DAA-triggering-thresholds> element to indicate thresholds to trigger DAA procedure upon detection of a flight path conflict for a UAE-C that has LDGS capability;

ii) may include a <time-validity> element that consists of validity time duration where DAA client configuration applies for a UAE-C that has LDGS capability; and

iii) may include a <reporting-frequency> element that indicates the frequency to collect the target UAVs information and frequency to report to the USS by a UAE-C that has LDGS capability; and

d) shall send the HTTP POST request message towards the UAE-C.

6.8.2.2 DAA support involving UAVs with U2X support procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <DAA-client-event-info> element,

the UAE-S shall store the DAA client event information and links information received in the <DAA-client-event-info> element and then forward the DAA client event information and links information to the UAS application specific server and upon receiving a DAA client event information acknowledgement from the UAS application specific server, the UAE-S shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-S:

a) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

b) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAE-info> root element:

1) shall include a <DAA-client-event-info-ack> element with an <acknowledgement> child element indicating the acknowledgement of DAA client event information; which

1) shall include a <UAS-id> element set to the identifier of the UAS (UAV or LDGS) for which the DAA client support information applies; and

2) shall include a <UAE-layer-detected-information> element indicating list of UASes where e.g. U2X layer has detected possible flight path conflict;

i) shall include a <UAS-identity> element set to identification of e.g. a U2X-UAS where U2X layer has detected possible flight path conflict or an LDGS where LDGS has detected possible flight path conflict via U2X or Uu communication;

ii) shall include a <location-information> element indicating location of e.g. a U2X-UAS where U2X layer has detected possible flight path conflict or an LDGS where LDGS has detected possible flight path conflict via U2X or Uu communication; and

iii) may include a <updated-flight-path> element that includes updated flight path received from a USS; and

c) shall send the HTTP 200 (OK) message towards the UAE-C.

6.8.2.3 DAA support involving UAVs without U2X support procedure

Upon receiving an application request from UAS application specific server (which can be the USS/UTM) to manage the DAA support involving UAVs without U2X support, the UAE-S shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the UAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <DAA-server-event-info> element in the <UAE-info> root element which:

1) shall include a <UAS-id> element set to the identifier of the UAS for which the DAA client support information applies; and

2) shall include a <UAE-layer-detected-information> element indicating list of UASes where e.g. U2X layer has detected possible flight path conflict;

i) shall include a <UAS-identity> element set to identification of e.g. a U2X-UAS where U2X layer has detected possible flight path conflict; and

ii) shall include a <Location-information> element indicating location of e.g. a U2X-UAS where U2X layer has detected possible flight path conflict; and

d) shall send the HTTP POST request message towards the UAE-C.

6.9 Tracking dynamic UAVs in an application defined area relative to a host UAV

6.9.1 Client procedure

6.9.1.1 Subscription for host UAV dynamic information

To subscribe for host UAV's dynamic information with UAE server, the UAE-C of the host UAV shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C of the host UAV:

a) shall set the Request-URI to the URI corresponding to the identity of the UAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <subscribe-host-UAV-dynamic-info> element in the <UAE-info> root element which:

1) shall include a <UAS-id> element set to the identifier of the UAS for which the host UAV client support information applies; and

2) shall include an <application-defined-proximity-range-info> element indicating the range information over which the host UAV's dynamic information is required; and

d) shall send the HTTP POST request towards the UAE-S.

6.9.2 Server procedure

6.9.2.1 Subscription for host UAV dynamic information

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <subscribe-host-UAV-dynamic-info> element,

the UAE-S:

a) shall store the subscription information;

b) the UAE-S shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-S:

1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

2) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <subscribe-host-UAV-dynamic-info> element in the <UAE-info> root element which:

i) shall include a <result> child element set to the value "positive" or "negative" indicating positive or negative result of the reception; and

ii) if the <result> element indicates positive result, shall include a <subscription-ID> element set to the identifier of a successful subscription; and

3) shall send the HTTP 200 (OK) message towards the UAE-C of the host UAV; and

c) shall obtain and initiate tracking the host UAV location from the location management server (LMS) as specified in 3GPP TS 23.434 [4].

6.9.2.2 Notification of host UAV dynamic information

Once UAE-C of the host UAV or UAS Application Specific Server (USS) has performed subscription for host UAV dynamic information, the UAE server UAE-S sends a notification of host UAV dynamic information to the UAE-C of the host UAV, and UAE-S shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-S:

a) shall set the Request-URI to the URI corresponding to the identity of the UAE-C of the host UAV;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <notification-of-host-UAV-dynamic-info> element in the <UAE-info> root element which:

1) shall include a <subscription-ID> element set to the identifier of a successful subscription;

2) shall include a <location-of-the-host-UAV> element indicating the location of the host UAV during the host UAV dynamic information subscription; and

3) shall include a <list-of-UAVs-info> element including the information of the UAVs which were detected in the application defined proximity range, which:

i) shall include a <nearby-UAV-ID> element set to the identifier of nearby UAS;

ii) shall include a <location-information> element set to the location information of the nearby UAV within the application defined proximity range;

iii) shall include a <distance-information> element set to the distance information of the nearby UAV relative to the host UAV; and

d) shall send the HTTP POST request towards the UAE-C of the host UAV.

6.10 Real time UAV flight path monitoring assistance

6.10.1 Client procedure

6.10.1.1 Management of real time UAV flight path monitoring assistance configuration procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <flight-path-reporting-configuration-info> element,

the UAE-C:

a) shall store the received configuration information;

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAE-info> root element:

i) shall include a <flight-path-reporting-configuration-info> element with a <result> child element set to the value "success" or "failure" indicating positive or negative result of reception and storing of the flight path reporting configuration parameters; and

c) shall send the HTTP 200 (OK) response towards the UAE-S.

6.10.1.2 Real time flight path reporting procedure

Once UAE-C detects event(s) for Uu or PC5 based on application layer experienced rules and thresholds as indicated from the flight path reporting configuration, the UAE-C shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall include a Request-URI set to the URI corresponding to the identity of the UAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <flight-path-event-report> element in the <UAE-info> root element which:

1) shall include a <report> element indicating of event based, periodic or final flight part event report which:

i) may include a <QoS-event> element providing indication of QoS event(s);

ii) may include a <QoE-event> element providing indication of QoE event(s);

iii) may include a <waypoint-event> element providing indication of waypoint event(s);

iv) may include a <geographical-event> element providing indication of geographical event(s);

vii) may include a <QoS-event-PC5> element providing indication of QoS event(s) for PC5;

viii) may include a <QoE-event-PC5> element providing indication of QoE event(s) for PC5;

viiii) may include a <waypoint-event-PC5> element providing indication of waypoint event(s) for PC5; and

x) may include a <geographical-event-PC5> element providing indication of geographical event(s) for PC5; and

d) shall send the HTTP POST request message towards the UAE-S.

6.10.2 Server procedure

6.10.2.1 Management of real time UAV flight path monitoring assistance configuration procedure

Upon receiving an application request from UAS application specific server (which can be the USS/UTM) to manage the real time UAV flight path monitoring assistance configuration for a UAS, the UAE-S shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the UAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <flight-path-reporting-configuration-info> element in the <UAE-info> root element which:

1) shall include a <UAS-id> element set to the identification of the UAS for which the the real time UAV flight path monitoring assistance configuration request applies;

2) may include a <parameters-for-Uu> element that contains the real time UAV flight path monitoring assistance configuration for Uu to be configured at the UAS which:

   i) may include a <QoS-parameter> element indicating parameters for flight path configuration related with QoS (i.e. QoS thresholds, QoS periodicity);

   ii) may include a <QoE-parameter> element indicating parameters for flight path configuration related with QoE (i.e. QoE thresholds, QoE periodicity);

   iii) may include a <time-validity> element indicating time validity where the flight path configuration applies;

   iv) may include a <list-of-waypoints> element providing one or more waypoints along the flight path where the flight path configuration applies;

   v) may include a <geographical-area> element providing the area where where the flight path configuration applies;

   vi) may include a <reporting-frequency> element indicateing on how often the UAS application specific server would like to be reported (i.e. event-based, time-based); and

3) may include a <parameters-for-PC5> element that contains the real time UAV flight path monitoring assistance configuration for PC5 to be configured at the UAS which:

   i) may include a <QoS-parameter> element indicating parameters for flight path configuration related with QoS (i.e. QoS thresholds, QoS periodicity);

   ii) may include a <QoE-parameter> element indicating parameters for flight path configuration related with QoE (i.e. QoE thresholds, QoE periodicity);

   iii) may include a <time-validity> element indicating time validity where the flight path configuration applies;

   iv) may include a <list-of-waypoints> element providing one or more waypoints along the flight path where the flight path configuration applies;

   v) may include a <geographical-area> element providing the area where where the flight path configuration applies;

   vi) may include a <reporting-frequency> element indicateing on how often the UAS application specific server would like to be reported (i.e. event-based, time-based); and

d) shall send the HTTP POST request message towards the UAE-C.

6.11 UAS provided flight routes

6.11.1 Client procedure

To provide possible fight path based on specific QoS requested from UTM or UAV with UAE-server, the UAE-C shall generate an HTTP POST request message according to procedures specified in IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall set the Request-URI to the URI corresponding to the identify of the UAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <flight-route-info> element in the <UAE-info> root element:

   1) shall include a <UASS-id> element set to the identity of the UAS application specific server;

   2) shall include a <UAV-id> element set to the identity of the UAV which requests the flight route;3) shall include a <start-point> element set to the geographical coordinates of starting point;

4) shall include a <start-time> element set to the time on which the UAV is at the starting point;

5) shall include a <destination-point> element set to the geographical coordinates of destination point;

6) shall include a <destination-time> element set to the time on which the UAV is at the destination point;

7) shall include a <required-minimum-QoS> element set to the needed QoS to support the flight mission;

8) may include a <service-availablity> element set to the percentage of needed service availablity; and

9) may include a <shortest-route-indicator> element set to the indicator for a need of shortest route; and

d) shall send the HTTP POST request message towards the UAE-S.

6.11.2 Server procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <flight-route-info> element in the <UAE-info> root element;

the UAE-S:

a) shall calculates possible waypoint and select waypoints (geographical coordinates and time) which meet the requested criteria based on the received information from NWDAF as specified in clause 7.10 of 3GPP TS 23.255 [2];

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5] and in the HTTP 200 (OK) response:

1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <flight-route-info> element in the <UAE-info> root element:

i) shall include a <result> element set to the value "success" or "failure" indicating success or failure of the reception; and

ii) may include a <list-of-waypoints> element set to the list of waypoints containing geographical coordinates and time for each waypoint; and

c) shall send the HTTP 200 (OK) response towards the UAE-C.

6.12 NTZ handling support

6.12.1 Client procedure

6.12.1.1 NTZ configuration procedure

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <NTZ-configuration-info> element,

the UAE-C:

a) shall store the received configuration information;

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAE-info> root element:

i) shall include a <NTZ-configuration-info> element with a <result> child element set to the value "success" or "failure" indicating positive or negative result of reception and storing of the NTZ configuration parameters; and

c) shall send the HTTP 200 (OK) response towards the UAE-S.

6.12.1.2 NTZ activation by UAE client procedure

Upon detection of approaching area for deactivating transmission based on their NTZ configuration, the UAE-C shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall set the Request-URI to the URI corresponding to the identity of the UAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <NTZ-notification> element in the <UAE-info> root element which:

1) shall include a <UAS-id> element set to the identifier of the UAS, a list of UAV or UAV-C identifier or both or a group identifier, for which the NTZ notification applies;

2) shall include a <NTZ-status> element indicating NTZ enforcement status e.g. "NTZ imminent entry" or "NTZ exit";

3) shall include a <NTZ-transmission-information> element indicating whether the transmission is switched on or off and includes the frequency band information;

4) shall include a <time> element set as date and time (with an offset from the UTC) of the instance when the notification is sent;

5) shall include a <location-information> element set to location and altitude, i.e., 3-dimentional geographical coordinates, of the UAE client when the notification is sent; and

6) may include a <NTZ-enforcement-time> element indicating the presence of NTZ enforcement time information;

i) may include a <estimated-start-time> element set as date and time (with an offset from the UTC) of the instance when the NTZ enforcement is expected to start;

ii) may include a <estimated-completion-time> element set as date and time (with an offset from the UTC) of the instance when the NTZ enforcement is expected to end; and

iii) may include a <actual-completion-time> element set as date and time (with an offset from the UTC) of the instance when the NTZ enforcement has ended; and

d) shall send the HTTP POST request towards the UAE-S.

6.12.1.3 New NTZ policy request

To enable UAE client to request a new NTZ policy when a change of USS happens, the UAE-C shall generate an HTTP POST request message according to procedures specified in IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-C:

a) shall set the Request-URI to the URI corresponding to the identity of the UAE-S;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with the <new-NTZ-policy-info> element in the <UAE-info> root element:

1) shall include a <UAS-id> element set to the identity of the UAS which requests the new NTZ policy;

3) shall include a <location-information> element set to location and altitude, i.e., 3-dimentional geographical coordinates, of the UAE client when the request is sent; and

d) shall send the HTTP POST request message towards the UAE-S.

6.12.1.4 UAE-layer/SEAL/LMS assisted NTZ trigger response

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <enforce-NTZ-info> element,

the UAE-C:

a) shall store the received configuration information;

b) shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-C:

1) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

2) shall include an application/vnd.3gpp.uae-info+xml MIME body and in the <UAE-info> root element:

i) shall include a <trigger-NTZ-info> element with a <result> child element set to the value "success" or "failure" indicating positive or negative result of the enforcement of NTZ request; and

c) shall send the HTTP 200 (OK) response towards the UAE-S.

NOTE: The procedure in this clause is not executed if the UAV is already in the NTZ.

6.12.2 Server procedure

6.12.2.1 NTZ configuration procedure

Upon receiving an application request from UAS application specific server (which can be the USS/UTM) to manage the NTZ for a UAS, the UAE-S shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the UAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <NTZ-configuration-info> element in the <UAE-info> root element which:

1) shall include a <UAS-id> element set to the identifier of the UAS for which the NTZ configuration information applies; and

2) may include a <NTZ-configuration> element that consists of the NTZ configurations to be configured at the UAS;

I) shall include one or more <geographic-area-ID> elements identifying the areas where the NTZ enforcement applies. Each <geographic-area-ID> element:

A) shall contain three or more <polygon-point> elements containing the latitude and longitude points of the polygon describing the geographic area as a polygon. Each <polygon-point> element:

i) shall include <latitude> element which is coded according to clause 6.1 of 3GPP TS 23.032 [11]; and

ii) shall include <longitude> element which is coded according to clause 6.1 of 3GPP TS 23.032 [11];

B) shall include <ceiling-altitude> element containing the altitude ceiling up to which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11];

C) shall include <floor-altitude> element containing the altitude floor above which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11]; and

D) shall include one or more <restricted-frequency-band> element containing the frequency bands and the time periods during which the frequency band is not allowed to be used in the NTZ. Each <restricted-frequency-band> element:

i) shall include <rat-type> element, set to either "E-UTRAN" or "NG-RAN";

ii) shall include <restricted-freq-band> element set to parameters that contain restricted frequency band defined in 3GPP TS 36.101 [14] clause 5.6.1 for E-UTRA or defined in 3GPP TS 38.101-1 [13] clause 5.2 for NR; and

iii) may include <time-periods> element that indicates the restricted time periods which:

- shall include <start-time> element containing the start time of the restriction; and

- shall include <end-time> element containing the end time of the restriction; and

II) shall include a <reporting-configuration> element that indicates NTZ reporting configutation of the UE, including the required reporting events, e.g., prior to entering an NTZ area and after exiting an NTZ area, and also the time interval for reporting; and

d) shall send the HTTP POST request message towards the UAE-C.

6.12.2.2 New NTZ policy response

Upon receiving an HTTP POST request containing:

a) a Content-Type header field set to "application/vnd.3gpp.uae-info+xml"; and

b) an application/vnd.3gpp.uae-info+xml MIME body with a <new-NTZ-policy-info> element in the <UAE-info> root element;

the UAE-S shall generate an HTTP 200 (OK) response according to IETF RFC 9110 [5]. In the HTTP 200 (OK) response message, the UAE-S:

a) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

b) shall include an application/vnd.3gpp.uae-info+xml MIME body with the <UAE-info> root element:

1) shall include a <UAS-id> element set to the identifier of the UAS for which the new NTZ policy information applies; and

2) may include a <NTZ-configuration> element that consists of the NTZ configuration to be configured at the UAS;

I) shall include one or more <geographic-area-ID> elements identifying the areas where the NTZ enforcement applies. Each <geographic-area-ID> element:

A) shall contain three or more <polygon-point> elements containing the latitude and longitude points of the polygon describing the geographic area as a polygon. Each <polygon-point> element:

i) shall include <latitude> element which is coded according to clause 6.1 of 3GPP TS 23.032 [11]; and

ii) shall include <longitude> element which is coded according to clause 6.1 of 3GPP TS 23.032 [11];

B) shall include <ceiling-altitude> element containing the altitude ceiling up to which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11];

C) shall include <floor-altitude> element containing the altitude floor above which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11]; and

D) shall include one or more <restricted-frequency-band> element containing the frequency bands and the time periods during which the frequency band is not allowed to be used in the NTZ. Each <restricted-frequency-band> element:

i) shall include <rat-type> element, set to either "E-UTRAN" or "NG-RAN";

ii) shall include <restricted-freq-band> element set to parameters that contain restricted frequency band defined in 3GPP TS 36.101 [14] clause 5.6.1 for E-UTRA or defined in 3GPP TS 38.101-1 [13] clause 5.2 for NR; and

iii) may include <time-periods> element that indicates the restricted time periods which:

- shall include <start-time> element containing the start time of the restriction; and

- shall include <end-time> element containing the end time of the restriction; and

II) shall include a <reporting-configuration> element that indicates NTZ reporting configuration of the UE, including the required reporting events, e.g., prior to entering an NTZ area and after exiting an NTZ area, and also the time interval for reporting; and

c) shall send the HTTP 200 (OK) message towards the UAE-C.

6.12.2.3 UAE-layer/SEAL/LMS assisted NTZ trigger request

Upon receiving the location area monitoring notification from LMS according to clause 9.3.2.16 of 3GPP TS 23.434 [5], containing the UAE client identifiers, the UAE-S shall generate an HTTP POST request message according to IETF RFC 9110 [5]. In the HTTP POST request message, the UAE-S:

a) shall include a Request-URI set to the URI corresponding to the identity of the UAE-C;

b) shall include a Content-Type header field set to "application/vnd.3gpp.uae-info+xml";

c) shall include an application/vnd.3gpp.uae-info+xml MIME body with a <trigger-NTZ-info> element in the <UAE-info> root element which:

1) shall include a <UAS-id> element set to the identifier of the UAS for which the NTZ configuration applies; and

2) may include a <NTZ-trigger-information> element that consists of the NTZ trigger information to be executed at the UAS to enforce NTZ when applicable;

I) shall include one or more <geographic-area-ID> elements identifying the areas where the NTZ enforcement applies. Each <geographic-area-ID> element:

A) shall contain three or more <polygon-point> elements containing the latitude and longitude points of the polygon describing the geographic area as a polygon. Each <polygon-point> element:

i) shall include <latitude> element which is coded according to clause 6.1 of 3GPP TS 23.032 [11]; and

ii) shall include <longitude> element which is coded according to clause 6.1 of 3GPP TS 23.032 [11];

B) shall include <ceiling-altitude> element containing the altitude ceiling up to which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11];

C) shall include <floor-altitude> element containing the altitude floor above which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11]; and

II) shall include one or more <restricted-frequency-band> element containing the frequency bands and the time periods during which the frequency band is not allowed to be used in the NTZ. Each <restricted-frequency-band> element:

i) shall include <rat-type> element, set to either "E-UTRAN" or "NG-RAN";

ii) shall include <restricted-freq-band> element set to parameters that contain restricted frequency band defined in 3GPP TS 36.101 [14] clause 5.6.1 for E-UTRA or defined in 3GPP TS 38.101-1 [13] clause 5.2 for NR; and

iii) may include <time-periods> element that indicates the restricted time periods which:

- shall include <start-time> element containing the start time of the restriction; and
- shall include <end-time> element containing the end time of the restriction; and

III) shall include a <time> element that indicates a time window for deactivating the transmission; and

d) shall send the HTTP POST request message towards the UAE-C.

NOTE: If NTZ enforcement information is not included, it indicates removal of the NTZ enforcement at the UAS for the indicated UAS ID.

7 Coding

7.1 General

This clause specifies the coding to enable an UAE-C and an UAE-S to communicate.

7.2 Structure

The UAE document shall conform to the XML schema described in clause 7.4.

The <UAE-info> element shall be the root element of the UAE document.

The <UAE-info> element shall include at least one of the followings:

a) a <c2-modes-switching-configuration-info> element;

b) a <C2-communication-mode-notification-info> element;

c) a <C2-related-trigger-event-report> element;

d) a <C2-operation-mode-switching> element;

e) a <UAV-application-message-info> element;

f) a <C2-operation-mode-switching-performed> element;

g) a <registration-info> element;

h) a <de-registration-info> element;

i) a <USS-change-info> element;

j) a <USS-change-notification-info> element;

k) a <USS-change-request-info> element;

l) a <DAA-support-configuration-info> element;

m) a <DAA-client-event-info> element;

n) a <DAA-server-event-info> element;

o) a <multi-USS-configuration-info> element; and

p) a <flight-route-info> element.

The <c2-communication-modes-configuration-info> element shall include the followings:

a) a <UAS-id> element;

b) a <C2-operation-mode-management-configuration> element which shall include the followings:

1) a <C2-operation mode-management-requirement> element;

2) an <allowed-C2-communication-modes> element;

3) a <primary-C2-communication-mode> element;

4) a <secondary-C2-communication-mode> element;

5) a <policy-of –C2-switching> element; and

6) a <dual-network-assisted-C2-communication-links> element which shall include the followings;

i) a <policy-of-C2-switching-in-case-of-network-assisted-C2-communication-link1> element;

ii) a <policy-of-C2-switching-in-case-of-network-assisted-C2-communication-link2> element;

iii) a <C2-service-area-for-network-assisted-C2-communication-link1> element; and

iv) a <C2-service-area-for-network-assisted-C2-communication-link2> element; and

c) a <result> element.

The <C2-communication-mode-notification-info> element shall include the followings:

a) a <UAS-id> element;

b) a <selected-primary-C2-communication-mode> element;

c) a <selected-secondary-C2-communication-mode> element; and

d) an <acknowledgement> element.

The <C2-related-trigger-event-report> element shall include the followings:

a) a <UAE-client-id> element;

b) an <application-QoS-related-event> element; and

c) an <application-QoS-related-event-2> element.

The <C2-operation-mode-switching> element shall include the followings:

a) a <UAE-server-id> element;

b) a <C2-operation-mode-switching-requirement> element;

c) a <time-validity> element; and

d) a <geographical-area> element.

The <UAV-application-message-info> element shall include the followings:

a) a <UAV-id> element;

b) an <application-defined-proximity-range-info> element;

c) an <application-payload> element; and

d) an <acknowledgement> element.

The <C2-operation-mode-switching-performed> element shall include the followings:

a) a <result> element.

The <registration-info> element shall include the followings:

a) a <UAV-id> element;

b) a <UAS-UE-information> element;

c) a <proposed-registration-lifetime> element;.

d) a <registration-lifetime> element; and

e) a <result> element.

The <de-registration-info> element shall include the followings:

a) a <UAV-id> element; and

b) a <result> element.

The <USS-change-info> element shall include the followings:

a) a <result> element.

The <USS-change-notification-info> element shall include the followings:

a) a <Reason> element; and

b) a <Target-USS-information> element.

The <USS-change-request-info> element shall include the followings:

a) a <UASS-id> element;

b) a <UAS-id> element;

c) a <USS-change-authorization-information> element;

d) a <Target-USS> element; and

e) a <Target-USS-info> element which shall include the followings:

1) a <USS-endpoint> element;

2) a <USS-capabilities> element;

3) an <LUN-id> element; and

4) a <List-of-USS-DNAI(s)> element.

The <DAA-support-configuration-info> element shall include the followings:

a) a <UAS-id> element;

b) a <list-of-UAS-id> element; and

c) a <DAA-application-policy> element, which shall include the followings:

1) a <DAA-triggering-thresholds> element;

2) a <time-validity> element; and

3) a <reporting-frequency> element.

The <DAA-client-event-info> element shall include the followings:

a) a <UAS-id> element;

b) a <UAE-layer-detected-information> element which shall include the followings:

1) a <UAS-identity> element;

2) a <location-information> element; and

3) an <associated-alert> element;

c) a <time-of-arrival> element; and

d) a <time-of-departure> element.

The <DAA-client-event-info-ack> element shall include the followings:

a) an <acknowledgement> element which shall include the followings:

1) a <UAS-id> element; and

2) a <UAE-layer-detected-information> element which shall include the followings:

i) a <UAS-identity> element;

ii) a <Location-information> element; and

iii) an <updated-flight-path> element.

The <DAA-server-event-info> element shall include the followings:

a) a <UAS-id> element; and

c) a <UAE-layer-detected-information> element which shall include the followings:

1) a <UAS-identity> element; and

2) a <Location-information> element.

The <DAA-server-event-info-ack> element shall include the followings:

a) a <acknowledgement> element.

The <multi-USS-configuration-info> element shall include the followings:

a) a <UAS-id> element; and

b) a <Multi-USS-policy-management-configuration> element which shall include the followings:

1) an <Allowed-USS> element;

2) a <Serving-USS-information> element;

3) an <Additional-information-for-change-of-USS> element; and

4) an <Area-for-change-of-USS> element.

The <subscribe-host-UAV-dynamic-info> element shall include the followings:

a) a <UAS-id> element;

b) an <application-defined-proximity-range-info> element;

c) a <subscription-ID> element; and

d) a <result> element.

The <notification-of-host-UAV-dynamic-info> element shall include the followings:

a) a <subscription-ID> element;

b) a <location-of-the-host-UAV> element; and

c) a <list-of-UAVs-info> element which shall include the followings:

1) a <nearby-UAV-ID> element;

2) a <location-information> element; and

3) a <distance-information> element.

The <flight-route-info> element shall include the followings:

a) a <UASS-id> elements;

b) a <UAV-id> element;

c) a <start-point> element;

d) a <start-time> element;

e) a <destination-point> element;

f) a <destination-time> element;

g) a <required-minimum-QoS> element;

h) a <service-availablity> element;

i) a <shortest-route-indicator> element; and

j) a <result> element.

The <flight-path-event-report> element shall include the followings:

a) a <report> element;

1) a <QoS-event> element;

2) a <QoE-event> element;

3) a <waypoint-event> element;

4) a <geographical-event> element;

5) a <QoS-event-PC5> element;

6) a <QoE-event-PC5> element;

7) a <waypoint-event-PC5> element; and

8) a <geographical-event-PC5> element.

The <flight-path-reporting-configuration-info> element shall include the followings:

a) a <UAS-id> element;

b) a <parameters-for-Uu> element;

1) a <QoS-parameter> element;

2) a <QoE-parameter> element;

3) a <time-validity> element;

4) a <list-of-waypoints> element;

5) a <geographical-area> element; and

6) a <reporting-frequency> element; and

c) a <parameters-for-PC5> element;

1) a <QoS-parameter> element;

2) a <QoE-parameter> element;

3) a <time-validity> element;

4) a <list-of-waypoints> element;

5) a <geographical-area> element; and

6) a <reporting-frequency> element.

The <NTZ-configuration-info> element shall include the followings:

a) a <UAS-id> element; and

b) a <NTZ-configuration> element:

1) one or more <geographic-area-ID> elements:

A) three or more <polygon-point> elements:

i) a <latitude> element; and

ii) a <longitude> element;

B) a <ceiling-altitude> element;

C) a <floor-altitude> element; and

2) one or more <restricted-frequency-band> elements:

A) a <rat-type> element;

B) a <restricted-freq-band> element; and

C) a <time-periods> element:

i) a <start-time> element; and

ii) a <end-time> element; and

3) a <reporting-configuration> element.

The <new-NTZ-policy-info> element shall include the followings:

a) a <UAS-id> element; and

b) a <NTZ-configuration> element:

1) one or more <geographic-area-ID> elements:

A) three or more <polygon-point> elements:

i) a <latitude> element; and

ii) a <longitude> element;

B) a <ceiling-altitude> element; and

C) a <floor-altitude> element; and

2) one or more <restricted-frequency-band> elements:

A) a <rat-type> element;

B) a <restricted-freq-band> element; and

C) a <time-periods> element:

i) a <start-time> element; and

ii) a <end-time> element; and

3) a <reporting-configuration> element.

The <trigger-NTZ-info> element shall include the followings:

a) a <UAS-id> element; andb) a <NTZ-trigger-information> element:1) one or more <geographic-area-ID> elements:

A) three or more <polygon-point> elements:

i) a <latitude> element; and

ii) a <longitude> element;

B) a <ceiling-altitude> element; and

C) a <floor-altitude> element; and

2) one or more <restricted-frequency-band> elements:

A) a <rat-type> element;

B) a <restricted-freq-band> element; and

C) a <time-periods> element:

i) a <start-time> element; and

ii) a <end-time> element; and

3) a <time> element.

7.3 XML schema

7.3.1 General

This clause defines the XML schema for application/vnd.3gpp.uae-info+xml.

7.3.2 XML schema

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="urn:3gpp:ns:uaeInfo:1.0"
xmlns:uaeinfo="urn:3gpp:ns:uaeInfo:1.0"
elementFormDefault="qualified"
attributeFormDefault="unqualified"
xmlns:xenc="http://www.w3.org/2001/04/xmlenc#">
  <!-- root XML element -->
  <xs:element name="uae-info" type="uaeinfo:uaeinfo-Type" id="uae"/>
  <xs:complexType name="uaeinfo-Type">
    <xs:sequence>
      <xs:element name="c2-communication-modes-configuration-info"
type="uaeinfo:tC2CommunicationModesConfigurationType" minOccurs="0"/>
      <xs:element name="c2-communication-mode-notification-info "
type="uaeinfo:tC2CommunicationModeNotificationType" minOccurs="0"/>
      <xs:element name="c2-related-trigger-event-report"
type="uaeinfo:tC2RelatedTriggerEventReportType" minOccurs="0"/>
      <xs:element name="c2-operation-mode-switching" type="uaeinfo:tC2OperationModeSwitchingType"
minOccurs="0"/>
      <xs:element name="UAV-application-message-info" type="uaeinfo:tUAVApplicationMessageInfoType"
minOccurs="0"/>
      <xs:element name="c2-operation-mode-switching-performed"
type="uaeinfo:tC2OperationModesSwitchingPerformedType" minOccurs="0"/>
      <xs:element name="registration-info" type="uaeinfo:tRegistrationInfoType" minOccurs="0"/>
      <xs:element name="de-registration-info" type="uaeinfo:tDe-registrationInfoType"
minOccurs="0"/>
      <xs:element name="DAA-client-event-info" type="uaeinfo:tDAAClientEventInfoType"
minOccurs="0"/>
      <xs:element name="DAA-server-event-info" type="uaeinfo:tDAAServerEventInfoType"
minOccurs="0"/>
```

```
      <xs:element name="Multi-USS-configuration" type="uaeinfo:tMultiUssConfigurationType"
minOccurs="0"/>
      <xs:element name="USS-change-request" type="uaeinfo:tUssChangeRequestType" minOccurs="0"/>
      <xs:element name="Subscribe-host-UAV-dynamic-info"
type="uaeinfo:tSubscribeHostUAVDynamicInfoType" minOccurs="0"/>
      <xs:element name="Notification-of-host-UAV-dynamic-info"
type="uaeinfo:tNotificationOfHostUAVDynamicInfoType" minOccurs="0"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tC2CommunicationModesConfigurationType">
    <xs:sequence>
      <xs:element name="UAS-id" type="uaeinfo:contentType" minOccurs="0" maxOccurs="1"/>
      <xs:element name="c2-operation-mode-management-configuration"
type="uaeinfo:tC2OperationModeManagementConfigurationType" minOccurs="0" maxOccurs="1"/>
      <xs:element name="result" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tC2CommunicationModeNotificationType">
    <xs:sequence>
      <xs:element name="UAS-id" type="uaeinfo:contentType" minOccurs="0" maxOccurs="1"/>
      <xs:element name="selected-primary-C2-communication-mode" type="xs:string" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="selected-secondary-C2-communication-mode" type="xs:string" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="acknowlegement" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tC2RelatedTriggerEventReportType">
    <xs:sequence>
      <xs:element name="UAE-client-id" type="uaeinfo:contentType" minOccurs="0" maxOccurs="1"/>
      <xs:element name="application-QoS-related-event" type="xs:string" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="application-QoS-related-event-2" type="xs:string" minOccurs="0"
maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tC2OperationModeSwitchingType">
    <xs:sequence>
      <xs:element name="UAE-server-id" type="uaeinfo:contentType" minOccurs="0" maxOccurs="1"/>
      <xs:element name="C2-operation-mode-switching-requirement" type="xs:string" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="time-validity" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="geographical-area-change" type="uaeinfo:tGeographicalAreaChange"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tUAVApplicationMessageInfoType">
    <xs:sequence>
      <xs:element name="UAV-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="application-defined-proximity-range-info" type="xs:string" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="application-payload" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="acknowlegement" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tC2OperationModesSwitchingPerformedType">
    <xs:sequence>
      <xs:element name="result" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tRegistrationInfoType">
    <xs:sequence>
      <xs:element name="UAV-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="UAS-UE-information" type="xs:string" minOccurs="0" maxOccurs="1"/>
```

```
      <xs:element name="proposed-registration-lifetime" type="xs:integer" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="registration-lifetime" type="xs:integer" minOccurs="0" maxOccurs="1"/>
      <xs:element name="result" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tDe-registrationInfoType">
    <xs:sequence>
      <xs:element name="UAV-id" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="result" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="contentType">
    <xs:choice>
      <xs:element name="uaeURI" type="xs:anyURI"/>
      <xs:element name="uaeString" type="xs:string"/>
      <xs:element name="uaeBoolean" type="xs:boolean"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:choice>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tC2OperationModeManagementConfigurationType">
    <xs:sequence>
      <xs:element name="c2-operation-mode-management-requirement" type="xs:string" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="allowed-C2-communication-modes" type="xs:string" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="primary-C2-communication-modes" type="xs:string" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="secondary-C2-communication-mode" type="xs:string" minOccurs="0"
maxOccurs="1"/>
      <xs:element name="policy-of –C2-switching" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="dual-network-assisted-C2-communication-links" type="
uaeinfo:tDualNetworkAssistedC2CommunicationLinksType" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
<xs:complexType name="tDualNetworkAssistedC2CommunicationLinksType">
    <xs:sequence>
      <xs:element name="policy-of-C2-switching-in-case-of-network-assisted-C2-communication-link1"
type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="policy-of-C2-switching-in-case-of-network-assisted-C2-communication-link2"
type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="C2-service-area-for-network-assisted-C2-communication-link1"
type="uaeinfo:tGeographicalAreaDef" minOccurs="1" maxOccurs="1"/>
      <xs:element name="C2-service-area-for-network-assisted-C2-communication-link2"
type="uaeinfo:tGeographicalAreaDef" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tMultiUssConfigurationType">
    <xs:sequence>
      <xs:element name="UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="Multi-USS-policy-management-configuration" type="xs:string" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="Allowed-USS" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="Serving-USS-information" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="Additional-information-for-change-of-USS" type="xs:string" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="Area-for-change-of-USS" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tUssChangeRequestType">
    <xs:sequence>
      <xs:element name="UASS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="USS-change-authorization-information" type="xs:string" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="Target-USS" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="Target-USS-info" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="USS-endpoint" type="xs:string" minOccurs="1" maxOccurs="1"/>
```

```
      <xs:element name="USS-capabilities" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="LUN-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="List-of-USS-DNAI(s)" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tSubscribeHostUAVDynamicInfoType">
    <xs:sequence>
      <xs:element name="UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="application-defined-proximity-range-info" type="xs:string" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="subscription-ID" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="result" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tNotificationOfHostUAVDynamicInfoType">
    <xs:sequence>
      <xs:element name="subscription-ID" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="location-of-the-host-UAV" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="list-of-UAVs-info" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="nearby-UAV-ID" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="location-information" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="distance-information" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tDAASupportConfigurationInfoType">
    <xs:sequence>
      <xs:element name="UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="list-of-UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="DAA-application-policy" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="DAA-triggering-thresholds" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="time-validity" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="reporting-frequency" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tDAAClientEventInfoType">
    <xs:sequence>
      <xs:element name="UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="UAE-layer-detected-information" type="xs:string" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="UAS-identity" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="Location-information" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tDAAClientEventInfoAckType">
    <xs:sequence>
      <xs:element name="acknowledgement" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="UAE-layer-detected-information" type="xs:string" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="UAS-identity" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="Location-information" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tDAAServerEventInfoType">
    <xs:sequence>
      <xs:element name="UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="UAE-layer-detected-information" type="xs:string" minOccurs="1"
maxOccurs="1"/>
      <xs:element name="UAS-identity" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="Location-information" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tDAAServerEventInfoAckType">
    <xs:sequence>
      <xs:element name="acknowledgement" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tFlightRouteInfoType">
    <xs:sequence>
      <xs:element name="UASS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
```

```
      <xs:element name="UAV-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="start-point" type="xs:uaeinfo:tCoordinateType"/>
      <xs:element name="start-time" type="xs:dateTime" minOccurs="0" maxOccurs="1"/>
      <xs:element name="destination-point" type="xs:uaeinfo:tCoordinateType"/>
      <xs:element name="destination-time" type="xs:dateTime" minOccurs="1" maxOccurs="1"/>
      <xs:element name="required-minimum-QoS" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="service-availablity" type="xs:string" minOccurs="0" maxOccurs="1"/>
      <xs:element name="shortest-route-indicator" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="result" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
      <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tFlightPathEventReportType">
    <xs:sequence>
      <xs:element name="report" type="uaeinfo:tReportType" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
      <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tReportType">
    <xs:sequence>
      <xs:element name="QoS-event" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="QoE-event" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="waypoint-event" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="geographical-event" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="QoS-event-PC5" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="QoE-event-PC5" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="waypoint-event-PC5" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="geographical-event-PC5" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
      <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tFlightPathEventReportingConfigurationInfoType">
    <xs:sequence>
      <xs:element name="UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="parameters-for-Uu" type="uaeinfo:tFlightPathConfigParameterType"
minOccurs="1" maxOccurs="1"/>
      <xs:element name="parameters-for-PC5" type="uaeinfo:tFlightPathConfigParameterType"
minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
      <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tFlightPathConfigParameterType">
    <xs:sequence>
      <xs:element name="QoS-parameter" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="QoE-parameter" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="time-validity" type="xs:dateTime" minOccurs="0" maxOccurs="1"/>
      <xs:element name="list-of-waypoints" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="geographical-area" type="uaeinfo:tGeographicalAreaDef"/>
      <xs:element name="reporting-frequency" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
      <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="tNTZConfigurationInfoType">
    <xs:sequence>
      <xs:element name="UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="NTZ-configuration" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="geographic-area-ID" type="uaeinfo:tGeographicalAreaDef"/>
      <xs:element name="polygon-point" type="uaeinfo:tPolygonAreaType" minOccurs="0"/>
      <xs:element name="latitude" type="uaeinfo:tCoordinateType"/>
      <xs:element name="longitude" type="uaeinfo:tCoordinateType"/>
      <xs:element name="ceiling-altitude" type="uaeinfo:tCoordinateType"/>
      <xs:element name="floor-altitude" type="uaeinfo:tCoordinateType"/>
      <xs:element name="restricted-frequency-band" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="rat-type" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="restricted-freq-band" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="time-periods" type="xs:dateTime" minOccurs="0" maxOccurs="1"/>
      <xs:element name="start-time" type="xs:dateTime" minOccurs="1" maxOccurs="1"/>
      <xs:element name="end-time" type="xs:dateTime" minOccurs="1" maxOccurs="1"/>
      <xs:element name="reporting-configuration" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:any namespace="##other" processContents="lax"/>
      <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
```

```
<xs:complexType name="tNewNTZPolicyInfoType">
  <xs:sequence>
    <xs:element name="UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="NTZ-configuration" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="geographic-area-ID" type="uaeinfo:tGeographicalAreaDef"/>
    <xs:element name="polygon-point" type="uaeinfo:tPolygonAreaType" minOccurs="0"/>
    <xs:element name="latitude" type="uaeinfo:tCoordinateType"/>
    <xs:element name="longitude" type="uaeinfo:tCoordinateType"/>
    <xs:element name="ceiling-altitude" type="uaeinfo:tCoordinateType"/>
    <xs:element name="floor-altitude" type="uaeinfo:tCoordinateType"/>
    <xs:element name="restricted-frequency-band" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="rat-type" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="restricted-freq-band" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="time-periods" type="xs:dateTime" minOccurs="0" maxOccurs="1"/>
    <xs:element name="start-time" type="xs:dateTime" minOccurs="1" maxOccurs="1"/>
    <xs:element name="end-time" type="xs:dateTime" minOccurs="1" maxOccurs="1"/>
    <xs:element name="reporting-configuration" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:any namespace="##other" processContents="lax"/>
    <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="tTriggerNTZInfoType">
  <xs:sequence>
    <xs:element name="UAS-id" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="NTZ-trigger-information" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="geographic-area-ID" type="uaeinfo:tGeographicalAreaDef"/>
    <xs:element name="polygon-point" type="uaeinfo:tPolygonAreaType" minOccurs="0"/>
    <xs:element name="latitude" type="uaeinfo:tCoordinateType"/>
    <xs:element name="longitude" type="uaeinfo:tCoordinateType"/>
    <xs:element name="ceiling-altitude" type="uaeinfo:tCoordinateType"/>
    <xs:element name="floor-altitude" type="uaeinfo:tCoordinateType"/>
    <xs:element name="restricted-frequency-band" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="rat-type" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="restricted-freq-band" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="time-periods" type="xs:dateTime" minOccurs="0" maxOccurs="1"/>
    <xs:element name="start-time" type="xs:dateTime" minOccurs="1" maxOccurs="1"/>
    <xs:element name="end-time" type="xs:dateTime" minOccurs="1" maxOccurs="1"/>
    <xs:element name="time" type="xs:dateTime" minOccurs="1" maxOccurs="1"/>
    <xs:any namespace="##other" processContents="lax"/>
    <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
<xs:complexType name="tGeographicalAreaChange">
  <xs:sequence>
    <xs:element name="any-area-change" type="uaeinfo:tEmptyTypeAttribute" minOccurs="0"/>
    <xs:element name="enter-specific-area" type="uaeinfo:tSpecificAreaType" minOccurs="0"/>
    <xs:element name="exit-specific-area-type" type="uaeinfo:tSpecificAreaType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tEmptyTypeAttribute">
  <xs:complexContent>
    <xs:extension base="uaeinfo:tEmptyType">
    <xs:attribute name="trigger-id" type="xs:string" use="required"/>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
<xs:complexType name="tSpecificAreaType">
  <xs:sequence>
    <xs:element name="geographical-area" type="uaeinfo:tGeographicalAreaDef"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
  </xs:sequence>
  <xs:attribute name="trigger-id" type="xs:string" use="required"/>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tGeographicalAreaDef">
  <xs:sequence>
    <xs:element name="polygon-area" type="uaeinfo:tPolygonAreaType" minOccurs="0"/>
    <xs:element name="ellipsoid-arc-area" type="uaeinfo:tEllipsoidArcType" minOccurs="0"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
  </xs:sequence>
  <xs:anyAttribute namespace="##any" processContents="lax"/>
</xs:complexType>
<xs:complexType name="tPolygonAreaType">
```

```
    <xs:sequence>
      <xs:element name="corner" type="uaeinfo:tPointCoordinate" minOccurs="3" maxOccurs="15"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tEllipsoidArcType">
    <xs:sequence>
      <xs:element name="center" type="uaeinfo:tPointCoordinate"/>
      <xs:element name="radius" type="xs:nonNegativeInteger"/>
      <xs:element name="offset-angle" type="xs:unsignedByte"/>
      <xs:element name="included-angle" type="xs:unsignedByte"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:complexType name="tPointCoordinate">
    <xs:sequence>
      <xs:element name="longitude" type="uaeinfo:tCoordinateType"/>
      <xs:element name="latitude" type="uaeinfo:tCoordinateType"/>
      <xs:any namespace="##other" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
    </xs:sequence>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
<xs:complexType name="tCoordinateType">
     <xs:choice minOccurs="1" maxOccurs="1">
       <xs:element name="threebytes" type="uaeinfo:tThreeByteType" minOccurs="0"/>
       <xs:any namespace="##other" processContents="lax"/>
       <xs:element name="anyExt" type="uaeinfo:anyExtType" minOccurs="0"/>
    </xs:choice>
    <xs:attribute name="type" type="xs:string"/>
    <xs:anyAttribute namespace="##any" processContents="lax"/>
  </xs:complexType>
  <xs:simpleType name="tThreeByteType">
    <xs:restriction base="xs:integer">
      <xs:minInclusive value="0"/>
      <xs:maxInclusive value="16777215"/>
    </xs:restriction>
  </xs:simpleType>

<xs:complexType name="tEmptyType"/>
  <xs:complexType name="anyExtType">
    <xs:sequence>
      <xs:any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

</xs:schema>
```

7.4 Data semantics

The <UAE-info> element is the root element of the XML document. The <UAE-info> element contains the <c2-modes-switching-configuration-info>, <C2-communication-mode-notification-info>, <C2-related-trigger-event-report>, <C2-operation-mode-switching>, <UAV-application-message-info>, <C2-operation-mode-switching-performed>, <registration-info>, <de-registration-info> and <flight-route-info> sub-elements.

<c2-communication-modes-configuration-info> element contains the following elements:

a) <UAS-id>, an element contains identification of the UAS, which could be in form of identifier for the UAS, e.g. group ID, or collection of individual identifiers for the UAV and UAV-C, e.g. CAA ID, GPSI, IP address;

b) <C2-operation-mode-management-configuration>, an element contains the following elements:

   1) <C2-operation mode-management-requirement>, an element contains the identification of the type of the C2 mode switching to be supported by the UAE server, which could be either from direct to network-assisted C2, or from network-assisted to direct C2 or to UTM navigated;

   2) <allowed-C2-communication-modes>, an element contains a string set to "direct", "network assisted", or "USS/UTM navigated";

3) <primary-C2-communication-mode>, an element contains a string set to "direct", or "network assisted" used to indicate the primary C2 communication mode;

4) <secondary-C2-communication-mode>, an element contains a string set to "direct", or "network assisted" used to indicate the secondary C2 communication mode;

5) <policy-of –C2-switching>, an element contains a string set to the parameters for C2 switching, which are the QoS thresholds on active and target link, and

6) <dual-network-assisted-C2-communication-links>, an element indicating multiple network-assisted C2 communication links;

i) <policy-of-C2-switching-in-case-of-network-assisted-C2-communication-link1>, an element contains a string set to the parameters for C2 switching for network-assisted C2 communication link1;

ii) <policy-of-C2-switching-in-case-of-network-assisted-C2-communication-link2>, an element contains a string set to the parameters for C2 switching for network-assisted C2 communication link2;

iii) <C2-service-area-for-network-assisted-C2-communication-link1>, an element contains a string set to the area where the C2 operation mode management request applies and in which the connectivity via subscription/network 1 is active; and

iv) <C2-service-area-for-network-assisted-C2-communication-link2>, an element contains a string set to the area where the C2 operation mode management request applies and in which the connectivity via subscription/network 2 is active; and

c) <result>, an element contains a string set to either "positive" or "negative" used to indicate the positive or negative result of the C2 mode switching configuration response.

<C2-communication-mode-notification-info> element contains the following elements:

a) <UAS-id>, an element contains identification of the UAS, which could be in form of identifier for the UAS, e.g. group ID, or individual identifiers for the UAV and UAV-C, e.g. CAA ID, GPSI, IP address;

b) <selected-primary-C2-communication-mode>, an element contains a string set to "direct", or "network assisted" used to indicate the selected primary C2 communication mode;

c) <selected-secondary-C2-communication-mode>, an element contains a string set to "direct", or "network assisted" used to indicate the selected secondary C2 communication mode; and

d) <acknowledgement>, an element contains a string set to either "yes" or "no" used to indicate the acknowledgement of selected C2 communication mode(s).

<C2-related-trigger-event-report> element contains the following elements:

a) <UAE-client-id>, an element contains a string set to the identifier of the UAE client which indicates the QoS downgrade;

b) <application-QoS-related-event>, an element contains a string indicating the expected or actual application QoS/QoE parameters which were changed (i.e. latency, throughput, reliability, jitter) of network-assisted C2 communication link 1; and

c) <application-QoS-related-event-2>, an element contains a string indicating the expected or actual application QoS/QoE parameters which were changed (i.e. latency, throughput, reliability, jitter) of network-assisted C2 communication link 2.

<C2-operation-mode-switching> element contains the following elements:

a) <UAE-server-id>, an element contains a string set to the identifier of the UAE server which instructs the UAS to apply the C2 mode switching;

b) <C2-operation-mode-switching-requirement>, an element contains a string set to either "direct to network-assisted" or "network-assisted to direct" used to indicate the type of the C2 mode switching to be applied;

c) <time-validity>, an element contains a string set to the time validity for the C2 switching requirement; and

d) <geographical-area>, an element specifying a geographical area for which the C2 switching applies and has the following sub-elements:

1) <polygon-area>, an optional element specifying the area as a polygon specified in clause 5.4 of 3GPP TS 23.032 [11]; and

2) <ellipsoid-arc-area>, an optional element specifying the area as an ellipsoid arc specified in clause 5.7 of 3GPP TS 23.032 [11].

<UAV-application-message-info> element contains the following elements:

a) <UAV-id>, an element contains the unique identifier of a UAV which requests the sending of the UAV application message. The UAV-id is in the form of a 3GPP UE ID (e.g. GPSI, External Identifier) or CAA level UAV ID as assigned by civil aviation authorities (e.g. FAA) via USS/UTM;

b) <application-defined-proximity-range-info>, an element contains the range information over which the UAV application message is to be sent;

c) <application-payload>, an element contains the application payload that is to be delivered to the other UAVs; and

d) <acknowledgement>, an element contains a string set to either "yes" or "no" used to indicate the acknowledgement of communications between UAVs within a geographical area.

<C2-operation-mode-switching-performed> element contains the following elements:

a) <result>, an element contains a string set to either "positive" or "negative" used to indicate the positive or negative result of the reception.

<registration-info> element contains the following elements:

a) <UAV-id>, an element contains the unique identifier of a UAV which initiates the UAS UE registration procedure;

b) <UAS-UE-information>, an element contains the information (e.g. UAS UE IP address, Multi-USS capability, DAA assist capability) the UAS UE needs to provide to the UAE-S;

c) <proposed-registration-lifetime>, an element contains the time during which the UAS UE wants to stay registered to the UAE-S for receiving UAV application messages from the UAS application specific server;

d) <registration-lifetime>, an element contains the time during which the UAS UE can stay registered to the UAE-S for receiving UAV application messages from the UAS application specific server; and

e) <result>, an element contains a string set to either "success" or "failure" indicating success or failure of the UAS UE registration.

<de-registration-info> element contains the following elements:

a) <UAV-id>, an element contains the unique identifier of a UAV which initiates the UAS UE de-registration procedure; and

b) <result>, an element contains a string set to either "success" or "failure" indicating success or failure of the UAS UE de-registration.

<USS-change-info> element contains the following elements:

a) <result>, an element contains a string set to either "positive" or "negative" used to indicate the positive or negative result of the reception.

<USS-change-notification-info> element contains the following elements:

a) <Reason>, an element contains the reason for change of USS; and

b) <Target-USS-information>, an element contains a string set to the identifier of the new USS that the UAV has connected to (identified e.g. by FQDN).

<USS-change-request-info> element contains the following elements:

a) <UASS-id>, an element contains the identification of the UAS application specific server which requests the change of USS. This ID can be the USS identifier, when the UAS application specific server is the USS;

b) <UAS-id>, an element contains identification of the UAS, which could be in form of identifier for the UAS, e.g. group ID, or collection of individual identifiers for the UAV and UAV-C, e.g. CAA ID, GPSI, IP address;

c) <USS-change-authorization-information>, an element contains the authorization token to verify the request;

d) <Target-USS>, an element contains a string set to the identifier of the USS that is the target of a switch (identified e.g. by FQDN); and

e) <Target-USS-info>, an element contains the information of the target USS:

1) <USS-endpoint>, an element specifying the endpoint information (e.g. URI, FQDN, IP address) used to communicate with the USS;

2) <USS-capabilities>, an element specifying the capabilities supported by the target USS;

3) <LUN-id>, an element contains a string set to the identifier of the LUN where the serving/target USS belongs; and

4) <List-of-USS-DNAI(s)>, an element contains DNAI(s) associated with the target USS.

The <DAA-support-configuration-info> element contains the following elements:

a) <UAS-id>, an element contains identification of the UAS (UAV or LDGS), which could be in form of identifier for the UAS, e.g. group ID, or collection of individual identifiers for the UAV and UAV-C, e.g. CAA ID, GPSI, IP address;

b) <list-of-UAS-id>, an element that contains a list of the identification of UASes that are identified as target UAVs; and

c) <DAA-application-policy>, an element contains the DAA application policy:

1) <DAA-triggering-thresholds>, an element to indicate thresholds to trigger DAA procedure upon detection of a flight path conflict;

2) <time-validity>, an element that consists of validity time duration, measured in milliseconds, where DAA client configuration applies; and

3) <reporting-frequency>, an element that indicates the frequency to collect the target UAVs information and frequency to report to the USS.

Editor's Note [UASAPP_Ph3, CR#0044]: The description of the DAA triggering threshold is FFS.

The <DAA-client-event-info> element contains the following elements:

a) <UAS-id>, an element contains identification of the UAS (UAV or LDGS), which could be in form of identifier for the UAS, e.g. group ID, or collection of individual identifiers for the UAV and UAV-C, e.g. CAA ID, GPSI, IP address;

b) <UAE-layer-detected-information>, an element contains a list of UASes where e.g. U2X layer has detected possible flight path conflict:

1) <UAS-identity>, an element contains a string set to the identifier of e.g. a U2X-UAS, where U2X layer has detected possible flight path conflict or an LDGS where LDGS has detected possible flight path conflict via U2X or Uu communication;

2) <location-information>, an element specifying the location of e.g. a U2X-UAS, where U2X layer has detected possible flight path conflict or an LDGS where LDGS has detected possible flight path conflict via U2X or Uu communication; and

3) <associated-alert>, an element that consists of an alert, e.g., collision is detect or collision is resolved by a UAE-C that has LDGS capability;

c) <time-of-arrival>, an element that consists of a time, defined as date and time of the measurement results with an offset from the UTC time, when a target UAS enters the monitoring range of a UAE-C that has LDGS capability; and

d) <time-of-departure>, an element that consists of a time, defined as date and time of the measurement results with an offset from the UTC time, when a target UAS leaves the monitoring range of a UAE-C that has LDGS capability.

<DAA-client-event-info-ack> element contains the following elements:

a) <acknowledgement>, an element contains a string set to either "yes" or "no" used to indicate the acknowledgement of DAA client event information.

1) <UAS-id>, an element contains identification of the UAS (UAV or LDGS), which could be in form of identifier for the UAS, e.g. group ID, or collection of individual identifiers for the UAV and UAV-C, e.g. CAA ID, GPSI, IP address; and

2) <UAE-layer-detected-information>, an element contains a list of UASes where e.g. U2X layer has detected possible flight path conflict:

i) <UAS-identity>, an element contains a string set to the identifier of e.g. a U2X-UAS, where U2X layer has detected possible flight path conflict or an LDGS where LDGS has detected possible flight path conflict via U2X or Uu communication;

ii) <location-information>, an element specifying the location of e.g. a U2X-UAS, where U2X layer has detected possible flight path conflict or an LDGS where LDGS has detected possible flight path conflict via U2X or Uu communication; and

iii) <updated-flight-path>, an element that includes updated flight path received from a USS.

The <DAA-server-event-info> element shall include the followings:

a) <UAS-id>, an element contains identification of the UAS, which could be in form of identifier for the UAS, e.g. group ID, or collection of individual identifiers for the UAV and UAV-C, e.g. CAA ID, GPSI, IP address; and

b) <UAE-layer-detected-information>, an element contains a list of UASes where e.g. U2X layer has detected possible flight path conflict:

1) <UAS-identity>, an element contains a string set to the identifier of e.g. a U2X-UAS, where U2X layer has detected possible flight path conflict; and

2) <location-information>, an element specifying the location of e.g. a U2X-UAS, where U2X layer has detected possible flight path conflict.

<DAA-server-event-info-ack> element shall include the followings:

a) <acknowledgement>, an element contains a string set to either "yes" or "no" used to indicate the acknowledgement of DAA server event information.

<multi-USS-configuration-info> element contains the following elements:

a) <UAS-id>, an element contains identification of the UAS, which could be in form of identifier for the UAS, e.g. group ID, or collection of individual identifiers for the UAV and UAV-C, e.g. CAA ID, GPSI, IP address; and

b) <Multi-USS-policy-management-configuration>, an element contains the requirements and policy for Multi-USS management:

1) <Allowed-USS>, an element contains a string set to the identifier of a USS that can be the target of a switch (identified e.g. by FQDN) which provides the information of the allowed USSs for the UAS;

2) <Serving-USS-information>, an element contains the information about the serving USS identifier;

3) <Additional-information-for-change-of-USS>, an element contains the information about the serving USS, related with the switch to a particular target USS; and

4) <Area-for-change-of-USS>, an element specifying an area where the Multi-USS management request applies. This can be geographical area, or topological area in which the capability is active.

<subscribe-host-UAV-dynamic-info> element contains the following elements:

a) <UAS-id>, an element contains identification of the UAS, which could be in form of identifier for the UAS, e.g. group ID, or collection of individual identifiers for the UAV and UAV-C, e.g. CAA ID, GPSI, IP address;

b) <application-defined-proximity-range-info>, an element that indicates the range information over which the host UAV's dynamic information is required;

c) <subscription-ID>, an element that is an identifier of a successful subscription; and

d) <result>, an element contains a string set to either "positive" or "negative" used to indicate the positive or negative result of the reception.

<notification-of-host-UAV-dynamic-info> element contains the following elements:

a) <subscription-ID>, an element that is an identifier of a successful subscription;

b) <location-of-the-host-UAV>, an element containing the location of the host UAV during the Host UAV dynamic information subscription; and

c) <list-of-UAVs-info>, an element including the information of the UAVs which were detected in the application defined proximity range:

1) <nearby-UAV-ID>, an element contains identification of the nearby UAS;

2) <location-information>, an element set to the location information of the nearby UAV within the application defined proximity range; and

3) <distance-information>, an element element set to the distance information of the nearby UAV relative to the host UAV.

<flight-route-info> element contains the following elements:

a) <UASS-id>, an element contains a string set to the identifier of the UAS application specific server;

b) <UAV-id>, an element contains a string set to the identifier of the UAV which requests flight route;

c) <start-point>, an element contains specifying the geographical coordinates of the start point and has the following sub-elements:

d) <start-time>, an element contains time on which the UAV is at the starting point;

e) <destination-point>, an element contains specifying the geographical coordinates of the destination point and has the following sub-elements:

f) <destination-time>, an element contains time on which the UAV is at the destination point;

g) <required-minimum-QoS>, an element contains a string set to the needed QoS to support the flight mission (e.g. 5QI);

h) <service-availablity>, an element contains the value of the percentage of needed service availability;

i) <shortes-route-indication>, an element contains the indicator for a need of shortest route; and

j) <result>, an element contains a string set to either "success" or "failure" indicating success or failure of the reception.

<NTZ-configuration-info> element contains the following elements:

a) <UAS-id>, an element contains the identifier of the UAS for which the NTZ configuration applies;

b) <NTZ-configuration>, an element contains the NTZ configurations to be configured at the UAS:

1) <geographic-area-ID>, an element identifying the areas where the NTZ enforcement applies:

A) <polygon-point>, an element contains the latitude and longitude points of the polygon describing the geographic area as a polygon:

i) <latitude>, an element which is coded according to clause 6.1 of 3GPP TS 23.032 [11];

ii) <longitude>, an element which is coded according to clause 6.1 of 3GPP TS 23.032 [11];

B) <ceiling-altitude>, an element contains the altitude ceiling up to which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11];

C) <floor-altitude>, an element contains the altitude floor above which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11];

2) <restricted-frequency-band>, an element contains the frequency bands and the time periods during which the frequency band is not allowed to be used in the NTZ:

A) <rat-type>, an element set to either "E-UTRAN" or "NG-RAN";

B) <restricted-freq-band>, an element contains restricted frequency band defined in 3GPP TS 36.101 [14] clause 5.6.1 for E-UTRA or defined in 3GPP TS 38.101-1 [13] clause 5.2 for NR;

C) <time-periods>, an element contains the restricted time periods:

i) <start-time>, an element contains the start time of the restriction;

ii) <end-time>, an element contains the end time of the restriction;

3) <reporting-configuration>, an element contains NTZ reporting configuration of the UE, including the required reporting events.

<new-NTZ-policy-info> element contains the following elements:

a) <UAS-id>, an element contains the identifier of the UAS for which the NTZ configuration applies;

b) <NTZ-configuration>, an element contains the NTZ configurations to be configured at the UAS:

1) <geographic-area-ID>, an element identifying the areas where the NTZ enforcement applies:

A) <polygon-point>, an element contains the latitude and longitude points of the polygon describing the geographic area as a polygon:

i) <latitude>, an element which is coded according to clause 6.1 of 3GPP TS 23.032 [11];

ii) <longitude>, an element which is coded according to clause 6.1 of 3GPP TS 23.032 [11];

B) <ceiling-altitude>, an element contains the altitude ceiling up to which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11];

C) <floor-altitude>, an element contains the altitude floor above which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11];

2) <restricted-frequency-band>, an element contains the frequency bands and the time periods during which the frequency band is not allowed to be used in the NTZ:

A) <rat-type>, an element set to either "E-UTRAN" or "NG-RAN";

B) <restricted-freq-band>, an element contains restricted frequency band defined in 3GPP TS 36.101 [14] clause 5.6.1 for E-UTRA or defined in 3GPP TS 38.101-1 [13] clause 5.2 for NR;

C) <time-periods>, an element contains the restricted time periods:

i) <start-time>, an element contains the start time of the restriction;

ii) <end-time>, an element contains the end time of the restriction;

3) <reporting-configuration>, an element contains NTZ reporting configuration of the UE, including the required reporting events.

<trigger-NTZ-info> element contains the following elements:

a) <UAS-id>, an element contains the identifier of the UAS for which the NTZ configuration applies;

b) <NTZ-trigger-information>, an element NTZ trigger information to be executed at the UAS to enforce NTZ when applicable:

   1) <geographic-area-ID>, an element identifying the areas where the NTZ enforcement applies:

      A) <polygon-point>, an element contains the latitude and longitude points of the polygon describing the geographic area as a polygon:

         i) <latitude>, an element which is coded according to clause 6.1 of 3GPP TS 23.032 [11];

         ii) <longitude>, an element which is coded according to clause 6.1 of 3GPP TS 23.032 [11];

      B) <ceiling-altitude>, an element contains the altitude ceiling up to which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11];

      C) <floor-altitude>, an element contains the altitude floor above which the restrictions apply, which is coded according to clause 6.3 of 3GPP TS 23.032 [11];

   2) <restricted-frequency-band>, an element contains the frequency bands and the time periods during which the frequency band is not allowed to be used in the NTZ:

      A) <rat-type>, an element set to either "E-UTRAN" or "NG-RAN";

      B) <restricted-freq-band>, an element contains restricted frequency band defined in 3GPP TS 36.101 [14] clause 5.6.1 for E-UTRA or defined in 3GPP TS 38.101-1 [13] clause 5.2 for NR;

      C) <time-periods>, an element contains the restricted time periods:

         i) <start-time>, an element contains the start time of the restriction;

         ii) <end-time>, an element contains the end time of the restriction;

   3) <time>, an element contains time for deactivating the transmission.

7.5 MIME types

The MIME type for the UAE document shall be "application/vnd.3gpp.uae-info+xml MIME body".

7.6 IANA registration template

<MCC name>

Your Email Address:

<MCC email address>

Media Type Name:

Application

Subtype name:

application/vnd.3gpp.uae-info+xml

Required parameters:

None

Optional parameters:

"charset" the parameter has identical semantics to the charset parameter of the "application/xml" media type as specified in section 9.1 of IETF RFC 7303.

Encoding considerations:

binary.

Security considerations:

Same as general security considerations for application/xml media type as specified in section 9.1 of IETF RFC 7303. In addition, this media type provides a format for exchanging information in SIP or in HTTP, so the security considerations from IETF RFC 3261 apply while exchanging information in SIP and the security considerations from IETF RFC 9110 apply while exchanging information in HTTP.

The information transported in this media type does not include active or executable content.

Mechanisms for privacy and integrity protection of protocol parameters exist. Those mechanisms as well as authentication and further security mechanisms are described in 3GPP TS 24.229.

This media type does not include provisions for directives that institute actions on a recipient's files or other resources.

This media type does not include provisions for directives that institute actions that, while not directly harmful to the recipient, may result in disclosure of information that either facilitates a subsequent attack or else violates a recipient's privacy in any way.

This media type does not employ compression.

Interoperability considerations:

Same as general interoperability considerations for application/xml media type as specified in section 9.1 of IETF RFC 7303. Any unknown XML elements and any unknown XML attributes are to be ignored by recipient of the MIME body.

Published specification:

3GPP TS 24.257 "Uncrewed Aerial System (UAS) Application Enabler (UAE) layer; Protocol aspects; Stage 3" version 17.0.0, available via http://www.3gpp.org/specs/numbering.htm.

Applications which use this media type:

Applications supporting the Uncrewed Aerial System (UAS) Application Enabler (UAE) layer as described in the published specification.

Fragment identifier considerations:

The handling in section 5 of IETF RFC 7303 applies.

Restrictions on usage:

None

Provisional registration? (standards tree only):

N/A

Additional information:

1. Deprecated alias names for this type: none
2. Magic number(s): none
3. File extension(s): none
4. Macintosh File Type Code(s): none
5. Object Identifier(s) or OID(s): none

Intended usage:

Common

Person to contact for further information:

- Name: <MCC name>
- Email: <MCC email address>
- Author/Change controller:
  i) Author: 3GPP CT1 Working Group/3GPP_TSG_CT_WG1@LIST.ETSI.ORG
  ii) Change controller: <MCC name>/<MCC email address>

Annex A (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2021-05	CT1#130-e	C1-213381				Draft skeleton provided by the rapporteur.	0.0.0
2021-06	CT1#130-e CT#92e	C1-213382 CP-211330				Implementing the following p-CR agreed by CT1: C1-213382 Addition of the TS number assigned in CT#92e.	0.1.0
2021-09	CT1#131-e	C1-214712 C1-214713 C1-214714 C1-214984 C1-214985 C1-214986 C1-214987 C1-214988 C1-214989 C1-214990 C1-214991 C1-214992 C1-215166 C1-215167				Implementing the following p-CRs agreed by CT1: C1-214712, C1-214713, C1-214714, C1-214984, C1-214985, C1-214986, C1-214987, C1-214988, C1-214989, C1-214990, C1-214991, C1-214992, C1-215166, C1-215167	0.2.0
2021-10	CT1#132-e	C1-215764 C1-215765 C1-215766 C1-215767 C1-215768 C1-215769 C1-215770 C1-215771 C1-215772 C1-215880 C1-215881 C1-215882 C1-215883 C1-215884 C1-215885 C1-215886 C1-215887				Implementing the following p-CRs agreed by CT1: C1-215764, C1-215765, C1-215766, C1-215767, C1-215768, C1-215769, C1-215770, C1-215771, C1-215772, C1-215880, C1-215881, C1-215882, C1-215883, C1-215884, C1-215885, C1-215886, C1-215887	0.3.0
2021-11	CT1#133-e	C1-216575 C1-216576 C1-216577 C1-216578 C1-216579 C1-216580 C1-216581 C1-216733 C1-216734 C1-216735 C1-216736				Implementing the following p-CRs agreed by CT1: C1-216575, C1-216576, C1-216577, C1-216578, C1-216579, C1-216580, C1-216581, C1-216733, C1-216734, C1-216735, C1-216736	0.4.0
2021-12	CT-94e	CP-213067				Presentation to TSG CT for information	1.0.0
2022-01	CT1#133 bis-e	C1-220313 C1-220314 C1-220315 C1-220317 C1-220318 C1-220837				Implementing the following p-CRs agreed by CT1: C1-220313, C1-220314, C1-220315, C1-220317, C1-220318, C1-220837	1.1.0
2022-02	CT1#134-e	C1-221635 C1-221636 C1-221638 C1-222015				Implementing the following p-CRs agreed by CT1: C1-221635, C1-221636, C1-221638, C1-222015	1.2.0
2022-03	CT#95e	CP-220314				TS presented for approval	2.0.0
2022-03	CT#95e					TS created after CT#95 by MCC	17.0.0
2022-06	CT#96	CP-221215	0001	-	F	Update to C2 communication modes configuration procedure	17.1.0
2022-06	CT#96	CP-221215	0002	1	F	Update to the structure of C2 communication modes configuration procedure	17.1.0
2022-06	CT#96	CP-221215	0003	-	F	Update to the data semantics of C2 communication modes configuration procedure	17.1.0
2022-06	CT#96	CP-221215	0004	-	F	Update to the XML schema of C2 communication modes configuration procedure	17.1.0
2022-09	CT#97e	CP-222134	0005	1	F	Update to the structure of C2 communication modes configuration procedure	17.2.0
2022-09	CT#97e	CP-222149	0006	1	F	Miscellaneous editorial corrections	17.2.0
2022-09	CT#97e	CP-222149	0007	-	F	Correction on communications between UAVs	17.2.0
2022-12	CT#98e	CP-223146	0008	1	F	EN resolution on IANA registration template	17.3.0

2023-06	CT#100	CP-231278	0009	1	B	To update UAS UE registration procedure	18.0.0
2023-06	CT#100	CP-231278	0010	1	B	Multi-USS management procedures	18.0.0
2023-06	CT#100	CP-231278	0011	1	B	DAA support configuration procedures	18.0.0
2023-06	CT#100	CP-231278	0013	-	B	DAA support involving UAVs with U2X support	18.0.0
2023-06	CT#100	CP-231278	0014	-	B	DAA support involving UAVs without U2X support	18.0.0
2023-06	CT#100	CP-231278	0012	1	B	Change of USS procedure	18.0.0
2023-09	CT#101	CP-232214	0016	2	B	Structure and Data semantics for USS change support procedure	18.1.0
2023-09	CT#101	CP-232214	0017	2	B	Structure and Data semantics for DAA support involving UAVs with/without U2X support procedure	18.1.0
2023-09	CT#101	CP-232214	0018	2	D	Editorial corrections in Multi-USS and DAA procedures	18.1.0
2023-09	CT#101	CP-232214	0015	2	B	Structure and Data semantics for multi-USS confgurations	18.1.0
2023-12	CT#102	CP-233196	0022	-	B	XML schema for multi-USS confgurations procedure	18.2.0
2023-12	CT#102	CP-233196	0023	-	B	XML schema for USS change support procedure	18.2.0
2023-12	CT#102	CP-233190	0019	1	F	Update to the obsoleted IETF HTTP RFCs	18.2.0
2023-12	CT#102	CP-233192	0021	1	A	Correction to undefined reference	18.2.0
2023-12	CT#102	CP-233196	0024	1	B	Tracking dynamic UAVs - general updates	18.2.0
2023-12	CT#102	CP-233196	0025	1	B	Tracking dynamic UAVs - client procedure	18.2.0
2023-12	CT#102	CP-233196	0026	1	B	Tracking dynamic UAVs - server procedure	18.2.0
2023-12	CT#102	CP-233196	0028	1	B	XML schema for tracking dynamic UAVs in an application defined area relative to a host UAV procedure	18.2.0
2023-12	CT#102	CP-233196	0029	1	B	XML schema for DAA procedure	18.2.0
2023-12	CT#102	CP-233196	0027	2	B	Structure and Data semantics for tracking dynamic UAVs in an application defined area relative to a host UAV procedure	18.2.0
2024-03	CT#103	CP-240123	0030	1	B	Introducing SEALDD support	18.3.0
2024-03	CT#103	CP-240127	0032	-	F	To remove EN in clause 7.4 Data semantics	18.3.0
2024-03	CT#103	CP-240127	0031	1	F	XML schema corrections UAS	18.3.0
2024-03	CT#103	CP-240127	0033	1	F	Corrections in clause 7.2 Structure and 7.3.2 XML schema	18.3.0
2024-09	CT#105	CP-242196	0034	1	F	Undefined reference to SEAL data delivery management	18.4.0
2024-09	CT#105	CP-242203	0042	2	F	Corrections in UASAPP TS 24.257 for Rel-18	18.4.0
2024-09	CT#105	CP-242204	0035	1	B	Improved redundanncy for command and control (C2) traffic related procedure	19.0.0
2024-09	CT#105	CP-242204	0039	1	B	Coding for support of flight route	19.0.0
2024-09	CT#105	CP-242204	0040	1	B	Update DAA procedure to support ground based DAA	19.0.0
2024-09	CT#105	CP-242204	0036	2	B	Support for real time UAV flight path monitoring assistance	19.0.0
2024-09	CT#105	CP-242204	0038	3	B	UAE procedure for support of flight route	19.0.0
2024-12	CT#106	CP-243234	0045	-	B	Update XML coding to support ground based DAA	19.1.0
2024-12	CT#106	CP-243234	0047	1	B	Update XML coding to support UAS provided flight routes	19.1.0
2024-12	CT#106	CP-243234	0046	2	B	Update structure and data semantics to support network assisted C2	19.1.0
2024-12	CT#106	CP-243234	0044	3	B	Update structure and data semantics to support ground based DAA	19.1.0
2024-12	CT#106	CP-243234	0048	-	B	Update structure to support UAV flight path monitoring assistance configuration procedure	19.1.0
2025-03	CT#107	CP-250171	0049	1	B	Update general procedure for NTZ support over UAE layer	19.2.0
2025-03	CT#107	CP-250171	0050	2	B	NTZ configuration procedure for NTZ support over UAE layer	19.2.0
2025-03	CT#107	CP-250171	0051	-	B	NTZ activation procedure for NTZ support over UAE layer	19.2.0
2025-06	CT#108	**CP-251181**	0052	1	F	Correction in NTZ configuration procedure	19.3.0
2025-06	CT#108	**CP-251181**	0053	1	B	New USS NTZ policy	19.3.0
2025-06	CT#108	**CP-251181**	0054	2	B	UAE-layer/SEAL/LMS assisted NTZ enforcement	19.3.0
2025-06	CT#108	**CP-251181**	0057	-	B	Update data semantics to support NTZ enforcement procedures	19.3.0
2025-06	CT#108	**CP-251181**	0056	1	B	Update data structure to support NTZ enforcement procedures	19.3.0
2025-06	CT#108	**CP-251181**	0058	1	B	Update XML schema to support NTZ enforcement procedures	19.3.0
2025-06	CT#108					Editorial corrections	19.3.1
2025-09	CT#109	**CP-252168**	0059	-	B	Update XML schema to support Real time UAV flight path monitoring assistance procedures	19.4.0
2025-09	CT#109	**CP-252168**	0060	-	B	Update XML schema to support Dual Network-Assisted C2 communications procedures	19.4.0

History

Document history		
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