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TECHNICAL SPECIFICATION

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Aircraft-to-Everything (A2X) services in 5G System (5GS) protocol aspects;
Stage 3
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In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Contents

Foreword

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

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x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

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 aircraft-to-everything (A2X) communication as specified in 3GPP TS 23.256 [3] for A2X services among the UEs over the PC5 interface and over Uu.

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 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode".

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

[4] 3GPP TS 23.285: "Architecture enhancements for V2X services".

[5] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services); Stage 2".

[6] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".

[7] 3GPP TS 24.501: " Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3"

[8] 3GPP TS 24.578: "Aircraft-to-Everything (A2X) services in 5G System (5GS); UE policies".

[9] 3GPP TS 24.587: "Vehicle-to-Everything (V2X) services in 5G System (5GS); Protocol aspects; Stage 3".

[10] 3GPP TS 33.256: "Security aspects of Uncrewed Aerial Systems (UAS)".

[11] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".

[12] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description; Stage 2".

[13] 3GPP TS 38.304: "User Equipment (UE) procedures in Idle mode and RRC Inactive state".

[14] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) specification".

[15] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

[16] IETF RFC 4862: "Neighbor Discovery for IP version 6 (IPv6)".

[17] ASTM F3411.19: "Standard Specification for Remote ID and Tracking".

[18] ASD-STAN prEN 4709-002:2022-03: "Aerospace series - Unmanned Aircraft Systems - Part 002: Direct Remote Identification".

[19] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General aspects".

[20] IETF RFC 4291: "IP Version 6 Addressing Architecture".

[21] ISO TS 17419 ITS-AID AssignedNumbers: http://standards.iso.org/iso/ts/17419/TS17419%20Assigned%20Numbers/TS17419_ITS-AID_AssignedNumbers.pdf

[22] IETF RFC 4566: "SDP: Session Description Protocol".

[23] IETF RFC 768: "User Datagram Protocol".

[24] IETF RFC 793: "Transmission Control Protocol."

[25] IETF RFC 1035: "DOMAIN NAMES - IMPLEMENTATION AND SPECIFICATION".

[26] 3GPP TS 24.008: "Mobile radio interface Layer 3 specification; Core network protocols; Stage 3".

[27] 3GPP TS 23.247: "Architectural enhancements for 5G multicast-broadcast services".

[28] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

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].

E-UTRA-PC5: PC5 reference point over E-UTRA. The term E-UTRA-PC5 used in the present document corresponds to the term LTE PC5 defined in 3GPP TS 23.256 [3].

NR-PC5: PC5 reference point over NR. The term NR-PC5 used in the present document corresponds to the term NR PC5 defined in 3GPP TS 23.256 [3].

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

A2X communication
A2X message
A2X service

For the purposes of the present document, the following terms and definitions given in 3GPP TS 38.331 [15] apply:

MBS Radio Bearer

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].

A2XP A2X Policy

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

A2X Aircraft-to-everything
BRID Broadcast remote ID
DDAA Direct detect and avoid

4 General description

The present specification defines means for transport of A2X messages, A2X Communication, and procedures for A2X services including BRID, DDAA, direct C2 communication and GBDAAA.

The A2X messages are generated and consumed by upper layers of the UE e.g., A2X application. A2X message can contain IP data or non-IP data. For IP data, only IPv6 is used for A2X messages sent over PC5. IPv4 is not supported in this release of specification for A2X messages sent over PC5.

The A2X message can be transported using A2X communication over PC5 or over Uu. A2X communication over PC5 supports both broadcast mode and unicast mode. Groupcast mode over PC5 and relay communication over PC5 is not supported in this release of specification. A2X communication over Uu supports both broadcast mode and unicast mode.

5 Provisioning of parameters for A2X configuration

5.1 General

A2X communication is configured using A2X configuration parameters and related procedures which allow configuration of necessary A2X configuration parameters.

5.2 Configuration and precedence of A2X configuration parameters

5.2.1 General

UE's usage of A2X communication is controlled by A2X configuration parameters.

The A2X configuration parameters consist of the configuration parameters for A2X communication over PC5 and A2X communication over Uu.

5.2.2 Precedence of A2X configuration parameters

The A2X configuration parameters can be:

a) pre-configured in the ME;

b) configured in the UICC;

c) provided as a A2XP using the UE policy delivery service as specified in 3GPP TS 24.501 [7] annex D;

d) provided by a A2X application server via A2X1 reference point; or

e) a combination of case a), b), c) or d) above.

The UE shall use the A2X configuration parameters in the following order of decreasing precedence:

a) the A2X configuration parameters provided as a A2XP using the UE policy delivery service as specified in annex D of 3GPP TS 24.501 [7];

b) the A2X configuration parameters provided by a A2X application server via A2X1 reference point;

c) the A2X configuration parameters configured in the UICC; and

d) the A2X configuration parameters pre-configured in the ME.

5.2.3 Configuration parameters for A2X communication over PC5

The configuration parameters for A2X communication over PC5 consist of:

a) a validity timer for the validity of the configuration parameters for A2X communication over PC5;

b) a list of PLMNs and RATs in which the UE is authorized to use A2X communication over PC5 when the UE is served by E-UTRA or served by NR. Each entry of the list contains a PLMN ID and RATs in which the UE is authorized to use A2X communication over PC5;

c) an indication of whether the UE is authorized to use A2X communication over PC5 when the UE is not served by E-UTRA and not served by NR;

d) list of RATs in which the UE is authorized to use A2X communication over PC5 and the radio parameters of the RAT for A2X communication over PC5 applicable per altitude range per geographical area with an indication of whether these radio parameters of the RAT are "operator managed" or "non-operator managed" when the UE is not served by E-UTRA and not served by NR;

e) optionally, a list of A2X service identifier to PC5 RAT(s) and Tx profiles mapping rules. Each mapping rule contains one or more A2X service identifiers, PC5 RAT(s) and:

   1) if the PC5 RAT(s) include E-UTRA-PC5, Tx profiles corresponding to the E-UTRA-PC5;

   2) if the PC5 RAT(s) include NR-PC5, NR Tx profile corresponding to the NR-PC5 for broadcast mode A2X communication over PC5; or

   3) if the PC5 RAT(s) include NR-PC5, NR Tx profile corresponding to transmitting and receiving initial signalling of the A2X PC5 unicast link establishment;

f) configuration parameters for privacy support, consisting of:

   1) a list of A2X services requiring privacy. Each entry of the list contains one or more A2X service identifiers and one or more geographical areas where the privacy is required; and

   2) a privacy timer value as specified in 3GPP TS 24.578 [8] clause 5.3;

g) configuration parameters for a A2X communication over PC5 in E-UTRA-PC5, consisting of:

   1) a list of A2X service identifier to destination layer-2 ID mapping rules. Each mapping rule contains one or more A2X service identifiers and the destination layer-2 ID;

   2) optionally, a default destination layer-2 ID;

   3) a list of PPPP to PDB mapping rules. Each mapping rule contains a ProSe Per-Packet Priority (PPPP) and a Packet Delay Budget (PDB);

   4) optionally, list of A2X service identifier to A2X E-UTRA frequency mapping rules. Each mapping rule contains one or more A2X service identifiers and the A2X E-UTRA frequencies with associated altitude ranges and geographical areas;

   5) optionally, a list of the A2X services authorized for ProSe Per-Packet Reliability (PPPR). Each entry of the list contains one or more A2X service identifiers and a ProSe Per-Packet Reliability (PPPR) value; and

NOTE 1: For the A2X service identifier(s) indicating direct C2 communication service, configuration parameters for A2X communication over PC5 in E-UTRA-PC5 are not applicable.

h) configuration parameters for a A2X communication over PC5 in NR-PC5, consisting of:

   1) optionally, a list of A2X service identifier to A2X NR frequency mapping rules. Each mapping rule contains one or more A2X service identifiers and the A2X NR frequencies with associated altitude ranges and geographical areas;

   2) a list of A2X service identifier to destination layer-2 ID for broadcast mapping rules. Each mapping rule contains one or more A2X service identifiers and the destination layer-2 ID for broadcast;

   3) optionally, a default destination layer-2 ID for broadcast;