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RP-223014

3GPP TSG RAN#98-e
Electronic Meeting, Dec 12-16, 2022
Agenda Item: 9.3.2.6

Views on objective 3: PC5-based BRID and DAA

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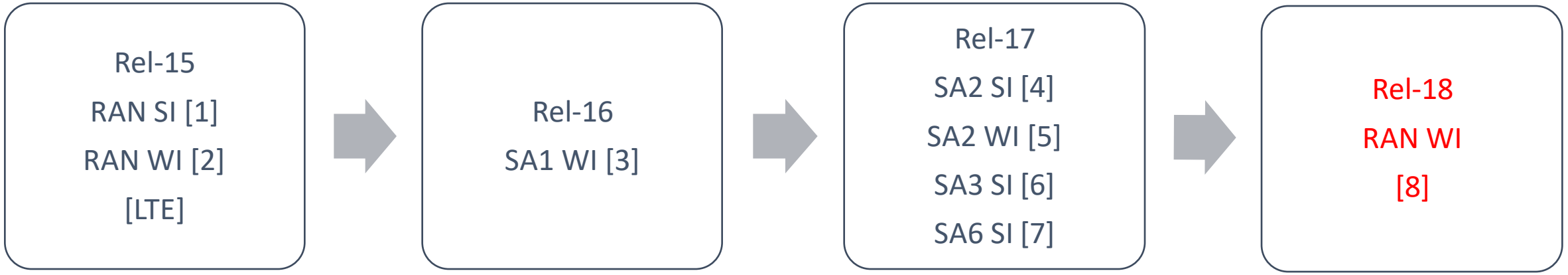
5G

Brief history of Drones/UAV work in 3GPP



[1] RP-171050, SID on Enhanced Support for Aerial Vehicles
[2] RP-172826, WID on Enhanced LTE Support for Aerial Vehicles
[3] SP-180771, New WID on Remote Identification of Unmanned Aerial Systems
[4] SP-181114, Study on supporting Unmanned Aerial Systems Connectivity, Identification, and Tracking
[5] SP-200979, New WID on Support of Aerial Systems Connectivity, Identification, and Tracking
[6] SP-200352, Study on security aspects of Unmanned Aerial Systems
[7] SP-181252, New SID Study on application layer support for UAS service
[8] RP-213600, New WID on NR support for UAV (Uncrewed Aerial Vehicles)

Background

- RAN#94 (Dec. 2021) approved Rel-18 work on NR UAVs.
- One of the heavily discussed item was using PC5 for broadcast remote ID and detect-and-avoid.
- Since SA2 had not concluded at that time, following objective was listed in the WID (see RP-213600):

3. Study and specify, if needed, enhancements for UAV identification broadcast [RAN2, SA2].

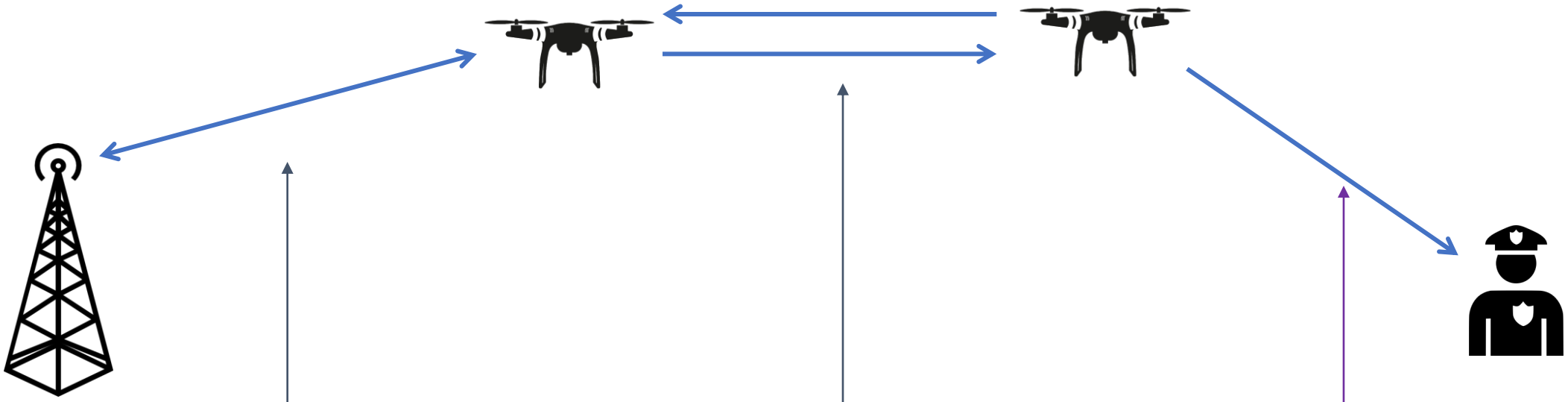
Applicable to both LTE and NR

Note: This study should consider existing techniques based on Uu or non 3GPP technologies, or unlicensed band as the baseline.

Note: This description is a placeholder for a more detailed objective to be drafted once SA2 will have concluded their study on the architectural aspects.

- Now SA2 has reached the conclusions regarding key issues identified during their study, WID update in RAN is needed.

Background: Necessary features for Aerial support



Uu enhancements (UAV-Network)

- Port LTE Rel-15 aspects
- NR specific enhancements

Use case: various applications (video, remote C2 etc.)

PC5 Enhancements (UAV-UAV)

- Use PC5 broadcast for collision control

Use case: U2X-DAA (detect and avoid)

PC5 Enhancements (UAV-Authority)

- Use PC5 to broadcast UAV ID, Flight info

Use case: U2X-ID (remote identification)

- Assumes law enforcement has a dedicated device that can receive PC5 broadcast

Already in the WI objectives

WI objective #3 placeholder needs updates for these

Relevant SA2 key issues and conclusions

Following Key Issues and corresponding solutions and conclusions are documented by SA2 in TR 23.700-58.

- Key Issue #1 - Transport C2 communication over PC5 interface
- Key Issue #2 - Support of Broadcast Remote ID
- Key Issue #3 - Support of Detect and Avoid Mechanism in 3GPP system

Among these Key Issues in the SA2 TR, KI#2 and KI#3 are relevant to objective #3 in RAN WID.

SA2 Conclusions for Key Issue #2 (BRID)

It is proposed to progress to normative phase the following:

- a mechanism based on PC5 leveraging U2X (UAV-to-everything) as described by the architectural enhancements identified in solution #5, applicable to both UAV UE that registers to the MNO network, and to UAVs that operate out of coverage
- for scenarios that UAV UEs in coverage and register to the network, and to UAV-C that are 3GPP UEs, a mechanism using MBS location dependent broadcast service, based on solution #3.

It is assumed that security of the U2X solution will be addressed by SA WG3.

NOTE 1: It is expected that SA WG3 will perform a security analysis of solution #5.

It is assumed that a combination of U2X and network-based solutions can be deployed.

NOTE 2: It is expected that RAN will define necessary enhancements to support PC5 for NR as described in solution #5.

SA2 Conclusions for Key Issue #3 (DAA)

It is proposed to progress to normative phase the following:

- a mechanism for DAA leveraging U2X (UAV-to-everything), with the architectural enhancements identified in solution #5, with the following principles:
  - The detection and resolution of collisions is locally performed between UAVs using direct UAV to UAV communication over PC5.
  - The USS can (optionally) be informed of the collision situation.

  NOTE 1: The UAV may inform the USS of the collision situation over application layer communication. No normative work in SA WG2 is expected to enable this.

  - Both unicast and broadcast mode direct communication over PC5 is supported for DAA.
- Additionally, may support network-assisted (ground based) DAA solution #7. It is applicable for a specific area, such as a stadium or arena where drones are used.

NOTE 2: The content of "local policies for DAA" in Solution #7 and how it is communicated between UAV, UAV-C and AAM is out of 3GPP scope.

NOTE 3: Whether the UAV UEs served by different PLMNs and with subscriptions to different PLMNs is supported depends on the Rel-18 NR sidelink RAN study conclusion.

It is assumed that security of the U2X solution will be addressed by SA WG3.

Observations and Proposal

Based on SA2 conclusions shown in earlier slides, following are observed:

- **Observation 1**: SA2 conclusions propose to progress to normative phase PC5-based solutions for the Broadcast Remote ID (BRID) and Detect And Avoid (DAA) in accordance with solution #5 in the SA2 TR 23.700-58.
- **Observation 2**: SA2 expects SA3 to perform a security analysis of solution #5.
- **Observation 3**: SA2 expects RAN to define necessary enhancements for NR as described in solution #5.

Based on the above, following is proposed:

- **Proposal**: Update RAN WID objective #3 to specify enhancements for PC5-based UAV identification broadcast and detect and avoid, for both LTE and NR.

Proposed text changes for WID objective #3 is shown in next slide.

Proposed changes for Rel-18 WI objective #3

3. ~~Study and specify, if needed,~~ Specify enhancements for PC5 broadcast based UAV identification broadcast (BRID) and PC5 broadcast and PC5 unicast based detect and avoid (DAA) [RAN2, RAN1, SA2].

Applicable to both LTE and NR

~~Note: This study should consider existing techniques based on Uu or non 3GPP technologies, or unlicensed band as the baseline.~~

~~Note: This description is a placeholder for a more detailed objective to be drafted once SA2 will have concluded their study on the architectural aspects.~~

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