**3GPP TSG-WG SA2 Meeting #139E e-meeting *S2-200xxxx***

**Elbonia, August 19 – September 1, 2020 (revision of S2-200xxxx)**

**Source: Huawei, HiSilicon**

**Title:** **Arch Update: Clarification on UAS concept**

**Document for: Approval**

**Agenda Item: 8.7**

**Work Item / Release: FS\_ID\_UAS / Rel-17**

*Abstract: This contribution proposes clarification on UAS concept and its impact to the network.*

# 1. Discussion

UAS definition is an un-resolved issue in the Q2 SA plenary and it will be further worked out in SA1 the definition of UAS definition. Following are possible components in a UAS:

UAS = one UAV + one UAVC

UAS = one UAV + multiple UAVC

UAS = m UAV + n UAVC

However it is observed whatever definition SA1 will conclude, the impact on SA2 is very limited and the same.

This can be implied according to the TR progress, it is agreed that operator’s network does no need to know exactly a UAS, i.e. how many UAV and UAVC in the UAS, but only know every individual UAV/UAVC status and their pairing status.

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.754.

\* \* \* \* First change \* \* \* \*

## 4.2 Architectural Assumptions

- Each UAS consist of one UAV Controller and one UAV.

- The UTM is a set of functionalities defined outside the 3GPP system and subject to specific regional requirements

- Connectivity for Command and control of a UAV may be between the UAV and, mutually exclusively, an UAV Controller, or a TPAE, or the UTM.

- UAVs not connected through the 3GPP network are out of scope of the 3GPP system.

- Each networked component of a UAS is considered as an individual UE from the perspective of the 3GPP system.

- UAVs can be added or removed from a UAS.

- An UAV Controller can be removed from a UAS and replaced with another UAV Controller or a TPAE.

- It shall be possible for the 3GPP system to identify if the 3GPP connectivity service (i.e. a PDU Session or a PDN Connection) requested by a UAV or UAVC will be used for a UAV flight operation or not.

NOTE 1: When a UAV requests 3GPP connectivity service for a flight operation, the 3GPP system can perform certain UAV procedures, such as, provide identification and tracking information to UTM, etc.

- A UAV is assigned, and a networked UAVC may be assigned, a CAA-level UAV Identity by functions in the aviation domain (e.g. USS) or by functions in the USS/UTM. This assigned identity is used for Remote Identification and Tracking.

- A 3GPP UAV ID is used by the 3GPP system to identify the UAV.

- The 3GPP CN is aware of the CAA-level UAV Identity. A mapping shall be possible in the mobile operator network and in the UAS application layer outside of 3GPP between the 3GPP UAV ID and the CAA-level UAV ID.

- The USS/UTM accesses 3GPP services (e.g. location services) for a UAV corresponding to the CAA-level UAV Identity by using the 3GPP UAV Identity.

- Consistent identification information for the UAV is used for both Networked Remote ID and Broadcast Remote ID, based on regulatory requirements (e.g. [2]), and the UAV identification information used for Networked Remote ID are assumed to be also applicable for Broadcast Remote ID and to satisfy the regulatory requirements.

NOTE 2: The study will not define how the solutions defined in Release 17 apply to access technologies outside the scope of 3GPP (e.g. Bluetooth or Wi-Fi).

- It is assumed that mechanisms are available to ensure privacy and protection (e.g. anti-spoofing) of the CAA-assigned UAV Identity when used for Remote Identification. Security solutions to provide such privacy are outside the scope of SA WG2 (e.g. in SA WG3's scope) and may be outside the scope of 3GPP (e.g. in ASTM's scope).

Editor's note: Whether security solutions to protect the CAA-Level UAV ID for privacy and against spoofing are necessary is FFS and should be discussed in coordination with SA3.

- For UAV authentication and authorization the following is assumed:

- The UAV is authenticated at registration with the 3GPP using the existing UE authentication mechanisms based on MNO credentials

- A UAV USS-registration takes place between the UAV and the USS/UTM. This e.g. involves authorization of the UAV and may involve authentication and is not performed by 3GPP system: it is not the 3GPP system that decides on the authorization. The results of such procedure may be known to the 3GPP system. This may be out of band and performed before accessing the 3GPP system. This is not performed each time the UAV registers with the 3GPP system. This is not performed on a per-flight basis and may have longer lifetime. However, this may be part of or follow-on of the 3GPP registration, authentication/authorization procedures.

- A UAV 3GPP authentication/authorization is performed by the MNO when the UAV accesses the 3GPP system. This may be required when the UAV registers with the 3GPP system or when the UAV request to establish user plane resources from the 3GPP system for UAV operations. This may be needed to ensure the UAV has successfully registered with USS/UTM and has been authorized for UAV operations by USS/UTM. This involves the USS, and it is not the 3GPP system that decides to authorize the UAV: the 3GPP system receives confirmation of the authorization from the USS.

- For networked UAV controllers and non-networked UAV controllers, pairing between the UAV and the UAV controller for the use of UAV3 or UAV5 may be at least authorized, or even authenticated. The pairing authorization/authentication, when performed, is authorized by the USS/UTM, not by the 3GPP system. The 3GPP system enables such authorization process. The result of such authorization/authentication are made known to the MNO in order to enable the USS/UTM to enable the connectivity between the UAV and the UAV controller.

Editor's note: Further work is needed to clarify if the 3GPP system needs to be aware of of connectivity set-up between UAV and UAV controller.

- The USS/UTM may indicate to the 3GPP system revocation of UAV3 connectivity between the UAV and UAV Controller.

NOTE 3: In some scenarios, the UAV to UAV Controller pairing may be established before the UAV connects to the 3GPP system or even before the UAV is registered with the USS/UTM. This may be common in case UAV8 is used.

- Flight plan authorization is the responsibility of air traffic control and is not performed by the 3GPP system. The 3GPP system may support the authorization of flight plan (i.e. the aviation-level flight plan authorization that UAV needs to receive from USS/UTM) between the UAV and the USS/UTM. Support of authorization of flight plan does not imply that the 3GPP system is involved in authorizing the flight plan (e.g. may provide transport for exchange of information related to flight plan authorization).

- The UAV is authorized for connectivity to USS over UAV9 based on existing MNO policies, and is allowed to establish connectivity with a DNN to exchange traffic with the USS without USS authorization

- One or more USS(s) may be present in a specific region and may manage UAVs over one or more 3GPP networks.

NOTE 4: Region in some geographies may correspond to a country or a set of countries (e.g. the whole Europe, North America including Canada, USA, and Mexico, etc.). The inclusions or exclusions of country(ies) to a region is outside the scope of 3GPP.

- For this release, it is assumed a UAV is served by the same USS/UTM for the duration of a flight.

- The 3GPP system should provide enablers to support geofencing (for in-flight UAV) and geocaging (for UAV on the ground intending to fly) functionality in USS/UTM.

NOTE 5: Geofencing mechanisms are an air traffic control functionality performed by the USS/UTM and are out of scope of this study. The 3GPP system provides enablers to support geofencing/geocaging functionality in USS/UTM, e.g. location services, enablement of UAV3/UAV4 for C2 connectivity, event notification to a subscribing USS/UTM, etc. However, no specific geofencing mechanisms are defined in 3GPP.

- Activation of RAN aerial features for UAV accessing via E-UTRA reuses the existing mechanism defined in TS 36.300 [9].

- UAS impact on architecture:

- at a given point of time, one UAV is controlled by one UAVC.

- pairing (UAV-UAVc) is known by the 5GS.

- UAS is only known by the UTM/USS, it may include one UAV and one or more UAVC.

- UTM may change the UAVc for the UAV and inform the 5GS, still 5GS only know the pairing.

\* \* \* \* End of changes \* \* \* \*