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Executive Summary

5G!Drones D5.3 deliverable aims at reporting standardization activities and contributions at international fora achieved during the period spanning from M1 (June 2019) to M18 (November 2020).

During this first period, 5G!Drones consortium has established a complete landscape of the standards Development Organization (SDOs) as well as various associations relevant within 5G!Drones frameworks, including 3GPP, GSMA, GUTMA, ACJA, IEEE, CEPT/ECC, ASTM, ETSI, IETF, BNAE, Drone REGIM, 5G-PPP (Pre standardization working group), FAA, SESAR JU, NASA, EUROCAE, EASA, ASD-STAN, ISO, LAANC, ARC.

Members of 5G!Drones consortium are not only closely monitoring standardization activities of these associations, so that the project technical work packages can take into account necessary outcomes but are also active contributors providing inputs within the context of the project, particularly with regards to the following topics: RAN slicing for NR, Multi-RAT Dual-Connectivity, NR Sidelink relay, industrial IoT and URLLC support for NR, UE power saving enhancements for NR, Access to Network Slice, Mission Critical Services, Remote Identification of UAS, Data Service for coverage information, MOPS and MASPS development for cellular, Multi-access Edge Computing, Air traffic management, and others detailed in this document.

5G!Drones partners have provided their standardization strategy for next period. They will continue monitoring and engaging in standardization activities related to 5G!Drones project. They are committed to explore potential contributions to SDOs as the project progresses until its completion in November 2022. At this date an updated version of this deliverable will be issued under D5.4 reference.
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<th>Description</th>
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<tr>
<td>5G</td>
<td>5th Generation Cellular Technology</td>
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<tr>
<td>5G-IA</td>
<td>5G Infrastructure Association</td>
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<td>5G-PPP</td>
<td>5G Infrastructure Public Private Partnership</td>
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<td>AAS</td>
<td>Active Antenna System</td>
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<td>ACJA</td>
<td>Aerial Connectivity Joint Activity</td>
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<tr>
<td>BVLOS</td>
<td>Beyond-visual-line-of-sight</td>
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<td>C2</td>
<td>Command and Control</td>
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<tr>
<td>CEPT</td>
<td>The Confederation of European Posts and Telecommunications Administrations</td>
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<tr>
<td>ECC</td>
<td>The Electronic Communication Committee</td>
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<tr>
<td>GSMA</td>
<td>Global System for Mobile Communications Association</td>
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<td>Global UTM Association</td>
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<td>ICT</td>
<td>Information and Communication Technologies</td>
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<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
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<tr>
<td>LTE</td>
<td>Long-Term Evolution</td>
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<tr>
<td>pCR</td>
<td>PseudoChange Request</td>
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<tr>
<td>PoC</td>
<td>Proof of Concept</td>
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<tr>
<td>SDO</td>
<td>Standards Development Organization</td>
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<tr>
<td>ToR</td>
<td>Terms of Reference</td>
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<tr>
<td>TRP</td>
<td>Total Radiated Power</td>
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<tr>
<td>UAV</td>
<td>Unmanned Aerial Vehicle</td>
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<td>UAVC</td>
<td>UAV Controller</td>
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<td>UTM</td>
<td>Unmanned Aircraft System Traffic Management</td>
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<td>WG</td>
<td>Working Group</td>
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<td>WP</td>
<td>Work Package</td>
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1. INTRODUCTION

1.1. Objectives of the document

5G!Drones D5.3 deliverable aims at reporting standardization activities achieved during the period spanning from M1 (June 2019) to M18 (November 2020). The document will be completed in a second version referenced as D5.4, that will be delivered at the end of the project in M42 (November 2020) and that will report standardization activities achieved during the whole project duration.

1.2. Structure of the document

The document is divided into two parts:

- First part will report 5G!Drones contributions to standardization and international fora. This part will:
  - Detail the organizations/associations that has been identified as relevant for 5G!Drones standardizations activities and their purpose
  - Present how they relates to 5G!Drones
  - Present the strategy used to contribute to these organizations/associations
  - Present work achieved:
    - Specify 5G!Drones representative role in the organization/association (contributor, attendance),
    - The WG in which 5G!Drones contributed.
    - Specify the different meetings attended, 5G!Drones role in the meeting as well as specific contributions
  - Present standardization plans regarding future contributions

- Second part will present 5G!Drones plans regarding next contributions to standardization and international fora, listing the WG, work items and study items 5G!Drones members will focus on as well as the upcoming meetings 5G!Drones representatives will attend.
2. 5G!Drones contributions to standardization and international fora

2.1. General overview

5G!Drones project brings together partners from the UAS vertical and the telecommunication industry, creating a unique mix that initiates the cooperation establishment between SDOs of the Global UTM association and the GSMA.

The figure above represents a global view of standardization status for UAS vertical on telecommunication networks. At the center of the picture, stands:

- GSMA, the GSM association which is an industry organization that represents the interests of mobile network operators worldwide
- GUTMA, which is the global UTM association which is a consortium of worldwide UTM stakeholders and which purpose is supporting and accelerating the transparent implementation of globally interoperable UTM systems

GSMA and GUTMA have launched together the ACJA which stands for the ‘Aerial Connectivity Joint Activity’. They have realized that cellular connectivity is a key to unlocking the full potential of drones: allowing them to operate at greater distances from the pilot, beyond the pilot’s line of sight, enabling critical functions such as search-and-rescue or traffic safety monitoring. With connected drone use cases set to multiply rapidly over the next few years, therefore, the aviation and mobile ecosystems need appropriate leads through which their collaborative work can be carried out. Let’s say that ACJA aims at addressing any misalignment between the aviation and cellular communities in aerial cellular.
They provide a forum to facilitate communication between the two communities, they implement a stronger alignment of the SDOs from the two communities and they try to establish acceptable architectures and interfaces between the components and assets respectively provided by the two communities.

Around this central organization, other interesting bodies have been identified as relevant within the framework of 5G!Drones project. These bodies will be detailed in the next paragraphs according to specific work and studies achieved by 5G!Drones consortium partners in this first period from M1 (June 2019) to M18 (November 2020):

- **RTCA**: Radio Technical Commission for Aeronautics which is a US volunteer organization developing technical guidance for use by government regulatory authorities and by industry.
- **ASTM**: American Society for Testing and Materials which develops and publishes standards for a large range of products and in particular UAS.
- **FAA**: Federal Aviation Administration which is a governmental body with powers to regulate all aspects of civil aviation in that nation as well as over its surrounding international waters.
- **MNOs**: with presence of international partners, US have already activated; Europe and Asia are currently activating their collaboration
- **3GPP**: 3rd Generation Partnership of course in charge of 5G standards, main focus for 5G!Drones partners.
- **ISO**: International Organization for Standardization: with specifically technical committee 20 / subcommittee 16 dedicated to Unmanned Aircraft System with a scope including but not limited to classification, design, manufacture, operation & safety management of UAS operations.
- **ASD-STAN**: This is an associated body to CEN, European Committee for Standardization for Aerospace standards.
- **EASA**: European Aviation Safety Agency having responsibility for civil aviation safety and carrying out certification, regulation and standardization activities.
- **EUROCAE**: The European Organization for Civil Aviation Equipment which deals exclusively with aviation standardization, for both airborne and ground systems and equipment and which collaborates with RTCA for consolidating published standards.

### 2.2. 3GPP

Cellular-Connected UAVs is a promising technology that can become a reality in the near future. Enabling ultra-reliability, low latency and high data rates is important in order to guarantee ubiquitous communications between UAVs and GCS/Users regardless of their locations. The main advantages of using cellular-connected UAVs compared to the traditional Ground-to-UAV communications can be summarized as follows:

- **Ubiquitous accessibility.** Thanks to the almost ubiquitous accessibility of cellular networks worldwide, cellular-connected UAV makes it possible for the ground pilot to remotely command and control (C2) the UAV with essentially unlimited operation range.
- **Enhanced performance.** With the advanced cellular technologies and authentication mechanisms, cellular-connected UAV has the potential to achieve significant performance improvement over the simple direct ground-to-UAV communications, in terms of reliability, security, and communication throughput.
- **Ease of monitoring and management.** Cellular-connected UAV offers an effective means to achieve large-scale air traffic monitoring and management.
Robust navigation. Traditional UAV navigation mainly relies on satellite such as the Global Position System (GPS), which is however vulnerable to disruption of satellite signals due to, e.g., blockage by high buildings or bad weather conditions. Cellular-connected UAV offers one effective method, among others such as differential GPS (D-GPS), to achieve more robust UAV navigation by utilizing cellular signals as a complementary for GPS navigation.

Cost-effectiveness. Cellular-connected UAV is also cost-effective. On one hand, it can reuse the millions of cellular base stations (BSs) already deployed worldwide, without the need of building new infrastructures dedicated for UAS alone, thus significantly saving the network deployment cost. On the other hand, it may also help saving the operational cost, via bundling UAV C2 and other numerous types of payload communications into cellular systems, which will create new business opportunities for both cellular and UAV operators[1].

Connectivity over mobile networks has a lot of advantages for the UAS ecosystem:

- The mobile network can be a part of UTM solutions;
- The general identification and registration schemes for mobile UEs (IMSI, IMEI) can be used for UAVs identification and registration in connected systems;
- The mobile network can assist law enforcement by enabling identification and tracking of drones, as well as no-flight zones.
- The mobile network ensures transmission reliability, privacy and data protection.

The 3rd Generation Partnership Project (3GPP) unites seven telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC), known as “Organizational Partners” and provides their members with a stable environment to produce the Reports and Specifications that define 3GPP technologies. The project covers cellular telecommunications technologies, including radio access, core network and service capabilities, which provide a complete system description for mobile telecommunications. The 3GPP specifications also provide hooks for non-radio access to the core network, and for interworking with non-3GPP networks. 3GPP specifications and studies are contribution-driven, by member companies, in Working Groups (WG) and at the Technical Specification Group (TSG) level.

![3GPP UAS model in the 3GPP ecosystem](image)

**Figure 2 - 3GPP UAS model in the 3GPP ecosystem**

The foundations of UAS communication services support by the 3GPP 5G system (5GS) are primarily in definition of the 5GS architecture[2] followed by definition of 5GS procedures[3], which provide various concepts and functions important for UAS. First of all, network slicing (NS) is an
inherent part of the 5GS vision. Until now, the mobile network was built as a universal network, supporting services with very divergent characteristics in a uniform manner. As a result, the compromise did not sufficiently satisfy the requirements of any of them. The LTE network operating in this logic will be replaced by a federation of parallel virtual networks, each of which is individually tailored to the requirements of different classes of services defined by ITU-R and followed also by 3GPP. This way, the traffic belonging to different communication links (C2, real-time video, sensors, etc.) will be directed to the right network, which will transmit and process it through the User Plane Function (UPF) in the best possible way.

The support of NS within the 5GS includes network slice instance (NSI) selection and admission control on per-user level (identified by IMSI). Currently, it is assumed that a 5G terminal can be attached to maximum 8 different NSIs of the same network operator, which is considered as an adequate number for typical usage scenarios. The User Plane (UP) in the 5GS is no longer just a user traffic tunnel anchored at the Packet Data Network (PDN) gateway, with user mobility provided. The UPF is now a service- and/or network slice-specific chain of functions processing the user traffic (e.g. firewall, Deep Packet Inspection – DPI, packet classification, redirection and alteration), i.e. the functionalities of SGi LAN in 4G are now incorporated to the 5GS UP.

All 5GS entities (UE, RAN, Core Network and also MEC, if exists) have to be NS-aware. In 4G and earlier generations, the UE requested only an access to specific Packet Data Network identified by its APN. In 5G UEs will specify also a path to this data network, i.e. request an access to specific NSI with a commonly recognized identifier. In case the requested NSI is unavailable in the specific area (due to inexistence or congestion), the 5G network will have to substitute the requested NSI with the best possible alternative.

The 5GS supports classification of traffic for QoS assurance. The standardized 5QI (5G Quality Identifiers) used for stamping of traffic are a significantly extended 4G QCI (QoS Class Identifier) list. The 5QI definition contains currently 27 classes (see Error! Unknown switch argument.) with processing types (guaranteed bit rate, non-guaranteed bit rate, delay-critical guaranteed bit rate) and allocated default priority level, E2E packet delay budget, allowed packet error rate; default maximum data burst volume (maximum size of user data in a packet); default averaging window (timeframe for measuring e.g. error rate) and example applications.

The architecture of 5GS Control Plane (CP) is designed according to service-oriented principle, which makes it easy to expand the CP functionally and enable new features. Additionally, the number of protocols used for exchange between the CP functions has been consolidated and now the protocol for interactions between all control-plane entities is HTTP instead of previously used telecom operator specific ones like Diameter or GTP-C (GPRS Tunnelling Protocol Communication). The CP functional applications will be designed as stateless ones, i.e. the state of each network procedure will be stored centrally and e.g. session request may be successively processed by various instances of the same CP application without a need of troublesome transferring a context to be able to complete a procedure.

With regards to 5G!Drones topics, significant work has been achieved in 3GPP since 2017 in the context of Releases 16, 17 and 18. 5G!Drones consortium has studied relevant items and will take them into account in the project:

- TR 36.777[4] – this study concerned the analysis of various aspects of UAS support in LTE networks. The conclusions are mainly focused on the issue of interferences mitigation, to a lesser extent on mobility performance and aerial UE identification.
- In TS22.125 (R16 SA1)[5], potential requirements and identification services have been analyzed for different drone use cases. This technical standard defines a variety of UAS use cases and their requirements (aviation domain-related, including C2, UTM and remote identification, as well as specific to drone usage), especially functional and in terms of
Performance targets: data rates, E2E delays, reliability rates, allowed altitudes above ground levels and ground speeds and positioning latencies/accuracies.

- TS 22.261[6] – this technical standard provides supplementary information, as it is dedicated to general 5G service use cases and requirements. Despite the fact that the UAS support area has been excluded from it and moved to the separate aforementioned document [TS 22.125], here the overall picture is complemented (e.g. tampering detection and prevention).

- Further study was conducted in TR 23.754 (R16)[7] to support drone connectivity, identification and tracking, with a special focus on detection and reporting of unauthorized UAVs towards the UTM. For Release 17, SA6 analyzed the potential impact on the application layer, considering support/enabler functionalities for UTM and service interactions between UAS and UTM (e.g. fly route authorization or location management). The architectures and solutions already developed for mission critical and V2X services have been considered for re-use in aerial systems, and new KPIs and communication needs of the UAV with a 3GPP subscription have been issued.

- TR 23.755[8] – this report of the architectural study on application layer support for UAS is also at the early draft stage and currently deals with:
  - applicability and possible needs for enhancements of service enabler architecture layer (SEAL – set of functions for management of location, group, configuration, identity, key and network resources) – common to all vertical industry applications – for UAS services;
  - broadcast communication amongst UAVs both in off-network and on-network scenarios;
  - UAV location information – both verification of location reported by UAV, which cannot be fully-trusted, by the 3GPP network and possible supplementing of 3GPP system-based location information to the location reporting towards UTM;
  - UAS services capabilities exposure – real-time monitoring of the UAV status information (e.g. location of UAV, communication link status) and exposure to a 3rd party of the information about UAV service status in a certain geographical area and/or at a certain time.

- Finally, for Release 18, detailed mechanisms and procedures are currently under study (TR 23.754) for UAV and UAV controller identification and pairing, authorization by UTM, tracking and User Plane connectivity.

It should be noted that the technical standards are normative documents, while study reports provide concepts or proposals which after further validation may be incorporated to normative documents. Hence, the 3GPP support needs standardization of functionalities and mechanisms, which will respond to already standardized UAS services requirements.

### 2.2.1. 3GPP RAN2/RAN3

RAN2 and RAN3 are two Working Groups of the Radio Access Network Technical Specification Group (TSG RAN) of 3GPP. Their role is to study and discuss change requests proposed by consortium members in order to maintain or improve 3GPP specifications. Once these work items are mature enough and are approved during a plenary meeting, they can be incorporated in 3GPP technical reports and specifications.
As part of our research activities, we follow closely the evolution of standardization, in order to always align our work in 5G!Drones with the latest technical recommendations. We chose to focus on the ongoing release (Release 17) and in particular on two Working Groups. RAN2 is responsible for the specification of the Radio Interface architecture and protocols, the Radio Resource and Management, and the services provided by the physical layer to the upper layers. RAN3 is in charge of the overall UTRAN/E-UTRAN architecture and the specification of the different interface protocols (Iu, Iur, lub, S1, X2). Within those two WG, we highlighted the Study Items of interest in relation to the 5G!Drones project requirements and to our research activities demands. The following paragraph is a non-exhaustive list of the main Rel-17 items that we are closely following. Note that some Work Items are shared between RAN2 and RAN3.

- **Study on enhancement of RAN slicing for NR**
  While Rel-15 specifications can provide the foundation of a common connectivity platform for various services, more efforts will be made in Rel-17 on RAN support of network slicing. The main objectives of this study item are to develop mechanisms to enable UE fast access to the cell supporting the intended slice, and to investigate the necessity to support service continuity.

- **Further Multi-RAT Dual-Connectivity (MR-DC) enhancements**
  In Rel-16, 3GPP has completed the mobility enhancements on NR and LTE to reduce data transmission interruption during handover between different Radio Access Technologies (RAT), and also improve handover robustness. The objective of this work item is to specify enhancements to MR-DC related scenarios. In particular, it will examine the efficient support of an activation/de-activation mechanism of Cells to save network and UE energy consumption.

- **Study on NR Sidelink relay**
  For Rel-16, a first version of NR sidelink has been developed and it solely focuses on supporting V2X related road safety services. The design aims to provide support for broadcast, groupcast and unicast communications in both out-of-coverage and in-network coverage scenarios. On top of that, sidelink-based relaying functionality will be additionally studied in order for sidelink/network coverage extension and power efficiency improvement, considering wider range of applications and services. In particular, the two scenarios to be considered in this Work Item are UE-to-network coverage extension and UE-to-UE coverage extension.

- **Enhanced Industrial Internet of Things (IoT) and ultra-reliable and low latency communication (URLLC) support for NR**
  The achievable latency and reliability performance of NR are keys to support use cases with tighter requirements, like drone related use cases. Based on the specifications provided in Rel-16, this Work Item will focus on the following objectives: identify and specify the required Physical Layer feedback enhancements to meet URLLC requirements; uplink enhancements for URLLC in unlicensed controlled environments; intra-UE multiplexing and prioritization of traffic with different priority.

- **UE power saving enhancements for NR**
  In Rel-17, additional enhancements are required to address outstanding issues in Rel-16, namely idle/inactive-mode power consumption in NR SA deployments, considering both eMBB UEs and Reduced Capability NR Devices (NR-Light), connected-mode power consumption with FR2 deployments, and optimizing network utilization of Rel-16 UE assistance information.
• Enhanced eNB(s) architecture evolution for E-UTRAN and NG-RAN

In the work item of eNB(s) Architecture Evolution for E-UTRAN and NG-RAN, the higher layer functional split architecture of eNB has been specified. As the split architecture for ng-eNB CU and DU is supported, it would be beneficial to support C-plane centralization or U-plane centralization for both eNB and ng-eNB. For the deployment scenario, as defined for gNB, it is worth to discuss on how to specify the interface to achieve LTE CP-UP separation for both E-UTRAN and NG-RAN.

2.2.2. 3GPP SA1

5G!Drones consortium members are directly involved in SA1. This working group referred as ‘Services’ reports to 3GPP TSG SA and focuses on service and feature requirements applicable to mobile and fixed communications technology. With regards to UAS activities in SA1, Rel-17 work was completed 12/2019. The results are published in TS22.125 which constitutes a reference document for 5G!Drones project. It is also important to note that so far, there is no proposal for Rel-18 items.

5G!Drones consortium has identified following studies as relevant with regards to targeted applications within the project:

- Release 18 (draft)
  - 3GPP SA1: Study on Enhanced Access to Network Slice (Description: S1-202284)

- Release 17 (finalized)
  - (study) 3GPP SA1: Study on Enhancement for Unmanned Aerial Vehicles / Drones (TR 22.829 / FS_EAV)
  - (standard) 3GPP SA1: Unmanned Aerial Systems / Drones (R17 TS 22.125)
  - (standard) 3GPP SA1: Mission Critical Services Common Requirements (R17 TS 22.280)

- Release 16 (finalized)
  - (study) 3GPP SA1: Study on Business Role Models for Network Slicing (TR 22.830)
  - (study) 3GPP SA1: Study on Remote Identification of Unmanned Aerial Systems - Drones (TR 22.825)
  - (standard) 3GPP SA1: Unmanned Aerial Systems / Drones (R16 TS 22.125)

2.2.3. 3GPP SA2

The last two SA2 meetings focused on Rel-17 studies, and among those, a progress review of the study Supporting UAS Connectivity, Identification, and Tracking (FS_ID_UAS) was given. This study, which is documented in TR 23.754 (v1.1.0 after the last SA2 September 2020 meeting), seeks to address the following system enablers for supporting Unmanned Aerial Systems Connectivity, Identification, and Tracking:

---

1 The latest revision of TR23.754 may be [retrieved on the SA2 branch of the 3GPP Website](https://www.3gpp.org).
1. UAV controller and UAV(s) **identification and tracking in the 3GPP system**;
2. In particular, how the 3GPP system can **provide support for UAV to ground identification** (e.g. to authorized third parties such as police devices);
3. **Support UAV controller and UAV(s) authorization and authentication by UTM**;
4. **Handle unauthorized UAVs and revocation of authorization** (e.g. lack of connectivity to carry the UAV command and control messages, denied registration, etc.) that enables the system to keep track of and control UAV(s).

This study considers a reference architecture involving the UAV, UAV controller and the 3GPP system, which is depicted in the below figure. It uses a set of interfaces which are summarized as follows:

- **UAV1** interfaces the UAV and UAVC with the 3GPP system to support UAV and UAVC authorization, authentication, identification, and tracking.
- **UAV2** interfaces a Third Party Authorized Entity (TPAE) with the 3GPP system for remote identification and tracking.
- **UAV3** represents the 3GPP user plane connectivity for transporting C2. UAV3 can be intra-PLMN or inter-PLMN.

![Figure 3 - Overview of the UAV architecture in a 3GPP System considered in TR23.754](image-url)
- **UAV4** interfaces a TPAE with a UAV over 3GPP network for C2 and for Remote identification (RID) and tracking of the UAV.
- **UAV5** is similar to UAV3, but transporting C2 while interfacing a UAV with a non-networked UAVC via the Internet. This is outside the scope of 3GPP.
- **UAV6** interfaces the 3GPP system with external USS/UTM for functionality exposure, support of identification and tracking, and UAV authorization.
- **UAV7** is used for RID information sent in broadcast (BRID), on a transport outside the scope of 3GPP.
- **UAV8** is used for C2 over a transport outside the scope of 3GPP.
- **UAV9** supports connectivity between the UAV or a networked UAV Controller and the USS/UTM for UAS management, such as authentication and authorization, transporting C2, networked remote identification (NRID) and tracking of the UAV, etc.
- **U2U** supports UAV to UAV communications for broadcast RID, and is out of the scope of this study.

This study has identified 7 Key Issues:
1. UAV identification
2. UAV authorization by UTM
3. UAV Controller identification and authorization/authentication
4. UAV and UAV Controller tracking
5. UAV authorization revocation and (re)authorization failures
6. UAV Controller and UAV association
7. User Plane Connectivity for UAVs

Some architectural assumptions were agreed at Meeting #139, and 20 candidate solutions were added to the TR, addressing all key issues, then 7 additional solutions have been added at Meeting #140, leading to 27 solutions in V1.0.0 in September 2020.

Orange has proposed the #27 solution that has been integrated in the TR23.754.

As is customary with SA2 studies, TR23.754 has broken down the 27 solutions in terms of the considered 7 key issues, and the following table summarizes the scope of the discussed solutions.
Table 1 - Mapping of the 27 solutions discussed in TR23.754

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Notes:

- The current version of the TR still hasn’t fully concluded on how the adopted discussed solutions should impact on the aforementioned 3GPP reference architecture for UAV remote identification. It is expected to be updated accordingly during the next SA2 study period.
- The security aspects are considered in some parts of this study, in particular as part of the Procedure for UAV Authentication and Authorization with USS/UTM in 5GS. Whether an actual authentication takes place depends on the security solutions to be defined for the communication between the UAV and the USS/UTM. For this issue and the other security aspects of TR23.754, the document mentions that “whether security solutions to protect the CAA-Level UAV ID for privacy and against spoofing are necessary in FFS and should be discussed in coordination with SA3”. A liaison with SA3 and subsequent discussions are therefore expected during the next period.
- Interestingly, this study contains an annex dedicated to external regulation regarding UAV, in particular a description of the FAA main regulations on Remote Identification. It also mentions how the US Federal Aviation Administration (FAA) chartered the Unmanned Aircraft Systems Identification and Tracking Aviation Rulemaking Committee (UAS-ID ARC) to provide recommendations to the FAA regarding technologies available for remote identification and tracking of UAS. Finally, the document mentions that ASTM International is defining a standard (to be published as F3411) in ASTM F38 committee aiming to satisfy the growing demand for
better identification and tracking of unmanned aircraft systems in airspace systems worldwide, called the Remote ID.

5G!Drones consortium members did submit the following pCRs to the SA2 meeting:

- S2-2004243 23.754: Update to Reference Architecture
- S2-2004244 23.754: Solution on Location Exposure to UTM/USS
- S2-2004245 23.754: Solution on 3GPP reference architecture for UAS remote identification and USS discovery

2.2.4. 3GPP SA6

With regards to UAS work in 3GPP SA6, a specific study item FS_UASAPP “Study on application layer support for Unmanned Aerial System” has emerged in April 2019 (as Rel-16 item), so at the time of 5G!Drones official kick-off (June 2019). Its content is the following:

- Analyse the re-use of functionalities from SA6 specifications
  - MCX: A platform for mission critical (MC) communications and MC Services has been a key priority of 3GPP in recent years and is expected to evolve into the future by taking more requirements, from different sectors of the global critical communications industry, on board. In particular, MCX are key in 5G!Drones considering Public safety use cases, supporting secured communications between first responders.
  - V2X: One important and critical topic for 5G!Drones project is allowing Drone-to-Drone communication via 5G to avoid and prevent collisions and coordinate routes. V2X researches are the most relevant for that.
  - The Common API framework, so called CAPIF: The main purpose of CAPIF is to have a unified north bound API framework across several 3GPP functions. There is a single and harmonized approach for API development, with a number of 3GPP specifications on the work – to specify a framework to host APIs of PLMN and also to allow for third parties to leverage the CAPIF framework to host their APIs. So, main goal consists in allowing quick on-boarding for verticals, the Vertical Application Enablers for support for the creation of actual applications, including drones
- Provide suitable application layer APIs

5G!Drones consortium got involved and participated in discussions leading the writing of TR23.755. Nonetheless, the progress on this topic has been quite slow, mainly because this needs results from the SA2 study as input. Nonetheless, AIR has been particularly active in 3GPP SA6. The SDO suffered from COVID19 with cancelation of all 3GPP face-to-face meetings now conducted as e-meeting and with less but still stable and high-quality output. The work was mainly focused on completion of Rel-16. More and more new vertical industry service proposals are brought to 3GPP and among them drone services. 3GPP aims at avoiding past experience with specific features developed for niche markets and now privileges global approaches. Drone chapter is twofold: eMBB with regards to data captured by drones and URLLC with regards to their remote control. FS_UASAPP corresponds to Study on application layer support for Unmanned Aerial System. Active companies in the discussions are Interdigital, Tencent, Airbus, China Unicom, Huawei, DT, Vodafone, Samsung, Qualcomm, KRRI, Ericsson, CATT. Two outgoing LSs approved, both to SA1 asking clarifications. The first one (544) is asking whether SA1 defined a 1-to-1 or 1-to-N relation between a UAV-controller and UAV(s). TS22.125 has some internal misalignments on this issue. The second LS is a trickier one, asking clarifications on SA1 requirements that list a bunch of parameters delivered between UAV and UTM, most of them being
out-of-3GPP-scope. AIR has written two CR to SA1 referring to the above LS clarifying that these parameters are not visible to the 3GPP system.

2.3. GSMA

The GSM Association (Global System for Mobile Communications, originally GroupeSpécial Mobile) [9] represents the interests of mobile operators worldwide and gathers more than 750 operators and around 400 companies in the broader mobile ecosystem, including handset and device makers, equipment providers or internet companies.

The GSMA initiated a Drones Interest Group (DIG) to investigate the opportunity for mobile cellular connectivity to be deployed in commercial UAVs (4G and 5G). Orange provided comments to the White Paper on Remote ID being under preparation.

This current activity relates to Identity and Access Management Services in 5G!Drones. 5G slices are not yet in the scope of GSMA DIG.

2.4. GUTMA

The Global UTM Association (GUTMA) [10] is a non-profit consortium of worldwide Unmanned Aircraft Systems Traffic Management (UTM) stakeholders. Its purpose is to foster the safe, secure and efficient integration of drones in national airspace systems. Its mission is to support and accelerate the transparent implementation of globally interoperable UTM systems. GUTMA gathers various types of stakeholders starting from UTM companies, Drone Manufacturers, Aircraft manufacturers, CAAs, ANSPs and Airline. As a strong player in UTM world, GUTMA is working with FAA / EASA and SDOs to provide market driven recommendations and standards.

INVOLI has been a member of GUTMA since its incorporation, in 2017, as the association is the largest effort of its kind, gathering members from all over the world. INVOLI has always actively participated to all GUTMA meetings, presenting itself as “the bridge between the drone and telecommunication world”. It is thus how INVOLI gained interest in and became a supporter of 5G to unleash never-seen-before drone operations.

It is on these occasions that INVOLI met GSMA representatives within GUTMA, which further organized the first Connected Skies conferences (Portland, June 2019), where INVOLI was present and took the opportunity to introduce 5G!Drones Project to a maximum number of members. The Connected Skies conferences set the bases for the creation of ACJA (see next chapter), which focuses on promoting interchange and understanding between the aviation and cellular communities, the purpose being to enhance information sharing and avoid incompatibilities between those groups. Therefore, INVOLI has been one of the early promoters of a stronger relationship between drones and telecommunications.

INVOLI is also involved in the reviewing of various technical documentation prepared by GUTMA in their capacity as industry representative and answering requests from various bodies (such as the European Aviation Safety Agency, during relevant phases of the regulatory process). While details are mostly reserved for the members, INVOLI’s contributions to these documents always underlines the
importance of 5G for Drones and of the tests envisaged by 5G!Drones project whose results may become relevant for the standardisation activities undertaken by the industry.

2.5. ACJA

The ACJA[10] (Aerial Connectivity Joint Activity) is a result of the cooperation by the GSMA and the Global UTM Association (GUTMA). ACJA has many relevant members from the aviation and cellular industries as ACJA aim is to share views on how these two worlds can work most effectively together[11].

ACJA aims to create a common understanding between the cellular and aviation ecosystems. ACJA will particularly focus to promote safety from standards usage point of view. The motivation for this focus is that standards-based systems can benefit from more testing, data analysis, and experience than individual proprietary systems.

The cellular networks possibilities for unmanned traffic management (UTM) and aviation are studied in ACJA work tasks. There are 4 work tasks in ACJA:

- Work Task #1: Aviation coordination with 3GPP
- Work Task #2: Supplementary Data Service for coverage information
- Work Task #3: Standard Aviation Service Profile
- Work Task #4: MOPS and MASPS development for cellular

Here is a more detailed description of these four work tasks with similar objectives to 5G!Drones:

- WT1: 3GPP coordination with aviation stakeholders (led by Qualcomm), to clarify the interfaces between 3GPP and aviation and help steer requirements and input to 3GPP from the aviation community;
- WT2: Interface for data exchange between MNOs and UTM ecosystem (led by TEOCO), to establish how MNOs can support UTM service providers (spectrum use, risk management, safety, security, coverage, additional monitoring services, etc.). The architectures developed within 5G!Drones, as well as the different trials, could be reported to this WT;
- WT3: Definition of a cellular connectivity profile for supporting aerial services (led by Verizon), to unify the performance provided to drones by MNOs and describe the behavior of cellular equipment, thus allowing aviation authorities to certify cellular equipment with confidence and knowledge. So far, the aerial unified base profile is based on LTE, but 5G!Drones could propose features related to 5G.
- WT4: Translating Cellular to Aviation Standards (led by Glonass Union), to define Minimum Operational Performance Standards (MOPS) and Minimum Aviation Systems Performance Standards (MASPS) and document the performance of cellular networks in aviation terms, based on the outputs from the other WTs.

ACJA has been quite active since a few months and several key deliverables are expected by the end of this year. Participants include aviation stakeholders (many including **Airbus**, Uber, Wing…) MNOs (AT&T, Verizon, T-Mobile USA, Telia, KPN, TELSTRA, LMT, Vodacom, Telefonica, British Telecom, Drei and **Orange**), vendors (Ericsson, **Nokia**, Qualcomm, **Thales**…), UTM providers (many including Google, Verizon Skyward, Teoco, OneSky, **Involi**…) and airspace regulation entities (principally FAA, but also EASA and EUROCAE). 5G!Drones partners are highlighted in bold.
There is a monthly meeting for each WT and a general meeting every month.

Planned deliverables for ACJA:

WT 1
- Recommended contributions to 3GPP deliverables TR23.754 and TR23.755, the deliverables of the Study Items in SA2 and SA6.
- Document proposing how cellular networks and related services might support F3411 and future versions thereof.
- "Leveraging this Work Task’s decisions and that helps to better align ASTM with 3GPP and vice versa."

WT 2
- Document with architecture; list of logical messages; typical flows for message exchange for coverage information for C2 and payload (to the extent feasible).
- Provide examples of the usefulness of such data provided by MNOs to the various stakeholders a further deliverable may include a White Paper.

WT 3
- Aerial UNI Base Profile of 3GPP features.
- Set of service profile definitions and procedural definitions that gives a MOPS-level characterization of several options.

WT 4
Requirements that will feed into WT3
- Key parameters for small package delivery and to the extent possible UAM to create mature input into SDOs (e.g. RTCA)
- Initial work will support an update to RTCA DO-377A MASPS for new CONOPS and Use Cases that support use of MNO’s for Command and Control (C2) links
- "Use base profile input from WT3 as input into an SDO MOPS (equipment specification that a CAA would approve)"

5G!Drones partners (INV, Orange) are actively participating in ACJA's work since June 2020. 5G!Drones aforementioned representatives are attending the monthly’s calls and are giving the project view about Terms of Reference (TOR) the work Tasks described above.

Due to interest and synergies with 5G!Drones project, INVOLI has decided to participate in Work Task 2, which is covering among other things the aspect of sharing by MNOs the 3D coverage maps for communication services used by drones. This will facilitate certain things, which need to be considered by drone operators, like mission route planning and risk assessment related to loss of connectivity.

In relation to Work Task 2 and within the framework of 5G!Drones project, INVOLI has submitted comments to TS 22.125 “Unmanned Aerial System (UAS) support in 3GPP” and in relation to Work Task 1, INVOLI has submitted our comments for 3GPP liaison statement treating three aspects:
- Interfacing between USS and 3GPP mobile networks (minimising impact on USS);
- UAV and UAV Controller Model (pairing);
- UAV identification at USS level (use of Session ID).
Orange has presented in WT2 a mapping between industrial and cellular KPI.

2.6. IEEE

The IEEE ICC workshops have covered the following topics in previous years 2019-2020, highlighting key topics related to the integration of UAVs and 5G. These are[12]:

- Channel measurement and modelling for UAV-BS/UAV-terminal/UAV-UAV communication links
- Network architectures and communication protocols for UAV communications
- Spectrum management and multiple access schemes for cellular-connected UAVs
- Interference mitigation for cellular-connected UAVs
- Massive MIMO/millimetre wave communications for cellular-connected UAVs
- 3D aerial BS placement and online/offline UAV trajectory optimization
- Joint trajectory design and resource allocation for UAV communications
- Energy consumption model and energy supplying methods of UAVs
- Energy-efficient UAV communications
- Theoretical frameworks for the analysis of UAV communications
- System-level simulation studies of UAV communications
- Cyber security and physicals security of UAV communications
- Machine learning for UAV communications
- Experimental performance demonstrations, prototyping, and field-tests of UAV communications
- Standardization progress
- Economical frameworks for UAV communications, e.g., cost studies, business models, etc.
- Regulatory schemes for UAV communications, e.g., safety operation, privacy protection, etc.

2.7. CEPT/ECC

The ECC[13] (Electronic Communication Committee) is an autonomous committee of the Confederation of European Posts and Telecommunications Administrations (CEPT). The CEPT target is to harmonise telecommunication, radio spectrum, and postal regulations. One of the targets for the ECC is to harmonize the efficient use of radio spectrum in Europe. There are several working groups and project teams to deliver to the ECC’s “Decisions” and “Recommendations”.

The European Conference of Postal and Telecommunication Administrations (CEPT) has identified existing Mobile Fixed Communications Network (MFCN) bands as a potential means to provide connectivity to UAS via existing LTE mobile networks for command and control links. It is also evaluating the current regulatory framework for MFCN bands for this use case. One possibility for professional UAV applications is to use existing mobile MFCN networks to provide connectivity to UAS by usual (unmodified) mobile networks with LTE technology provided that the command and control link(s), where appropriate, meet the relevant aviation safety requirements prevalent in the country of concern. This can be realised either by an external LTE device attached to UAS or in future by implementing SIM-cards installed within UAS. Such a connectivity could be used both for serving the payloads such as video or other collected data via sensors and for the command and control function of UAS[14].

In Europe, there is a fast-growing demand to operate Unmanned Aircraft Systems (UAS) under beyond-visual-line-of-sight (BVLOS) conditions mainly for professional purposes. To enable this intended range of use cases there is the need for communication links between the UAS, its operator and an intended UAV Traffic Management (UTM) system. The purpose of the ECC Report nr 309 is to evaluate the use
of Mobile Fixed Communication Networks (MFCN) for the communication links of Unmanned Aircrafts (UAs) within the current MFCN spectrum harmonised regulatory framework for the different MFCN bands, including potential impact of such use on MFCN networks and other systems and services and possible regulatory considerations.

The intention is to use already existing MFCN BSs which are typically deployed to provide effective coverage at ground level. At this stage, mobile operators do not intend to develop specific network planning to respond to these new usages. Due to this, coexistence studies are mostly required for uplink due to the elevated position of aerial UEs. No specific studies are required in the downlink for non-AAS (Active Antenna Systems) base station, since the emissions characteristics are not modified. Studies in the downlink would only be required for the case of AAS-Base Station, where beam steering may lead to beam pointing above the horizon and may modify the emission characteristics\(^2\).

The final report ECC 309 is now completed, after a 6-month period for resolution of comments, and the final report of ECC report 309 on professional drones operation in MFCN networks has published in July 2019.

Based on this ECC report 309, an ECC decision on aerial UEs use in MFCN frequency bands will be developed by ECC-PT1 in 2021, but real measurements are still required in order to validate results of simulations in the report.

Two main issues will be discussed also when developing this ECC decision on drones: 1) How to manage non-fly zones; 2) additional unwanted emission limits for drones in some of the frequency bands in order to protect adjacent band services.

2.8. CEPT/ECC SE21

One of the ECC's working groups is the WGSE (Working Group Spectrum Engineering), which is taking care of developing technical guidelines for radio spectrum usage. Under the WGSE is a SE 21 - "Unwanted emissions and receiver characterisation" project team[15].

The SE 21 itself is not directly linked to UAS (Unmanned Aerial Systems) as such. However, there are studies and PoCs for using a UAS as a flying platform for 5G AAS (Active Antenna System) measurement instruments in the field as presented above figure. The SE 21 is studying the UAV usage as a potential platform tool to measure new 5G features like beam forming affect to TRP (Total Radiated Power) in AAS.

Currently there are no direct representative or contributor in SE 21 from 5G!Drones. The plan is to contribute for coming studies and reports related to UAS usage in TRP measurement with Nokia 5G!Drones members and tools.

2.9. ASTM

ASTM is a globally recognized leader in the development and delivery of voluntary consensus standards. INVOLI has been a member since 2019, being particularly interested in the participation to meetings of F38 UAS Committee, in charge with issues related to design, performance, quality acceptance tests, and safety monitoring for unmanned air vehicle systems.

INVOLI is specifically involved in the standardisation regarding supplemental data service providers (SDSP). In such capacity, it participated in the last meeting in November, 2019, in Raleigh, North Carolina, USA, where various UAS related aspects were discussed, including connectivity and how to ensure its continuity and redundancy.

Related standards preparation is ongoing and INVOLI participates to weekly meetings of related Working Group 69690 meeting since 8th of January 2020. As of 19th of August, INVOLI’s CEO, Manu Lubrano, is co-leader of the Working Group and, in this capacity, he participates to separate strategic discussions and planning meetings, also held weekly.

The SDPS standard aims at defining minimum performance requirements for SDSPs, equipment, and services to UAS Service Suppliers/Providers (USS/USP) in a UAS Traffic Management (UTM)

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“Proof of concept drone measurements in the field – trial flights at test range” Page 4.
ecosystem. The SDSPs will provide aircraft track information to Detect and Avoid (DAA) systems to enable Beyond Visual Line of Sight (BVLOS) UAS operations.

The working group and the standard are referencing to the main documents existing throughout the industry, such as, without limitation, (simplified reference for the purpose herein): JARUS SORA package or ASTM Remote ID standard, as well as UTM standard or DAA standard respective working groups. As such, INVOLI is also part of the DAA standard Working group 62668 and UTM standard Working group 63418.

2.10. ETSI MEC

The ETSI Industry Specification Group (ISG) on Multi-access Edge Computing (MEC) is active since its opening meeting on 2nd December 2020 in Munich DE. It is dedicated to creation of standardized and open framework for efficient and seamless integration of IT service and cloud-computing capabilities at the edge of the mobile/wireless network based on various radio access technologies. The developed environment is intended to offer proximity, ultra-low latency, high bandwidth and standardized way of real-time radio network and context information exposure to hosted applications. The point is in opening the Radio Access Network (RAN) edge, i.e. the nearest point to mobile customers, to authorized third-parties. This way various use-case driven applications and services towards mobile subscribers, enterprises and vertical segments will be deployed in the way which will be optimal for flexibility and time-to-market targets. The range of use cases covers artificial intelligence, augmented reality, video analytics, location services, IoT, optimized local content distribution, data caching or offloading the network terminals (UEs) from extensive data processing and computation to have a gain on batteries capacity – clearly the use cases of very high relevance and importance for UAV applications.

Initially, during the Phase 1 (2014-2018) the scope and also name of the group was focused on Mobile Edge Cloud, i.e. integration of edge cloud concept with the 3GPP network, namely LTE. With the Phase 2 (since 2018, currently on-going) the group has been refocused and renamed to cover various radio access technologies. Additionally, the DECODE Working Group has been created to facilitate the ETSI MEC-compliant applications implementation path for operators, application developers and vendors by providing application development tools and environments such as implementation of standardized ETSI MEC APIs to be used by MEC applications, testing and compliance framework and sandbox. The efforts of the ETSI MEC ISG are not only around development of normative specifications, informative reports, white papers or application development toolboxes. By hosting Proof-of-Concept (PoC) and MEC Deployment Trial (MDT) environments as well as running Hackathons the concept is promoted in the telco and IT markets.

The integration of the telco and IT-cloud domains in RAN undertakes the challenge of provisioning a common environment both for mobile network connectivity and hosting the applications/services on top of this network to bring the benefits of being near to the customer, receiving local RAN conditions information, tapping into local content, reshaping the mobile network architecture for more efficient use of resources and mitigation of its overloading. Moreover, the architectural design of the unified environment should be harmonized and consistent, without functional gaps or overlaps, and include also other fundamental concepts like virtualization or network slicing as well as the 3GPP vision of the mobile network development. The initial view of MEC framework architecture, based on hardware nodes, has later been aligned with ETSI NFV architecture (which is still under development to accommodate containerization technology). The topic of MEC framework slicing awareness and compatibility is still under studies (both by ETSI MEC ISG, see: ETSI GR MEC 024, and outside) and various proposals of the harmonized architecture can be found.
2.11. ETSI Smart BAN

The ETSI SmartBAN Technical Committee is responsible for standardisation to support the development and implementation of Smart Body Area Network (BAN) technologies (Wireless BAN, Personal BAN, Personal Networks etc.) in health, wellness, leisure, sport, and other relevant domains. This technology uses small, low power devices to support a range of medical, health improvement, personal safety and wellbeing, sport, and leisure applications. Lately, there has been activities in expanding the work to also cover machine bodies, which can be better served by recent extensions of the Technical Specifications (TSs), including Hub-to-Hub communications and connectivity guarantee by relay communications. A Hub is a BAN coordinator entity and by enabling Hub-to-Hub communications, multiple BANs can not only co-exist, but to coordinate and share information.

The SmartBAN technology is a viable option for inter-drone communications, especially for drone swarms. The currently ongoing relay communications specifications also aid in guaranteeing BAN connectivity with devices that occasionally move out of direct radio communications range of their respective hubs.

UO has been an active member of the SmartBAN Technical Committee since its foundation. It is the rapporteur for the medium access control related Work Items. UO has been one of the major contributors in the development of the Technical Specifications and it is active contributing into amending the standard for additional versatility and usability in new domains. UO is also making patent applications related to the SmartBAN developments.

The 5G!Drones representative of UO, Jussi Haapola, in ETSI SmartBAN occasionally attends the standardisation meetings. He is very active in innovating and refining the technical contributions to be proposed for SmartBAN development. During the 5G!Drones project he has been UO internally actively contributing to the inclusion of the Hub-to-Hub communications mechanisms to the TSs. He has also been one of the main innovators in the currently ongoing relay connectivity addition to the TSs, and he is one of the inventors in the patent application “Method for establishing relay connectivity in ETSI SmartBAN”.

2.12. IETF DRIP

In spring 2020, the IETF[16] launched a working group, called Drone Remote ID Protocol (DRIP), co-chaired by Orange. Mostly based on the ASTM standards, DRIP’s goal is to specify how Remote ID can be made trustworthy and available in both Internet and local-only connected scenarios[17]. Several documents are expected by the end of 2020 – beginning of 2021. First, an informational document is under preparation to list technical requirements for UAV identification and show new or adapted identifiers from existing protocols meeting these requirements. Second, a standard document will be proposed to describe the related architecture and third, protocols will be extended or designed, based on the work done during the two previous items. Specifications will need to balance public safety authorities’ need with UAS operators’ and other involved parties’ privacy.

So far, DRIP primarily leverages work started in the Host Identity Protocol (HIP) working group. HIP protocol was proposed to build a trusted unique identifier on the top of server IP addresses and to provide the community with a standard for exchanging this identifier securely. However, the current version of DRIP mostly focuses on Broadcast Remote ID and on the US perspective. Orange provided comments to put more emphasis on Network Remote ID and on the European vision.

2.13. BNAE
The Bureau de normalisation de l’aéronautique et de l’espace (BNAE) is a standard body for standardization in the field of Aeronautics and space construction[19]. The BNAE has an AFNOR (Association Française de Normalisation) delegation for establishing standards. The BNAE has been supporting experts in the development of national and international standards since 1941. It is dedicated to:

- Take part in the production of standards following French, European, and international processes;
- Guide experts in their standardization choices;
- Support experts through technical secretariat and watch activities.

The BNAE abides by:

- Openness - Standardization works are open to all interested parties;
- Consensus - Consensus is a general agreement, characterized by the absence of sustained opposition by any important part of the concerned interests;
- Transparency - Sufficient up-to-date information is issued in order to enable any interested group to participate;
- Balance - A balanced repartition of interests within working groups is essential.

2.14. Drone REGIM

At the RPAS CivOps 2019 conference in Madrid, Spain on 23 & 24 January 2019, the conference delegates agreed on the formulation of the «Madrid Declaration», which indicated that, in the context of the new European Union (EU) drone regulation, and with the objective to contribute to European Union harmonization relative to the implementation of the EU drone regulation on a national level, the representatives of the European drone communities present at the conference agreed their intent to endeavour to coordinate, cooperate, and share knowledge & experience.

Drone REGIM is a drone community action launched by UVS International to contribute to the harmonization of the national approaches in the EU Member States relative to the implementation of the new European drone regulation. It consists of the following 5 Focus Groups (FGs) and 13 Working Groups (WGs): [20]

- Focus Group 1 - Training & Qualification & Using SORA
  - WG 1.1 - Training Operators in the Use of SORA
  - WG 1.2 - Drone Operations Manual
  - WG 1.3 - Flight School & Examination Qualification
  - WG 1.4 - Specific Category Drone Pilot Training & Licensing & Examination
  - WG 1.5 - Making Professional Drone Pilot an Officially Recognized Profession
  - WG 1.6 - Open Category: Online Pilot Training & Examination
  - WG 1.7 - Safety Rules for Training / Test / Validation / Demonstration Sites

- Focus Group 2 – Operations
  - WG 2.1 - UTM / U-Space Implementation & U-Space Service Provision & Air Navigation Service Providers (ANSPs)
2.15. 5GPPP activities

5G!Drones project joined the 5G PPP Pre-standardization WG in 2019. Serge Delmas, Airbus DS SLC expert, 5G!Drones WP5 leader and 5G!Drones T5.2 standardizations activities leader is 5G!Drones representative in this working group. The WG has specific goals that can be summarized as:

- Collect and monitor inputs from the family of 5G PPP projects across the three funding phases to relevant standards bodies, e.g. 3GPP, ETSI, IETF, ITU, IEEE, and several industry associations,
- Influencing pre-standardization on 5G and related R&D: Potentially propose where topics should be standardized; Influence timing on R&D work programs (e.g. EC WPs). Foster the development of globally harmonised standards,
- Tracking progress towards EU priority topics as defined by the EC (Unit E1),
- Identify gaps to be targeted in future funding programmes,
- Develop a roadmap of relevant standards. Inputs from projects are tracked in a regularly updated file,
- Collaborate with other WGs and Task Forces (TF) as required, e.g. forthcoming white paper of the 5G PPP Architecture WG on relevant standards, as well as the Verticals TF and a recently formed TF with selected market representation partners attending 3GPP WGs.

The WG is constantly following standardization activities and keeps updated a document that tracks the status of this activity, document that was made available to all 5G!Drones consortium members in a shared folder within the project website. This WG organized the “3rd 5G Vertical User Workshop” on the 5th May 2020 (online workshop due to COVID19 situation), and 5G!Drones attended the workshop (the announcement is depicted in Figure 5). This 5G Vertical Users Workshop, as an initiative of a subset of European 3GPP Market Representation Partners (MRPs), is designed to help vertical industries become part of the standardization process, create new synergies and obtain guidance from 3GPP by exchanging on future needs and upcoming standards developments.
The WG has organized as well a Webinar on “5G Spectrum for Industry Verticals” on June 18th 2020 (the announcement is shown in Figure 6), and 5G!Drones has attended it and shared with the ecosystem the outcomes of the workshop.

Finally, the 5G!Drones Standardization Manager has submitted to the Pre-Standardization WG the information requested by Riccardo Trivisonno, working group manager, for tracking SDOs impact for 5GPPP projects to be integrated in the Standards tracking tools that the workgroup is promoting.

Also, CAF participates in 5G-PPP Automotive Working Group since 2019 November. In September 2020 5G-PPP Automotive WG prepared new version of the ToR and this WG:

- Collect and analyse outcomes from relevant 5G-PPP projects as well as other global projects and initiatives on V2X research solutions and results, including various transportation means.
Facilitate consensus building on the 5G automotive roadmap strategy. The 5G Automotive WG contributions and input towards standardization will only take place in collaboration with the pre-standards WG and Spectrum WG.

Provide support to the projects and other WGs in V2X and transportation related aspects. Foster collaboration between projects on the aspect of overall 5G system – to 5G automotive system.

One important and critical topic for 5G!Drones project is how to organize Drone-to-Drone communication via 5G to avoid and prevent collisions and coordinate routes. In 5G-PPP ecosystem the Automotive WG is the most relevant for that (V2X researches). By ToR of September 2020 the Automotive WG deals with all automated transportation (incl. cars, trucks, UAV-s, buses etc.).

Automotive WG held weekly meetings and CAF contributes by inputs from UAVs and UGVs.

Finally, 5GDrones participated in the “5GPPP workshop 5G Trials in Europe – 5G Experimentation Facilities and Vertical Trials” Webinar. The workshop attracted almost 100 participants. It was organised by the Institute of Informatics & Telecommunications of the Greek National Centre of Scientific Research “Demokritos” (NCSRD) in the framework of 5G PPP infrastructure project 5GENESIS, which they are coordinating, and 5G PPP vertical use case project 5G!Drones. The main goal of the workshop was to present the recent developments of the 5G experimentation facilities of the three 5G PPP infrastructure projects and the vertical trials by the 5G PPP use case projects. To complete the 5G picture, the workshop also featured presentations by projects under the Horizon 2020 topics ‘Secure Societies’ and ‘5G Long Term Evolution’, showing 5G trials related to first responder teams and discussing future perspectives of 5G. 5G!Drones project coordinator presented the UAV trials plan and the experiments executed so far. The full webinar has been recorded and the video sessions are available online.

2.16. FAA

The FAA (Federal Aviation Administration)[18] is founded 1st of April 1967. There is a long history in US aviation for government actions to improve and maintain safety standards before FAA. The aviation history of plane collisions highlights the need for air traffic control. Those historical lessons are integrated to FAA’s mission: “Our continuing mission is to provide the safest, most efficient aerospace system in the world”. The impact of FAA activities related to UAS is monitored in the framework of 5G!Drones. As we said earlier, there is a close connection with GUTMA in which some 5G!Drones consortium members are key contributors.

2.17. SESAR JU

What is SESAR JU?

As the technological pillar of Europe’s ambitious Single European Sky (SES) initiative, SESAR is the mechanism which coordinates and concentrates all EU research and development (R&D) activities in ATM, pooling together a wealth expert to develop the new generation of ATM. Today, SESAR unites around 3,000 experts in Europe and beyond. In 2007, the SESAR Joint Undertaking was set up to manage this large scale and truly international public-private partnership.[22]

Purpose & Vision of SESAR JU
Air traffic management (ATM) is an essential part of European air transport and aviation, connecting cities and people citizens as well as boosting jobs and growth. Europe’s ATM system is based on ageing technology and procedures and needs updating particularly considering the expected traffic growth between now and 2035. This is where SESAR comes in. As one of the most innovative infrastructure projects ever launched by the European Union, SESAR’s role is to define, develop and deploy what is needed to increase ATM performance and build Europe’s intelligent air transport system. 

SESAR’s vision builds on the notion of trajectory-based operations’ and relies on the provision of air navigation services (ANS) in support of the execution of the business or mission trajectory — meaning that aircraft can fly their preferred trajectories without being constrained by airspace configurations.

Relation to 5G!Drones Project
In ATM, for both manned and unmanned traffic management, one of the most important piece of the puzzle is the connectivity and communication between the various entities involved. Ensuring that there is coverage available, low latency in communication, and high range and bandwidth to enable successful BVLOS operation for various verticals, etc. are some of the factors considered by SESAR JU as a part of the roadmap. All of these factors have a direct and significant relationship and dependency on the 5G!Drones project.

Strategy
The 5G!Drones project has a lot to exchange with the SESAR JU community. The architecture, results from trials and feasibility tests, etc. add value to the discussions within SESAR. These will be shared with the SESAR JU members during meetings and presentations. In return, SESAR JU underlines the technical requirements for ATM/UTM operations. Attributes such as timeliness, reliability, latency, traceability, etc. are defined and structured by SESAR in coordination with EASA, ICAO & EUROCONTROL. These attributes will be considered by the 5G!Drones Project consortium as a part of technical requirements while designing various subsystems.

Representing Member
From the 5G!Drones project consortium, Robots Expert (RXB) will participate in SESAR JU meetings, conferences and other appropriate dissemination channels. RXB will also bring valuable information and insights from the SESAR JU meetings. One of the working groups within SESAR JU is the Strategic Research and Innovation Agenda (SRIA). The SRIA will set out the objectives for what needs to be achieved in terms of ATM and U-space research and innovation throughout the Horizon Europe funding programme (2021-2027), complementing the initial partnership proposal and the ATM Master Plan 2020.

Meetings & Contributions
1. 6th of July, 2020 - SESAR 3 Strategic Research and Innovation Agenda – Workshop
RXB participated in the workshop and exchanged information about the 5G!Drones project, and provided feedback and insights on the roadmap for UTM, U-space, use of AI, data connectivity and other relevant topics 
2. 8th of September - CMSC workshop - SESAR 3 SRIA workshop
Feedback and comments provided by various members were discussed in detail and presented to the CMSC and SESAR JU officials.
Next Steps
SESAR JU will conduct workshops, meetings and conferences periodically and as a member, RXB will participate and contribute to all the events.

2.18. NASA

What is NASA AAM?
NASA’s vision for Advanced Air Mobility (AAM) is to help emerging aviation markets to safely develop an air transportation system that moves people and cargo between places previously not served or underserved by aviation – local, regional, intraregional, urban – using revolutionary new aircraft that are only just now becoming possible. AAM includes NASA’s work on Urban Air Mobility.[23]

The primary purpose of the AAM ecosystem working groups is to share input, information and opinions that may help to accelerate the development of safe, high-volume AAM flight operations in the existing and anticipated future national airspace system. A broad participation from many organizations will enable NASA, the Federal Aviation Administration (FAA), and the AAM community to supplement the existing efforts in the industry, focusing on understanding the viewpoints of a diverse group of stakeholders and an understanding of the ecosystem as a whole. The AAM ecosystem working groups, in coordination with the National Campaign series, industry developments and other ARMD efforts, will contribute to the enablement of AAM markets.

NASA seeks to accomplish the following goals:
• Communicate the current and future state of the AAM ecosystem and align on terminology, challenges, barriers, and solutions.
• Provide a forum to forge collaborative opportunities to advance the state of the art AAM, including establishing new industry partnerships.
• Increase awareness of NASA’s research and planned transition paths.
• Develop a NASA-curated “Book of Requirements” for AAM technology, systems, and operations.
• Support discussions of regulatory and standards development activities at the federal, state, and local level.
• Inform the community on the current state of the industry to identify research gaps and areas of highest industry need.
• Engage the public on AAM, including stakeholders from state and local governments.

Relation to 5G!Drones Project
Any conversation related to Urban Air Mobility would be incomplete without touching upon the topics of connectivity, reliable communication and integration of various systems and subsystems across the ecosystems. Hence, the relationship of the AAM initiative to the 5G!Drones is absolutely critical and intuitive.

Working Groups
1. Aircraft Working Group
2. Community Integration Working Group
3. Airspace Working Group
Representing Member
RXB has been actively participating in all the NASA AAM working groups and exchanging information between the 5G!Drones Project and the AAM ecosystem. Furthermore, RXB is also advising NASA on SORA, and other relevant safety assessment methods, topics related to autonomy, connectivity and communication. RXB will continue to participate in the meetings in the future as well.

Meetings and Contributions
1. On the 22nd of October 2020, RXB is giving a 90 minutes presentation to exclusive technical members from NASA SWS team. The presentation will cover SORA, U-space and insights from 5G!Drones project.
2. Between the 23rd of March and 1st of September, NASA AAM organized 21 meetings and workshops. RXB participated in these events at various levels and contributed by providing comments, feedback, and sharing information about the 5G!Drones project activities and technical information.

Next Steps
RXB will continue to be a technical member of the working groups and contribute to various activities as and when required.

2.19. EUROCAE

5G!Drones consortium has identified as relevant EUROCAE monitoring and will follow activities related to WG-105 dedicated to UAS. Here is an extract from their website[24]:

WG-105 is tasked to develop standards and guidance documents that will allow the safe operation of UAS in all types of airspace, at all times and for all types of operations.

The work of WG-105 is organised in six Focus Teams working in a specific area. The current Focus Areas are:
- UAS Traffic Management (UAS)
- Command, Control, Communication (C3)
- Detect and Avoid (DAA)
- Design and Airworthiness Standards
- Specific Operations Risk Assessment (SORA)
- Enhanced RPAS Automation (ERA)

The work of the Focus Teams is coordinated by a Steering Committee ensuring consistency across their developments.

WG-105 works in coordination with RTCA SC-228 for Unmanned Aircraft Systems.
2.20. EASA

5G!Drones consortium is also taking into account for next trials inputs from outcomes of EASA activities. In particular, rules published last April[19]:

The European Union Aviation Safety Agency (EASA) has published the first view worldwide on the use and control of drones in an urban environment, balancing the desire to maximise the commercial and convenience benefits of drones against the need to ensure the safety and privacy of citizens and the potential environmental impact on our cities.

The challenge of integrating drones into urban environments is that these areas are already densely used by ground traffic, other types of air traffic – such as commercial airplanes, other civil aviation and police or hospital helicopter services – and also people, concerned about noise, privacy and the possibility of low-level flights causing accidental injury.

2.21. ASD-STAN

During this first period, 5G!Drones consortium was also following activities achieved within ASD-STAN body and reported relevance for taking into account some inputs like 8/30379527 DC BS 9129. Unmanned aircraft systems (UAS). Registration and identification[20].

2.22. ISO

ISO/TC 20/SC 16, Unmanned Aircraft Systems, was formed in 2014. Its scope is the following: Standardization in the field of unmanned aircraft systems (UAS) including, but not limited to: Classification, Design, Manufacture, Operation (including maintenance) & Safety Management of UAS operations[21].

ISO has consolidated reputation in the fields of safety and quality and published widely accepted certification mechanisms. Several working groups with assigned work items are defined within ISO TC/20 SC/16:

- WG 1: General: his Working Group specifies general requirements for UAS for civil applications in support of other standards created within ISO/TC 20/SC 16. 5G!Drones consortium has identified as relevant:
  - ISO/CD 21384-1, Unmanned aircraft systems -- Part 1: General specification
  - ISO/CD 21384-4, Unmanned aircraft systems -- Part 4: Vocabulary
  - ISO/CD 21895, Categorization and classification of civil unmanned aircraft systems
    - Published February 2020.

- WG 2: Product manufacturing and maintenance: This Working Group specifies the quality and safety requirements for components of unmanned aircraft systems (UAS) to influence the design and manufacturing process.
  - This group is focusing on the individual components that comprise a UAS to further operational safety.
  - The standards will include information regarding components associated with the unmanned aircraft, any associated remote control station(s), the command and control
5G!Drones is interested in the evolution of two work items:

- ISO/CD 21384-2, Unmanned aircraft systems -- Part 2: Product systems
  - 3rd Committee Draft (CD) ballot closed in April 2020.
- ISO/WD 24356, General requirements for tethered unmanned aircraft system
  - At Working Draft (WD) stage, in development.

**WG 3: Operations and procedures (including training)** This Working Group details the requirements for safe commercial UA operations and applies to all types, categories, classes, sizes and modes of operation of UA. It develops international standards that detail the requirements for safe civil RPAS/UAS operations. More specifically, the working group aims to provide international quality standards for operational safety and applies to all types, categories, classes and sizes and modes of operation of UAS. Work items:

- ISO 21384-3, Unmanned aircraft systems -- Part 3: Operational procedures
  - Published November 2019; revision initiated.
- ISO/DIS 23665, Unmanned Aircraft Systems -- Training of Operators
  - DIS ballot opened 12 MAR 2020; close date 04 JUN 2020.
- ISO/NP 5015-1, Operational procedures for passenger-carrying UAS
  - Proposed standard out for ballot; closed 26 April 2020.
- ISO/NP 5015-2, Operation of vertiports for unmanned aircraft (UA)
  - Proposed standard out for ballot; closed 26 April 2020.

**WG 4: UAS Traffic Management:** WG4 scope consists in establishing international standards and guidelines in the area of Unmanned Aircraft Systems Traffic Management. The standards and guidelines are to be developed aligned with the rules and guidance provided by aviation authorities. Work items identified:

- ISO TR 23629-1, UTM - Part 1: General requirements for UTM -- Survey results on UTM
- ISO/WD 23629-5, UTM — Part 5: UTM functional structure
  - Approved as working draft; in development.
- ISO/CD 23629-7, UTM – Part 7: Data model for spatial data
  - 2nd CD ballot to be sent spring 2020.
- ISO/PWI 23629-8, UTM — Part 8: Remote identification
  - Preliminary Work item proposal in development.
- ISO/23629-12, UTM — Part 12: Requirements for UTM services and service providers
  - Approved as working draft; in development.

**WG 5: Testing and evaluation:** Testing and evaluation of UAS for safety and quality of product.

- ISO/AWI 4358, Test methods for civil multi-rotor unmanned aircraft system
  - Approved January 2020; in development
- PWI TR 4595, Suggestion for improvement in the guideline for UA testing classification
  - Preliminary work item proposal under development.
- PWI TR 4594, UA wind gust test
  - Preliminary work item proposal under development.
- PWI TR 4584, Improvement in the guideline for UA testing/design of accelerated lifecycle testing (ALT) for UAS/Sub-system/components
  - Preliminary work item proposal under development.
2.23. LAANC

LAANC is the Low Altitude Authorization and Notification Capability, a collaboration between FAA and Industry. It directly supports UAS integration into the airspace, that's why it was revealed as relevant within 5G!Drones to better understand its role. [28]

LAANC provides:

- Drone pilots with access to controlled airspace at or below 400 feet.
- Awareness of where pilots can and cannot fly.
- Air Traffic Professionals with visibility into where and when drones are operating.

Through the UAS Data Exchange, the capability facilitates the sharing of airspace data between the FAA and companies approved by the FAA to provide LAANC services. The companies are known as UAS Service Suppliers – and the desktop applications and mobile apps to utilize the LAANC capability are provided by the UAS Service Suppliers (USS).

LAANC automates the application and approval process for airspace authorizations. Through automated applications developed by an FAA Approved UAS Service Suppliers (USS) pilots apply for an airspace authorization.

Requests are checked against multiple airspace data sources in the FAA UAS Data Exchange such as UAS Facility Maps, Special Use Airspace data, Airports and Airspace Classes, as well as Temporary Flight Restrictions and Notices to Airmen. If approved, pilots can receive their authorization in near-real-time.

Unless specifically requested in an authorization, drone pilots do not need to notify the tower before they fly.

LAANC provides airspace authorizations only. Pilots must still check Notices to Airmen, weather conditions, and abide by all airspace restrictions.

2.24. ARC

The Federal Aviation Administration (FAA or the Agency) chartered the Unmanned Aircraft Systems (UAS) Identification (ID) and Tracking Aviation Rulemaking Committee (ARC) (UAS-ID ARC) to provide recommendations to the FAA regarding technologies available for remote identification and tracking of UAS, which will be a crucial topic when implementing 5G!Drones use cases. This was used as a basis for the FAA proposed rule on Remote Identification.[29]
ARC reports for available technologies for UAS remote ID tracking identified eight viable technologies for UAS ID tracking: Automatic Dependent Surveillance Broadcast (ADS-B); Low Power Direct RF; Networked Cellular; Satellite; SW-based Flight Notification with Telemetry; Unlicensed Integrated C2; Physical Indicator; and Visual Light Encoding.
3. 5G!Drones Plans Regarding Next Contributions to Standardization and International Fora

3.1. UO

For ETSI SmartBAN the current action plan is to agree on the format in which both Hub-to-Hub communications and relay connectivity will be included in the Technical Specifications. The currently open Work Item allows either the direct amendment of the medium access control base TS or creation of a dependent TSs. This item is currently under negotiation as it has a significant impact on how future amendments of the SmartBAN TSs will be managed. The technical contributions have been presented, but may still require some modifications when writing them to the TSs. The work in the near future will focus on writing the contributions in TS technical format and moving on the process to have the TSs accepted by the TC.

3.2. THA

In the future, THA will carry on with their work following 3GPP standardization, focusing on the Work Items listed in section 2.1.1, and other specifications of interest regarding 5G!Drones research activities. THA will watch closely the outcomes of the upcoming meetings and analyse the different documents resulting from these discussions.

At the time of the drafting of this document, the next meetings THA will be interested in are the following:

- RAN3 #110-e (Online) 2020-11-02 to 2020-11-12 for RAN3 Working Group
- RAN2 #112-e (TBD) 2020-11-16 to 2020-11-20 for RAN2 Working Group
- RAN #90-e (Online) 2020-12-07 to 2020-12-11 for RAN Technical Specification Group

3.3. ALE

ALE is part of two Standard Organizations focusing on drone technologies and operations, namely the BNAE (Bureau de Normalisation de l'Aéronautique et de l'Espace) and the Drone REGIM initiative by UVS-International. The current works of these organisations are on producing or commenting standards that can include a wide range of technologies and operations, as well as producing elements to help in this process. Currently there exists no draft standard specifically applicable to drones using 5G.

Alerion will check that the work in 5G!Drones is compatible with the drafts of publicly available UAV standards. If this is not the case, ALE will propose changes to the standards.

ALE will keep an eye on any specific standard on 5G technologies for drones that may be initiated and will provide comments accordingly.

3.4. INV
INVOLI plans to actively participate to the regulatory and standardisation works within organisations mentioned below.

- As the standardization efforts within GUTMA in general are more at a political level (this may include, for example, the formal point of view of the association on proposed regulations in its field of activity), INVOLI is planning on continuing being active and proactive within the association, which is achieved by holding a seat in the Board of Directors until June 2022 and being part of the relevant working groups.

- We will participate in ACJA monthly general meetings and Work Task 2 meetings, submit our contribution to the documents produced in Work Task 2 and submit our comments to the other documents presented by ACJA. For the moment the foreseen time schedule is till the end of 2020, when some documents need to be delivered.

- In its capacity as co-leader of the SDSP standard working group 69690 within ASTM, INVOLI will continue its work until such time as the standard will have been officially issued, which is scheduled for the beginning of 2021.

- Additionally, INVOLI will remain part of the ASTM DAA standard Working group 62668 and ASTM UTM standard Working group 63418, until the standards will have been officially issued.

### 3.5. AU

AU has been checking if there are suitable standards groups on UAVs within IEEE Standards Association, and could not find any. They will keep looking if the situation changes.

Regarding IEEE CSCN, unfortunately, the 2020 edition got cancelled due to the ongoing COVID pandemic situation. The 2021 edition may take place in Greece in Oct-Nov 2021. Once this becomes public, they will share the info with the partners encouraging them to consider submitting their scientific publications there.

### 3.6. AIR

AIR will mainly focus on the 3GPP Release 17 and the associated working groups and work and study items, among which:

- **Study items**
  - FS_MCOver5GS - Study on Mission Critical Services support over 5G System which is the core study items to evolve the critical collaboration platform to support drones in 5G.
  - FS_UASAPP - Study on application layer support for Unmanned Aerial System (UAS), study item in direct line with 5GDRONES objectives.
  - FS_enhMCLoc - Study on location enhancements for mission critical services
  - FS_FFAPP - Study on application layer support for Factories of the Future in 5G network
  - FS_EDGEAPP - Study on Application Architecture for enabling Edge Applications
  - FS_eV2XAPP - Study on enhancements to application layer support for V2X services
  - FS_5GMARCH - Study on support of the 5GMSG Service
3.7. NOK

In the framework of 5G!Drones, in 3GPP SA2 NOK is currently working on below study item «Study on supporting Unmanned Aerial Systems Connectivity, Identification, and Tracking (TR 23.754)”. This study is trying to address following areas in Release 17:

- Mechanism for Unmanned Aerial Vehicles (UAV) controller and UAV(s) identification and tracking in the 3GPP system;
- How the 3GPP system can provide support for UAV to ground identification (e.g. to authorized third parties such as police devices);
- A mechanism to support UAV controller and UAV(s) authorization and authentication by UTM;
- A mechanism to handle unauthorized UAVs and revocation of authorization (e.g. lack of connectivity to carry the UAV command and control messages, denied registration, etc.) that enables the system to keep track of and control UAV(s).


3.8. RXB

RXB will go on contributing to the following organisms as 5G!Drones representative:

- ASTM F38 & F39, voting member
- RPAS Finland, Board Member
- SRIA, participating member
- NASA AAM, Technical member

3.9. EUR

EUR is a member of the ETSI and follows the activities of the MEC standardization group closely. In the past EUR has provided several contributions related to the MEC platform developed to demonstrate the MEC API proposed by the group. In the context of 5G!Drones, EUR envisions contributions related to its activities on the extension of the MEC model to support the deployment of LoRa-based IoT applications at the edge. This contribution, in general, allows an IoT vertical to deploy an IoT network slice at the edge, taking advantage of a low-latency and context-aware environment. In 5G!Drones we
allow the drones vertical to deploy two slices: one using LORA to send IOT messages, and another one uses 5G for the C2link. We have leveraged the Mp1 ETSI MEC interface to abstract the low-level configuration of end-devices and ease the registration of LoRa-based applications.

3.10. CAF

CAF plans to actively participate in field of to standardise D2D (Drone-to-Drone) communication and coordination. Therefore, CAF plans to participate to standardization bodies and organisations which deal intelligent transportation systems and V2X (Vehicle-to-Everything) protocols, communication and coordination standards and researches:

- 5G-PPP Automotive WG which is leader in the V2X communication and coordination field
- V2X EU regulation bodies
- European partnership on CCAM (Connected, Cooperative and Automated Mobility)

3.11. OPL

OPL representatives are involved in the works of ITU-T SG13/Q21 and IETF in the domain of network slicing, integration of various architectural frameworks as well as orchestration and management of softwarized communication networks. In particular, the area of interest for OPL includes the following topics:

- Intelligence capability for network slice management and orchestration;
- Classification of network slice level;
- AI-based network slice management and orchestration;
- Local shunting for MEC.

3.12. ORA

In the framework of 5G!Drones, Orange will go on to contribute to the 3GPP SA2 study item «Study on supporting Unmanned Aerial Systems Connectivity, Identification, and Tracking (TR 23.754)”, especially on the follow up of the ‘replacement of UAV controller of a UAS’ solution. The Study is expected to end in December 2020.

Orange will also contribute to the follow up of activities at IETF DRIP on Network Remote ID. The follow up of the work on KPI will take place in a survey within ACJA WT2.

Regarding ECC-PT1, Orange plans to achieve measurement tests in a real environment in 4G then in 5G, regarding interference MFCN frequency bands, in order to contribute to the ECC decision on aerial UEs use as the next step of the ECC report 309.

Finally, Orange will still contribute to GSMA Drone Interest Group.
References


