SESAR Academy - U-space Webinar session (28 and 30 April) - Questions and Answers

During the three webinar sessions, participants posted a series of questions some of which were answered by speakers in writing (see below). If you attended the session and you do not see your question answered, please feel free to inform us at communications@sesarju.eu

Question	Answer
What do ATCOs think about providing tactical conflict resolution to drones in controlled airspace (CTRs)? Have they been consulted?	Although live trials on those services (procedural interface with ATM and collaborative interface with ATM) were performed in DOMUS (with ATCOs) and in SAFEDRONE (totally focused on activities around airports), a lot of work needs to be done. How a highly automated system as U-space interacts with ATM?
Recently ICAO recommended to not use ADS-B for very low level UAS. It is affecting manned aircraft range. What is future technologies for this, which can also integrated into ATM displays ?	ATM will need to receive U-space surveillance no matter what its source. Some work is needed to understand the quality (uncertainty, latencey...) of this information and hence determine what the ATCo can do with it.
How can the System detect manned A/C and circumnavigate them? e.g. Emergency Helicopters?	Both U-space systems were connected to the live information from LVNL
Did you use geo-fencing or geo-caging technology? if yes, with which results?	Both, apologies for the brief mix-up during my explanation. If the drone approaches a given distance from the border of either cage or fence, he receives an alert. The supervisor also receives an alert, first in orange to warn a drone is approaching the wrong area and then in red when it is too close
Ellen - You stated that several UTM Providers are integrated -- who has the final authority over the respective airspace?	Every authority has the control on its respective airspace. The BCAA has the final word for complex flights by blocking a flight if SORA is not ok
To Pablo: Which U-Space services can be safely delegated in your opinion?	For me, those dealing with the mission and flight planning preparation are the first ones that should be done by the U-space service providers. We can maybe think that this will not imply too much business for USSPs, but in the drones' business, I think this will not the case. The design of the mission and flight plans taking into account mission requirements, drones performances, weather provision... will be an essential
Who is responsible for U space within CTR? ANSP (TWR) or USSP?	Formally, the ANSP is responsible for everything in the airspace. But I do not envisage that a controller will be in charge of every drone. Changes are to come to give (delegate) some responsibility to some U-space provider.
Hi Ellen, Did you study any model of business for your tracking devices for final users? (e.g. service model, product model ? B2B2C ?,...) thank you!	Hi Alberto, in CLASS we used the Airbus tracker, I am sure Alexandre Piot could tell you more about the specs of the tracker. We at Unifly have our BLIP for tracking and e-ID, please do not hesitate to reach out if you would like more
Class project. What kind of technonogy your are using for tracking? Performances ?	Hi Blete, in CLASS we used the tracker of Airbus, Alexandre Piot can tell you more about the exact specs of their tracker.
Hello, all the presentation Shows Commercial use of drones. How will be drones integrated to U-Space which fly´s only for use of Hobby fly´s and which will be used only at Modell Airport area´s outside urban Areas and in a very limited and clear defined air space?	Hi Ludger, I invite you to look into the ConOps created by the CORUS project, they deal with leisure drones as well as commercial ones.
To Ellen You told us that your project focused on tactical de-confliction. But I did not see any slide beyond delivering a situation awareness.	Hi Michel, CLASS laid the groundwork for tactical deconfliction. You need detection and data fusion to determine and send out alerts based on the trajectory of drones .

Regarding the Tracker (Surveillance Data Processor) of CLASS, did you adapt an ATM Tracker or was it developed from scratch?	Hi Pablo, it was developed and created by Airbus, Alexandre Piot could tell you more no doubt!
Hi Ellen and everyone, about class what is it the modality to connect the UTM to ATM?	Hi Samuele, for CLASS the connection with manned aviation was out of scope. We looked at in the CEF projects, I am certain several other siblings also looked into it!
Sir what kind of processors used in Enaire drones........	I am sorry I don´t know these details, but please contact by mail and I will try to answer: psescalonilla@e-crida.enaire.es
In SAFEDRONE, I understand that the ADS-B uses GNSS position to feed the surveillance informacion. How is the integrity of the GNSS signal provided? If not, would it be interesting to have a measure of confidence in the GNSS signal?	I think it could be interesting, but I also think the requirement tof GNSS integrity would depend on the risk on the operation. If the operation os low risk, maybe it is not worth to ask for GNSS integrity
Easa has been publishing an opinion which suggests a common information service provider (CIS) in every u-space that is providing safety and security services and that should not be a USSP. Has a CIS been discussed in your project (except for ecosystem manager in DOMUS) and what is your opinion?	I think that the SJU reference architecture, including the example architectures from the VLD's are a good starting point. The way e.g. GOF was setup, the demonstrated FIMS was mostly about information sharing and very close to a CIS..
To Petr: did you consider the FLARM?	I tried to talk about it online - did it answered your question?
Thanks, but is there any initiative to define the role?	I would recomend to review TERRA material. THis project was totally focused on CNS technologies
Which technologies were included for the surveillance of the drones? Primary radar? ADS-B? Cellular mobile telephony? etc...	In CLASS, we used primary and holografic radar, in SAFIR we also used a 4G connection. We did not use ADS-B.
Is the data exchange with the ANSP's ATM system done solely through SWIM (yellow profile?)?	In VUTURA, we presented the U-space HMIs at the control tower. The controller needed to clear the flights of the drones through the U-space systems
To Antidio: what sensor are using in Safedrone to get the 3D map for safe navigation?	It is 3D LIDAR. Some models available on the market are VELODYNE PUCK or OUSTER
Do the drones transmit Mode S?	It very much depends on scope and size of the respective drone / drone operator, some do transmit. A significant part of trials and project report was around telemetry, coverage and the fusion of those various datasources - for sure worth to have a closer look at the outcomes on the SJU site.
Hello Henk. What has been the role of LVNL in these trials? Thank you very much.	LVNL provided the link to the radar feed with manned traffic & they participated to the demonstrations. We were lucky they would allow the U-space to be installed at the control tower
What are dimensions of dynamic geogence arround manned aircraft?	Manned aircraft was not in scope for CLASS, sorry!
As a former helicopter pilot, I experienced several times nap-of-the-earth flights (let me say VLL flights). Have you also tested such situation to detect helicopters during CLASS project?	Manned aircraft was not in scope for CLASS, sorry!
Did the CLASS system have any interaction with the flight controller or the autopilot?	No, we just received the information from the tracker and/or the primary radar.
Is the stated "Drone Operation Plan Processing" service the same as the service referred to as "Operation Declaration"? THank you in advance!	No. The Operation Declaration is part of the SORA timescale. The ere may be one Operation Declaration for several similar flights. The operation plan is a tool for strategic conflict resolution. It clearly describes one flight at a particular moment.
Do you plan to change the fact that CTR starts from ground according to ICAO?	volume

Ref: SAFEDRONE: are we considering "geofencing" an alternative to "detect & avoid" ?	Not exactly. Geofencing or dynamic No-fly zones could be seen as a way to improve safety but at a higher level than Detect&avoid. I see it more as a tactical level tool to increase safety. Also, take into acocunt that once the drone is in a No-fly zone, it will stop the operation and land.
Thanks, but there is nothing really relevant about using GNSS in TERRA	ok, sorry, I am not deeply involved in TERRA, my understanding is that they analysed the applicability of the different CNS
I also have question on integration with other technologies, also for aerial traffic in non-controlled airspace. E.g. gliders mostly use FLARM. Integration will happen in UTM, and how would you interact with these pilots?	Out of scope for CLASS but in another project SKYOPENER we integrated the flarm feed in our UTM! There we were able to see and integrate vehicles transmitting FLARM (gliders, balloons). Bear in mind that the connection back towards those pilots is another matter.
Amazing work Thomas, congratulations! Did you use a point-to-point link for video, C&C and surveillance information? Did you handle any Ground Control Station handover ? Thank you!	Please check the project report for details and a more comprehensive answer. It's been several links in use, mobile network, VPNs (connecting ground based servicse), ATM surveillance feeds, proprietary links, For the international flight there was ground control on both sides of the Gulf of Finland.
To Anastasia: Are the specifications for the U-Space services that were tested publicly available?	Please check with TERRA materials. For PODIUM all the materials collected are publicly available on the SJU website, please check: SJU PODIUM
GOF: Are the standards, APIS, ... publicly available an usable in other deployments?	Refering to Ludo's answer, they will be published on SJU site before summer. Especially for the service specifications (draft standard and logical APIs) we definitely would very much welcome reuse. (Please get in touch if it's more urgent).
For DIODE, why not use ADSB instead of a new broadcast capability	see answer provided by presenters.
What about Public acceptance evaluation in the different projects?	see answers from the presenters during the Q&A
What is the approach used to maintain drones safely separated by all other airspace users (VFR manned A/C, model aircraft and so on) especially in uncontrolled airspaces?	see answers from the presenters during the Q&A session
will we get any Information on the incorporation of GA, or is it assumed that there is no such Thing.	see answers from the presenters during the Q&A session
After these quite good presentations (today and the days before) what are the positions of the NAAS to endorse the next U-Space steps and when?	see the answers from the presenters during the presentation
What about the civil-military coordination during U-space operation ? Oleg Shupik	see the answers from the presenters during the Q&A
@EMPHASIS: do you think feasible in the short-term for network operators to commit on positioning service performances? I think this is key to understand under which circumstances 4G/5G can complement or be a back to GNSS, and thus mitigate certain risks.	see the answers from the presenters during the Q&A
On standardization, do you think that specific standards / guidelines for developing APIs for U-Space are needed? Or just material coming from other domains (e.g. telecom) is enough?	see the answers from the presenters during the Q&A session.
to all project: which technology did you use for tracking positioning, with which accuracy and latency	see the answers from the presenters during the Q&A.
How will you determine the capacity of Y or Z airspace?	see the answers of the presenters during the Q&A

Which technological systems or solutions are used to prevent collision with sailplanes, paragliders and GA entering U-space either by accident or because they are runningnof altitude (thermal liuft?) Regards Helmut	see the answers of the presenters during the Q&A.
What are the drone limitations regarding the atmospheric conditions ?	Small UAS are rather sensitive to wind and turbulence. Some are not very resistant to rain. Very few have de-icing. Most are powered by LiPo batteries that are rather temperature sensistive
We have a 'commercial' datasheet that defines some of the performance and capabilities of around 150 different drones but is there a definitive database available that provides drone performance data ?	Some reference is sometimes made to the AUVSI database, but I believe it is crowdsourced roboticsdatabase.auvsi.org/home
Hi Ellen, very interesting, thanks. Clearly, safety can only be guaranteed with full situational awareness. What requirements do you see for manned-aircraft - in particular light aircraft in VFR - to ensure safe coexistence in shared air space?	Thanks Timo! I would imagine a tracker, so either ADS-B or another type of tracker.
Did you identified in CLASS performance requirements for the positioning system (i.e. accuracy, availability, integrity and continuity)?	That depends on what you mean by "the positioning system". We took onboard the latency and architecture of the Unifly system.
So. This is primarily aimed at drones BUT I see it looks like it is planned to move this 'drone' infrastructure into Commercial flight operations..Both Cargo and Passenger?	That is an interesting idea. We may keep that at the back of our minds but for now we have to focus on VLL and sUAS..
What about the next steps aimed at creating an interface to ensure that drones do not have opportunity to enter forbidden zones and flight restriction zones?	That was not in scope for CLASS, sorry! There are several C-UAS solutions on the market, however.
Is GSM tracking accurate enough in type Y and Z airspace?	The capacity of the airspace will depend on the accuracy of the surveillance. The separation will consider the uncertainty. So the answer will depend on the level of demand to fly..
Is there a clear and defined role for GNSS? Is it used as an external service? Is there a Navigation service defined or going to be defined?	The CORUS U-space ConOps does not describe GNSS as a U-space service. However it is clear that GNSS has an important role in UAS navigation.
The matrix on pg. 13 of vol. 1 of ConOps refers to 2 seperate GeoFence techniques; Tactical & Dynamic (with Dynamic NOT mandated in Type Y). However, the table on page 15 just refers to "GeoFencing Provision, and says is mandated for all types of airspace. Can you explain the nuances to me please?	The dynamic form of geo-fencing is the creation of geo-fences at very short notice, for example to allow a helicopter emergency medical service.. This type of geo-fecne is communicated to the pilot via the Emergency Management Service in the short term. In the longer term the Geofencing Provison service will communicate such dynamic geofences
Are all these brochures available on the Sesa website?	the initial version of the brochure, the blue print and other documents such as principles for U-space architecture are downloadable from the sesarsju website
To Pablo: What was the responsibility of the "orchestrator"?	The orchestrator has the global picture of the drone traffic in an area and it is responsible for those services that require to have this global view and are impacting the safety of operations, specially during the flight execution. Those services that for us should be centralized by the moment are tactical deconfliction
What was the input based on which the system could compute a probability that something is a drone? Trajectory properties, maybe? Which ones?	The primary radar used trajectory properties, the holographic radar focused on the shape of the object. The Aveillant system uses algoritms based on doppler.
To Pablo: Thanks so much for your replies so far! I have another question: Is there any documentation available on the data model that you used for coupling the micro services in your federated architecture?	the project that was totally focused on micro-services was IMPETUS. We did four different experiments with four different designs by boeing, ineco, Jeppesen and Altitude Angel. Most of the material is public and available in the website. I think also

With which sensors was equipped your quad-copter?	The real time 3D map was obtained using information from 3D LIDAR (like VELODYNE PUCK or OUSTER). Then, the 3D LIDAR information was used to create a complete map of the environment using Voxel-based map techniques
For GOF: Is your system able to recognize the model flyer in rural aera?	The system realized by all partners is able to ádd information streams, yes. It needs a tiny bit of integration work, but, depending on context a GNSS or Volume could easily be achieved. It was demonstrated in one GOF Trial.
Do you intend to combine the tracking module with ADS-B or tranponder technology for cooperative data exchange with other drones or aircraft in the air?	The tracker in CLASS is Airbus' so Alexandre Piot is best placed to explain about their plans with them. In our UTM we have integrated various protocols, including ADS-B.
Good morning, thanks for the presentation. How do you ensure interoperability with military flights and more precisely how do you interface with the national air defence systems in case the QRA must be launched ?	The two layered approach we took, non technical service specifications with actual technical implementations tracing to them allows for interaction with more closed systems and information. A good amount of information processing was done in FIMS/CIS, This information processing could include near realtime transformation to make this information available to the
Was the 3D model post processed? Doesn't look fast enough for a real-time. also, is this the PX4 stack algorithm using the global and local planner for pose estimation?	The video was a illustration to show the functionality. The 3D model is obtained in real time, using a 3D LIDAR on-board the UAV. The position of the UAV was the one obtained by PX4, we then installed also an on-board computer on the drone with ROS to implement the local re-planning system.
Pablo, thank you for an engaging talk. You talked about automation and adaptive CNS performance. It seemed implicit that the navigation component was largely based on GPS/GNSS. Is there a concept for loss of GPS/GNSS performance?	There is a U-space service described which monitors navigation service performance. Another is foreseen to provide maps for navigation service performance
For GOF: What safety assurance was provided, particularly for use in urban areas or near airports?	There was weeks of preprations, incl. (but not limited to) SORAs, premits, setup of communication structures with ATC and other relevant organisations. For trials there was an "airboss" ensuring safe operations, partners guarding take off / landing sites. Especially the urban demonstrations quere quite a busy place, both partners and audience.
For GOF: please, could you explain a bit further the U-Space architecture you used? Thanks	There's more on the SJU website. In an nutshell: distributed where possible, hierarchical where necessary. Several USSPs where connected to one FIMS (naming in the context of the timeline, we started 2018), a registry was designed to clearly define who's operating where and responsible for which parts of the eco system. ATM was integrated using FIMS.
Why not Potugal and Irland ?	They were a lot of candidates and a limited budget....I cannot give the details but I'm pretty sure Portugal will be contributing to SESAR in a near future
For safedrone: What are dimensions of dynamic geofence arround manned aircraft? 500 m radius x 70 m height?	This dynamic geofence was bigger. But I do not rembember right now exactly the dimensions that we used for the project
From what I've just seen the manned aircraft either has to be ADSB equipped AND in ADSB coverage, OR have a radio AND be in contact with ATC. What work has been done to establish how many aircraft fly outside these criteria?	This is a good point. We did not study in detail the percentage of aircrafts that fit one of the criteria. Our approach was to test these two procedures, and then, it is true that it has to be ensured ADSB- coverage or radio coverage. Then, investment or studies should be performed to ensure these coverages (ADS-B or any other broadcasting technology or ATC radio)

Hi Ludo. Do you plan to organize a webinar to introduce the new batch of Exploratory & Research projects (once they are evaluated and awarded)?	this is our first experience with the webinar. Your idea is a good idea, we have to see what can be done or not. Together with the introduction of the ER4 we can as well disseminate the SESAR consolidated results. I take your idea and see internally to the
Did those projects have some influence over EASA Opinion on UTM services? Some of the architectures seem quite opposite to it.	This is true, and I think organizations will have some influence to find an intermediate solution
For Safedrone: How much time would a UAV pilot to react to incoming manned traffic? This kind of conflicts seems to evolve very fast.	This will depend on the parameter of the alert system of the U-space system. Our experience is that you will need at least one minute to properly react to this kind of events
For DOMUS: How was the data exchanged between the UTM and the ATM system	through a module developed by INDRA, that was DOMUS member, and it's the current ATM provider in Spain
For VRF flight, the rule is "see and avoid". How drones will apply this rule ?	Through U-space services until the S&A it's a reality and matures for drones
VUTURA: Why did you only use 2 Service-Providers? What is the Challenge to user more in such a demonstration?	Two scenarios were investigated: shared airspace where both USPs covered the same area & cross border situation where the USPs covered adjacent flight areas. We demonstrated connection between USPs concerning 1) flight plans, 2) tracking information and 3) no fly zones
How relevant is the provision of tailored meteorological services via e.g. SWIM (at later stage) in order to identify adverse weather conditions which can be a threat to drones ? Thanks.	Very relevant! We saw in CLASS and other projects that drones are very susceptible to harsh/sudden changes in conditions.
Hello Henk, what are the next steps? Are there further demonstrations planned?	We are happy to see this is taken up by Netherlands operators who are now further investigating B-VLOS LVNL is now in the first phase of deploying U-space We further investigate the use of priorities for drones
Did you address ADS-B spoofing issues?	In EMPHASIS we primarily considered that an independent positioning source - such as 4G/5G should be used to address potential spoofing.
How is unidentified intrusion planned to be dealt with? Some kind of U-space Police over sensitive/fordibben areas?	We integrated the radar data with the UTM system. Drones that are not connected to an authorized operation are shown in our UTM system as rogue drone (in red color). Also alerts were sent to the authorities. The police/port authorities have access to the same data so there is no time wasted looking for the drone from
What about the capacity of the de conflict systems if we are talking about the swarms of drones?	we need intelligent solutions. Not only having the drones do all surveillance & calculations, but optimise cooperation between U-space and the drones. For example: U-space has a good situational awareness (as all information on tracks/surveillance is avaiable). U-space should send the information on nearby drones to each drone. This means that no on-board detection is necessary! We demonstrated this scenario in VUTURA in Delft.
In SafeDrone project have you performed any preliminary Risk Analysis? If so was there still any outstanding safety issue?	We performed some SORA analysis and with the use of U-space, we obtain low SAIL. So, we did not find any additional

What kind of radar did you use and what do you do if it's a threat?	We used primary and holographic radar, used trajectory and the shape of the object. Aveillant's system also uses doppler ands has classification algoritms
This may have been mentioned, but could you further explain what criteria you use to deduce a drone as a 'threat?'.	We used primary and holographic radar, used trajectory and the shape of the object. Aveillant's system also uses doppler ands has classification algoritms. Given the critical area, we consider any drone a threat if it is not supposed to be there.
What about non cooperative drones??	What is your question about non-cooperative drones? They are picked up by the ground-based radar system and entered into the system that way.
I see collaborations with Boeing..Was Airbus interested in getting involved?	were part of our advisory board in IMPETUS and now we are initiating a collaboration with them to research into the Urban Air Mobility concept Further remark: Airbus are very active in UTM and U-space and have been onn the advisory board of several projects
Did you integrate any kind of non-cooperative antidrone sensor?	Yes, Aveillant provided ground-based holographic radar .
What is the positioning source on-board the cooperative drones? Does it use GNSS?	Yes, the Airbus tracker uses GNSS.
It would be possible to have access to deliverables produced by different U-space Projects?	yes, we are preparing the publication of the project technical reports deliverable before the summer together with the update of the U-space brochure
Did you use SORA for risk assessment for group of UAVs ?	yes, we used SORA. SAIL was 4 - the highest ever investigated and approved in The Netherlands
Is the system able to detect or gather info about manned A/C operating in VLL?	Yes, we were fully linked with information of manned traffic though the formal FLIGHT-API of LVNL (i.e. the radar feed)
To Antidio, using DAA, you said the flight plan was automiccaly changed to avoid the obstacle, please confirm you were talking about the trajectory instead of the flight plan.	Yes, you are right. The drone automatically changes the trajectory within the flight plan limits authorized by U-space. Thanks for pointing this out.
Is Switzerland part of U-Space?	Yes. Switzerland is a partner and an active contributor of the development of U-space. Not active in SESAR projects so far when at the same time we have exchanged a lot of information and experiences. Switzerland players have been part of SESAR working groups for the vision (blueprint) and principles for U-space architecture. finally, key players working in SESAR are as well working in Switzerland.
How to become partner of next projects?	you have to make a proposal to the calls when they are open. some are still open at the time of this webinar.