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# Network exposure APIs in 5G expand connected drone capabilities

How network exposure and service exposure APIs  
in 5G can dynamically boost drone quality of service.



In recent years, commercial drones have become increasingly crucial for business operations, solving such vital tasks as inspections and surveillance.

Ericsson and TDC NET—a mobile network provider serving Denmark -- jointly conducted pilot tests related to Beyond Visual Line of Sight (BVLOS) drone operations. The tests were in response to business requests prompted by recent (January 2023) EU regulations that imposed safety measures on Beyond Visual Line of Sight (BVLOS) drone operations.

Currently, drones are primarily operated within visual line of sight (VLOS) using short-range wireless communication. However, businesses are seeking solutions that offer reliable video transfer from drones while enabling remote operators to view

live footage. Many drone operators still rely on SD cards and on-site experts for data transfer and management of surveillance and inspection tasks.

Soon, however, cellular networks may enable real-time monitoring and control of BVLOS drone flights. TDC NET suggests that mobile operators can utilize 5G to support drone operations with communication services, managed connectivity, and contextual data via APIs.

To do this, layers of **Network Exposure APIs and Service Exposure APIs** in 5G will be needed to make it easier for third-party software developers to create more advanced drone solutions that can better utilize 5G connectivity. Network and service exposure APIs can facilitate use cases like connected drones and remote drone operation.

While the EU regulations require that a backup pilot be on the ground with a line of sight of their drone in flight and ready to take control of it, this restriction limits the scalability of drone operations within European countries.

Remote drone control would enable greater scalability and flexibility. But why have remote control if you still need a back-up pilot on site? These will be in effect two different jobs. The ground pilot won't have to be trained to conduct inspections of on-site structures, like windmills, power lines, towers, and bridges. Whereas inspection experts who are trained to inspect these objects can do so remotely by viewing real-time video as it's sent from the drone. With this more efficient approach, remote experts can conduct many more inspections.

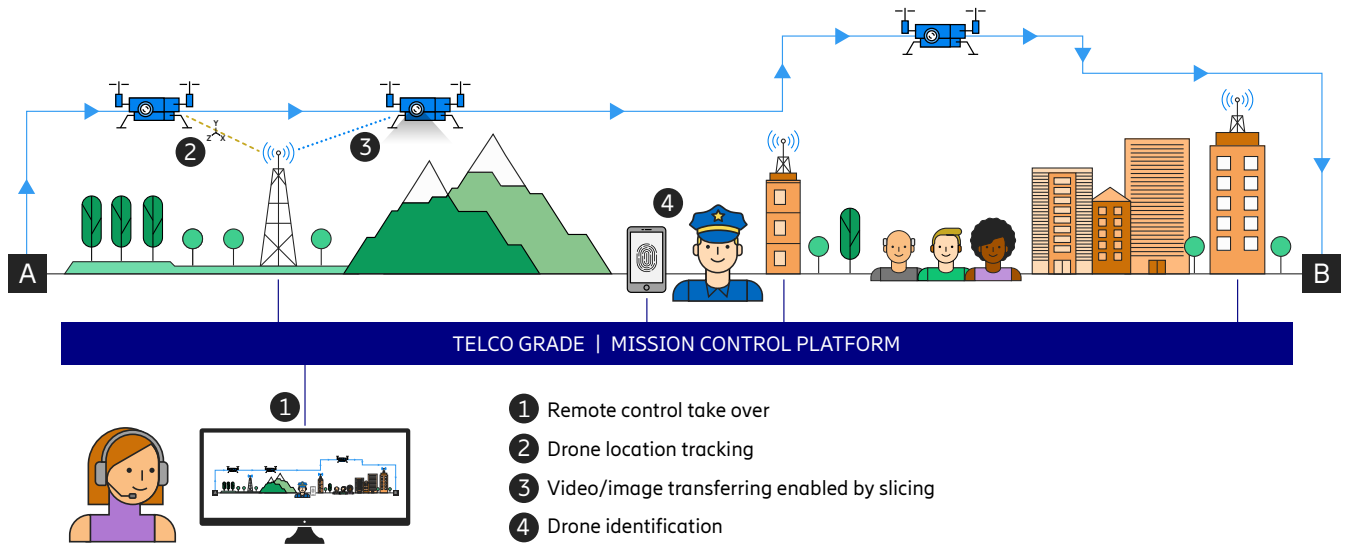


Figure 1: Remote drone control setup with a remote expert and local pilot

As shown in the graphic above, potential 5G applications include remote control of the drone, location tracking, video transfer via enhanced QoS or a dedicated network slice, drone identification and route planning to avoid crowded areas.

TDC NET partnered with Ericsson to jointly test service packages for their daily drone operations. This includes optimized drone connectivity, remote command and control, and video streaming.

Between February and May 2022, TDC NET and Ericsson ran a commercial pilot test harnessing the services of many companies, including: Norwegian media company TV2, engineering company Connect 44, which inspects cell towers, video production firm Open House and

Lorenz Technology, which conducts port inspections and manages security.

The Danish government envisions extensive drone use benefiting society and commercial interests, such as infrastructure inspection and environmental monitoring, through its 5G-enabled Communication Infrastructure for Unmanned Aerial Systems (GENIUS) project, exploring the potential of 5G networks for large-scale drone operations.

Network exposure plays a pivotal role in monetizing 5G capabilities by unlocking the full value of the drone services industry. That’s because it’s key to automating data flows and operating beyond the visual line of sight. This partnered pilot project will play a key role in evolving drone capabilities.

“It is exciting to now have drones flying and operating on our 5G network. This is an important milestone on our joint journey towards enabling drones to take on even more critical tasks solved autonomously.”

— Jakob Werner  
5G Innovation Manager  
TDC NET

# Using exposure of network APIs to improve video quality of service (QoS)

Exposure of network and service APIs in 5G can be used to dynamically control the Quality of Service (QoS) for individual drones. For example, a 5G network's bandwidth can be dynamically augmented or limited to a drone in flight.

In the demo, drone network QoS was upgraded or limited by the drone operators in real time in accordance with the mission's demands. Whenever greater bandwidth was required, a dedicated bearer (see graphic) was established with defined QoS to support a specific video streaming quality. The application-driven QoS request allows use of the network in an optimized way for specific sessions.

As the drone approaches its destination, the QoS can be increased to support detailed surveillance. In such cases, network resources can be prioritized for emergency services over normal traffic. During the tests run by Ericsson and TDC NET, the QoS for a drone user could be dynamically upgraded and downgraded virtually immediately. However, the real-time video stream improvement was slightly delayed due to the cache mechanism built into the video encoder.

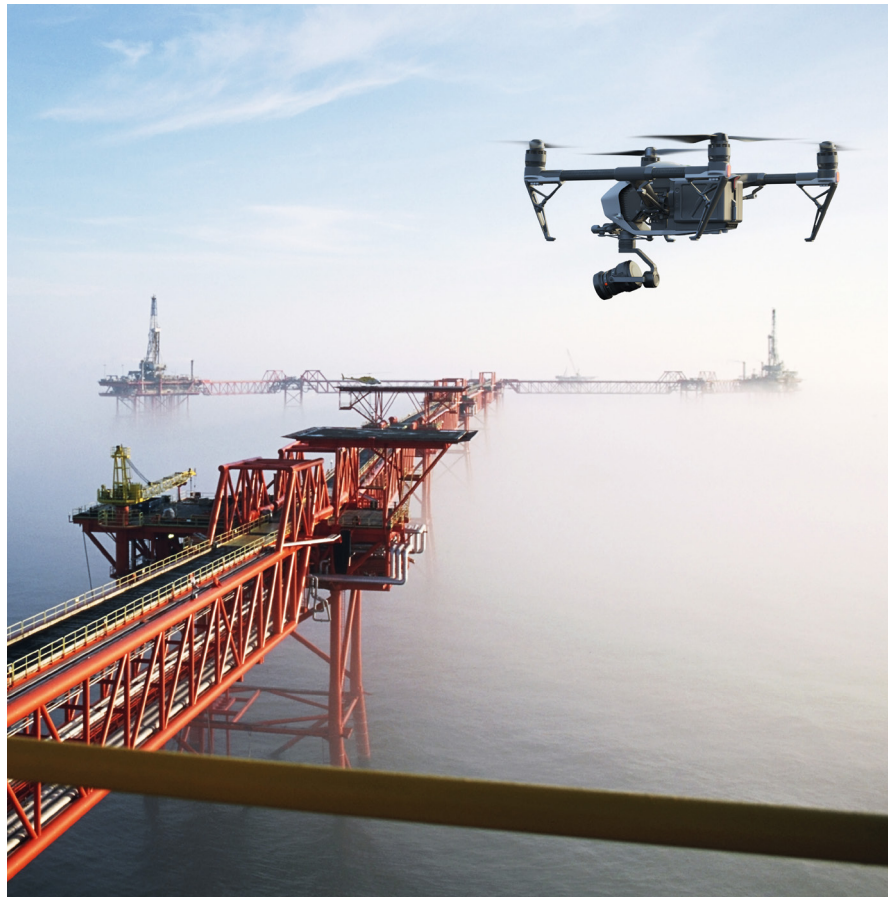
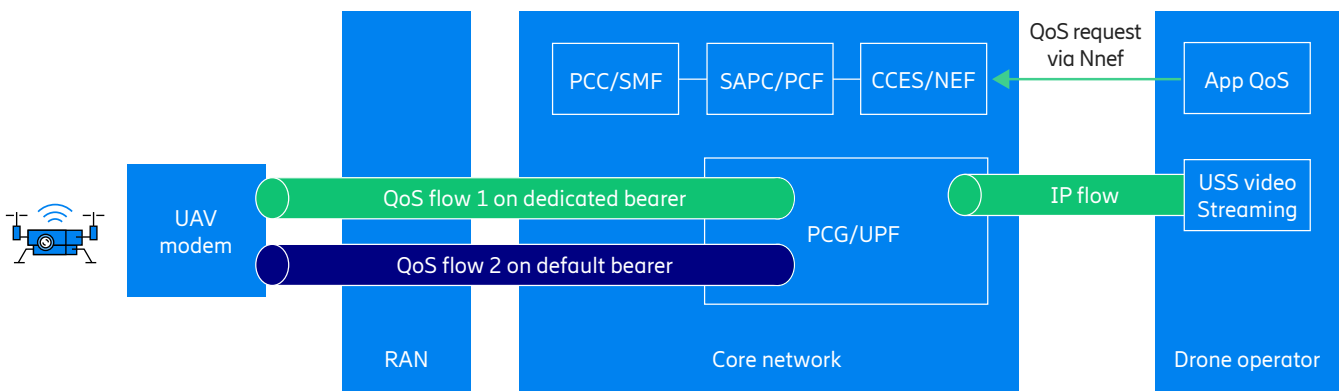


Figure 2: The drone control app can request a dedicated bearer for video transfer via an API towards the exposure function in 5G core.



# What is required in the 5G network?



Ideally, the CSP should have a 5G SA (standalone) network in place with a 5G Core that includes the NEF (Network Exposure Function). Ericsson includes this in the Cloud Core Exposure Server (CCES). The benefit with CCES is that it not only aggregates network APIs from many parts of the network nodes but also converts

them into CAMARA standardized network service APIs that can be used by third-party application developers.

In the future, network slices will be a very good way to secure the differentiated connectivity for a premium service necessary to allow for enhanced video capture from the drone. 5G core also

includes 3GPP standardized functions like NSSAI to enable the setup of slices to guarantee a higher bitrate for the video stream from the drone. The drone can be equipped with a 5G modem and a SIM card. This type of slice can be used for different types of video capture like live TV video capture and surveillance cameras.

# How is this operated and monetized?

For this PoC (Proof of Concept), we chose to use standard commercial drones, which are not currently equipped with 5G modems. Therefore, a good solution would be to connect the hand control of the pilot on the ground -- who must be there for regulatory reasons -- to a 5G mobile or access point.

The remote pilot accesses the drone via an app in the cloud that can access the drone via APIs that can be provided by either the CSP directly or via API aggregators like Vonage. The APIs in this demo PoC were used to authenticate the remote pilot as well as invoke improved QoS for the video when it was needed.

## There are multiple monetization models possible for CSPs:

1. Enterprise or drone application provider pays per usage of the quality (QoS) boost duration.
2. Enterprise or drone application provider pays per API call.
3. Enterprise or drone application provider pays for a bundle of connectivity and API service.
4. Enterprise or drone application provider has revenue share with CSPs
5. Enterprise or drone application provider pays aggregator and aggregator buys wholesale on APIs from multiple CSPs in multiple countries.



## Conclusion

The use of 5G SA and network exposure APIs will enable differentiated connectivity for premium services for new revenue streams for CSPs and others in the ecosystem who need optimized connectivity for innovative services, such as connected drones. Even as further regulations become established, this use case will likely see significant future growth thanks to network and service exposure APIs making 5G capabilities broadly available.

## About Ericsson

Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans Networks, Digital Services, Managed Services, and Emerging Business and is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's investments in innovation have delivered the benefits of telephony and mobile broadband to billions of people around the world. The Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

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