Drones’ operation and generated communication traffic

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Current Intel drone offerings

Drone Global Advocacy and Awareness

Encouraging safe and collaborative drone usage, policy and regulation

Safety

Protection of people and property

Efficient use of airspace and radio spectrum

Standardization

Global harmonization is key

UAS Operation

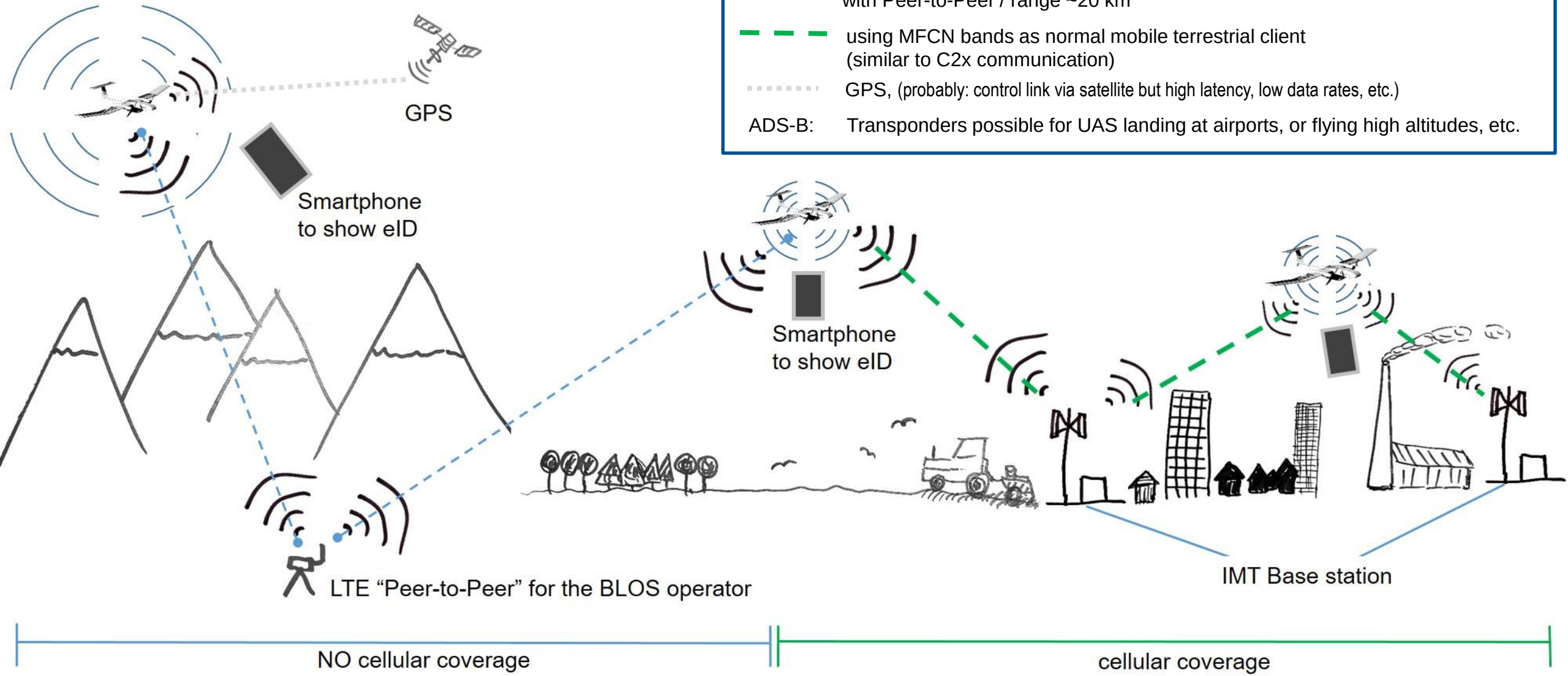
eID / Remote-ID using Bluetooth / beacon (BLE) / broadcast only / position and UAV-ID (250m/1km range)

Point to Point connection using MFCN bands with Peer-to-Peer / range ~20 km

using MFCN bands as normal mobile terrestrial client (similar to C2x communication)

GPS, (probably: control link via satellite but high latency, low data rates, etc.)

ADS-B: Transponders possible for UAS landing at airports, or flying high altitudes, etc.



Small, <25kg weight, commercial drones, flying <150m

Data traffic of UAS operations

#	Communication type	Description	Connectivity	Requirements	Possible data transfer rates
1.	**Beacon – eID**	Identification (+sense & avoid)	Bluetooth	high reliability low bandwidth	~1k Byte/s
2.	**Air Traffic Control**	UAS Traffic Management Together with networks e.g. Phoenix & Asterix	MFCN bands (2G/3G/4G/5G modems) ISM bands (WiFi modems @ 2.4 & 5 GHz)	high reliability (Separate LTE modem)	~1k Byte/s
3.	**Command & Control**	Flight operation		high reliability low latency low bandwidth	~4k Byte/s
4.	**Payload**	Data transport on fly		high bandwidth	~100 Mbit/s – 1Gbit/s (net)
5.	**Satellite**	Positioning	GNNS	accuracy	N/A
6.	**Detect & avoid**	radar, visual, eID, etc.	e.g. ISM bands + tbd	tbd	tbd

MFCN: Mobile/Fixed Communication Network
ADS–B: Automatic Dependent Surveillance - Broadcast

Impact on MFCN networks

Examples for possible issues:

1. Avoiding connection with many BS
2. Ensuring handover from BS to BS
3. Ensuring coverage of air space
4. Roaming between the MNOs

In case of no connectivity the automated flying system must ensure design safety level according to e.g. RTCA DO-178 and DO-254

RTCA, https://de.wikipedia.org/wiki/Radio_Technical_Commission_for_Aeronautics

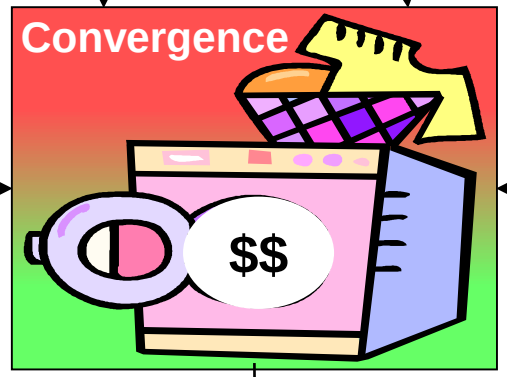
DO-178B, Software Considerations in Airborne Systems and Equipment Certification, https://en.wikipedia.org/wiki/DO-178B

DO-254, Design Assurance Guidance for Airborne Electronic Hardware, https://en.wikipedia.org/wiki/DO-254

Evolution of MFCN Spectrum Management for Verticals

Now: Spectrum assignment – service specific

- **Broadcasting bands:** AM, FM, DAB, DVB-T
- **Cellular bands:** 2G, 3G, 4G, 5G, etc.
- **ISM bands:** Wi-Fi, WiGig, BT
- **Dedicated bands:** ITS, UAS, PMSE, PPDR, PMR, PAMR, etc.



Applications: Video, Voice, Data

Technologies: OFDM Radio, IP-Protocol, Network Slicing & Virtualisation

- **Coverage** Bands < 1 GHz
- **Coverage/Capacity** 1 GHz < bands < 5 GHz
- **Capacity** 5 GHz < bands

Future: MFCN bandwidth assignment – demand specific

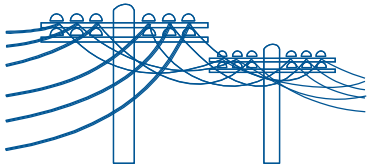
UAS require access to MFCN bands like other terrestrial verticals

Automobile industry

1886 – first motor car

Telecommunication

1844 – first telegraph line



Conclusions

- Emerging industrial verticals like UAS are game changer
- UAS can easily use MFCNs, they do not need dedicated bands
- UAS require access to MFCN bands like other terrestrial verticals
- Regulations and policies should be adapted to satisfy the verticals' needs

DISCLAIMER

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration.
No computer system can be absolutely secure.
Check with your system manufacturer or retailer or learn more at https://www.intel.co.uk/content/www/uk/en/drones/drone-applications/commercial-drones.html?wapkw=drones.

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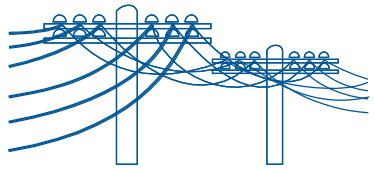
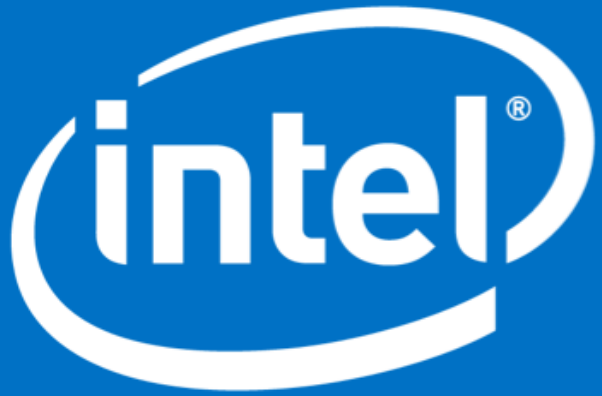


Q & A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