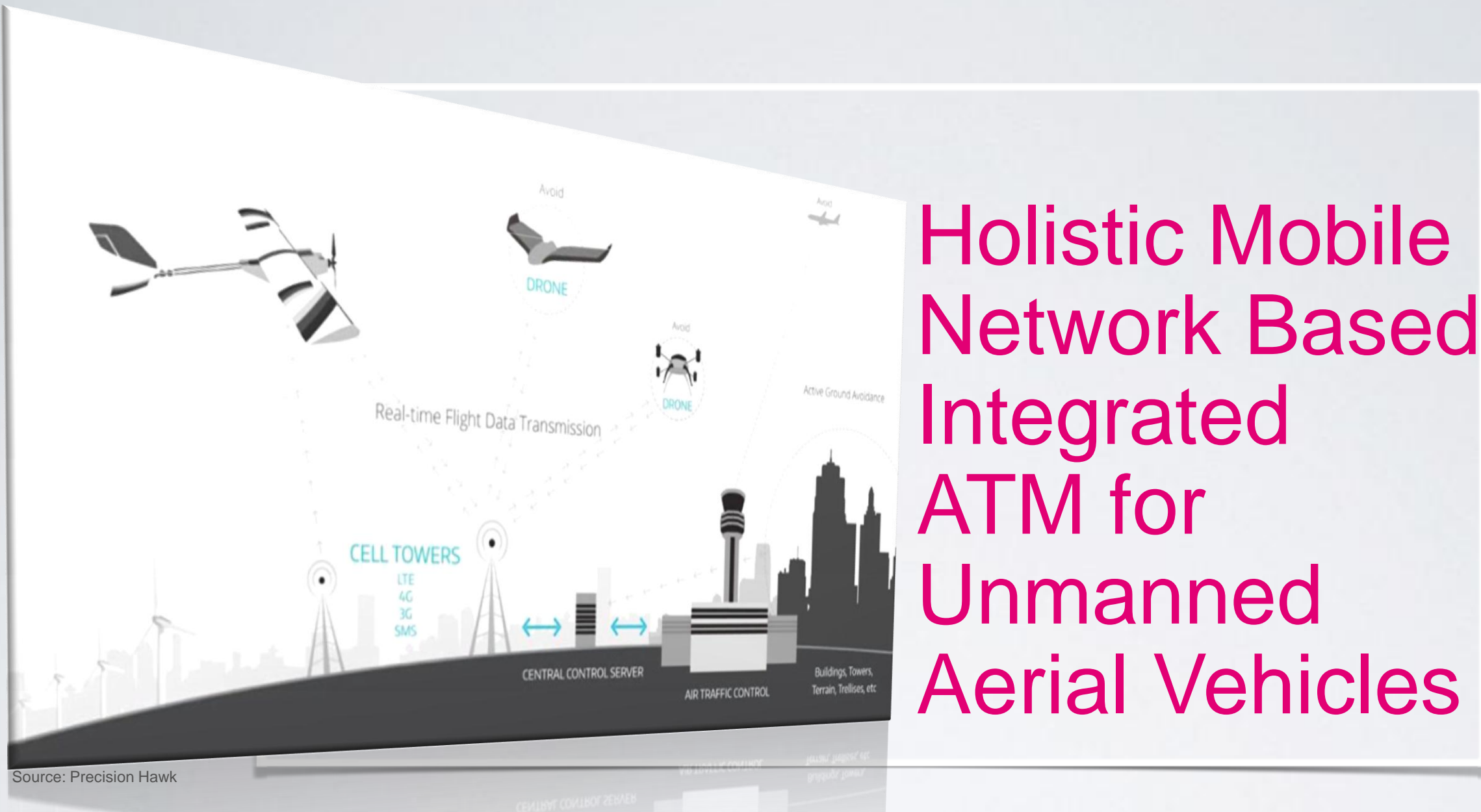




8th Air Forum Florence  
Disruptive Technologies in Air Traffic Management  
-- Mobile Communication Challenges in ATM --  
Florence October 21st, 2016 Andreas Lassak





# Holistic Mobile Network Based Integrated ATM for Unmanned Aerial Vehicles

Source: Precision Hawk

ASPIRATION



ERLEBEN, WAS VERBINDET.

# How can mobile communication networks be the next C<sup>2</sup>/C<sup>3</sup> platform for ATM?

LATENCY

LOCALISATION

DENSITY

CONNECTIVITY



SECURITY

SAFETY

## Challenges

## LOCALISATION

- Radar → too expensive
- GPS → not precise enough
- NetRTK → high investment
- Onboard measurement
  - Use Existing Infrastructure
  - NB-IoT triangulation → 2D
  - Barometric Altitude → 3D

## CONNECTIVITY

- C<sup>2</sup> and C<sup>3</sup> requirements are different and similar
- Flexible Multiconnectivity Secure Data Transmission
  - Primary → GSM
  - Secondary → NB-IoT
  - Backup → Overarching Next Gen. Network



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## LATENCY

- Requirements to be refined
- Is < 20ms roundtrip safe enough?
- Stability prerequisite
- 5G → Quantum Leap
- LLC → Low Latency Comp./ Edge Cloud Comp.

## DENSITY

- Mobile Netw. → Shared Media
- Future → Terrestrial + Air
- 5G + NB-IoT → 10 x Higher Density  
→ Scalability
- Spectrum → Separate Traffic

## SECURITY

- Data Storage
- Encryption (vs. Latency)
- Edge Computing
- Data Analytics
- Intrusion Detection & Prevention
- Back-up

## SAFETY

- Technology and Rules
- C2 / C3 through mobile networks
- OnboardSense & Avoid
- V2V Communication
- Backup Emergency Operators
- Intelligent Fly Zone / Corridors
- Integration with segregated air space



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Dziękuję  
谢谢  
Go  
Obrigado  
Teşekkür  
Pakka  
Grazie  
dankie  
Dankewol  
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Paldies  
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Terima kasihzz  
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