Bittium's view on 5G

Requirements, opportunities and challenges in critical wireless communications

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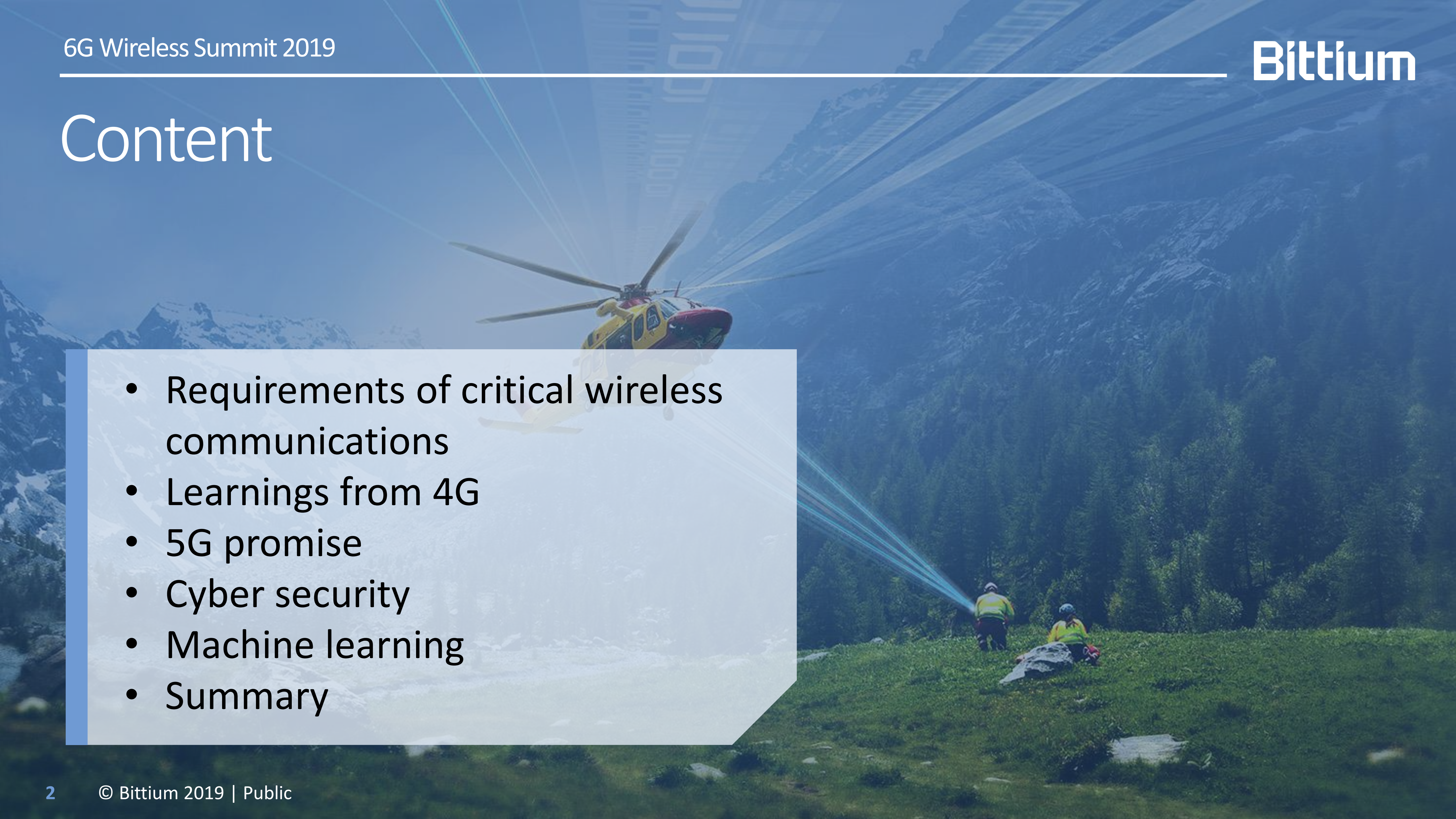
Content



- Requirements of critical wireless communications
- Learnings from 4G
- 5G promise
- Cyber security
- Machine learning
- Summary

Critical Communications

Tactical Communications

- Communications for command and control (C2) applications, sensors and real time situation awareness in tactical operations
- Specialized tactical waveforms
- MESH topology
- 4G/5G utilized as a backhaul and as a complementary solution

Public Safety Communications

- Communication and situational awareness for police, fire fighters and rescue officers in field operations
- TETRA based solution utilized, operational ~2030
- 4G/5G based solutions emerging, operational in ~2022

Secure Communications

- Governmental institutions and enterprises
- Requiring higher level of certified security in mobile communications

Key Requirements

Tactical Communications

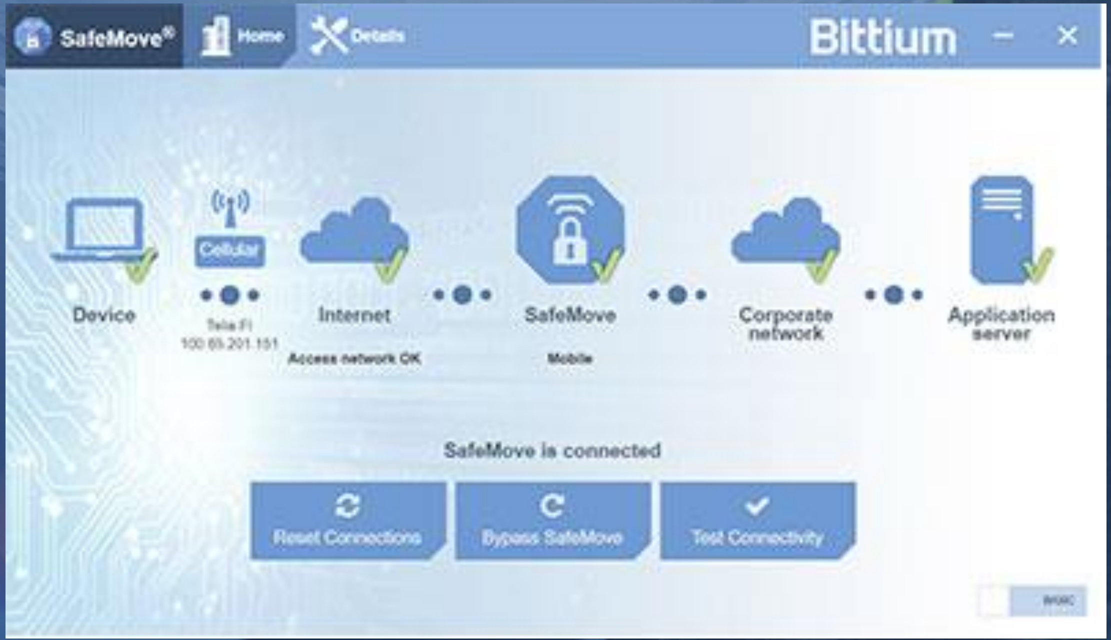
- Rapidly deployable, secured MESH network
- Resilient with respect to strong and intentional interference
- Solutions need to be as flat as possible
- Interoperability with legacy military radios

Public Safety Communications

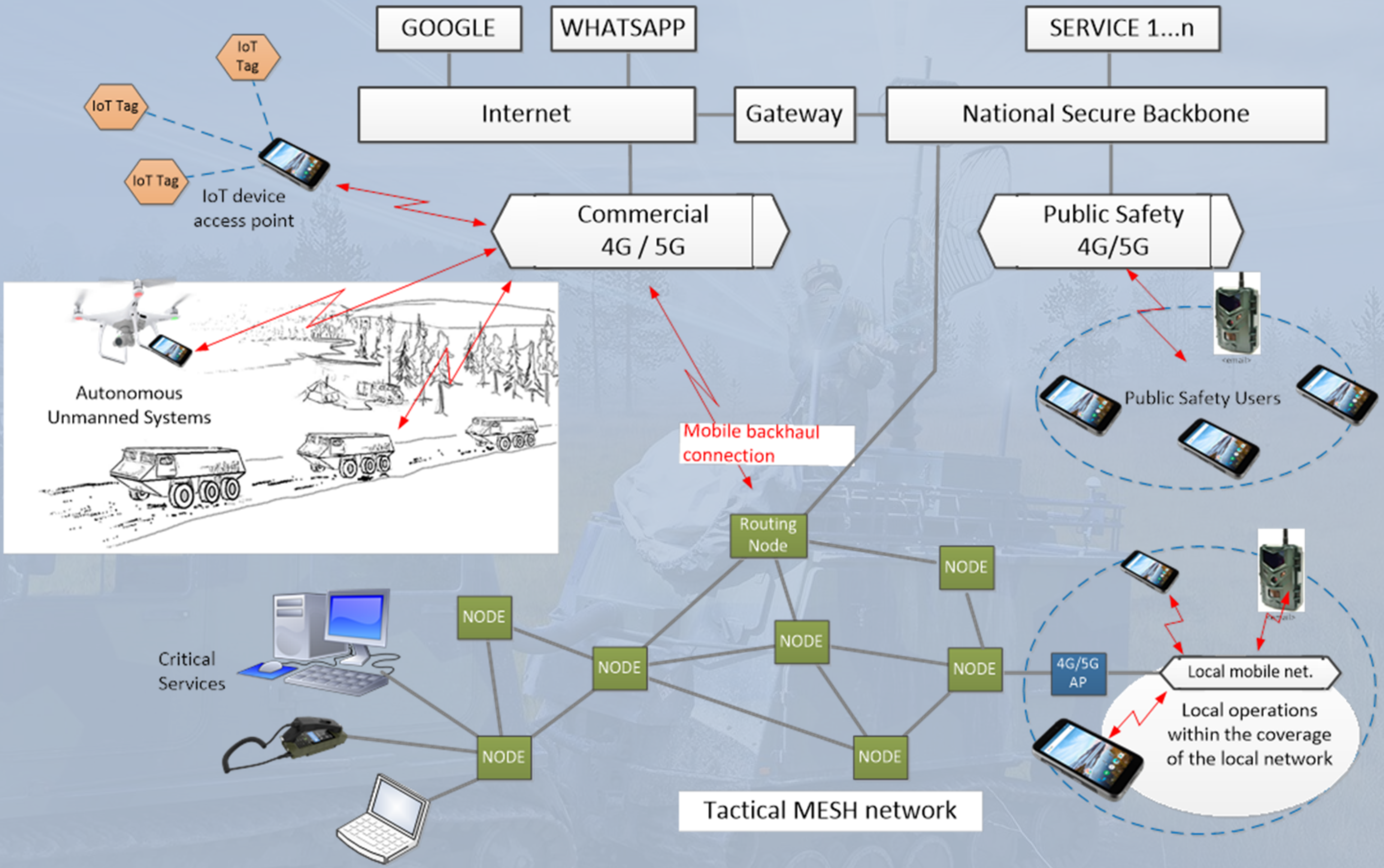
- Geographical coverage
- Mobile Public Safety services and access for field force
  - Access to operational databases / reporting
- Interoperability with legacy PS communication systems
- Access to commercial mobile services

Secure Communications

- Certified RESTRICTED and CONFIDENTIAL level communication

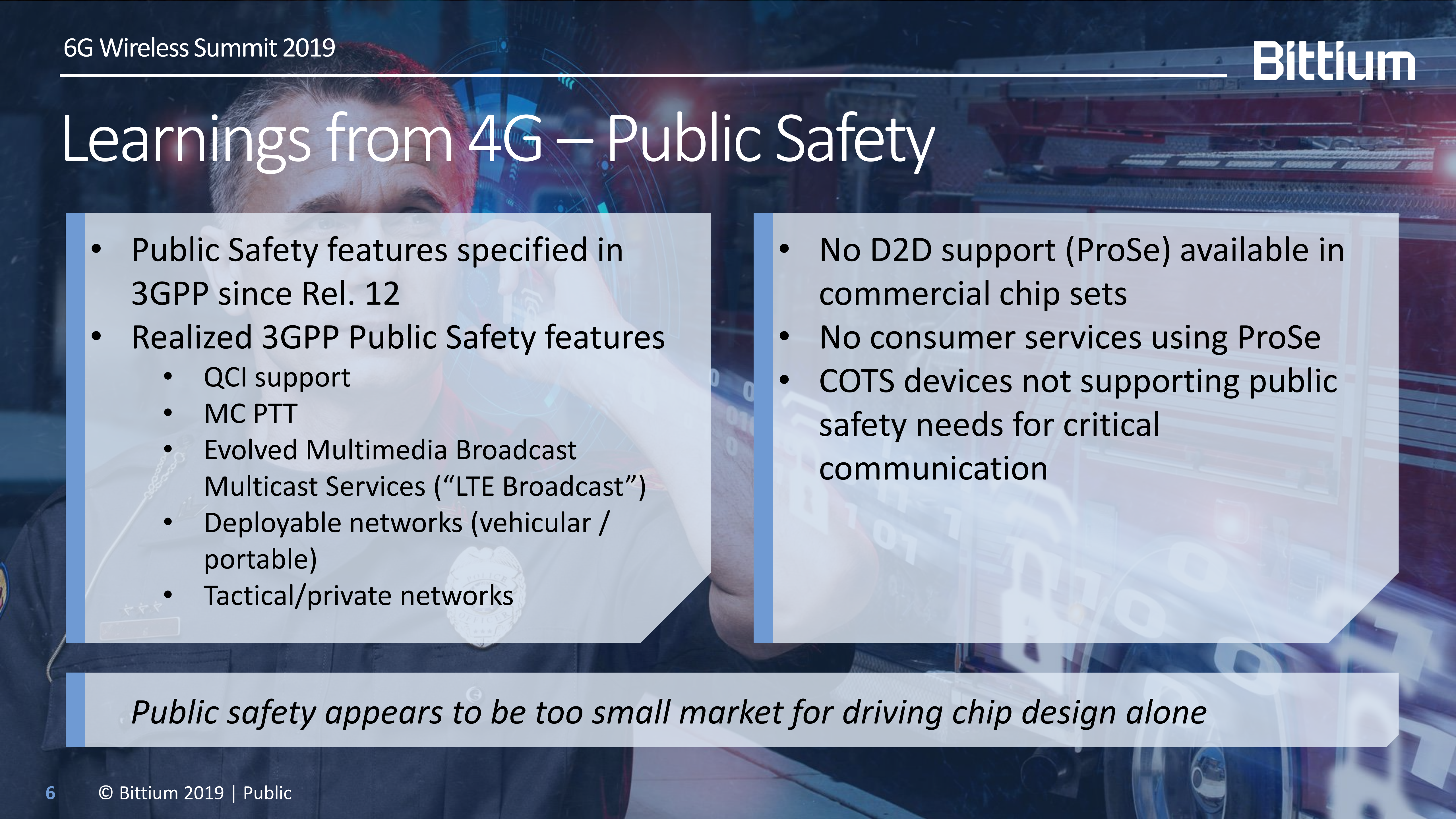


SafeMove is connected



- Resiliency
- Cyber security
- Dynamic spectrum access

Learnings from 4G – Public Safety



- Public Safety features specified in 3GPP since Rel. 12
- Realized 3GPP Public Safety features
  - QCI support
  - MC PTT
  - Evolved Multimedia Broadcast Multicast Services (“LTE Broadcast”)
  - Deployable networks (vehicular / portable)
  - Tactical/private networks

- No D2D support (ProSe) available in commercial chip sets
- No consumer services using ProSe
- COTS devices not supporting public safety needs for critical communication

Public safety appears to be too small market for driving chip design alone

5G – Critical Communications

5G promise

- Faster data speeds
- Lower latency
- Edge computing
- Network slicing
- New frequencies
- Cost per bit goes down
- Reliability

Key areas

- Intelligent vehicle systems
- Advanced manufacturing
- Advanced use of energy and utilities
- Entertainment (e.g. cloud based gaming)

How to exploit commercial main stream solutions in critical communications?

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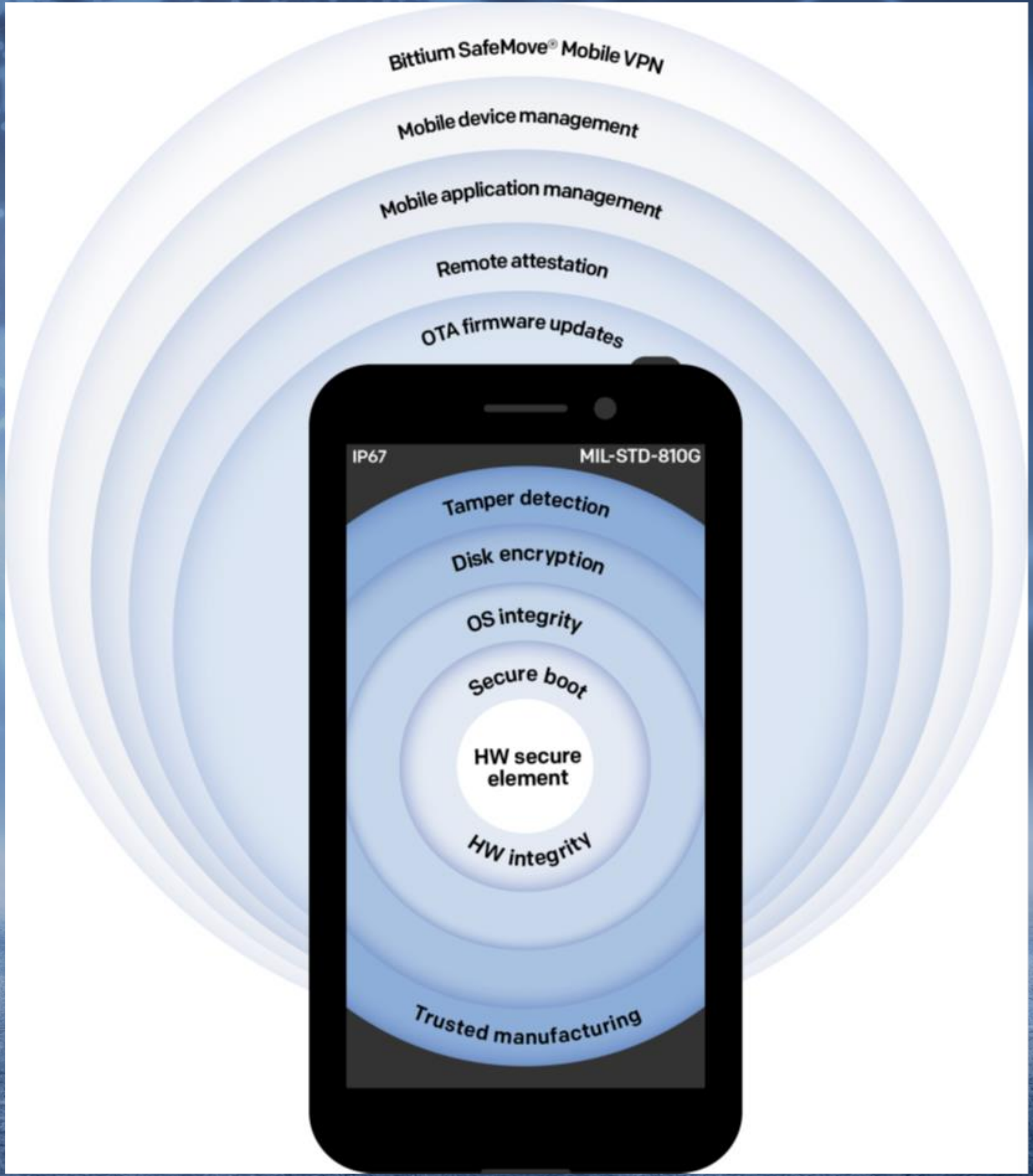
Cyber Security

Cyber threats

- Number of attack interfaces increasing
- Trend: attacks' life spans shorten
- ML based methods increasingly utilized

Added value of 5G in cyber threat mitigation

- Enhanced real-time cloud based solutions
- Benefit from more capable encryption algorithms
- Edge computing



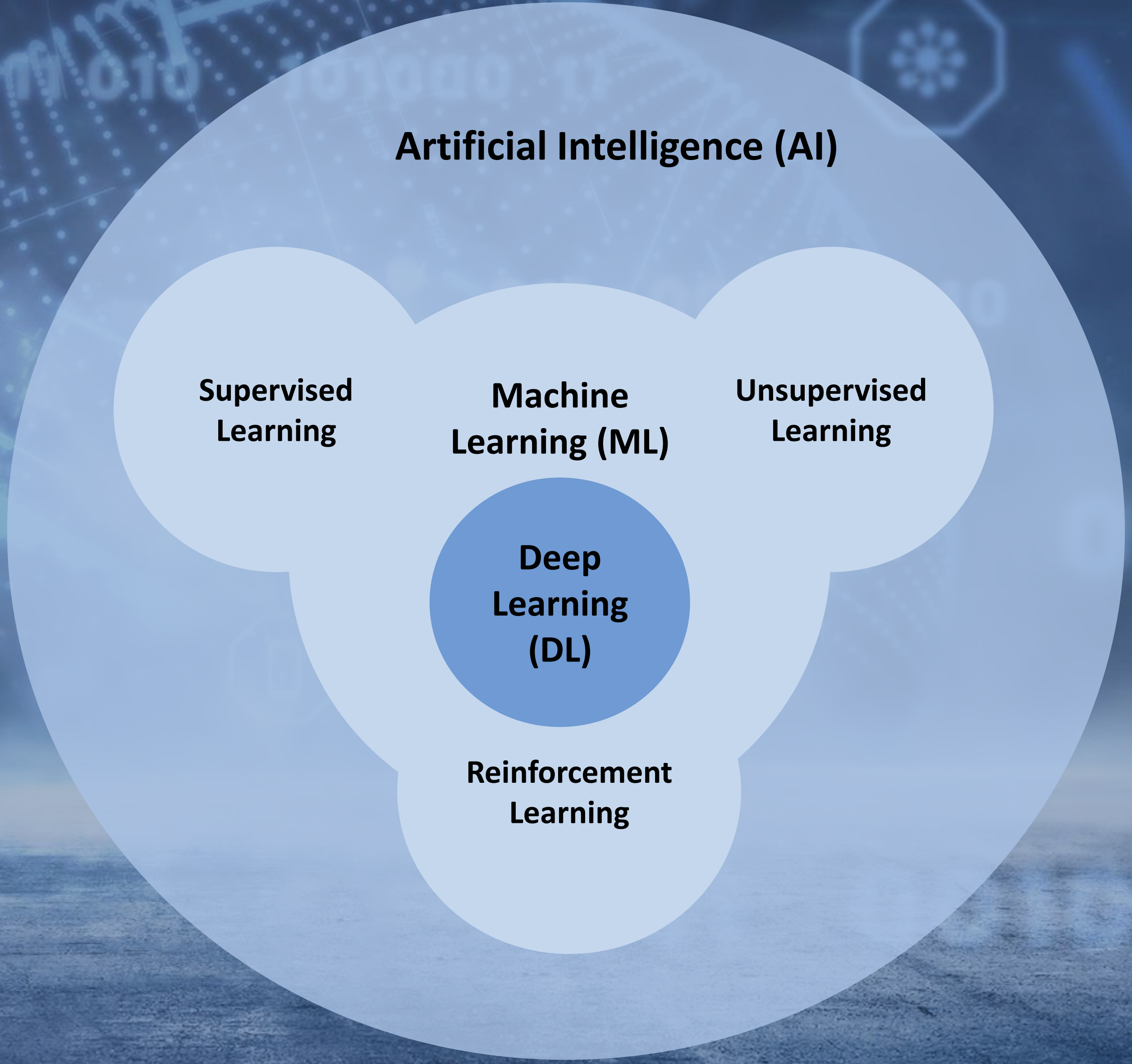
Machine Learning

Important questions

- What parameters/data can we measure or collect?
- Do we have example answers, which support our target?
- If not, can we create a roadmap to collect the data and determine the example answers

Machine Learning use cases

- Detecting anomalies from the encrypted IP traffic
- Adapting to cyber weather
- Dynamic spectrum access
- MESH network performance optimization



Summary

Key requirements

- Availability of the services
- Geographical coverage
- Cyber security

Learnings from 4G

- Not all specified features commercially available
- How exploit commercial main stream

5G

- Real time cloud based solutions
- Edge computing
- Network slicing
- Dynamic spectrum access

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