Bittium’s view on 5G
Requirements, opportunities and challenges in critical wireless communications

Taavi Hirvonen
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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
- 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?
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
Contact us.

www.bittium.com
firstname.lastname@bittium.com