5G Standards and Security

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ITU's IMT-2020 Use Cases & 3GPP’s 5G-NR Vision

Enhanced Mobile Broadband
• Ultra high bandwidth
• High spectral efficiency
• Ultra dense network
• Energy efficient

Ultra-reliable and Low Latency Communications
• Ultra low latency
• Low network access and synchronization time
• High reliability

Massive Machine Type Communications
• Ultra high density
• Long battery life
• High system gain and efficiency
One Global Standard

Global Specifications

• Interoperability between networks
• Economies of global scale – significant advantage in device and equipment cost
• Worldwide service wherever operators deploy the technology
• Global roaming
• Device portability
• Case in point is the worldwide adoption of 3GPP-based 4G LTE standard (170 countries)
• Forward compatibility
3GPP Working Procedures

**Work Items**
- Supported by at least four Members
- Rapporteur is named
- Worked through contributions and drafting process

**Approval Process**
- Approval by a TSG is normally by consensus
  - Where consensus cannot be achieved a vote may be taken
  - 71% required to approve

**IPR Policy**
- Individual Members are bound by the IPR Policy of their respective Organizational Partner
- Declare essential, or potentially essential, to any work ongoing within 3GPP

Source: 3GPP Working Procedures
Expected Timeline for Industry 5G

3GPP Release 14
- NR NSA Option 3 Initial specs for silicon design

3GPP Release 15 (5G Phase 1)
- NR NSA Initial full specs for eMBB and UHRLLC
- Option 4 & 7 NSA
- R15 Late Drop

3GPP Release 16 (5G Phase 2)
- Full 5G Standard

IMT-2020 Technical Performance Reqts
- IMT-2020 Proposals
- IMT-2020 Specifications
- IMT-2020 Evolution

You Are Here
- 2016
- 2017
- 2018
- 2019
- 2020
- 2021

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Overview of Cellular Security per Generation

1G
Threats: Analog, fraud, eaves dropping

2G
Improvements: Digital, air-link encryption
Threats: Attacks on encryption

3G
Improvements: Mutual mobile/network authentication, open algorithms
Threats: Exploit clear transmission of IMSI, hacking in/out going calls

4G LTE
Improvements: Strong encryption, built-in security mechanisms
Threats: Internet IP-based attacks (DDoS, etc.)

Source: based on CTIA
3GPP 5G Security Examples

- **Increased Home Network Control for Authentication**
  - Home network verifies the UE is present and requesting service

- **Unified Authentication Framework**
  - Same authentication for 3GPP and non-3GPP access

- **Introduction of Security Anchor Function (SEAF)**
  - Re-authentication of UE as it moves between access networks

- **Subscriber Identity Privacy**
  - Use of home network key to encrypt subscriber identity (e.g., IMSI)

- **Introduction of Security Edge Protection Proxy at PLMN border**
  - Application layer security for information exchanged between Network Functions in different PLMNs

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**Drivers for 5G Security**

- New service delivery models
- Evolving threat landscape
- Increased focus on privacy
- New Trust Models