
PSCR 2021
THE DIGITAL EXPERIENCE
#PSCR2021 • PSCR.GOV
NIST
PSCR

ARE WE THERE YET?

5G CAPABILITIES, GAPS and OPPORTUNITIES

NIST

#PSCR2021

PSCR

SPEAKERS

LISA SOUCY

Advanced Communications
Research Group Lead

PSCR

CEO of Firefighting

SAM RAY

Electronics Engineer
DHS Portfolio Lead

PSCR

DISCLAIMER

Certain commercial entities, equipment, or materials may be identified in this document in order to describe an experimental procedure or concept adequately.

Such identification is not intended to imply recommendation or endorsement by the National Institute of Standards and Technology, nor is it intended to imply that the entities, materials, or equipment are necessarily the best available for the purpose.

*** Please note, unless mentioned in reference to a NIST Publication, all information and data presented is preliminary/in-progress and subject to change**

PULLING THE FUTURE **FORWARD**

5G ENABLING CAPABILITIES

eMBB

ENHANCED MOBILE BROADBAND

Providing significantly faster data speeds and greater capacity

URLLC

ULTRA-RELIABLE AND LOW LATENCY COMMUNICATIONS

Enabling mission critical communications

mMTC

MASSIVE MACHINE TYPE COMMUNICATIONS

Connecting billions of devices without human intervention

YET2 – 5G TEST BEDS MINI SEARCH

DEVICE AVAILABILITY

Device/infrastructure alignment for unlicensed bands
Support for AR/VR[1] devices
Support for device-to-device (D2D) off-network (sidelink)

RESEARCH FOCUS AREAS

Public safety use cases
Unlicensed (private) networks
Open source/Open RAN[2] solutions
Defense/academia (budget/TRL considerations)

RADIO FREQUENCY BANDS

mmWave licensed and unlicensed
Sub-6 bands (for cabled testing)

[1]Augmented Reality/Virtual Reality [2]Radio Access Network

YET2 FINDINGS AND INTERNAL RESEARCH

DEVICE AVAILABILITY

5G device/infrastructure for 60 GHz (not available in the near term)
Support for AR/VR devices (Qualcomm Snapdragon XR2)
Device-to-device technologies are focused on the automotive space

RESEARCH FOCUS AREAS

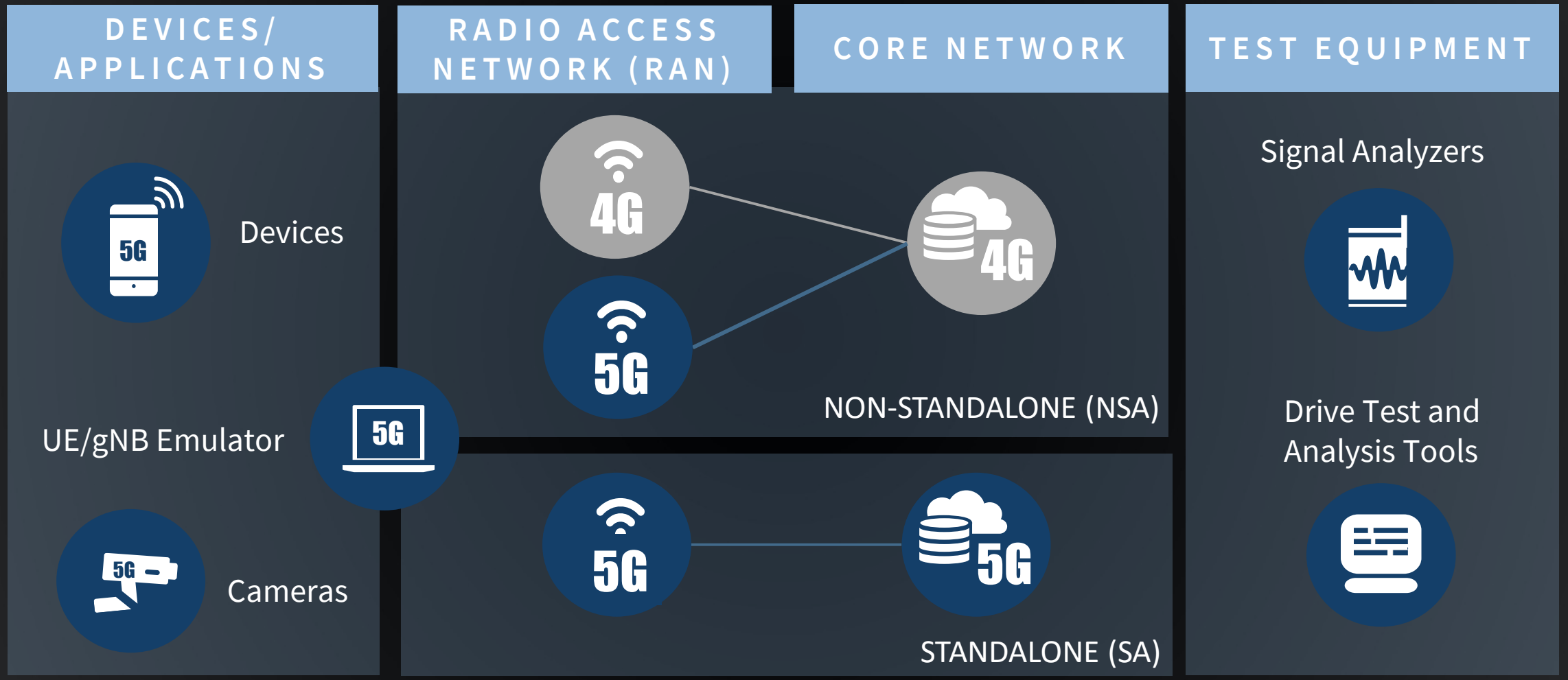
Public safety use cases
Unlicensed (private) networks (CBRS[1] support is maturing)
Open source/Open RAN solutions (a year out)

RADIO FREQUENCY BANDS

mmWave standalone (SA) support (a year out)
60 GHz unlicensed NR[2] (no road map)

[1]Citizens Broadband Radio Service [2]New Radio

5G PUBLIC SAFETY INNOVATION LAB UPGRADES



LAB NETWORK UPGRADES INCLUDE: SERVERS, FIREWALLS, SWITCHES AND WORKSTATIONS

3GPP PUBLIC SAFETY STANDARDS TIMELINE

2016 2017 2018 2019 2020 2021 2022

Release 15

- Improvements of Mission Critical (MC)
- Vehicle-to-Everything (V2X) Communications Improvements
- Machine-Type of Communications (MTC) and Internet of Things (IoT)

Release 16

- Mission Critical, Public Warning
- Advanced V2X support (includes 5G V2X with NR sidelink)
- Enhancement of Ultra-Reliable and Low Latency Communications (URLLC)

Release 17

- Multicast-broadcast Services (MBS) and Mission Critical (MC) enhancements
- V2V/D2D/Sidelink related
- Multicast-broadcast Services (MBS) and Mission Critical (MC) Services
- IoT related enhancements

UP NEXT

5G USE CASES, GAPS AND OPPORTUNTIES IN PUBLIC SAFETY

Sam Ray

Electronics Engineer

PSCR

NIST

#PSCR2021

PSCR

5G PUBLIC SAFETY USE CASES

YET2 – GAPS AND OPPORTUNITIES IN 5G TECHNOLOGY FOR PUBLIC SAFETY APPLICATIONS

- Identify a list of promising new topics for further research in the area of 5G for public safety (e.g., opportunities and gaps that are yet to be researched/solved/fully developed).
- Share insights on which of these are promising technology categories versus those which may be considered simply hype/buzzwords.

GAPS

GAPS THAT WERE IDENTIFIED / WHAT WE KNOW

General

mmWave propagation
Dense network deployments
Public pushback (surveillance)
mmWave spectrum variance/compatibility
5G public safety devices (power/range limits)
Timeline for network coverage vs. device development

Resilient Systems

Device-to-device (D2D) communications
mmWave UAV channel optimization
Public safety network slicing
5G backhaul

Mission Critical Comms

PTT application standardization (3GPP)
MCPTT limited device support
LMR integration
Cloud-based inter-PTT app delays

Security

Security information exchange between databases and applications
Divergent standards (US vs. rest of world)
Multi-access Edge Computing (MEC)
Resources/awareness in public safety orgs

GAPS THAT WERE IDENTIFIED / WHAT WE KNOW

Location Based Services

Susceptible to malicious users
PNT[1] backup to GPS
Indoor 5G accessibility
Seamless transfer (Wi-Fi/BLE[2]/5G)
Wi-Fi vs. BLE vs. 5G (cost factor)
Adoption challenges

User Interface/User Experience

First responder use cases
Network coverage limits for AR use
Most AR/VR tech runs on Wi-Fi
Understanding of 5G enabled functions that will save lives ➔ responders and industry
Support and testing across networks

[1]Position, Navigation and Timing [2]Bluetooth® Low Energy

PUBLIC SAFETY USE CASES

PUBLIC SAFETY USE CASES

General

SENSORS & VIDEO

- "Digital PPE[1]"
- Push-to-video via mobiles/wearables
- Near real-time biomedical signals/video
- High resolution video on demand
- Real-time BWC[2] streaming
- Video as a sensor (multiple use cases)

REMOTE

- Drone-aided emergency response
- Hyper responsive remote control
- Telemedicine support
- Autonomous vehicles (food, fuel, logistics)
- Teleoperation of surveillance equipment

Mission Critical Comms

Critical push-to-talk (PTT) services
Emergency field network deployments

Resilient Systems

Self-backhauling for deployable systems (integrated access and backhaul links, in-band relay)
Device to device (or vehicle to vehicle) when primary network fails

Security

TBD

[1]Personal Protective Equipment [2]Body-Worn Camera

PUBLIC SAFETY USE CASES

Location Based Services (LBS)

Video-as-a-sensor and LBS—geofencing, personnel tracking
3D LBS (5G enhancements, new techniques)
Location tracking as “digital PPE”

User Interface/User Experience

Robot- or drone-enabled video
AR for EMT remote assistance (including AI[1])
AR for firefighter sight/vision through smoke
Video-as-a-sensor for anomaly detection
VR for training (EMT desensitization, de-escalation, other)
AR for situational awareness (HUD[2])

[1]Artificial Intelligence [2]Heads-Up Display

ARE WE THERE YET?

5G CAPABILITIES, GAPS and OPPORTUNITIES

NIST

#PSCR2021

PSCR

GET CONNECTED

pscr@nist.gov

https://www.nist.gov/ctl/pscr

pscr@nist.gov


THANK YOU
#PSCR2021 • PSCR.GOV