5G in Crisis and Emergency Operations

Evolving First Responders, Emergency Response, and National Security to Next Generation Mobile Standards

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How 5G aims to end latency
Crisis and Emergency Operations

- Communications across dynamic coalitions
- Operations without infrastructure
- Sensitive communications
- Richer information to support complex missions

Must put Technologies in Service of Operations
## Technology and Integration Demonstrations
DHS S&T Next-Generation First Responder

<table>
<thead>
<tr>
<th>Event</th>
<th>Description</th>
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<tbody>
<tr>
<td>JANUARY 2016</td>
<td>IoT PILOT</td>
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<tr>
<td>MAY 2016</td>
<td>INTEGRATION DEMO                                                               Highlighted integration of physio monitoring devices, sensors, video-streaming, UASs, wearables and alerting capabilities</td>
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<td>OCTOBER 2016</td>
<td>BOSTON EXPERIMENT                                                                 Assessed two communications systems ability to allow multiagency collaboration, interoperability to include multimedia data</td>
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<td>JUNE 2017</td>
<td>GRANT COUNTY (WA) TechEx                                                                 Partnership with rural agencies to assess integration of technologies with their mission-based needs.</td>
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<td>DECEMBER 2018</td>
<td>HARRIS COUNTY OpEx                                                                 Assessed the ability of multiple NGFR technologies and commercially-available solutions to support and integrate with existing systems.</td>
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<tr>
<td>AUGUST 2019</td>
<td>BIRMINGHAM SHAKEN FURY OpEx</td>
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“What we saw during this experiment with on-body sensors for responders and simulated victims, is that we were able to move all that data back to the situational awareness displays for mission critical incidents. . . we’re now going from a thousand words to a ‘picture that is worth a thousand words.’”

– Rodney Reed, Assistant Chief of Operational Support, Harris County Fire Marshal’s Office
“Camera feeds from the Adams Central School...integrated into the Adams County 911/Dispatch Center [who] select relevant camera feeds and forward them to the command officers”
Lessons Learned

• Information delivery is not enough
  - Standard operating procedures lacking for richer information feeds
  - Video data management and control burdens operations centers
  - Information overload and poor information delivery can burden more than help

• But the opportunities are huge
  - Improved threat awareness to keep responders safe
  - Sensor integration and operational coordination for containing threats and timely recovery of injured

The right information to the right people at the right time
What’s needed?

- Operations in degraded environments
  - Non-Public networks, both standalone and integrated

- Management of communications across coalitions
  - broadcast and multicast group management and communications

- Usability
  - eXtended Reality

Opportunities in 3GPP 5G Standards Development
5G Vertical Industries
Driving new service requirements in 3GPP that can benefit the emergency operations community
5G Standards
Non-Public Networks

- Industrial IoT is currently a key driver
- 3GPP Rel-16 work areas
  - 5GS Enhanced Support of Vertical and LAN Services (Rel-16)
    - Study complete; Feature in progress
  - NR-Based Access to Unlicensed Spectrum (Rel-16)
- Applicable to Emergency Operations
  - Stand up isolated network when infrastructure is unavailable or destroyed
  - Flexible architecture defined for standalone or integrated operation with public networks
  - Interworking with public networks is supported when native infrastructure comes back online

Opportunities to Adapt to Emergency Operations Use Cases and Deployment Scenarios
5G Standards
Broadcast and Multicast in 5G Rel-17

• SA1 (Service Requirements): Broadcast / Multicast requirements supporting Mission Critical Services in 5G
  - 0% complete
  - Normative work; Normative service requirements are generally a precursor to future features
• SA2 (Architecture): Study on Architectural enhancements for 5G multicast-broadcast services (FS_5MBS)
  - 80% complete
• SA6 (Mission Critical & Applications): Study on Mission Critical services over 5G multicast-broadcast system

3 Justification

Clause 6.13 in TS 22.261 provides requirements for services based on broadcast/multicast. Currently these requirements do not reflect the needs of the mission critical community. The newly proposed requirements enhance group communications specifically used by mission critical users. These new requirements may also support the work of the currently ongoing studies in SA2 and SA6, as stated in 2.3.

5GS mission critical users would not be able to use group communications efficiently, as only unicast transmissions would be possible.

4 Objective

The goal of this Work Item is to add requirements for broadcast/multicast, to the existing requirements enhancing the capabilities for group communication, supporting in particular requirements for mission critical users.
5G Standards
Extended Reality

- Extended Reality (XR) includes...
  - Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR)
- Service requirement exceed LTE capabilities
- 3GPP SA Activities related to XR
  - 3GPP SA1 (Service Requirements): study and work on Network Controlled Interactive Services (NCIS)
    - Study item & work item (feature) completed in Rel-17
  - 3GPP SA2 (Architecture): 5G System Enhancement for Advanced Interactive Services (5G_AIS)
    - Rel-17 feature
  - 3GPP SA4 (CODECs): study on Extended Reality (XR) in 5G (FS_5GXR)
    - Rel-16 study item
    - Proposed work area in Rel-17
  - 3GPP SA6 (Mission Critical & Applications): study on application architecture for enabling Edge Applications (FS_EDGEAPP)
    - Rel-17 study item

Potential to be the "Killer App" for 5G
5G in Crisis and Emergency Operations

- Technology Demonstrations and Integration with Operations show tremendous opportunities to improve operations
- Requires the right information to the right people at the right time
- Key engagement opportunities in 3GPP