Resilient Communication Network Platforms Research:

A New Direction for Deployable Communications

Samuel Ray

Hien Nguyen

National Institute of Standards and Technology Public Safety Communications Research



#PSCR2020



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Agenda



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Resilient Communication Network Platform (RCNP) Overview Samuel Ray (PSCR)



RCNP Components, Deployment Configurations

Hien Nguyen (PSCR)





Resilient Communication Network Platform Overview

Sam Ray

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New Direction for Deployable Communications

Rapidly Deployable Research Platform

Five <u>research</u> platforms (require engineering support) Focus: accommodation for research applications LTE-centric communications + Wi-Fi, MANET Forward-looking research (continuing)





Resilient Communication Network Platform

Two identical systems, deployable from PSCR or APL Focus on readiness, operation by <u>field personnel</u> Unified communications over Wi-Fi/MANET Modular/scalable for mission flexibility Supports research applications 1 A first responder team arrives on a scene in a remote area with reported wildfires and medical incidents.

Table Mountain Antenna Field Sites Boulder Feeder

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OGALLALA RD

Table Mountain 2 First, responders with standalone comms move out (using LTE, or satellite devices where no LTE coverage is available).

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Boulder Feeder

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Table Mountain Antenna Field Sites

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OGALLALA RD

Table

Mountain

3 The data center is deployed, with local Wi-Fi providing access to tools and data supporting the incident while remaining components are set up.

Boulder

Feeder

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Table Mountain Antenna Field Sites

Micro Data Center

OGALLALA RD

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4 Next, a mast is raised while MANET radios with Wi-Fi access points are deployed around the area.

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5 The mesh is established, and Wi-Fi APs are online.
6 At this point, FRs may begin communicating across the area.

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Table Mountain Antenna Field Sites Boulder Feeder

Micro Data Center

OGALLALA RD

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7 Finally, a portable satellite system is set up, and backhaul enables voice and data communications with the PSTN and internet.

Table Mountain Antenna Field Sites Boulder

Feeder

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Micro Data Center

OGALLALA RD Satellite backhaul (data, voice)

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Resilient Communication Network Platform







RCNP Components Deployment Configurations

Hien Nguyen

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Local Data Center / Communications Hub





Micro Data Center

- Servers, cores, memory, storage
- Wi-Fi access points for IC/immediate area
- LTE router
- SD-WAN Management
 - Auto load balancing/failover for backhaul
- Future: 5G, Wi-Fi 6

Local Applications

- Unified Communications Solution
 - Internal and external (PSTN) voice calls, voicemail, text, conferencing
- Active Directory
- ATAK/Situational Awareness/MCPTT
- Research Applications



LTE (Data Center)

- 2 LTE carriers via data center/comms hub
- High speed, moderate cost in covered areas
- Future: extended SD-WAN management (failover, bonding, load balancing, etc.)

Satellite

- Portable system (1 VoIP connection)
- Low speed/bandwidth, high cost, high coverage

Ethernet/Tactical Fiber

- Ruggedized
- High speed/bandwidth, low cost (where available)

Wireless P2P

- High speed/bandwidth, low cost (where available)
- High setup time

Access Network



External Wi-Fi Access Point Command Center Support High power for local area



MANET—extends data center functions to remote teams

- Unlicensed 2.4/5 GHz ISM bands
- Wi-Fi dongles support remote UEs



Devices (UEs)

- LTE: commercial/PS carrier (in coverage area)
- Wi-Fi: PSTN/internet via data center backhaul Local communications (no backhaul)

Standalone Comms





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Cellular/LTE Carrier

- LTE devices (priority/preemption)
- Wi-Fi used with local data center



Satellite Devices

- Wi-Fi Access Points for UEs, tablets, etc.
- Very low data throughput
- Future: Low Earth Orbit (higher data rates)



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Elevation



Portable Mast

- Up to 14 meters (46 feet)
- Increased coverage in terrain or vegetation



Aerostat

- Future research area
- Increased elevation for MANET/Wi-Fi radios

Use Cases

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Config 1: MANET Wireless LAN



Config 2: Portable Satellite Comms

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Config 4: Satellite Communication System



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Wi-Fi or Ethernet Devices (BYOD)

Table Mountair

OGALLALA RD

Config 5: Tactical Edge (Connected Backhaul)

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Table Mountain Antenna Field Sites



Satellite backhaul (data, voice)

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Config 6: Expanded Tactical Edge (Disconnected)

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Config 7: Expanded Tactical Edge (Connected)

eede



ALTE

BYOD





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Research Goals

- Validate configurations.
- Document for deployment.
- Execute demonstration plan.
- Establish guidelines for coverage/capacity.
- Acquire Stage 2 elements.







Contact Us





<u>samuel.ray@nist.gov</u> <u>hien.nguyen@nist.gov</u> <u>jay.chang@jhuapl.edu</u>

THANK YOU







Acronyms/Abbreviations

- AP Access Point (Wi-Fi)
- ATAK Android Team Awareness Kit
- IC Incident Command
- ISM Industrial, scientific and medical (radio bands)
- ISP Internet Service Provider
- LTE Long Term Evolution
- MANET Mobile Ad Hoc Network
- MCPTT Mission-Critical Push to Talk
- P2P Point-to-Point
- PS Public Safety
- PSTN Public Switched Telephone Network
- PTT Push to Talk
- Sat Link Satellite Link
- SD-WAN Software-Defined Wide Area Network
- UE User Equipment (LTE device)
- VoIP Voice over Internet Protocol