Commonwealth of Massachusetts

Massachusetts FirstNet Initial Consultation Meeting

The Boston Marathon Case Study: Wireless Data and the 2013 Marathon Bombing

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Introduction

This document is case study of wireless needs identified based on preparations for the annual Boston Marathon and the events that transpired following the 2013 Boston Marathon bombings. This document is intended to provide pre-reading materials and supplemental detail to the planned panel discussion of the Boston Marathon as part of the use case portion of the Massachusetts FirstNet Initial Consultation meeting on March 12, 2015.

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Use Case 1: Preparing for the Annual Boston Marathon

The Annual Boston Marathon is a 26.2 mile race held on the third Monday of April (a State holiday called "Patriots Day"). The Boston Marathon is the world's oldest annual marathon, having originally been run in 1897, and it is one of six marathons that comprise the Abbott World Marathon Majors.

The race is hosted by eight communities, starting in Hopkinton and passing through Ashland, Framingham, Natick, Wellesley, Newton, and Brookline, before ending in Back Bay in Boston. In 2014, there were 36,000 registered runners with thousands of additional unregistered runners, called "bandits." Traffic control is in place throughout the eight host communities, and a major logistical consideration is the transportation of 40,000+ runners to a starting line in a community of less than 14,000 residents. Over one million spectators line the course to watch and participate in the event.

The Boston Marathon is organized by the Boston Athletic Association (BAA) and is staffed by over 10,000 BAA volunteers. In 2014, over 3,500 police officers and thousands of additional first responders supplemented the volunteers from the BAA to ensure public safety, provide traffic control, and serve as pre-positioned first responders. The event is covered by 260 media outlets from over 30 countries. In total, there were 2,200 media credentials issued in 2014.

Roles and Responsibilities

The Boston Marathon is a major event for the Commonwealth and is a particularly significant event for the eight host communities. Roles and responsibilities for the Marathon are divided across the across several key groups.

Boston Athletic Association (BAA)

The Boston Athletic Association has primary responsibility for organizing and hosting the Boston Marathon. The BAA recruits, trains, and supplies 10,000 volunteers that manage operations through the duration of the marathon. Key responsibilities for the marathon include:

- Managing 10,000 volunteers
- Providing services to race participants, including hydration and first aid
- Operating medical tents
- Coordinating meeting areas
- Managing belongings of thousands of racers
- Providing transportation, including shuttle buses to starting line
- Coordinating with public safety and transportation officials on road closures and public safety procedures

Public Safety Multi-Agency Coordination Center (MACC)

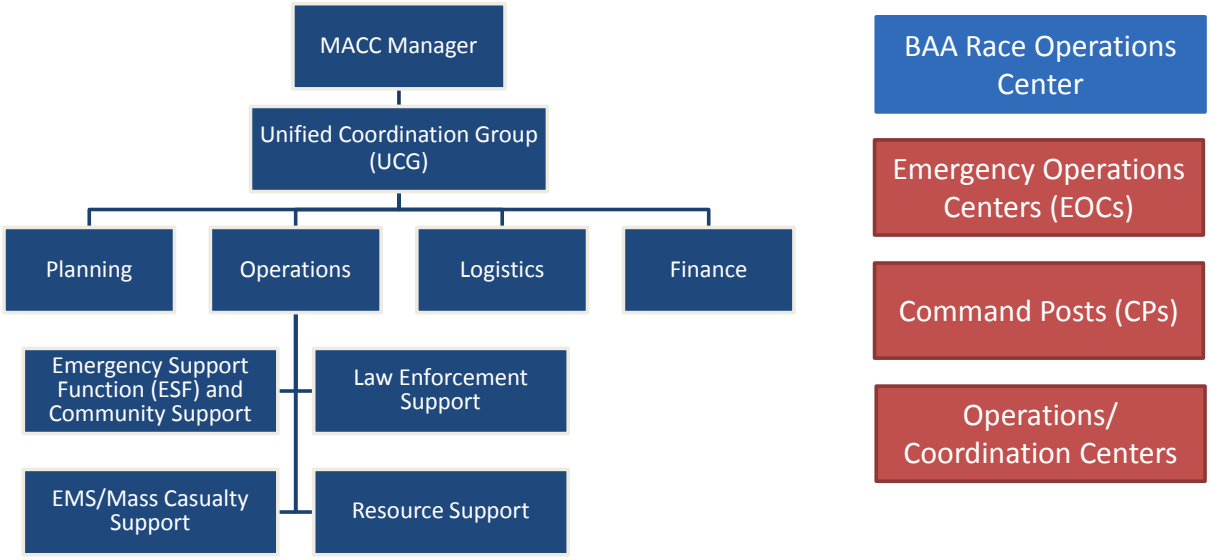
The Massachusetts Emergency Management Agency (MEMA) in Framingham, MA, hosts the Public Safety Multi-Agency Coordination Center (MACC) for the annual running of the Boston Marathon. Starting at 6:00 AM on the morning of the marathon, over 250 individuals representing more than 60 local, regional, state, federal, private and volunteer agencies and organizations staff the MACC. The MACC remains operational until around 6:00 PM when all planned multi-jurisdictional public safety operations have ended.

The MACC works closely with local, state, and federal emergency operations centers to:

- Maintain situational awareness and a common operating picture
- Manage resource requests and support the eight host cities and towns
- Prepare for race day
    - Train first responders
    - Produce 2 videos (Roll Call and Volunteer)
    - Conduct tabletop exercises
    - Manage *See Something, Say Something* public campaign
- Coordinate multi-jurisdictional public safety operations and decision making
    - Interoperable communications
    - Law enforcement tactical operations (SWAT/STOP)
    - Explosive Ordinance Disposal (EOD)
    - Chemical, Biological, Radiological and Nuclear (CBRN) Weapons Detection Teams
    - Intelligence and investigation
    - EMS and mass casualty response
    - Course disruption response

The MACC operates under the Incident Command System (ICS) with four sections: Operations, Planning, Logistics and Finance. Each section reports to the MACC Manager and Unified Coordination Group (UCG). The UCG is an executive level decision making body comprised of representatives from MEMA, the BAA, the Federal Bureau of Investigation, the Massachusetts State Police, the Department of Fire Services, the Massachusetts National Guard, the Massachusetts Department of Public Health, and representatives of each of the eight cities and towns that host the Marathon.

Public Safety Multi-Agency Coordination Center hosted by the Massachusetts Emergency Management Agency (MEMA)



The 2014 Boston Marathon MACC was staffed by 250 individuals representing over 60 local, regional, state, federal, private, and volunteer organizations, as shown in the chart below.

17 Local Fire, Police, & EM

Ashland Fire and Police
Boston Office of Emergency Management
Boston Fire, Police, and EMS
Brookline Fire and Police
Framingham Fire and Police
Hopkington Fire and Police
Natick Fire and Police
Newton Fire and Police
Wellesley Fire and Police

12 Technology Companies

Amateur Radio
AT&T
Comcast
ESRI
Intermedix
MITRE
Motorola
Raytheon
Sprint
T-Mobile
Verizon
Verizon Wireless

15 State Agencies

Commonwealth Fusion Center
Department of Fire Services
EOPSS Office of Technology and Info Services
MA Dept of Conservation and Recreation
MA Dept of Public Health
MA Dept of Public Utilities
MA Dept of Telecommunications and Cable
MA Dept of Transportation
MA Emergency Management Agency
MA National Guard
MA Office of the Chief Medical Examiner
MA State Police
MA Taskforce-1
MassGIS
MBTA Transit Police

5 Volunteer & Service Providers

American Red Cross
AMR Ambulance
Boston Athletic Association (BAA)
Cataldo Ambulance
Fallon Ambulance

13 Federal Agencies

Bureau of Alcohol, Tobacco, Firearms & Explosives
Federal Aviation Administration
Federal Bureau of Investigations
Federal Emergency Management Agency
Homeland Security Investigations
National Weather Service
US Coast Guard
US Customs and Border Protection
US Department of Energy
US Department of Homeland Security
US Department of State
US Environmental Protection Agency
US Secret Service

4 Regional Organizations

Boston Regional Intelligence Center
Central MA Law Enforcement Council
Metro Boston Law Enforcement Council
Northeast Law Enforcement Center

2 Transportation Companies

AMTRAK
CXS Railroad

Mass Casualty Response Command

The annual Boston Marathon is considered a mass casualty event for planning purposes, and often results in hundreds of individuals treated for race related injuries, including blisters, dehydration, and heat exhaustion. The 2012 Marathon, for instance, was run on an exceptionally hot day. The resulting medical demands included 800 runners treated at the medical tent at the finish line and 275 people transported to hospitals, some patients with core body temperatures as high as 108°F. Additionally, it is estimated that nearly ten percent of the entire running field was seen by at least one clinician throughout the duration of the 2012 Marathon.

Medical Intelligence Center (MIC)

The Medical Intelligence Center at the Boston Public Health Commission (BPHC) serves as a coordination center for Boston public health and healthcare organizations. The MIC is activated during major public health events, including the annual Boston Marathon, and in response to major public health disasters. The MIC's responsibilities on race day include:

- Sharing information across health care providers and responders
    - Information on patients
    - Hospital supply needs
    - Ongoing security updates
    - Services available to victims
- Coordinating critical resources
- Supporting medical surge capabilities for hospitals and health centers

Boston Emergency Medical Services (EMS) Dispatch Operations Center

The Boston EMS Dispatch Operations Center serves as a daily coordination center for ambulance dispatch and hospital communications. Key among its race day responsibilities include:

- Coordinating EMS field providers and area hospitals
- Managing EMS channel usage
- Providing EMS resource information
- Offering command and control assistance during a mass casualty incident

Area Trauma Centers

Hospitals along the marathon course and within the Boston area implement special procedures to prepare for and respond to treatment needs resulting from the Boston Marathon. This includes six Boston area Level 1 Trauma Centers who have their emergency systems activated on race day.

Electronic Assets and Tools

There are a number of electronic assets and tools that are used to ensure public safety at the annual Boston Marathon. Key among these are WebEOC, ArcGIS Online, interoperable command channels, Health and Homeland Alert Network (HHAN) messages, and other communications tools.

WebEOC

WebEOC is a situational awareness and incident reporting tool from the vendor Intermedix. WebEOC is the primary platform for information sharing across jurisdictions at the Boston Marathon and other major Commonwealth events. There are three instances of WebEOC typically active during the Marathon, including one managed by the MACC, another by the City of Boston, and a third by the Department of Public Health. Information in WebEOC is entered by the staff of the MACC or the partner EOCs, CPs, and other coordination centers. The tool is used to track and provide shared situation awareness for the following information at or near the marathon course:

- Road closures and reopenings
- Status of local reception centers
- Activation of command centers
- Calls to police, fire, and EMS
- Significant events and issues
- Potential race disruptions
- Detours of racers and stoppages
- Abandoned or suspicious packages
- Weather conditions
- Hazardous conditions
- Threats to public safety
- Incidents resulting in serious injury and mass casualty incidents

ArcGIS Online

ArcGIS Online is a tool used for the 2014 Boston Marathon to help visualize key information on interactive maps. The ArcGIS maps are prepopulated with key information and is updated with realtime information from WebEOC and other sources.

Prepopulated and real-time GIS data include:

- Static layers about the course and host communities, including location and capabilities of medical tents

- Incidents and events from WebEOC
- Locations of mobile command posts
- Locations of escort vehicles
- Density of runners crossing timing mats
- Road closures and detours

Graphic products include:

- Situation maps
- Briefing maps
- Live, interactive web maps
- Ad hoc maps to support command staff

Interoperable Command Channels

There are numerous dedicated, interoperable voice communication channels used to support communications within public safety and other organizations supporting the annual event. Key among these channels are those managed by the Greater Boston Police Council (BAPERN) and the Massachusetts State Police (Commonwealth Radio Network).

Health and Homeland Alert Network (HHAN) Messages

The Health and Homeland Alert Network provides secure web-based communication and information sharing capabilities to the Commonwealth of Massachusetts. Its three core functionalities are:

- Semi-automated alerting compatible with telephones, email, fax, and pagers
- Web-based collaboration on documents and other files
- Statewide directory of key personnel organized by role

There are around 13,000 HHAN users in the Commonwealth, including public health, hospitals, community health centers, emergency preparedness, and the volunteer Medical Reserve Corps. During the marathon, it is used, in part, to share information with the Executive Decision Group and to provide notifications for scheduled and unscheduled events like convening conference calls.

Other Communications Tools

There are a variety of other communications tools deployed by the MACC and its partner agencies to support the Boston Marathon. These include:

- Situational Awareness Statements and Urgent Matter Reports, which are typically disseminated by email on a large distribution list

- Periodic briefings (scheduled and unscheduled using a dedicated conference call bridge)
- Public warnings and emergency notifications
    - Emergency Alert System (EAS)
    - Wireless Emergency Alerts (WEA)
    - Massachusetts Alerts app (powered by Ping4alerts!)
    - Traditional media, websites, and social media postings

Additionally, the Joint Information Center connected more than 30 Public Information officers by email to coordinate information releases and public responses to marathon events.

Finally, other organizations provide information to the MACC and the host communities to support decision making and planning efforts. Among these is the National Weather Service, which provides weather tracking and performs air hazards detection.

Current Wireless Usage

The thousands of formal public safety officials and first responders supporting the Boston Marathon currently utilize a variety of wireless communications as part of their formal duties. Current wireless usage includes:

- Interoperable LMR voice communications
- Text and email communications
- Pager notifications
- HHAN messages
- Remote access to agency RMS, CAD, and other mission critical systems
- Remote access to WebEOC and incident reporting systems
- Streaming video feeds
- GPS location tracking
- Interactive maps
- Wireless Emergency Alerts
- Massachusetts Alerts app
- Weather and air telemetry

Use Case 2: Responding to the Mass Casualty Incident

Marathon Bombing Event Timeline

Monday, April 15, 2013

Early morning – MACC, Boston and other EOCs, Boston MIC, Boston EMS DOC, BPHC DOC, and other command centers activated.

9:17 AM – Boston marathon races starts

11:56 AM – Elite runners begin to finish

2:49 PM – Two bombs explode near finish line; 3 people killed and 282 injured, including 14 amputations; Medical Tent A converted to serve as mass triage, trauma unit, and morgue

Afternoon – Command center set up at the Westin Copley Place Hotel, under the lead of the FBI; 12 block area crime scene closed

Afternoon/Evening – Police and others respond to numerous false alarms, including backpacks near bombing site, reports of a bomb at the JFK Library, and a Code Red at the Moakley Courthouse in South Boston

Topic 1: Managing the MCI on the Scene

The Boston Marathon is considered a planned mass casualty event each year, and in two recent years (2004 and 2012) preceding the 2013 Marathon Bombing, the marathon has resulted in numerous hospitalizations due to effects of "rogue heat days" on Marathon Monday. In 2004 alone, 2,300 people were treated in some capacity, most for heat-related conditions.

As a result of lessons learned from previous marathons and continuing efforts following 9/11 to better prepare for mass casualty incidents (MCI), Boston area public safety organizations, first responders, area hospitals, and others have participated a series of MCI preparation exercises, including:

- Operation Prometheus (a 2002 dirty bomb response drill)
- Joint Counterterrorism Awareness Workshop Series
- Operation Falcon II (a 2011 patient surge exercise sponsored by the Metro Boston Homeland Security Region)
- Urban Shield Boston (a continuous 24-hour exercise including 600 emergency responders from 50 agencies, funded by the UASI grant program, 2012)
- Pre-Boston Marathon Tabletop Exercise (MCI planning exercise for the Boston Marathon sponsored annually by Massachusetts State Emergency Operations Center)

Race Day Medical Resources

Each year, the BAA and its partners provide extensive medical and health support to the Boston Marathon runners and spectators. In 2013, race day medical resources along the course included:

- 800 medical volunteers and staff
- 26 medical tents, including 10 enhanced tents with ambulance support
- 2 Medical Tents (A and B) with communications, 100s of cots, laboratory sections, and other resources (focused on race-related injuries)
- 16 first aid stations
- 49 hydration stations
- 100 wheelchairs and stretchers pre-positioned
- 3 Disaster Management Admin Teams tents
- Numerous medical buses and ambulances
- Additional medical teams positioned after mile 20
- EMTs and Paramedics deployed on bicycles/carts
- Prepositioned MCI trailers at mid-course

Post-Incident Operations

Following the twin explosions at 2:49 PM, Medical Tent A quickly transformed into a mass triage and trauma unit, including the identification of a morgue area. Volunteers and bystanders became involved in first aid and victim transportation to Medical Tent A, as instantly there were hundreds of blast victims and a chaotic scene near the finish line. First responders surged on scene resources, including an additional 30 firefighters in the minutes following the blasts.

Within Medical Tent A, patients were triaged and tagged as "red," "yellow," or "green," depending on the severity of the victim's injuries. Within 18 minutes of the blasts, Boston EMS transported 30 “red tag” patients to areas hospitals, and all patients were transported within 45 minutes.

Notifications of the bombings were sent out informally over the media and over social media, and formally via HHAN messages and notifications from the MACC, MIC, and other command centers. Cellular service was quickly overwhelmed with traffic, and land mobile radio channels were cluttered with incident reports. Many first responders resorted to shorter text messaging to communicate. During the day, 150 separate HHAN messages were sent to 40,000 devices.

Wireless Needs

Among the wireless needs identified to support Commonwealth first responders in responding to an MCI on the scene are:

- Reliable voice and data communications during event

- Shared situational awareness across public safety, race organizers, nongovernmental entities, and private companies
- Locations, inventories, and transportation status of pre-staged supplies and resources for first responder use
- Use of shared, scaled event maps to facilitate dispatch
- Communications and information sharing across first responder agencies and volunteer groups on Band 14
- Defined and assigned incident reporting zones
- Telemetry from environmental monitoring sensors and gunshot detection

Topic 2: Managing Surge Volume at Hospitals

While the MIC, EMS, and the MACC notified area hospitals of the mass casualty situation, many medical personnel learned of the event through social media and smartphone apps. The bombings occurred around the shift change of area hospitals, so emergency department (ED) staffing were nearly double usual with staff reporting to or leaving shifts.

Boston EMS largely coordinated the distribution of patients among eight area hospitals, including six Level 1 Trauma Centers. Within each hospital, an incident commander was activated based on the hospital's MCI protocols. Among the typical hospital surge trauma procedures implemented in 2013 include:

- Mobilizing trauma teams
- Cancelling all scheduled surgeries and imaging
- Preparing equipment trays for vascular and orthopedic procedures
- Calling orthopedics-manufacturer representatives for extra hardware to be mobilized
- Contacting blood banks to secure blood supplies
- Coordinating between EDs for supplies of equipment
- Arranging added security as potential secondary targets
- Preparing HAZMAT decontamination units (at Brigham and Women's Hospital)

In addition to patient treatments, hospitals aided the collection, identification, and conveyance of evidence to FBI investigators. Hospitals and EMS providers were also active users of the tool WebEOC and used the HHAN message system to communicate status and ED needs.

Hospital Trauma Loads

As a result of the Marathon Bombings, the following were the trauma loads of the primary area hospitals:

- Brigham and Women's Hospital treated 38 patients, including 12 that underwent surgery that day for vascular or orthopedic procedures
- Massachusetts General Hospital treated 37 patients, including 4 amputations
- Boston Medical Center treated 29 patients
- Beth Israel Deaconess Medical Center treated 24 patients, including 7 that required emergency surgery
- Tufts Medical Center 28 patients
- St. Elizabeth's Medical Center 18 patients
- Boston Children's Hospital 8 children (ages 2 to 12)

Wireless Needs

Among the wireless needs for managing surge patients loads resulting from an MCI are:

- Pushing trauma team notifications using different electronic avenues
- Providing an ability for trauma teams to reply they are responding and to track their location
- Needing better tools to deploy emergency room employees who respond in a crisis but can contribute to congestion
- Assigning report to locations and trauma roles to staff in transit
- Wireless accessing WebEOC and other situational awareness tools to prepare for the patient surge
    - Tracking locations and ETA for patients
    - Providing updates on equipment, ED, and staff availability and medical capacity
    - Preparing rooms and trauma teams for types of injuries to expect
- Maintaining real-time communications with EOCs/EMS
- Requesting and tracking emergency supplies
- Quickly and remotely accessing medical records and patient histories

Topic 3: Identifying Victims and Reuniting Families

At the time of the marathon blasts, there were 9,000 runners still on the course. Each registered runner carries a chip indicating their location on the course as they cross tracking mats set up at 5K intervals, so the general location of runners on the course was understood. Race officials stopped runners along the course, and tens of thousands of racers, families, and spectators were separated by the chaos that ensured.

Identifying Victims

A problem faced by many EMS and hospital officials was the correct identification of victims. Many patients were not identified immediately, and the influx of patients overwhelmed standard registration systems and procedures. Patients arrived without purses, wallets, or family members. In one instance, a woman was incorrectly identified by the wrong handbag that was transported with the victim. In another instance, the family of a fatality victim was informed their loved one was being treated at an area hospital. In one facility using a procedure that has since been changed, numeric numbers were assigned to unidentified patients which nearly resulted in issues with test results and medications to the correct patient. Once identified, hospitals shared patient identification with the MIC to help locate and reunite families.

Reuniting Families and Friends

Many racers were left without IDs, wallets, and phones, which has been transported to the area of the finish line and were now part of a crime scene. Roads were still blocked off for the race, and others were cordoned off near the blast site. Commercial cellular and wireless was overloaded, further complicating family reunification.

After the bombings, the Boston Public Health Commission (BPHC) worked with the Boston Mayor's Office of Emergency Management and the Boston Center for Youth and Families to establish multiple drop-in centers, including one at the Park Plaza Hotel near the finish line. These drop-in locations were used to reunite families and to provide services to those living or staying near the crime scene, including many runners from out of state. Additionally, the Seaport Hotel donated significant space and resources to aid victim services in South Boston.

Wireless Needs

Among the wireless improvements that would aid first responders in identify victims and reuniting families include:

- Improved tools to collect and track mass missing persons reports
- Improved tools to identify victims and communicate victim identifications
- Improved tools to locate victims across trauma centers
- Improved tools to communicate meeting locations to first responders

Topic 4: Conducting Bomb Disposal Investigations

As standard procedure for Race Day public safety procedures, the course was swept for explosive devices prior to the start of the race and a dozen bomb Explosive Ordnance Disposal (EOD) technicians were stationed at the finish line to quickly response to reports of suspicious or abandoned packages, vehicles, or other threats. Following the twin explosions and under the uncertainty of how many additional bombs may still be at or around the race course, a call was made for every available bomb technician to deploy to Back Bay.

Thousands of backpacks, purses, and other personal items were abandoned all throughout the crime scene, and many were treated as potential explosives requiring examination. The sheer volume of bomb threats resulted in deviation from protocol and the use of hand entry of backpacks and other abandoned items. In the area near the blast sites, a small car was found loaded with eight propane tanks, and in a downtown garage, a car was found fill with fuel canisters. These reported bomb threats where among hundreds reported, including threats at the JFK Library and the Moakley Courthouse in South Boston.

During the day of the bombing and throughout the week that followed, EOD units conducted a "Whac-A-Mole" game of bomb disposal investigation, responding to hundreds of reports of abandoned vehicles and item, hits from K-9 units, and tips from 911 and tip lines. Bomb technicians worked on long shifts and coordination was made across the multiple jurisdictions providing EOD resources. On the Friday following the shootout in Watertown, EOD units were responsible for disposing of unexploded pipe bombs on the streets of Watertown.

Using Specialized Equipment

Specialized units, like EOD technicians, frequently utilize highly specialized and expensive equipment to perform their jobs. Many of these tools may, in the future, operate on Band 14. These include:

- Talon robots
- Logos XR200, portable x-ray units
- Thermal imaging cameras
- Total Containment Vessels

Coordinating Bomb Disposal Units

Supporting the bomb investigation and disposal responsibilities during the week following the Boston Marathon Bombing were 45 bomb technicians and 40 K-9 handlers from:

- Boston Police Department
- Cambridge Police Department
- Massachusetts State Police
- Connecticut State Police
- MA Army National Guard (Camp Edwards)
- New Hampshire State Police
- New York State Police
- Suffolk County, NY
- US Navy (from Rhode Island)

Wireless Needs

The EOD technicians and other public safety officials responding to or reporting on threats would benefit from the following wireless improvements:

- Coordinating resource availability, schedules, assignments, status, and information sharing across responding units
- Assuring priority be given to specialized equipment on Band 14, including video feeds from bomb disposal sites to multiple CPs
- Using shared maps to locate suspicious objects
- Sharing photos and video from the crime scene to help bomb techs identify potential explosives
- Pushing pictures/video from NG911 and other sources to bomb disposal units
- Providing reliable communications with media outlets to announce controlled detonations and status
- Working with specialty equipment vendors to upgrade or retrofit existing equipment to work on Band 14

Use Case 3: Conducting the Investigation

Marathon Bombing Event Timeline

Tuesday, April 16, 2013

Morning – Victim Jeff Bauman gives description of suspect with backpack; authorities recover mangled parts of exploded device

Afternoon – At police request, the public and local businesses provide huge numbers of photos and videos for analysis

Wednesday, April 17, 2013

Afternoon – Several media outlets erroneously report arrest has been made; BPD and FBI deny report; President Obama signs emergency declaration for disaster assistance

Thursday, April 18, 2013

11:00 AM – City holds interfaith service at Cathedral of the Holy Cross with President Obama in attendance

Afternoon – President visits victims at Massachusetts General Hospital; First Lady visits victims at Boston Children's and Brigham and Women's Hospitals

Topic 5: Managing Volumes of Digital Assets

A key lead in identifying the Marathon Bombers happened on the Tuesday following the blast when a victim Jeffery Bauman's awoke from sedation and helped officials focus attention on backpacks as the delivery mechanism for the bombs. That victim statement was among the 2,000+ other leads reported to authorities during the week, many of which resulted in multiple false reports from the media and posted online.

To manage the formal investigation, the FBI secured a warehouse in Boston's Seaport District and set it up to serve dual purposes:

- Half of room set up to examine hundreds of pieces of collected evidence
- Half of room set up to sift through hundreds of hours of video and thousands of still pictures

Wireless Needs

The following wireless improvements would aid the collection, use, and dissemination of digital assets in investigations and other public safety uses:

- Improved facial recognition tools, including tools in the field to support identification of wanted or missing individuals
- Ability to get digital information off personal devices, potentially using Band 14 as a transport avenue

- Tools to push digital resources out to officers in the field

Topic 6: Managing Competing Command Needs

In managing the annual race and in responding to the event of April 2013, numerous command and operation centers were activated throughout the metro Boston area. These command centers involved numerous agencies and all levels of government. Many of these command centers utilized mobile command vehicles that were dependent upon AirCards connecting to commercial carriers for wireless data needs. In many instances, like the Arsenal Mall parking lot in Watertown later in the week, these mobile command posts were set up in very close proximity, placing these command posts in direct competition with one another for wireless broadband capacity on local towers.

Command and Operation Centers Activated During Week of Boston Bombing

Throughout the week of the 2013 Boston Marathon, there were scores of law enforcement and public safety agencies operating numerous command and operation centers throughout the Boston metropolitan area, including:

- Boston Emergency Medical Services Dispatch Operations Center
- Boston Public Health Commission Department Operations Center
- Boston Unified Command Center
- FBI Investigation Command Post at the Westin Copley
- Governor's Situation Center
- MA State Police Command Center
- Mayors' Situation Centers
- Medical Intelligence Center at the Boston Public Health Commission
- Northeastern Massachusetts Law Enforcement Council (NEMLEC) Command Center
- Public Safety Multi-Agency Coordination Center at MEMA
- Secret Service Presidential Escort Team
- Watertown Command Center at the Arsenal Mall
- Numerous agency command posts
- Numerous tactical team commands

Wireless Needs

The following wireless data improvements would aid in rapidly setting up multiple mobile command centers and managing competing command needs:

- Ability to understand wireless usage and capacity across the region

- Ability to surge wireless capacity when needed (e.g., streaming multiple live video feeds to multiple CPs simultaneously)
- Ability to coordinate wireless capacity use across multiple CPs and levels of government

Use Case 4: Managing the Multijurisdictional Manhunt

Marathon Bombing Event Timeline

Thursday, April 18, 2013

5:00 PM – FBI releases photos of suspects ("black hat" and "white hat")

10:30 PM – Suspects kill MIT Officer Collier; suspects hijack Mercedes SUV and vehicle owner "Danny" and intent to head to NYC to bomb Times Square

Friday, April 19, 2013

12:15 AM – Carjack victim escapes from suspects and asks Mobil station clerk to call 911; police track suspects using iPhone and SUV GPS

12:00 to 12:50 AM – Suspects take hijacked SUV and Civic to Watertown; Watertown officer identifies brothers and radios for backup; gunfight ensues with police on Laurel Street, including use of 200-300 rounds, 1 IED, and several "crude grenades"; Tamerlan is shot and hit by Mercedes SUV; MBTA Officer Donohue is shot and critically wounded; Dzhokhar rams police cars and flees the scene by car; police chase suspect along Dexter Avenue and Dzhokhar flees on foot near corner of Spruce and Lincoln

1:35 AM – Tamerlan pronounced dead at Beth Israel Hospital

Early morning – Command center set up at the Arsenal Mall in Watertown

6:33 AM to 6:00 PM – Governor issues "shelter in place" advisory for Boston area; mass transit is shut down; reverse 911 calls ask people to stay indoors

Morning and afternoon – 20 block area of Watertown is cordoned off; police execute door-to-door search; 1,800 officers respond

Between 6:00 PM and 7:00 PM – Outside the search area, Watertown resident finds blood and body in his boat in his backyard, calls 911; police re-issue "shelter in place" advisory for Watertown residents

7:30 PM – Law enforcement include SWAT team members surround boat and open fire; MSP infrared camera captures image of Tsarnaev in boat; dozens of residents evacuated from area

8:45 PM – Second bombing suspect located on Franklin St and taken into custody and transported to Beth Israel Deaconess Medical Center

Topic 7: "Shelter in Place" and Door to Door Search

The public identification of the Boston Marathon bombing suspects in the early evening of Thursday, April 18, set forth a chain of events that spanned a number of law enforcement jurisdictions, including the City of Cambridge, the City of Boston, the City of Watertown, the Massachusetts Institute of Technology, and Beth Israel Deaconess Hospital, as well as larger jurisdictions policed by the Massachusetts State Police and the Massachusetts Bay Transportation Authority police.

Relocating Operations to Watertown

After reports of a shootout and bomb detonations in Watertown around midnight on Friday, April 19, an estimated 1,800 law enforcement officers responded to Watertown area, many "self deployed". Many of these responding officers from other jurisdictions reported navigation issues trying to locate the 100 block of Laurel Street, resulting in delays in response to the live fire scene. Many command centers also relocated to the City of Watertown and eventually gathered in the parking lot of the Arsenal Mall.

Issuing the "Shelter in Place" and Conducting Door-to-Door Searches

With one suspect dead and the other at large, Governor Deval Patrick, Boston Mayor Thomas Menino, and the command leadership of the Boston Police, Watertown Police, Massachusetts State Police, and other authorities agreed for the need to issue a "shelter in place" order for the Boston area.

Additionally, a 20-block area of Watertown was cordoned off for door-to-door searches. These searches were organized on a grid-basis and were led by tactical teams from multiple jurisdictions with Watertown officers assigned to each. These searches were supported by MSP helicopters and other video surveillance.

Over a million local residents in Belmont, Boston, Brookline, Cambridge, Newton, and Watertown were notified of the "shelter in place" order by use of local media, social media, internet postings, and transportation signs throughout the metro area. Watertown and Somerville residents received reverse 911 calls explaining to stay indoors. The Massachusetts Alerts app and the Wireless Emergency Alerts (WEA) service were used to push messages to the local community. Authorities also coordinated with public transit, Amtrak, and taxi services to suspend service. Businesses were asked to close and all events were canceled including a scheduled Red Sox game, a Boston Bruins game, and performance of the Big Apple Circus.

During the events of Friday, April 19, the HHAN system delivered another 20,000 pings throughout the area.

Wireless Needs

The following wireless improvements would aid the issuance of public orders and the conducting of grid searches:

- Use of Band 14 as a vehicle for urgent public notifications
- Improved navigation, including pushing information from command centers ("respond to" locations, avoid streets for crossfire, clear routes for ambulances)
- GPS tracking and interactive maps of deployed vehicles and officers, suspect sightings, bomb locations, and crime scenes
- Tools to support inter-agency command structures, assignments, and reporting
- Mapping tools to track and report progress along grid searches

- Consistent avenues of communication with other agencies and private organizations to support "shelter in place" and other public orders, including road and rail closures, event cancellations, and use of video assets

Topic 8: Establishing Situational Awareness

Establishing situational awareness is critical to proper decision-making in crisis situations and was a challenge during several events throughout the week of the Marathon Bombings. Different views of situational awareness were maintained by permanent operations centers, Marathon event command centers, and bombing response command centers. Many of the latter were set up in mobile command centers with locations that changed throughout the week.

Current Electronic Assets

There are many systems and tools that help commanders in the field establish situation awareness today. These include:

- Command and Situational Awareness Tools
  - MEMA's WebEOC
  - MIT Lincoln Laboratories' Next Generation Incident Command System (NICS) and ArcGIS
- Agency Operations Support Systems
  - Incident Reporting System
  - Computer Aided Dispatch
  - Records Management Systems
  - 911 call and tip line record systems
  - Forensic Information Systems
- Intelligence Systems
  - Boston Regional Intelligence Center systems
  - Fusion Center systems
- Boston EMS's Central Medical Emergency Direction (CMED) System
- Public Camera Systems/ Video Feeds
- Detection Systems
  - Shot detection systems
  - NWS air hazard detection systems
- Traffic control systems

- Photo/video analysis tools (facial recognition)

Current Wireless Usage in Mobile Command Centers

Most of the mobile command centers are dependent on wireless communications to function. These include:

- Dedicated voice communications channels
- Cellular calls
- Text messaging and email
- Pager notifications and HHAN messages
- GPS locations and internet tools
- Access to some agency systems, including criminal justice inquiries
- Streaming video feeds
- File transfers

Wireless Needs

Wireless improvements would aid the rapid and accurate establishment of situational awareness by:

- Providing reliable voice communications during mass usage
    - Private lines for command staff
    - Dedicated channels for deployed officers
- Better managing voice channels with multiple, simultaneous reporting sources
- Improving GPS maps and directions
- Sharing, real-time interactive situation maps
- Remotely accessing key agency systems
- Improving large file transfers
- Expanding the use and quality of video feeds

Potential Needs from the Boston Marathon Case Study

Looking across the preparations for the annual Boston Marathon and the events that unfolded following the 2013 Boston Marathon bombing, there are a number of items that FirstNet should consider when designing and planning for the National Public Safety Broadband Network. These include the following 73 potential needs across seventeen categories.

1. Establishment of Reliable Communications

1.1. Ability to expand coverage areas (e.g., expand handheld coverage through length of course, including buffer zone around course)

1.2. Ability to increase capacity

1.3. Use of hardened, redundant LTE towers

1.4. Ability to provide reliable backup to existing voice channels

2. Expanded Wireless Video and Telemetry Use

2.1. Ability to expand capacity for multiple additional wireless video feeds

2.2. Ability to expand capacity for multiple additional environmental monitoring sensors and gunshot detectors

2.3. Ability to expand capacity for wireless patient monitoring

3. Access to Mission Critical Systems

3.1. Remote access to local, regional, state, and national data sources

3.2. Remote access to agency RMS, CAD, and other mission critical systems

3.3. Ability to access forensics tools in the field

4. Improved Field Incident Reporting

4.1. Ability to define, assign, and track incident reporting zones

4.2. Ability to report incidents using a variety of different devices in the field

4.3. Ability to attach photos, videos, and reporter information to an incident

5. Enhanced Tools in the Field

5.1. Improved facial recognition and video analytics tools in field

5.2. Ability to push images and digital files to officers in the field (“black hat” and “white hat”)

5.3. Ability to get images and video off non-Band 14 devices and share across Band 14

5.4. Improved navigation tools that include information pushed from command and operations centers

5.5. Ability to utilize next generation mobile identification tools (e.g., fingerprints in the field, mobile latent prints, etc.)

5.6. Ability to support evidence collect for subsequent prosecution in the field

6. Improved Tools to Manage Resource Assignments

6.1. Ability to use multiple different communications avenues to notify of emergencies

6.2. Ability to assign responsibilities and team assignments to responders in transit

6.3. Ability to assign responders and officers to other agency commands

6.4. Ability to push command and report to locations

6.5. Ability for responders to reply about response status

6.6. Ability to calculate and track ETAs of responders

7. Tools to Manage Cross Jurisdictional Response and Tactical Teams

7.1. Ability to assign responsibilities across jurisdictions

7.2. Ability to broadcast shared orders across reporting teams

7.3. Ability to manage time-off schedules for long shifts

7.4. Ability to shift activities and responsibilities across teams

7.5. Ability to push locations of multiple hazards to responding teams with images and video

7.6. Ability to push video from tactical teams to multiple command centers in real-time

7.7. Ability to quickly set up inter-agency tactical “chat” rooms

7.8. Ability to quickly establish voice and video communications between tactical teams and other responders (stream video directly to a EOD team)

8. Improved Tools to Manage Grid Searches and Tactical Teams

8.1. Ability to quickly sub-divide maps into grids

8.2. Ability to assign and communicate grid responsibilities

8.3. Ability to report grid activities in real-time

8.4. Ability to view grid activity status from command centers

8.5. Ability to push leads, incidents, and other information to proper tactical teams

9. Better Support for Mobile Command Centers

9.1. Ability to support priority for multiple, co-located mobile command centers and tactical teams

9.2. Ability to view all active command and operations centers and quickly establish communications

9.3. Ability to quickly surge capacity when needed (immediately prioritize all communications within a geographic areas)

9.4. Ability to push large files and videos to multiple command centers simultaneously

9.5. Ability to push large files and videos directly between command centers (device to device)

9.6. Ability to understand and control wireless usage and capacity across the region (chose to stream lower resolution video when appropriate)

10. Shared Situational Awareness

10.1. Ability to access wireless aware tools (like WebEOC) in the field, including expanded mobile data reporting

10.2. Ability to temporarily expand Band 14 usage to include key race organizers, nonprofits, and private companies

11. Improved, Shared Maps

11.1. Ability to share scaled maps and mapping tools (to facilitate dispatch)

11.2. Ability to share situation maps across command centers, operations centers, and field personnel

11.3. Ability to push locations to responders

11.4. Ability to push routing information to responders, including indicating avoid locations (gunfire, unpassable due to vehicles, etc.)

11.5. Ability to track locations of responding vehicles and people

11.6. Ability to track locations, inventories, and transportation status of medical supplies

12. Integration with Next Generation 911

12.1. Ability to push photos, videos, and other leads to appropriate command centers and response or tactical teams

13. Improved Victim Identification and Tracking

13.1. Ability to share victim identification responsivities across locations (get help IDing a victim)

13.2. Ability to quickly pull racer, RMV, medical record, and other information to build a victim profile in the field

13.3. Ability for mobile command centers to be quickly find victim locations

13.4. Ability to push critical medical information (critical medical conditions) to appropriate responders in the field

13.5. Ability to build a shared view of all known victims across first responder agencies and track status and location

13.6. Ability to track and share mass missing persons reports and track reunification

14. Enhanced Emergency Department Support Tools

14.1. Ability for EDs to report real-time capacity

14.2. Ability to request and track emergency supplies (blood, amputation kits)

14.3. Ability to communicate with and redirect (if needed) ambulances in transit

14.4. Ability to push victim information from triage tents and EMS to hospitals

14.5. Ability to append medical records to information received from the field

14.6. Ability to communicate emergency procedures to staff inside and outside the hospital

15. Inclusion of Temporary First Responders

15.1. Ability to temporarily expand "users" to include race organizers and volunteer and support organizations

15.2. Ability to use cache devices for large events and authenticate large numbers of new, temporary users

16. Reliable Communications with the Public

16.1. Ability to set up reliable communications with others not on Band 14 (e.g., media to announce controlled detonations)

16.2. Ability (if technically possible) to use Band 14 as a vehicle for urgent public notifications (Wireless Emergency Alerts, Massachusetts Alerts app)

17. Better Options for Managing Equipment

17.1. Work with device manufacturers upgrade or retrofit existing specialized equipment (bomb detection, infrared cameras) to operate on Band 14

17.2. Ability to maintain caches of digital devices that can be quickly assigned in an emergency

17.3. Support multiple user authentications on shared devices

17.4. Provide a billing option for cache devices (only billed when used)