Mobile Emergency Alert System
Jay Adrick
Wayne Luplow
Sandy’s Toll on Telecom

Sandy Takes Out 25% of Cell Towers – LongIslandPress.com


Authorities said cell phone traffic was so heavy that it hampered their ability to respond to emergencies – ABC News
NYC TV broadcasters stay on-air during Sandy

– TV Technology
Mobile Emergency Alert System (M-EAS)

A “hardened” mass-alerting system for reaching citizens anytime, anywhere
First thing to remember:

M-EAS Rides on top of MDTV

- and only consumes bitrate during emergency alerting telecasts
Each Broadcast TV Station can serve all kinds of users
...using only its regular DTV channel
What is M-EAS?

- M-EAS is a next-gen service that adds CAP-based emergency messaging to Mobile DTV
- Very low-cost addition to Mobile DTV requiring no new spectrum and minimal new transmission infrastructure
  - Regular MDTV programming continues during M-EAS Alerts
- M-EAS has two components:
  1. The text-based message from CAP similar to EAS currently on TV
  2. Rich media additions (photos, videos, evacuation maps, radar images, predicted storm tracks, HTML, etc.)
- Includes a device wake-up function
M-EAS Compatibility

• M-EAS is completely CAP compliant
• M-EAS is designed to integrate seamlessly with – and become an extension of – IPAWS (Integrated Public Alert and Warning System)
  o Not a replacement but rather an embellishment
• M-EAS is compatible with existing IPAWS systems, as well as compatible with local alerting capabilities
• Now an integral part of the Mobile DTV standard (ATSC A/153)
M-EAS Easily Plugs Into Broadcasters’ Station Operations

Alerting Authorities
- FEMA
- State
- Regional
- NWS
- Local

Existing Alert Options
- EAS
- CMAS
- NOAA
- Internet

IPAWS Open Platform

Local Stations with M-EAS
- Mobile DTV Devices
- Cell Phones
- Tablets
- GPS
- In-vehicle Devices
Alert Disseminators (public alerting systems)

Standards based alert message protocols, authenticated alert message senders, shared, trusted access & distribution networks, alerts delivered to more public interface devices

Alerting Authorities
- Local
- State
- Territorial
- Tribal
- Federal

* Includes NOAA

Alert Aggregator/Gateway

the Message Router (Open Platform for Emergency Networks)

IPAWS OPEN

IPAWS – M-EAS Integration

American People

All Radio and TV
AM FM; Digital, Analog, Cable, and Satellite

web applications, widgets, web sites, social media

cell phones

Digital Signage

IPAWS compliant CAP Alert Origination Tools

IPAWS – M-EAS Integration

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IPAWS compliant CAP Alert Origination Tools

Alert Aggregator/Gateway

the Message Router
(Open Platform for Emergency Networks)

Alert Disseminators

- Mobile Emergency Alert System (M-EAS)
- Mobile DTV Emergency Alert System (M-M-EAS)
- Other emergency networks

American People

Cell phones

Web applications, widgets, websites, social media

M-EAS - Mobile Emergency Alert System

Future Technologies

- IPAWS – M-EAS Integration
- Digital Signage
- Siren
- FM RBDS
- ETN
- NWS
- Other emergency networks
Initial Project Participants

• Lead Partners
  o PBS
  o LG Electronics/Zenith

• Additional Technology Providers
  o Harris Broadcast
  o Roundbox

• Participating Stations
  o Vegas PBS (KLVX)
  o WGBH (Boston)
  o Alabama Public Television
  o WRAL (Raleigh) – first commercial station
Funding and Supporters

- Corporation for Public Broadcasting (CPB)
- LG Electronics (and its Zenith subsidiary)
- NAB Labs
- Open Mobile Video Coalition
- Mobile500 Alliance \{MyDTV\}
- Mobile Content Venture \{Dyle\}
Milestones Completed

- April 2011: M-EAS Pilot Project announced
- October 2011: First discussions* with FCC, FEMA, NWS
- November 2011: Three PBS Pilot Stations named
- January 2012: First public demonstration (CES 2012)
- Feb/March 2012: Trials with participating PBS stations
- April 2012: Successful results demonstrated (NAB Show)
- June 2012: ATSC standardization process initiated
- September 2012: Use at first commercial station (WRAL)
- January 2013: Demonstrated at International CES
- February 2013: Demonstrated as part of APTS Public Media Expo
- March 2013: ATSC Standard adopted for M-EAS

* Discussions are on-going
ATSC and M-EAS

- ATSC quickly moved through standardization
  - June 2012 – work began
  - December 2012 – ballot initiated for Proposed Standard
  - January 2013 – Approved as PROPOSED STANDARD
  - January 2013 – ballot initiated for Full ATSC Standard
  - March 2013 – M-EAS Approved as FULL ATSC STANDARD
    (ATSC Mobile DTV Standard: A/153 Part 10, Mobile Emergency Alert System)

- ATSC forms M-EAS Implementation Team (M-EAS I-Team)
  - Announced in January 2013
  - Jay Adrick named as Chair
  - Work begun March 2013
M-EAS Developments In-Progress

• New M-EAS website:  www.mobileeas.org
• Continued rich media development for real-time FEMA/NWS alerts
  – KATU/Portland – Demo launch for Earthquake and Tsunami use cases
• “Mobile TV Emergency Alerting” now on NAB homepage www.nab.org
• Transport streams available for testing by MDTV device makers, app developers, and others (see www.mobileeas.org)
• Continued outreach to Congress, federal agencies, and state and local emergency managers
M-EAS I-Team

• In the first part of this project:
  • We developed the system,
  • we demonstrated it, and
  • we started the standardization process…
  • … now it’s time to make it real and put the standard to use

• I-Team Scope: “Provides a venue for industry discussions of issues related to implementation of this addition to the ATSC A/153 MDTV Standard”
M-EAS Content Sources

Types of M-EAS Messages and Content

M-EAS Content Manager at TV Station

- Video Clips
- CAP Messages
- Library Files
- Graphic Files

Mobile EAS Content Server

Note: Resides within Signaling and Announcement Server

DTV Transmission System

- Mobile Encoders
- ATSC Encoders
- Mobile Network Adapter
- DTV Transmission System
M-EAS Content Sources

Video Clips

M-EAS Content Manager at TV Station

Mobile EAS Content Server

Note: Resides within Signaling and Announcement Server

Mobile Encoders
ATSC Encoders

Mobile Network Adapter

DTV Transmission System

SNG

ENG

News Copter

Traffic Cameras

Tower Camera

Live Studio

Video Clips
CAP Messages
Library Files
Graphic Files

DTV Transmission System
M-EAS Content Manager at TV Station

Library Content

- Mobile EAS Content Server
  - Video Clips
  - CAP Messages
  - Library Files
  - Graphic Files

Note: Resides within Signaling and Announcement Server

DTV Transmission System

- Mobile Encoders
- ATSC Encoders
- Mobile Network Adapter
- DTV Transmission System
M-EAS Content Sources

Graphic Content Files

M-EAS Content Manager at TV Station

- Video Clips
- CAP Messages
- Library Files
- Graphic Files

Mobile EAS Content Server

Note: Resides within Signaling and Announcement Server

DTV Transmission System

- Mobile Encoders
- ATSC Encoders
- Mobile Network Adapter
- DTV Transmission System

Weather Radar and Forecast Systems

TV Station Graphic Systems

Hyperlinks to Internet Content

Electronic Still Camera

- DTV Transmission System
- Mobile Network Adapter
- Mobile Encoders
- ATSC Encoders
Update Message

Assets Loading

Update Message

A tornado is coming to Springfield. It is moving east at 30 mph.
INVESTING IN YOUR SAFETY
Content Loading Screen

Assets Loaded

Asset Loading
Viewing Video Clips

Play

Controls
Targeted Alerts

Three simultaneous tornadoes within line of severe thunderstorms

County-Based Tornado Warnings
8 counties under warning
Almost 1 million people warned

Storm-Based Tornado Warnings
70% less area covered
~600,000 fewer people warned

More specific
Increased clarity
Supports new dissemination technology
Video from WRAL/Raleigh Demonstration can be seen in the Harris booth in the TechCon Exhibit Hall.
Mobile DTV Pavilion - N2638 (plus MyDTV & Dyle)
ATSC Pavilion – N2837
Harris Broadcast Booth – N2503
For further information on M-EAS please visit our website:

www.MobileEAS.org
A Case Study of Economical Broadband Antenna Solutions for the Next Digital Transition

Presented by: Keith Pelletier - Director, Engineering
Digital Transition

Significant Engineering Depth and Skills Required to Deliver Solutions for Both Transitions

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Customer Specific Engineering Solutions

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Characteristics of the first U.S. Digital Transition:

• Early Adopters did not consider CP (Circular Polarization).

• Mobile TV was not a consideration

• Early receivers showed it was detrimental to have both polarizations

• High Power sites deployed
Digital Transition

Continuing characteristics of the Digital Transition:

• More Broadcasters looking to combine channels for economic reasons.

• More Medium Power and Low Power Stations converting to Digital Television

• Tower Space and Loading Concerns

• CP (Circular) or EP (Elliptical) help Mobile Reception and Improve Signal Saturation

• Result = More Broadband Systems
Case Study – WNYT
WNYT Requirements

- Limited Tower Space
- D39 (596-602 MHz) and D45 (656-662 MHz)
- 15 kW ERP and 1.3 kW Transmitters
- EPOL Antenna (as much VPOL as possible with TPO Available)
- Limited Building Space – Requires Small Combiner
- Small Antenna Required - Needs Bandwidth similar to Panel Antenna
WNYT Antenna Design

- Design Impedance with Equal Vectors and 90 degrees Apart if Possible (Results in Full Cancellation)

- Resultant Vector = Sum of Two Vectors
  \[ R = X + Y \]
  \[ R = X(350°) + Y(170°) \]

  As long as Y and X are Equal Magnitude

  \[ R = 0(0°) \]

In order to achieve good Elevation Pattern Bandwidth Smaller Increments of Phase can be used. **Need to Balance Design for Customer Needs.**

If you use 80 degrees: \( Y(160) \), \( R = 0.87(75°) \)
WNYT Antenna Design

- Eliminate Slot Add up of Impedances
- End Fed Designs are Detrimental to Broadband Systems
- Multiple Center fed Designs Optimize Bandwidth
- Phasing Needed to Achieve Optimal VSWR - but need to balance with pattern bandwidth

**VSWR vs. Frequency**

- Center Feed D39 to D45
  - VSWR vs. Frequency
  - 620 to 660 MHz

- 19 Layer End Feed D41 to D47
  - VSWR vs. Frequency
  - 628 to 678 MHz

Careful Design Required to Maintain all Electrical Characteristics

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WNYT Antenna Design

- Vertical Polarization (VPOL) is driven from Parasitic Dipole on front of Slots
- VPOL set at Mid Channel. It is channel specific (length and angle)
- Correct VPOL percentage achieved at Both Channels

All Electrical Characteristics need to be Considered for Optimal Design
WNYT Azimuth Design

• One Main Slot and One Parasitic Slot

• Parasitic Slot fills In Backside of Pattern (9 dB down from Main Slot)

• Minimize Slots and Dipoles To Maximize VSWR Bandwidth

Careful Consideration of All Narrow Band Impedances to Achieve Final Result
Multi Stage Center Fed Designs More Stable Than End Fed Designs over Wide Bandwidth
WNYT Antenna Design Recap

- Minimized Slot Add-Up to Maximize Elevation Pattern Bandwidth – 12 Layer Antenna

- Large Phase Offset Used at 3 Locations to get VSWR Bandwidth (Antenna Sections are center feeds)

- Elevation Pattern Reviewed Closely while Maximizing VSWR Bandwidth

Bottom Line – New York Antenna Met the Needs of the Customer
WNYT Low Power Filter

- 6 Pole Filters - 3 kW Max Input Power
- Cavity Size (Q) Determines Loss
- Power Tested to Ensure Low Temperature Cases
- Liquid Cooled Version Available to 6kW Plus Ratings
- Band Tunable from 470 – 860
- Power Ranges from 100W to 7 kW
- DVB-T (2), ISDB-T, ATSC

Low Power Filter Line Covers Many Power Levels and Standards
New York Filter Data

- Filters Met Mask
- Great Response
- Run with Low Case Temperatures
- Low Loss for Cavity Size

Small Filter Package with Excellent Performance

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Case Study - East Carolina
East Carolina Requirements

- Need 5 Station Combiner to feed existing Horizontally polarized Antenna
- 100 Watt Transmitters
- Small Filters and Economical Solution
- Limited Space - Small Footprint Required
- Future Antenna Solution with EPOL or CPOL
- 488 MHz to 572 MHz (Channels 17, 22, 24, 28, and 30)

Economical Low Power Combiner Required
East Carolina 100 W Filters

- 6 Pole Filters - 100 W each
- Cavity Size (Q) Determines Loss
- Power Tested to Ensure Low Temperature Cases
- Band Tunable from 470 – 860
- Power Ranges from 100W to 7 kW
- DVB-T (2), ISDB-T, ATSC

Low Power – High Quality

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Low Power 5 Station Combiner

Manifold Technology Allows Economical Solution
East Carolina Combiner Results

- 5 CH Manifold Combiner
  - 100 Watt Transmitters
  - Economical Manifold Design - Type-N Inputs
- Excellent Filter Response
- CH 17 (488-494 MHz) Data Shown
East Carolina CH 30 (566-572 MHz)

CH 30 (566-572 MHz)

• Low Loss
• Small Package
• Good 6 Pole Response
• All 5 stations meet mask
East Carolina Future Requirement

Antenna
- Upgrade to Circular Polarization
- TUL Panel to Cover CH 17-30 (488-572 MHz)
- Economical
- 7/16 Din Input
- 500 Watts / Panel Rating

RF System
- Need 600 Watt Filters
- Low Loss
- Larger Cavity
- 7/16 Din Input / Output

East Carolina will Increase Power and Require Circular Polarization
Case Study – California
California Requirements

- 3 Sites, 3 Stations Combined per Site
- 15 Horizontally Polarized Broadband Panels
- Systems Integrated as “kits” at each site
- Economical Solution Designed for 100 W Transmitters
- Quick Delivery

Economical Products with Quick Delivery

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California Antenna Requirements

- Panels Pre-tuned in Inventory
- Broadband 470- 870 MHz
- 7/16 DIN Inputs
- 1kW Power Rating Per Panel

Broadband Horizontally Polarized Panel
California Site 1   15/17/29 (476-566 MHz)

- Excellent Combiner Results
- Small Package
- Low Loss

High Quality, Economic Combiner
California Site 2 – 18/21/23 (494-530 MHz)

- Engineering Expertise
- Precision Manufacturing
- Reliable Results

Customer Driven Solutions

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California Site 3 - 30/32/34 (566-596 MHz)

- Proven Technology
- 100 W 6 Pole Filters
- Stable Response Band Tunable
- Quick Delivery

High Quality, Low Power Products
Conclusions
• Strong Engineering Houses Required for Low Or High Power Digital

Transitions

• Economical Designs Required

• Engineering Economical Solutions and New Technology a Must

• Engineering Tool belt Remains the Same
SPX is committed into investing into Technology
Thank you

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