Toward an Integrated
Electronic Messaging System

Santa Clara County ARES®/RACES

Revised: 25-Jan-2014 (print)
Our Mission

• Provide Santa Clara County emergency communications responders with a **reliable**, **efficient** and **effective** digital messaging environment that meets the needs of our served agencies.
  – **Reliable** – a system that will stand the test of an infrastructure-impacting event
  – **Efficient** – optimize the digital messaging environment within the constraints of the technologies used
  – **Effective** – enhance our served agencies’ ability to focus on the job of disaster stabilization and recovery
Mission Scope: Intra-city

Message Flows

• CERT neighborhoods/zones/Arks → City EOC
• Shelters → City EOC
• School Districts → City EOC

Message Types

• Forms (Damage assessment, logistics requests, ICS-213 messages, ...)
• Structured text (lists, addresses, tables, ...)
• Unstructured text
Mission Scope: Intra-agency

- **Message Flows**
- Schools → School Districts
- Red Cross shelters → Red Cross EOC
- Water infrastructure sites → Water District DOC
- Hospitals → Medical Health Operations Center (MHOC)

**Message Types**

- Forms (hospital, status, logistics)
- Structured text (lists, addresses, tables, ...)
- Unstructured text
Mission Scope: Intra-county

Message Flows

- City EOC → County EOC
- Agency EOC → County EOC
- Remote ICPs → County EOC

Message Types

- Forms (ICS-213 messages, logistics, ...)
- Structured text (lists, addresses, tables, ...)
- Unstructured text
Mission Scope: Regional

Message Flows

• County EOC to Coastal Region EOC
• County EOC to surrounding counties
  – May or may not be strictly ICS compliant, but a reality nonetheless

Message Types

• Forms (ICS-213 messages, ...)
• Structured text (lists, addresses, tables, ...)
• Unstructured text
Mission Scope: 3rd Party

Message Flows
• Health & Welfare
  – 1st responder/DSW and family
• Logistics
  – Equipment and supply vendors

Message Types
• Health and welfare: unstructured text
• Logistics: Structured text (orders, status updates, ...) and Unstructured text
## Requirements

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2009 Electronic Messaging Situation

• A working system based on packet radio. However ...
• Each city had separate systems
• A single county system – single point of failure
  – Aging HW; unsupported SW
  – RF channels were overloaded
  – Limited geographic coverage
• No automation; many manual processes
• Client software was advanced, but could be better
• No integration
  – City systems not networked to county system
  – County system not connected to any other networks/services
## Requirements Scorecard: 2009

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2009 PLANNING ACTIVITIES
Electronic Messaging Technology Tradeoffs

• Public Internet (Mbps)
  – Including: hard-wired connections, public WiFi, wireless carriers, ...
  – If you have it, use it. But ...
  – Local outages occur even under normal operating conditions
  – “Emergency” comms must operate even without Internet connectivity

• Private WiFi (Mbps)
  – Crowded band, extremely line-of-site limited
  – Ubiquitous deployment not possible without enormous costs
  – OK for point-to-point and short-range, hot spot scenarios
  – Most implementations are less reliable than existing commercial nets

• HF Digital Modes (100bps)
  – Slow, large antennas, noise, propagation issues (skip)

• VHF/UHF Packet (Kbps)
  – VHF frequencies allow ubiquitous deployment throughout county
  – Slower speed partly mitigated by smart software, ops procedures
Typical Packet Network Components

Portable, Battery operated, Deploy anywhere

- TNC (Modem)
- Radio
- PC Running Outpost and PacFORMS

Fixed Sites (typically)
- UPS, Generator
- VHF/UHF (typically)
- Wide Coverage
- BBS (Bulletin Board System)
- GW (Gateway)
- Key for Integrated Messaging
- Other Networks

No Internet Required
2009 Plan

- Four-site network
- Presentation to SVECS October 2009
2010 - 2013

CLIENT SOFTWARE IMPLEMENTATION
Ease of Use

- Outpost: Simple e-mail like client interface
- PacFORMS: Simple web-based interface for forms
- Automatic default browser detection
- Tactical Calls: Cities, agencies can create their own
- Automatic forwarding to primary BBS for tactical calls
Installation, Configuration

• Integrated Outpost/PacFORMS installer
  – Compatible with Windows 2000, XP, Vista, Win7, Win8
  – Configures dozens of Santa Clara County preferred options
  – Optimized TNC settings for all popular TNCs

• Enhanced support for USB-to-serial adapters

• Outpost Profiles allow switching configurations easily
Performance and Optimization

- TNC setting optimizations reduced number of packets by 80%
- PacFORMS: already reduced message size by 97%; enhanced to further reduce message size by another 30%!
- Outpost: duplicate bulletin downloads are avoided; BBS interactions optimized to minimize commands
- More frequencies greatly reduces congestion
Automation

- Sent and received message numbers auto-assigned, unique
- Delivery receipts automatically generated
- ICS-309 Comm Log automatically generated, can be automatically printed
- PacFORMS auto-fills: date, time, message number, call sign, method, ...
- Weekly check-ins automatically error-checked, totaled, reported
- At SCCo EOC, advanced logger automatically receives, logs, prints multiple copies with unique footers, and backs up data
Integration with Multiple Messaging Systems

• Multiple networks, address formats supported
  – Local user: w6xrl4
  – Local tactical: xndeoc
  – AMPRnet: w6xrl4@w2xsc.ampr.org
  – BBS network: w6xrl4@w4xsc.#nca.ca.usa.noam
  – Winlink: w6xrl4@winlink.org
  – E-mail: herman@the-munsters.org
  – SMS/Text: 6508675309@someserviceprovider.com

• PacFORMS is now 7-bit compatible; can be sent/received via packet or e-mail, from/to PCs, tablets, smart phones
2010 - 2013

NETWORK IMPLEMENTATION
2009
Starting Point

- Single BBS
- Three frequencies
  - Heavy congestion
  - Huge message backlogs during drills
- x386 hardware
- DOS operating system
- AA4RE BBS software
  - Supported tactical calls
  - Numerous problems
  - Developer no longer supporting it
Convert Existing BBS, Add Second BBS, Move County EOC to LAN Connection

- Updated hardware
- Linux Operating System
- JNOS BBS server software

AX.25 Backbone (70cm)
Scripted BBS Configuration, Third BBS

- Auto-generated configuration files specific to SCCo
- 100s of parameters across multiple files, zero errors
Fourth Server, AMPRnet, Outbound E-mail, Test Environment
2-way E-mail, Distributed AMPRnet

EOC

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RF Connections to BBS Network

- **BBS Network**
- **AMPRnet**
- **Internet E-mail**
- **AX.25 Backbone (70cm)**
- **Winlink**

**Nodes:**
- **W1XSC**
- **W2XSC**
- **W3XSC**
- **W4XSC**

**Connections:**
- 2m
- 1.25m
Quality Network Operations

- All components on UPS with generator backup
- Remote monitoring and control; multi-level security
- Automated alerts
2013 Electronic Messaging Integration Status

- Gateways to BBS Network, AMPRnet, E-Mail
- 2-way text and PacFORMS* with virtually any networked device
  - Inbound from SMS/Text network is carrier dependent

*No PacFORMS

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Weekly Testing

- Each check-in acknowledged; receives automated feedback about errors
- Totals automatically reported
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LOOKING FORWARD
1H 2014: Distributed BBS Net, Higher Speed Backbone

- BBS Network
- AMPRnet
- Internet E-mail
- AX.25 Backbone (70cm)
- 802.11/Microwave/Fiber Backbone
- Winlink
- Test
- EOC
- Alt EOC
Are We Done?

• Is this sufficient for our needs?

• If not, then what do we need?
  – Lots of opinions

• So, what problem are we trying to solve?
  – ... and how does that fit within our mission?
2014+ Ideas

• Some ideas for more integrated messaging
  – Support for more Internet message formats (MIME, base64)
  – Support binary attachments (spreadsheets, images ...)
  – Possible integration with WebEOC?

• Some basic connectivity ideas
  – Hot-spot support at local command post?
  – Site-wide or even incident-wide LAN connectivity?
  – Public service event-wide LAN connectivity?
  – Flexible, ad hoc deployment – bring up network quickly, without the need for centralized design of addressing and routing
One Connectivity Idea: Mesh Networking

• Self-configuring, auto-discovering
• Can use 802.11 (WiFi) equipment
  – Low-cost H/W available on eBay
  – Limited distance, VERY line-of-site!
• We can operating under Part 97 rules
  – Better antennas, possibly more power
• Broadband-Hamnet group in Austin, TX
  – Amateur radio-optimized software
• Several experiments underway
  – Cupertino, Milpitas, individuals
• More info:
  – Website: http://www.scc-ares-races.org/packet/mesh.html
  • Links to: Broadband Hamnet website, scc-mesh Yahoo discussion group
  • More information as we develop it
Help Us Turn These Ideas Into Requirements

• Specifically, what problem needs to be solved?

• What are the usage scenarios?
  – **Who** needs to send the message? Who needs to receive it?
  – **What** type of message? What format? What content?
  – **When** do they need to send it?
  – **Where** is it coming from / going to? (physical location)
  – **How** is it going to get there? (proposed connectivity)

• Bring the details and discuss at the monthly SIG meeting
  – 7pm, 3rd Thursday of each month at the SCCo EOC
How to Get Involved

• Join the discussion groups
  – http://groups.yahoo.com/group/scc-packet
  – http://groups.yahoo.com/group/scc-mesh

• Get a station and use it
  – Check-in to Monday or Tuesday nets
  – Regularly verify connection via primary BBS, backup BBS, e-mail, ...

• Come to packet training classes
  – There’s new information every year

• Participate in drills, public service events
  – City or county EOC, field stations

• Investigate new electronic messaging requirements
  – Dig into the details, bring to the monthly SIG meeting

• Join or start a mesh networking experiment in your area
Packet Committee Members

• John Altieri, W6HW
• Jim Clark, N6JRC
• Bob Fishman, K6FSH
• Michael Fox, N6MEF
• Jerry Haag, K6GAC
• Phil Henderson, KF6ZSQ

• Tim Howard, KE6TIM
• Doug Kalish, KA3L
• Jim Oberhofer, KN6PE
• Andy Rose, KI6SEP
• Tom Smith, KD6SOJ
• Logan Zintsmaster, KZ6O

Everything we’ve discussed today is due to the efforts of these people!
Thank You!