Regional Resource Sharing For NG9-1-1

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Objectives

- Learn how regional 9-1-1 organizations have successfully implemented shared 9-1-1 technology including telephony equipment
- What are the driving factors (NG911, cost savings, etc…)
- Learn how the sharing of technology resources can uniquely position PSAP’s for future technology advancement such as Next Generation 9-1-1 and communications interoperability
Lets Look At The Differences Between Traditional & Shared Systems From a Call Takers Perspective

Hint...There Really Are None
Traditional 9-1-1 Controllers

Everybody’s got one...
Shared 9-1-1 Controllers

- Still use virtually all features & functions of legacy 9-1-1
  - Incoming trunks
  - Telco managed selective routing
Shared 9-1-1 Controllers

- Multiple redundant controllers

Diagram showing a Telco Selective Router connected to Shared Controllers, which are connected to Private IP Network and then to PSAP A, PSAP B, and PSAP C.
NG9-1-1 environment
- Calls delivered in IP format
- Controllers manage selective routing & NG9-1-1 Functions
Case Study 1
South Central Iowa Regional E-911
Details
South Central Iowa Regional E-911

- Seven counties located South and West of Des Moines
- The counties have operated as a “Regional 911 Board” since inception in 1997
- Area served by three area codes (712, 515 and 641)
- All PSAP’s previously had their own CPE
- Disparate CAD systems
- Centralized GIS data management
- Antiquated mapped ALI software
Details
South Central Iowa Regional E-911

- Three “shared” and redundant controllers
Selective routing is handled by CenturyLink.

Routed calls to each PSAP are directed to a specific controller which handles calls for that PSAP.

New 8Mb private network links controllers to PSAP workstations.
Details

South Central Iowa Regional E-911

- Centralized and shared CAD/RMS/Map implemented operating over the new private IP network
- Project cost $1.5 million
Future Plans
South Central Iowa Regional E-911

- Connect to State IP network for wireless call delivery (completed)
- Direct wireline calls to State IP network (Planned 2014)
- Remove CAMA to IP Gateway and receive all calls via IP (Planned 2014)
- Implement GIS call routing and other NG9-1-1 features as they become available (Planned 2014)
Funding
South Central Iowa Regional E-911

- Local landline surcharges
- State Wireless Grant ($50,000 per county)
- Local loan
Case Study 2
Region 24, Nebraska (KBRC)
Details
Region 24, Nebraska (KBRC)

- Four counties located in North Central Nebraska
- Rock County was the first to implement E-911 services in 2008
- Cherry, Brown & Keya Paha Counties began implementation that same year
- The 9-1-1 CPE was set to be the single largest expenditure by each of the counties
- The counties had a track record of working together through Region 24 Emergency Management
Details
Region 24, Nebraska (KBRC)

- Area served by three area codes (402, 308 and 605)
Once decided to share 9-1-1 CPE, a larger hurdle became network connectivity between the shared controller and the PSAP workstations

- Telco T1 cost prohibitive
- Broadband connectivity not yet available
- What about wireless…
  - Future State of NE Broadband Network (NRIN)
Details
Region 24, Nebraska (KBRC)

- A regional wireless carrier had towers with microwave connectivity at all 4 PSAP cities
  - T1 connectivity over microwave
  - Relatively low monthly cost
  - Interim solution
  - What about “last mile” connection to PSAP’s

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Details
Region 24, Nebraska (KBRC)

- Limited hardwire connectivity to wireless towers
- Line of sight from PSAP’s
- Wireless link hardware best solution
  - 5.4 Ghz
  - Little or no recurring cost
  - Can be re-used later with NRIN
Selective routing is handled by CenturyLink.
Routed calls to each PSAP are directed to a specific “port” which handles calls for that PSAP.
1.5Mb wireless network links controller to PSAP workstations.
Case Study 2
Region 24, Nebraska

- Network only carries 911 traffic and map signaling due to limited bandwidth
Future Plans
Region 24, Nebraska (KBRC)

- Migrate to NRIN network
  - Increased bandwidth
  - Low recurring cost
- Implement GIS call routing and other NG9-1-1 features as they become available
Funding
Region 24, Nebraska (KBRC)

- Local landline surcharges
- State Wireless Fund
- State allocation of Federal Enhance 911 Act funds
Case Study 3
East Central 9-1-1 Region, Nebraska
Details
East Central 9-1-1 Region, Nebraska

- Ten counties located in East Central Nebraska
- Serve a combined population of 137,309
- Track record of working together through Region 10 Emergency Management
- All counties currently E-911, PI and PII
- Selective routing and ALI database management provided by LEC’s (CenturyLink & Windstream)
Details
East Central 9-1-1 Region, Nebraska

- Majority have 8-10 year old CPE
- One PSAP has newer IP capable CPE

<table>
<thead>
<tr>
<th>PSAP</th>
<th>Current 9-1-1 Equipment</th>
<th>Number of Workstations</th>
<th>Number of 9-1-1 Trunks</th>
<th>Number of Non-Emergency Trunks</th>
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<td>Boone County Sheriff's Office</td>
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<td>Cassidian Vesta</td>
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<td>Columbus Police Department</td>
<td>TCI</td>
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<td>Positron LL 100 connected to Positron Workstations</td>
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<tr>
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<td>Positron LL 100 connected to Positron Workstations</td>
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<td>3 wireline 2 wireless</td>
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<td>Nortel InVision (TCI)</td>
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<td>2</td>
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<tr>
<td>Saunders County Sheriff's Office</td>
<td>Cassidian Vesta</td>
<td>3</td>
<td>2</td>
<td>4</td>
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<td><strong>Total</strong></td>
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<td><strong>28</strong></td>
<td><strong>35</strong></td>
<td><strong>37</strong></td>
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</table>
Details
East Central 9-1-1 Region, Nebraska

- Area served by three area codes (402-Norfolk, 402-Lincoln and 308)
Goals
East Central 9-1-1 Region, Nebraska

- Save money by sharing the 9-1-1 CPE
- Increased redundancy between PSAP’s
- Improve call transfer capability
- Transition to future NG9-1-1 technologies
Models Evaluated
East Central 9-1-1 Region, Nebraska

Model One

- Assumes each participating PSAP in the region replaces its existing 9-1-1 equipment with new, independent, state-of-the-art 9-1-1 premise equipment. Each PSAP would purchase an independent controller and operate as a completely stand-alone entity. Network configuration would remain as it is currently.

Estimated Cost $1,750,000
Models Evaluated
East Central 9-1-1 Region, Nebraska

Model Two

- Model Two assumes the purchase and installation of a new single controller to support all participating PSAPs in the region. The controller would be housed at a central location and would be implemented along with a redesign of the 9-1-1 network to achieve efficiencies.

Estimated Cost $935,000
Models Evaluated
East Central 9-1-1 Region, Nebraska

Model Three

- Model Three would utilize the Howard County controller as a host with necessary PSAP upgrades to transition to Next Generation 9-1-1 (NG9-1-1).

Estimated Cost $900,000
Models Evaluated
East Central 9-1-1 Region, Nebraska

Model Four

- Model Four would utilize the Howard County controller as host with necessary PSAP upgrades to transition to the NG9-1-1 in addition to securing a shared regional back-up controller.

Estimated Cost $1,500,000
Recommended Model

- The East Central 9-1-1 group is pursuing implementation of Model 4
  - Use existing IP capable controller
  - Procure an additional controller for back-up
  - Transition to NG9-1-1 as appropriate
  - Utilize State of Nebraska wireless broadband network (currently being constructed) for connectivity
Happening Now
East Central 9-1-1 Region, Nebraska

- RFP has been issued and Bids Received
  - 6 vendors
  - One “hosted” solution
    - $21,525 per month ($258,300 per year) with one-time implementation cost of $162,000
  - Five “locally installed” solutions
    - Installation cost range from $762,994 – $1,713,984
    - Annual support cost range $27,857 – $84,522
Future Plans
East Central 9-1-1 Region, Nebraska

- Implement new shared system
- Migrate to NRIN Network
  - Increased bandwidth
  - Limited recurring cost
- Implement GIS call routing and other NG9-1-1 features as they become available
Funding
East Central 9-1-1 Region, Nebraska

- Local landline surcharges
- Local general fund budgets
- State Wireless Fund
So How Can You Share Equipment & Become an “IP Enabled PSAP”?
Keys To Success

- Cooperation
- Connectivity
- Funding
  - One-Time
  - Recurring
Cooperation

- The governing bodies and local PSAP operators in the region must be willing to work together
- Think of the 911 CPE as a shared resource
- Governance...
Governance

- Some regions have existing cooperative or interlocal agreements which can be expanded to cover shared 911
  - Cost Sharing
  - Where Is Core Equipment Located
  - How Is Maintenance Handled
  - Who Is The “Lead” Agency
  - Opt-In
  - Opt-Out
Connectivity

- Can be wired or wireless
- Single T1 is probably not enough bandwidth
- Network needs to be...
  - Managed (secure and quality of service)
  - Scalable (sized to fit and expandable)
  - Reliable (resistance to failure)
  - Configurable (compatible with a mix of public and private networks)
Connectivity

• Think of the Region as a large PSAP…
  ■ Instead of having all of the call taker workstations in one room, they are spread throughout the Region, all connected to one or more “controllers”
  ■ Wide area network instead of local area network
  ■ Easy call transfers
  ■ Instant messaging
  ■ Back-up
  ■ Call overflow
Funding

- Local funds pooled across a region...
- Leverage regional, state and federal resources
  - Grants
  - Cooperative Agreements
Now That We Agree That 9-1-1 CPE CAN Be Shared...
Benefits

- Cost savings
  - Shared implementation
  - Shared maintenance
- Increased overall redundancy
  - Continuity of Operations
  - Common Operating Picture
- Prepare for future technologies (NG9-1-1)
- Consolidation...
Future Technologies

- NG9-1-1
  - Text
  - Video
  - Telematics
    - Automatic Crash Notification
    - Weather data
    - Caller details (Smart911)
- Other data sources
  - PSAP will be the “integration” point
Technology Trends

- Changes in personal communication technologies are accelerating the obsolescence of the current 9-1-1 system.
- People expect the same level of access to 9-1-1 service regardless of which town, county or State the caller is in.
- The primary long-term goal for migrating to IP-enabled emergency networks is to allow the general public to make a 9-1-1 "call" from any communication device in any mode (e.g., voice, text, or video).
What is NG9-1-1?

“An IP-based replacement for E9-1-1 features and functions, supporting all sources of emergency access to the appropriate public safety agency (or agencies), operating on managed, multi-purpose IP networks, and providing expanded multimedia data capabilities for PSAP’s and other emergency communications entities.”
NG9-1-1 vs. Legacy 9-1-1

- Improved ability to transfer misrouted calls
- Ability to transfer calls in the event of call overload or inoperable PSAP
- Available data (e.g., location information, photographs) delivered with calls
- Sharing data across regions
- Improved data sharing with responders
- Improved ability to establish virtual PSAPs
Why NG9-1-1...

- A generation has grown up not only with words, but with pictures and videos as well
Why NG9-1-1...

- Many people with hearing and speech disabilities have abandoned TDD in favor of text messaging
Why NG9-1-1...

- Think of our current 9-1-1 infrastructure as a “dial up internet connection” and NG9-1-1 as a “broadband connection”
In the Future, PSAP’s Will Need To...

- Receive calls from the public switched telephone network, managed private IP networks, and directly from the Internet
- Transfer IP 9-1-1 calls to any other IP PSAP, with data, regardless of proximity or equipment used
- Receive telematics info, directly from vehicle
- Receive and respond to emergency e-mail messages
- Receive and respond to emergency “Instant Message” or “Short Message Service”
In the Future, PSAP’s Will Need To...

- Receive and respond to TDD calls with location data
- Receive and respond to multimedia information, including audio, digital photographs & streaming video
- Share information with emergency responders in a multimedia environment that would permit the exchange of digital photography, digital audio, video, etc…
- Connect to multiple location databases utilizing the Internet, a dedicated IP 9-1-1 network or both
Challenges

- IP Enabled 911 will present PSAP’s with challenges...
  - New information will expand the functions of the call-taker.
  - Increase the workload of call-takers
    - See incident instead of just hearing about it
What About A Phased Approach To NG9-1-1 Implementation?
NG9-1-1 Phase 1

Wireless Carriers

VoIP Carriers

Telco SR

Regional IP Network

IP PSAP Workstations

Legacy Network Gateway

Telco ALI

Legacy ALI Gateway

Geo-Redundant 911 & Map Servers

Geo-Redundant 911 & Map Servers

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NG9-1-1 Phase I

- Implement Regional IP Network (ESInet)
- Implement IP Capable 911 Equipment
- Create regional GIS dataset
- Implement “Hosted” Mapping, CAD, Etc…
- Connect to “Legacy” Call Transport Network & Database (ALI & MSAG)
- Telco continues to provide for call routing
- Deploy Interim Text to 911 Solution
NG9-1-1 Phase 2

Regional IP Network

- Network Gateway
- Border Control Function (BCF)
- Location Validation Function (LVF)

Network Carriers
- Wireless Carriers
- VoIP Carriers
- Landline Carriers

- Call Routing
  - Emergency Call Routing Function (ECRF)
  - Emergency Service Routing Proxy (ESRP)

- Location Information Server (LIS)
- Subscriber Database

- Geo-Redundant 911 & Map Servers

Geo-Redundant 911 & Map Servers

IP PSAP Workstations

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NG9-1-1 Phase 2

- Remove Legacy Network Gateway to directly receive new SIP call transport (i3)
- Replace ALI with LIS
- Replace MSAG with ECRF/ESRP
- Begin using GIS for call routing and validation
- Directly receive text and multi-media (i3)
What role does GIS play in NG9-1-1?

- Call Routing
  - PSAP Service Boundaries
  - Based on the location...which PSAP should receive this call
- Location Validation
  - Is this location valid for this PSAP...
- PSAP Mapping
  - Graphically display the location for call taker and responders
NG9-1-1 Interim Call Routing (GIS)

- Regional IP Network
- Wireless Carriers
- VoIP Carriers
- Telco SR
- Landline Carriers
- ALI Database
- Legacy Network Gateway
- Legacy ALI Gateway
- Geo-Redundant 911 & Map Servers
- Wireless Carriers
- VoIP Carriers
- IP PSAP Workstations
NG9-1-1 i3 Call Routing (GIS)

- **Regional IP Network**
  - **IP PSAP Workstations**
  - **Geo-Redundant 911 & Map Servers**
  - **Geo-Redundant 911 & Map Servers**
  - **Geo-Redundant 911 & Map Servers**

- **Network Gateway**
- **Border Control Function (BCF)**
- **Location Validation Function (LVF)**

- **Call Routing**
  - **Emergency Call Routing Function (ECRF)**
  - **Emergency Service Routing Proxy (ESRP)**

- **Location Information Server (LIS)**
- **Subscriber Database**
- **Voice over IP (VoIP) Carriers**
- **Landline Carriers**
- **Wireless Carriers**
Is Your GIS Data Good Enough To Replace Your MSAG
Who is Responsible for GIS Data?

- The local jurisdictions are responsible for maintenance of the GIS data used for NG9-1-1
- Can be maintained via City/County Staff or via contractor or vendor
Public Safety Consulting & GIS is our specialty.

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Consulting Services

GIS Data Analysis
GIS Data Work Flows
Wireless 9-1-1 Accuracy
Communications Networks
Staffing and SOPs
Operations Consolidation
Feasibility, Design & Implementation
NG9-1-1 Transition & Project Management
Public Safety GIS Services

- GIS Data Analysis
- GIS Data Development
- GIS Maintenance Services
- NG9-1-1 GIS Data Provisioning
- NG9-1-1 GIS Portal Services
- NG9-1-1 Managed SIF
Software Products

9-1-1 / CAD / AVL Mapping
In Vehicle Navigation
GIS Maintenance Tools
NG9-1-1 SIF
NG9-1-1 GIS Provisioning
NG9-1-1 ECRF / LVF
Our Customers

- 1,000+ Customers in 43 States
- Software in over 720 9-1-1 Centers
- 285 GIS Data Management Projects
- 750 Consulting Projects
- Developed over 225,000 miles of road centerline data
- 175 active GIS maintenance customers
Our Experience

- Our Team Is Dedicated To You
- 17 years of Public Safety GIS Experience
- Only Esri Platinum Tier business partner in the Public Safety space
## Our NG9-1-1 Projects

<table>
<thead>
<tr>
<th>Location</th>
<th>Population</th>
<th>Projects Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCTCOG, TX – 6.7 Million Pop</td>
<td></td>
<td>Data model and workflow consulting, GIS data management tools, ECRF GIS provisioning system, ECRF spatial router</td>
</tr>
<tr>
<td>State of Maine – 1.3 Million Pop</td>
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<td>GIS Data consulting, data management tools, ECRF provisioning service, ECRF, statewide PSAP mapping</td>
</tr>
<tr>
<td>State of North Dakota – 646,844 Pop</td>
<td></td>
<td>2007 study, 2008 proof of concept &amp; 2012 GIS dev project</td>
</tr>
<tr>
<td>State of Nebraska – 1.7 Million Pop</td>
<td></td>
<td>Centerline and addressing development and maintenance</td>
</tr>
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