UTILIZING GIS IN NEXT GENERATION 9-1-1
Tennessee Information for Public Safety
Presented by State of TN, OIR-GIS Services
Next Generation 9-1-1

WHAT IT IS AND HOW IT WORKS
Next Generation 9-1-1

• IP (Internet Protocol) based system
  – Information transferred digitally to responders
    • Voice
    • Soon – text and photos/video
      – This endeavor has its own challenges
  – Travels on ESI Net (Emergency Services IP Net)
    • In TN, this is NetTN
GIS and NG911 in TN

• Tennessee Information for Public Safety (TIPS)
  – Conforms to National Emergency Number Association (NENA) Standards
  • Street Centerlines
  • Address Points
  • Emergency Service Number (ESN) Polys
  – Uniform GIS Platform
    • ESRI ArcGIS Based
      – Not using Arc at all Districts
      – Product provided is ArcGIS Based
  • Currently receiving weekly updates
    – All 100 Emergency Communications Districts (ECDs)
Regional Stats

• The Stats:
  – 100 ECDs broken up by region
    • 94 county ECDs
      – Overton and Pickett Co in Middle TN are combined into one district
    • 6 municipal ECDs
      – 5 of which are in East TN
      – 1 in Middle TN
Next Gen vs. Current System

• Critical parts in current system:
  – MSAG (Master Street Address Guide)
  – ALI (Automatic Location ID)
    • Separately maintained, apart from GIS
    • Provided by phone co – record of each phone line
      – Tied to addresses

• Problems with current system
  – Separate records
    • Multi step process to update MSAG, ALI and GIS
  – Potential for missing addresses/streets in GIS

• Solution: Next Generation 9-1-1
  – Next Gen employs seamless integration of GIS into 9-1-1
    • GIS is Everything
      – ECDs’ GIS data will be default “correct” dataset moving forward
      – In-house phone records (ALI) will be validated against GIS data
    • Edit GIS data – Done!
Emergency Service Numbers

• All 100 ECDs have seamless call routing (ESN) boundaries in State GIS database
  – Nearly 2,000 ESN polygons within the State of TN

• Did You Know?
  – TN has no “official” county boundaries
    – Each County (and ECD) maintains their own boundary
      – None match
      – TDOT maps and signs are simply “close approximations”
  – OIR GIS orchestrated Herculean task of matching all ESN (Emergency Service Number) boundaries
    – Used for call routing only
Public Safety Answering Points

• PSAP polygons are related to ESN polygons
  – Routing information is tied to the PSAPID field within ESNs
    • Call plots (Lat/Lon from ALI validated point)
    • Lat/Lon falls within a PSAP polygon
    • Call routes to that particular PSAP
  – For visual reference, ESNs are dissolved here on the PSAPID field
    • Some ECDs have multiple PSAPs
    • Total of 140 PSAPs in TN
The Future of NG911 in TN

• Near Future
  – Statewide database will be replicated between Nashville and Seattle/Phoenix
    – Phoenix is backup database
  – TCS, based in Seattle, validates the address and street data against ALI records
  – Data then sent back to TN for use in NetTN system
    – Used for initial call routing
  – Jackson area will be first to deploy
    – Should be live sometime in 2015
Next Gen: Data Centers

• NetTN:
  – Data backups stored in Nashville and Knoxville
    • Regional hubs in Memphis, Nashville, Chattanooga, Knoxville, Tri-Cities
      – Each has a dedicated high speed connection to at least two other regional hubs
  – System Used for initial call routing
    • Call routing is not the same as dispatch
    • Dispatching is up to each district and separate from 9-1-1
      – Most districts take calls and perform dispatching
When GIS Based Routing is Deployed

THE 4-1-1 ON 9-1-1 CALL PROCESSING
Land Line Calls: Using GIS

• The Lat/Lon data is tied to the address point
• If the address point is in the GIS data, it will be found and the call sent to the appropriate PSAP
  – This is the goal: every point in the GIS data
    • Primary and sub-addresses
  – Ensures fastest call routing
  – What if the point isn’t found?
    • Geocode based on centerlines
    • Goes to regional call center
      – Takes additional time
      – Responder must talk to caller
Cellular Phone Calls

• Handled exclusively by location of phone
  – No address information is involved as in land-line calls
  – AT&T bases locations off of cell tower triangulation
  – All other carriers use GPS location
    • All initialized phones have GPS receiver capability

• When call is received:
  – Phase 1
    • Displays location at “handling tower”
      – Happens immediately
  – Phase 2
    • Refined location based on carrier method
    • Takes a few seconds for Phase 2 to come to PSAP
      – Maximum time delay dictated by FCC
Standards and QC Metrics

QUALITY STANDARDS
Feature Classes

• Address Points and Centerlines
  – Maintained by ECDs
  – Updated via weekly upload to State
    • Conglomerated into single statewide DB

• ESNs
  – Changes directed by ECDs via interactive website
    • Updated as needed
  – Edits maintained by State
    • Not all districts have ability to maintain topology
    • Calls will be routed based on poly
      – Essential that no gaps/overlaps are present
Quality Control Process

• Primary automatic quality checks:
  • Data is checked and filtered prior to upload into statewide DB
    • Several “pass/fail” fields
      • Other fields lumped together and checked for >2% error rate
    • If any of these parameters fail, the upload is stopped
      • Ensures that we maintain “clean” data in our statewide DB
  • Reports are generated, showing any errors that need to be addressed
    • ECDs are using these to improve the overall quality of their local GIS data
  • Point/poly analysis to ensure address point ESN value matches the ESN polygon where it resides
    • Reports of these errors are also generated for ECD benefit

• Other manual periodic quality checks:
  • Topology
  • Compare ALI (Automatic Location ID) table to address points
As of the end of 2014: All 100 ECDs have data quality at 98% or higher
How we did it – and how you can, too!

BUILDING A STATEWIDE 9-1-1 DATABASE
Standardization

- Standardization of database schema
  - Allows for easy integration into statewide DB
  - Provides common ground for addressing data quality issues
  - Allows for easy data sharing between ECDs
- Access to surrounding ECDs’ data
Facilitation of Data and Support

- Incentive funding for GIS
  - Provided by TN ECB (Emergency Comm. Board)
    - Allowed ECDs to build or contract out GIS Infrastructure
    - Provides money toward maintenance of GIS accuracy
    - Helps with ECD buy-in for the project

- Dedicated support staff
  - Regional analysts
    - Provides a “face” for the project at the district level
    - Assisted in transitioning ECDs to a standard schema
    - Tasked with assisting and facilitating quality control
OTHER USES FOR 9-1-1 DATA
Other Entities Using TIPS Data

• TN Fire Marshal’s Office
• TN Dept. of Safety and Homeland Security
• TN Highway Patrol
• TN One Call (811)
• TN Dept. of Health
• TN National Guard
• TN Dept. of Forestry
Addressing at a National Level

• Beginning of April, 2015:
  – National Summit held in Baltimore, MD
  – Many representatives from Local, State, Federal Government, non-profit, and for-profit companies attended

• Single, unified addressing database
  – Efforts underway to orchestrate

• Likely data source will be local jurisdictions such as 9-1-1 districts
  – Data will pass from Local → State → Federal
    • Assimilated into single DB
Addressing at a National Level

• Difficulties to overcome:
  – Branding
    • Memorable (for the right reasons)
    • Something that is authoritative
      – “System” implies living, up-to-date entity
      – “Database” implies static digital storage facility
  – Logistics
    • Data will need to be updated periodically to maintain currency
    • Ownership and legal issues remain in the air
      – Which Federal Agency will spearhead the effort
Questions?

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TIPS
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