Determining Routing of Wireless Sectors in a Multi PSAP 9-1-1 System

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- 2013 Population of 745,913 with an addition 200k over the next 20 years
- 2 Primary PSAPs
- In 2014 SNOPAC answered 508,491 calls and SNOCOM answered 176,732
- Of those 685,223 calls, 62% or 427,641 calls were made from wireless phones
This is in Snohomish County
And also this.....
A little history of Wireless Routing in the county

- Historically Wireless Sectors were routed to the PSAP that served the community listed on the routing sheet.
- Before 2006, Cell tower locations were recorded in a Thomas Guide
- No consideration was given to where the sectors pointed
Why does it matter

• On average a 9-1-1 call transfer between PSAPs adds 40 seconds of call time.
• In 2014, there were around 94,648 transfers between PSAPs
• This equates to 3.8 million seconds or 1051 hours of call delays
The Solution

• In December 2013, the county invested in the GeoComm Geolynx DMS software for quality control of 9-1-1 Data
• Each Wireless Sector in Snohomish County was given a unique ID assigned by the county for use in our record keeping. This allows us to geo process the entire sector layer regardless of the carrier unique ID
• The 9-1-1 Advisory Board hired an outside consultant to determine what standards exist in routing Wireless Sectors
Routing Criteria

• NENA standards are vague on routing leaving it up to the local jurisdictions
• Carriers generally route by a judgment call based on population
• Consultant recommended routing based on three criteria, number of calls over a period of time, population and percentage coverage area
Mapping Sectors

- In ArcGIS there is not a native way to automatically create the shape of a sector

- Snohomish County has roughly 4000 sectors to map, so manual creation was not an option
Using the GeoComm DMS tool we were able to automatically map the sectors in Snohomish County using the routing sheets provided by the carriers.
Results of Mapping

- Approximately 100 sectors were obviously routed incorrectly. These sectors laid complete within the boundary of one of the PSAPs.
- These changes were sent to the carrier for immediate change.
- Another 995 sectors straddled the boundary between the two PSAPs.
- The decision was made that a model would be built to determine the proper routing of those sectors.
Model Creation

- Using model builder, a model was created to first split each of the sectors coverage areas between the two PSAPS
- Split tool created hundreds of thousands of fragments which were the dissolved based on the Snohomish County unique ID
- Through a series of spatial joins the number of phase 2 wireless calls, the number of site address points and the area covered for each part of the sectors was calculated
Example of Model Output

Initial Sector Mapping

Sectors after Split
Example of Model Output

Sectors after Dissolve

Count Phase II Calls
Example of Model Output

Count Address Points
Result Calculation

• Several methods of calculating results were considered
• Hierarchy - Number of Phase 2 calls was considered first, followed by the site address count and finally the amount of area covered
• Statistical ties were defined as counts which were within 2% of being the same with each PSAP which triggered the next step in the Hierarchy
• Total Vote Model – Each criteria was given one vote for the PSAP with the highest count. The sector is routed to the PSAP with the most votes
• Weighted Vote Model – Each criteria was given a weighted vote based on importance
Results

- The focus of the model was the sectors that straddled the border between the PSAPs
- Of the 995, using the one vote method it recommended changing 233 of them.
- The hierarchical model outputted close to the same results
Reduction in Transfers

• At this point only the obvious sector changes have occurred.
• Between 2013 and 2014 there was a 7% increase in Wireless Calls and a 2% decrease in wireless transfers.
• This decrease is equivalent to 16.4 hours of time saved during 9-1-1 Calls.
The Future

• More recently, work is being done on mapping taken directly from the 9-1-1 record management system.

• Phase 2 Calls were mapped looking at the Wireless ESN where the call originated as well as the X and Y coordinates of the call.

• We have already identified that although Snohomish County has 2 primary PSAPs, 10 different PSAPs answered calls that were made in Snohomish County.

• Work has been done with are neighboring counties to refine and move sectors to their appropriate PSAPs.
Questions
Thanks