



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

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Snohomish County

- **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

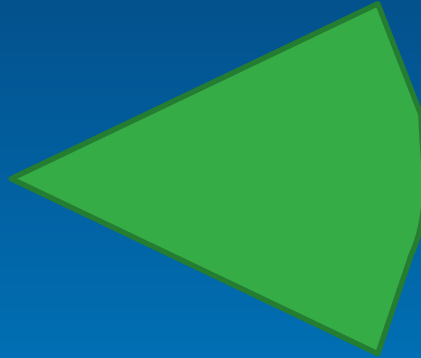
- **In December 2013, the county invested in the GeoComm Geolynx DMS software for quality control of 9-1-1 Data**
- **Each Wireless Sector in Snohomish County was given a unique ID assigned by the county for use in our record keeping. This allows us to geo process the entire sector layer regardless of 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

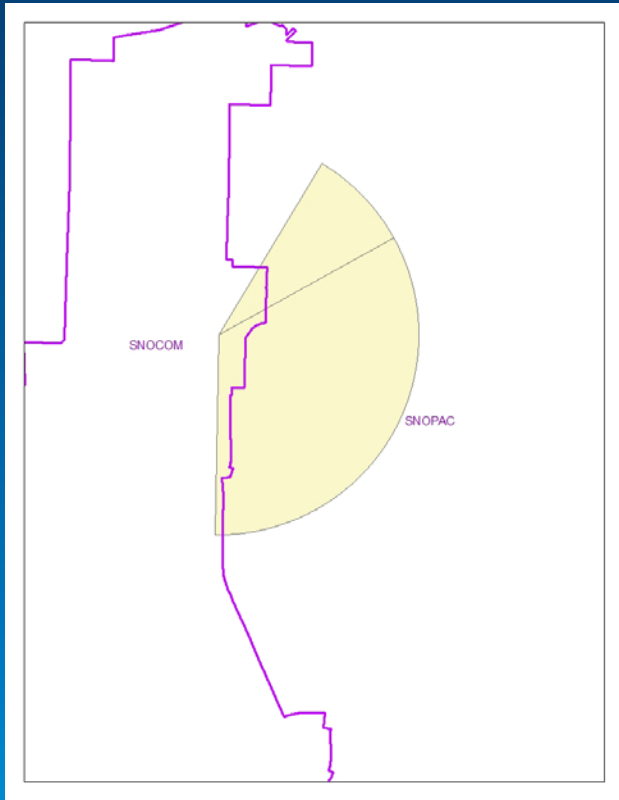
Results of Mapping

- **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**

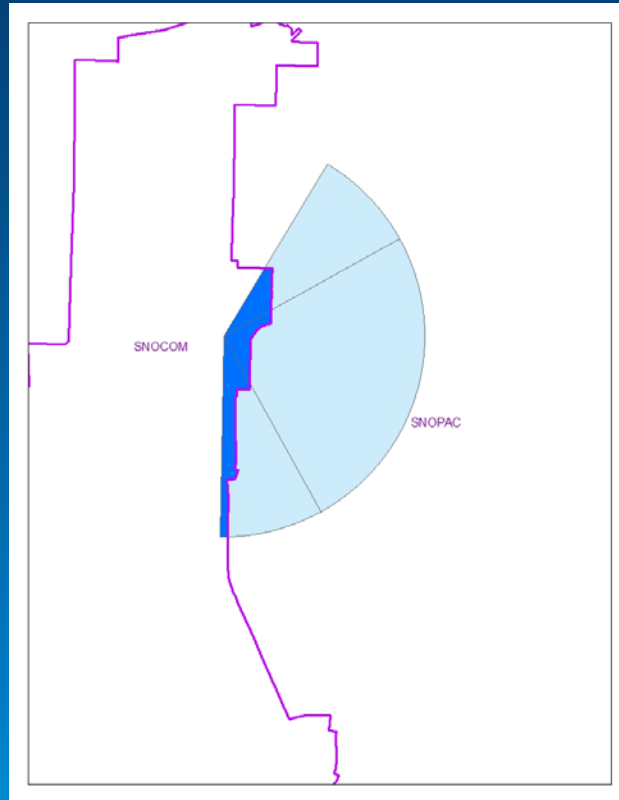
Model Creation

- **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 then 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

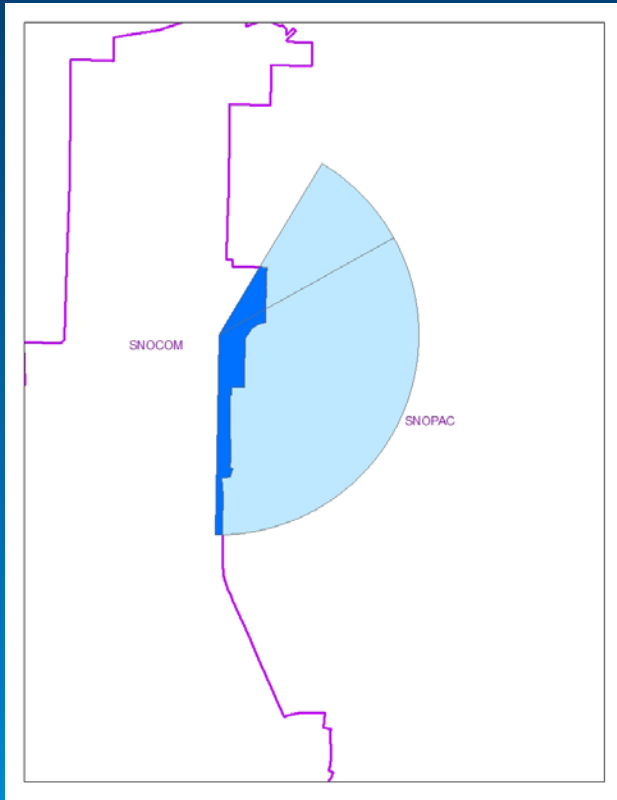


Initial Sector Mapping

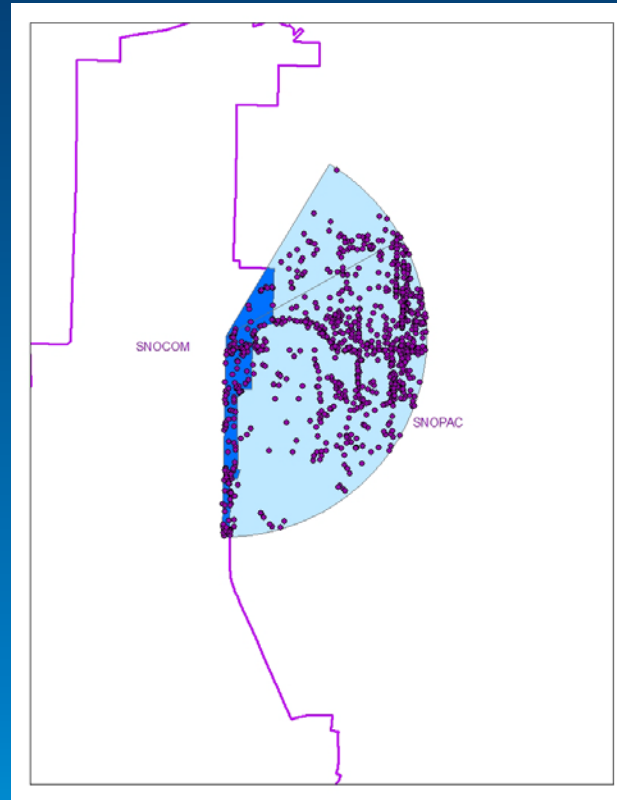


Sectors after Split

Example of Model Output

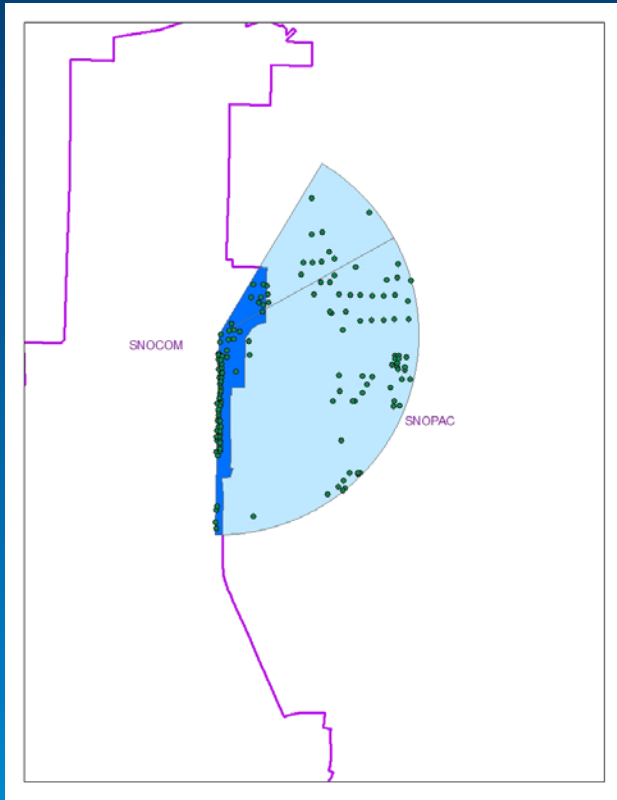


Sectors after Dissolve



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



