

The logo for the Nebraska Public Service Commission, featuring the text "Nebraska Public Service Commission" in a bold, black, sans-serif font. A yellow swoosh underline is positioned beneath the word "Public".

**Nebraska Public
Service Commission**



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Nebraska Wireless Border Testing Report and Solution Strategies

Report

PREPARED JUNE 2017
FOR NEBRASKA PUBLIC SAFETY COMMISSION

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Executive Summary

The states of Nebraska and Iowa share a 250-mile border, and over the past several years, a combined total of 14 public safety answering points (PSAPs) in each state have experienced issues related to routing and the ability to transfer 9-1-1 calls across their borders.

In some cases, routing is considered incorrect for the appropriate response, the attempted transfer technology does not permit the completion of a call, necessary references and resources are not readily available to the telecommunicator, and some calls are not relayed with the full call details. In some cases, callers have been asked to call back repeatedly to reach the appropriate PSAP. These challenges are cause for concern, and both states are eager to identify a solution to remedy the issue.

Determining the location of a call for public safety response services is one of the biggest priorities for any PSAP. Identifying the location of a wireless caller is challenging and limited by technology and environmental factors out of the control of the caller and the PSAP. The inability to accurately locate a wireless emergency caller makes it intrinsically more difficult for telecommunicators to determine the appropriate response to an incident.

The Nebraska Public Service Commission (PSC) shares the public's concerns about misrouted calls and the call-handling processes of border PSAPs. The PSC has contracted with Mission Critical Partners, Inc. (MCP) to perform wireless testing focused on how calls are routed along the border and, leveraging analysis from those tests, to develop an action plan for improving service. The goal of wireless border routing testing is to identify any technical or operational issues that prevent the answering PSAP or the destination PSAP from expeditiously routing and responding to the public's wireless 9-1-1 calls for service. MCP's subject-matter experts (SMEs) conducted such testing in the nine counties along the Nebraska-Iowa border. The test points were arranged in a grid for a total of ten test points per county. Test points were identified randomly in each PSAP jurisdiction to provide a broad cross section that provided the PSAP with a comprehensive view of the calling experience in that area.

The states of Nebraska and Iowa have expressed a desire and a willingness to address the issues of wireless call processing along their border. The results of the border testing effort have produced numerous recommendations that can help improve the prompt and efficient handling of wireless 9-1-1 calls along the states' border. These recommendations are discussed fully in this report, and include:

- Meeting with Nebraska and Iowa 9-1-1 administrative leadership
- Meeting with PSAP leadership
- Developing an action plan
- Creating a memorandum of understanding (MOU) between the states and PSAPs
- Updating standard operating procedures (SOPs)
- Refreshing the training program
- Meeting with wireless carrier and vendor representatives
- Developing an annual review of wireless routing data

The test results and recommendations outlined herein provide the Nebraska PSC with a collaborative approach for working with the state of Iowa, and will assist the Nebraska and Iowa PSAPs in improving wireless call handling for 9-1-1 callers along their border.

1 Background

1.1 General Wireless Calling Behavior

Except for Hawaii and Alaska, all states throughout the U.S. share borders with other states. Borders are defined by bodies of water such as rivers or lakes, highways, or arbitrary lines agreed to by governments. Calls for emergency service know no boundaries: a person needs assistance and they dial 9-1-1. The technology and infrastructure employed in a geographical area routes that call to the correct public safety answering point (PSAP) if the systems are designed properly and the technology permits such routing. The systems are designed to relay the call for help in the quickest and most expeditious manner without the caller needing to do anything but dial three simple numbers to summon help.

9-1-1 calling behaviors along borders between PSAP jurisdictions and states are a bit more complicated and offer additional challenges. Often the 9-1-1 caller is unaware that he or she is near a border. The caller may not even know what state he or she is in, let alone what county. In these cases, it is of the utmost importance that the technology and the infrastructure that has been implemented work effectively and accurately route the call to the appropriate PSAP, or allow for the efficient transfer of that call. The complete transfer of the call and all associated data, such as automatic number identification (ANI) and automatic location identification (ALI) information.

The routing of a wireless 9-1-1 call is more complicated compared with a wireline 9-1-1 call. A wireless 9-1-1 call originates from a subscriber's device, i.e., a cellular phone, and is transmitted via a radio signal over the wireless carrier's network to a base station/antenna located at one of the respective carrier's tower sites. The base station sends the 9-1-1 call to the wireless carrier's mobile switching center (MSC) for proper call processing. The MSC uses a mobile positioning center (MPC) database to assign an emergency services routing key (ESRK) number based on the tower site from which the call originated. A primary PSAP designated to receive the call is provisioned with multiple ESRKs in the database. From the MSC, the 9-1-1 call is connected to the 9-1-1 service provider's tandem switch/selective router within their network. The call then is routed from the tandem switch/selective router and delivered to the PSAP for answering and processing of the request for service. The diagram in Figure 1 below demonstrates how a Phase II wireless call¹ reaches a PSAP.

¹ Federal Communications Commission, [Enhanced 911 – Wireless Services](#).

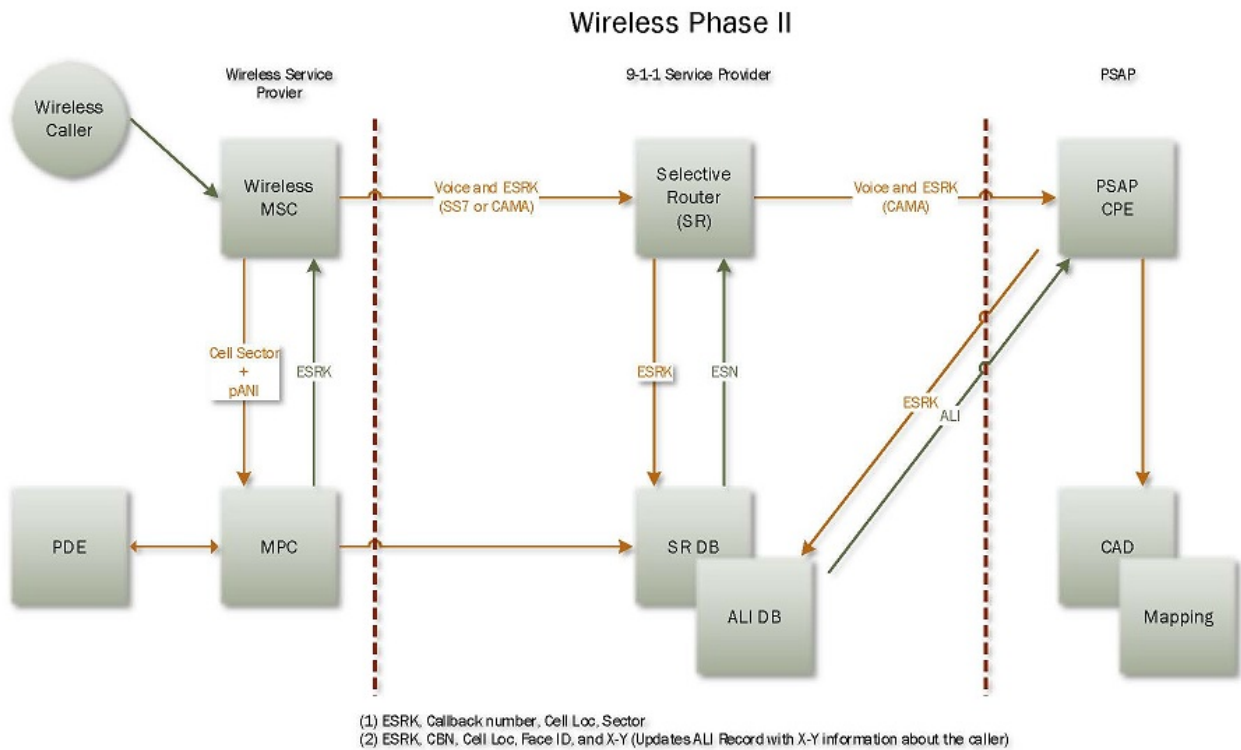


Figure 1: How a Wireless Phase II Call Reaches a PSAP

The callers along the Nebraska and Iowa border rely on the governmental entities responsible for 9-1-1 service to create a system and an infrastructure that will transmit their calls to the correct agency to provide them the service they need when they need it. That is the goal of the Nebraska PSC in this endeavor.

1.2 Need for Testing in Nebraska

The states of Nebraska and Iowa share a 250-mile border defined primarily by the Missouri River. Several PSAPs in each state, 14 combined, need to transfer 9-1-1 calls across the border. This functional need has increased significantly over recent years with the implementation of wireless 9-1-1 calling along Interstate 29, which traverses this border.

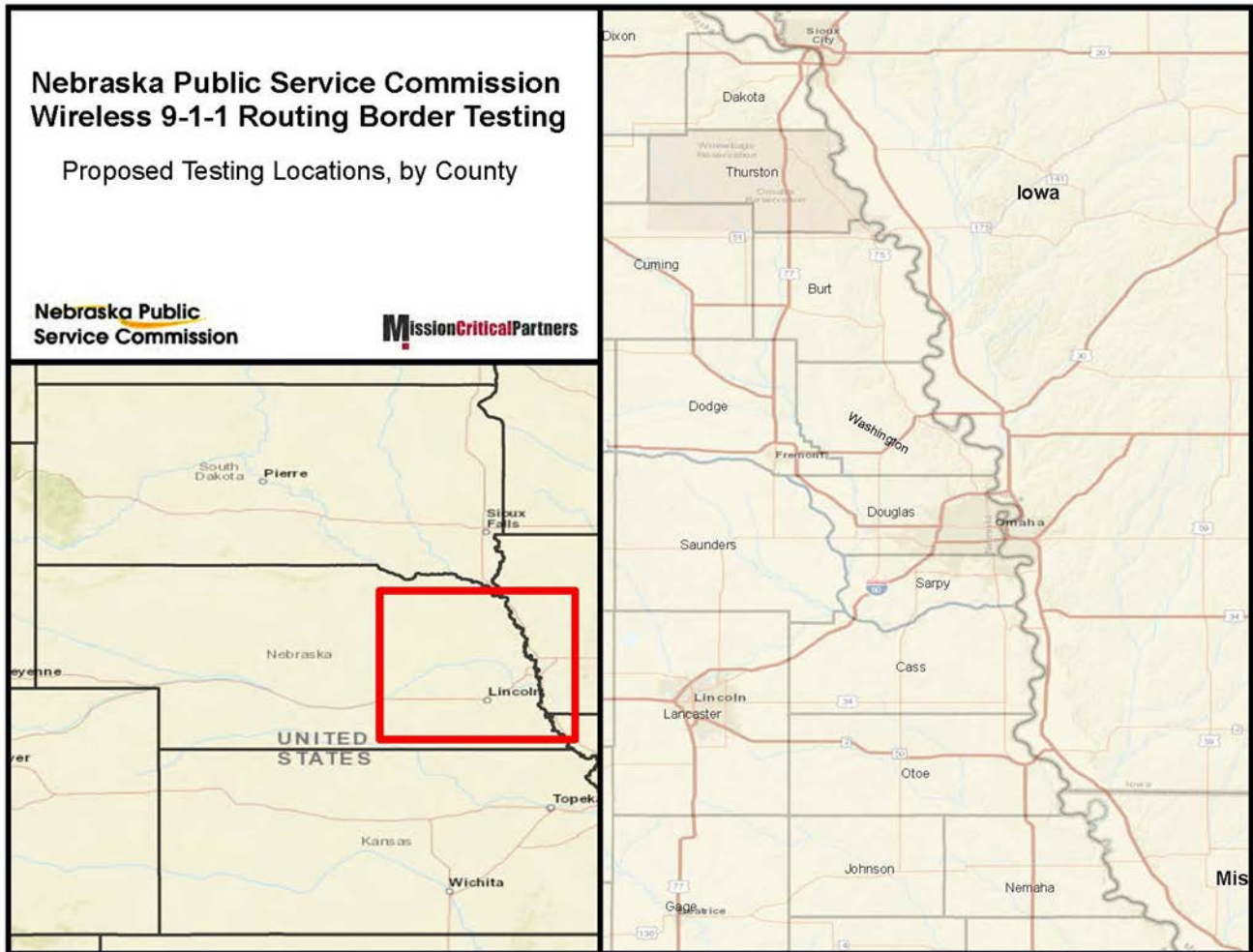


Figure 2: Proposed Wireless Test Call Area

Numerous wireless towers exist along Iowa Interstate 29 which follows the river boundary between Nebraska and Iowa. Wireless carriers frequently use the right of way access along Interstates to erect towers to achieve the greatest coverage possible for their customers. Traditionally, and in accordance with accepted best practices, the routing of calls that use a wireless tower, by tower address or by sector, has been determined by the 911 authority of the jurisdiction in which the tower physically is located. We do not know what practice was followed in the Nebraska/Iowa border situation. This routing determination is generally done at the time of deployment. If a wireless call is received by one state's PSAP and it needs to be transferred to another state's PSAP, that transfer generally is accomplished by manually transferring the call to the appropriate PSAP. In some cases, the PSAP has elected to implement a single-button transfer feature on its 9-1-1 call-handling equipment—also known as customer premises equipment, or CPE—which allows the depression of a single button to initiate the transfer dial-tone signal and dials the appropriate number in that neighboring PSAP.

This border transfer situation was recognized as a concern as far back as 2010, when the state of Nebraska installed two inter-tandem T1 circuits that connected a Nebraska selective router (in Council Bluffs, Iowa, managed by CenturyLink) and an Iowa selective router (in West Des Moines, Iowa, managed

by Comtech) to facilitate the transmission of ANI and ALI data when 9-1-1 calls are transferred across the border. The state of Nebraska has covered the cost of these two T1 connections since their installation. Prior to the installation, no call data could be transferred with the voice call; for border PSAPs not connected to either of these two selective routers, no call data is transferred.

Over the past several years, wireless 9-1-1 calls along the Nebraska-Iowa border have caused concerns. Some calls that should have been transferred were not, some callers have been asked to call back repeatedly in order to reach the appropriate PSAP, and some calls, if relayed at all, are relayed with only minimal call details. These are only some of the service issues expressed by the public that have raised concerns and have inspired the Nebraska Public Service Commission (PSC) to authorize wireless border routing testing undertaken by Mission Critical Partners, Inc. (MCP). The map in Figure 2 above shows the area targeted for testing.

1.3 Industry Standards and Best Practices

With the introduction of wireless technology more than 20 years ago, the 9-1-1 community and public safety at large have developed wireless standards and best practices that impact individuals who call 9-1-1 using mobile devices.

The National Emergency Number Association (NENA)² has developed wireless routing and wireless maintenance standards (NENA 57-001 and 002) and the Association of Public Safety Communications Officials (APCO)—through their Project LOCATE *Wireless Deployment and Effective Practices Guide* and related standards³ process—have several standards that the public safety community consults to implement and manage wireless services in the PSAP operational setting. The Alliance for Telecommunications Industry Standards (ATIS) addresses the technical aspects of wireless technology and its Emergency Services Interconnection Forum (ESIF) specifically addresses the application of wireless services as it relates to 9-1-1 communications networks.

The Federal Communications Commission (FCC), while not a standards-setting body, also has provided guidance to both wireless service providers and public safety managers regarding how wireless 9-1-1 should integrate into the emergency services networks that handle emergency calls. For example, the FCC Office of Engineering and Technology (OET) issued Bulletin No. 71, *Guidelines for Testing and Verifying the Accuracy of Wireless E911 Location Systems*, which addressed testing and models for random sampling of locations, and illustrated a statistical approach for demonstrating compliance with FCC rules for wireless carriers and testing methodology.

² http://www.nena.org/resource/resmgr/Standards/NENA_57-001.1_Wireless_Routi.pdf and http://www.nena.org/resource/resmgr/Standards/NENA_57-002.1_Wireless_Maint.pdf

³ <https://www.apcointl.org/doc/911-resources/apco-standards/188-wireless-9-1-1-deployment-and-management-effective-practices-guide/file.html>

Meanwhile, the Department of Homeland Security (DHS), through its SAFECOM⁴ program and National Emergency Communications Plan, also addresses the needs of the public safety community regarding wireless 9-1-1 services.

2 Testing

2.1 Objectives

Determining the location of a call for public safety response services is one of the biggest priorities for any PSAP. Identifying the location of a wireless caller is challenging and limited by technology and environmental factors out of the control of the caller and the PSAP. The inability to accurately locate a wireless caller during an emergency makes it intrinsically more difficult for telecommunicators to determine the appropriate response to an incident. Location issues exist with wireless 9-1-1 calls because of the ever-increasing number of wireless emergency calls, the addition of new cell sites to networks, improper routing, and jurisdictional boundaries.

The wireless border routing testing effort led by the Nebraska PSC and MCP focused on the nine counties along the Nebraska-Iowa border to identify any technical or operational issues that prevent the answering PSAP or the destination PSAP from expeditiously routing and responding to the public's wireless 9-1-1 calls for service.

2.2 Strategy and Methodology

2.2.1 Testing Process

The test points used by MCP subject-matter experts (SMEs) during the effort were arranged in a grid to achieve a total of ten per county. Test points were identified randomly in each PSAP jurisdiction to provide a broad cross section of testing locations that would give the PSAP a comprehensive view of the wireless 9-1-1 caller's experience at any of the test points. The map in Figure 3 below shows each of the test points.

⁴ SAFECOM's mission is to improve emergency response providers' interjurisdictional and interdisciplinary emergency communications interoperability through collaboration with emergency responders across federal, state, local, tribal, and territorial governments, and international borders.

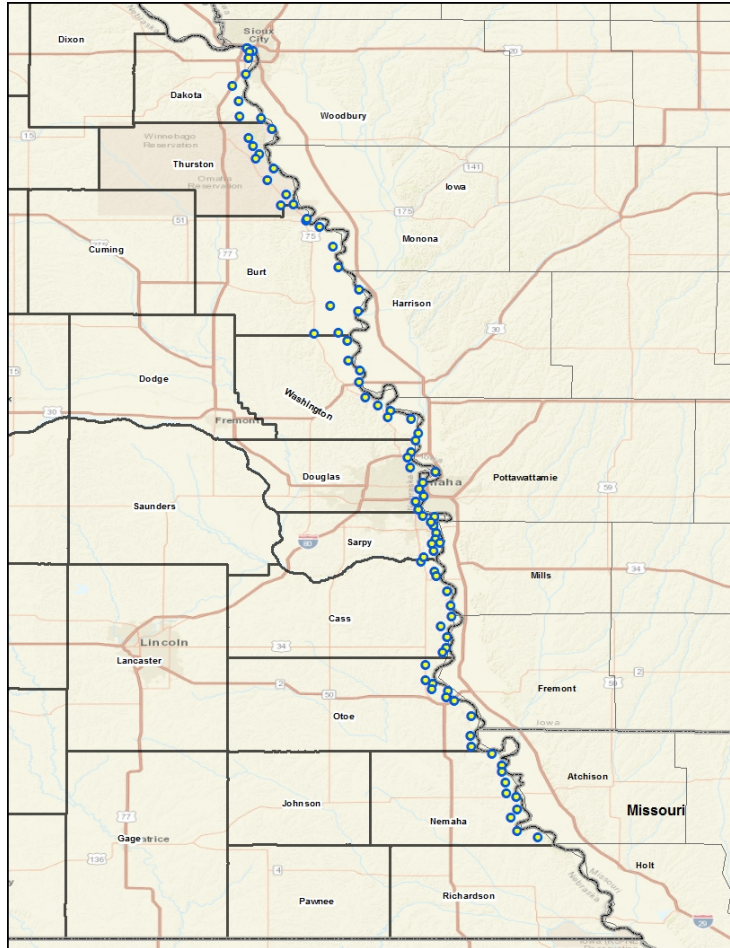


Figure 3: Border County Test Points

MCP’s testing process provides an assessment of wireless 9-1-1 call routing and the location information presented to the PSAP during live call-handling operations. Testing that involves live PSAP operations necessarily must balance statistical validation with the risk of unnecessary interference to other emergency calls. MCP is grateful to the PSAPs involved in the border testing for their cooperation in the process working with MCP personnel. Their collaborative participation is valued and necessary to assess the possible reasons for issues experienced by the PSAPs in call-handling and transfer scenarios related to wireless calls along the border, and to evaluate possible solutions for more-effective call delivery and processing in those border situations.

2.2.2 Test Calls

MCP testing staff drove to each of the preselected test locations. Once in position, with all test equipment tested and deemed functional, MCP notified the appropriate PSAP staff that the testing would begin. From each site, three wireless carrier networks were tested by placing a 9-1-1 call. The carriers’ networks used were rotated for each test point.

The calls were processed in a live 9-1-1 environment, i.e., the PSAP would answer each call, the MCP tester would identify himself as a test 9-1-1 caller and identify which PSAP had been reached. If the call was routed to an unintended destination, MCP staff requested information about the cellular tower presenting the call to the receiving PSAP. After confirming the tower, MCP staff requested to be transferred to the appropriate Nebraska PSAP and, in most instances, the out-of-jurisdiction PSAP would transfer the call to the appropriate Nebraska PSAP to complete the testing procedure. There were, however, numerous instances when calls received by surrounding counties were unable to be transferred due to call-transfer-protocol issues.

The process for performing wireless border routing testing was repeated for each county or PSAP jurisdictional area along the border. The variables involved in this test are the current routing formats, the wireless service providers in the jurisdictions tested, the connectivity to the 9-1-1 service provider network, the location of the cell towers, and the level of knowledge and understanding of the receiving PSAP personnel.

The tests were designed to produce measurable performance data relative to the location and routing of wireless 9-1-1 calls from the four major wireless service providers (AT&T, Verizon Wireless, T-Mobile, and Sprint). Where applicable and mutually agreed upon, additional regional carriers, such as U.S. Cellular and Viera Wireless, also were tested when it was appropriate for the jurisdiction. Handsets from each of these carriers were used in the testing process to replicate the actual experience of a public caller using the device and network of the wireless carrier serving the jurisdiction.

To achieve a truly random sample, the test locations within a given county or PSAP jurisdiction were chosen arbitrarily. One wireless 9-1-1 test call was made from each handset device for each wireless carrier network tested in that test point, with the activity summarized in Table 1 below.

Table 1: Wireless Border Routing Test Calls

Providers	Number of Test Calls
AT&T	70
Sprint	50
T-Mobile	20
U.S. Cellular	50
Verizon	78
Viaero	10

From each location, the MCP test staff performed the following actions:

- Selected three carriers to test within the county from the pool of AT&T, Sprint, T-Mobile, U.S. Cellular, Verizon, and Viera
- Executed a single test 9-1-1 call on the carrier networks selected for the county being tested

- Documented the closest available physical address, and when the address was not available, documented a landmark or cross street
- Documented call completion, routing, and anomalies of each call
- If routed to an unintended destination PSAP, requested a call transfer to the intended destination PSAP
- Documented the results of the transfer
- Communicated with the PSAP jurisdiction 9-1-1 staff member during the test calls; no rebid requests were made on border testing and only initial routing was tested
- In the event that the 9-1-1 call misrouted to a PSAP outside of the expected service area, documented the receiving PSAP and obtained the cell tower location (when the answering PSAP could provide it)

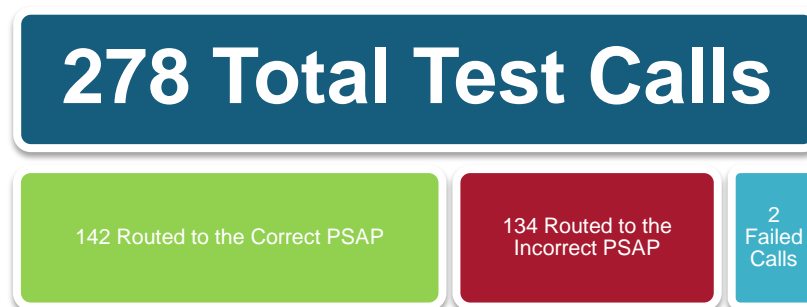
The testing was conducted over a period of one calendar week from March 13 to March 16, 2017, during normal business hours.

The assessment and deliverable documentation for wireless routing and data delivery throughout each PSAP jurisdictional area are based upon the current FCC rules for the performance of outdoor wireless 9-1-1 calls. Wireless location integrity is the assessment of the caller's location information that is presented to the PSAP as compared with their actual location, and an evaluation of the routing of the test call based on the jurisdictional boundary of the intended destination PSAP for response dispatch.

2.3 Results

Upon completion of the field testing, results data was compiled and analyzed to determine any reason for the answering PSAP's inability to appropriately handle the call for service. These include: routing inconsistencies or inaccuracies, technical issues, inability to achieve a transfer to the appropriate PSAP, audio quality issues that prevent the answering PSAP from handling the call, and dropped calls.

2.3.1 What We Know



Several observations have been gathered from the testing effort:

- 278 total test calls were placed
 - 142 calls (51 percent) were routed to the correct PSAP on the initial dial
 - 134 calls (48 percent) were routed to the incorrect PSAP on the initial dial
 - 2 calls (1 percent) failed and no PSAP was reached

- All 278 test calls were placed within the state borders of Nebraska
 - 134 were routed incorrectly
 - 106 (79 percent) stayed within the state borders of Nebraska but simply went to the wrong PSAP (right state, wrong PSAP)
 - 28 (21 percent) went to a PSAP in Iowa (wrong state, wrong PSAP)
 - 134 calls were incorrectly routed and were supposed to be transferred
 - 80 calls (60 percent) were transferred without issue to the proper PSAP
 - 54 calls (40 percent) were not transferred properly

During the testing phase, it was identified that some of the calls, though they routed correctly on initial dial, presented in the PSAP with issues. The industry standard for expected wireless phase information was not met for these calls, issues included:

- Information appearing on the screen could not be deciphered properly by the telecommunicator
- AT&T calls in Thurston County were showing up as “WRLS” without Phase I or Phase II being relayed
- Calls were showing up as business class calls versus wireless calls
- There was bad audio and/or poor coverage making the call inaudible
- Verizon appears to be sending a Phase II class of service (COS) on the initial call delivery, which may or may not provide actual Phase II location information at the time of the initial call delivery.

Table 2: Number of Calls with Issues by Carrier

Carrier	Number of Calls
AT&T	3
Sprint	2
T-Mobile	2
U.S. Cellular	3
Verizon	3
Viaero	0

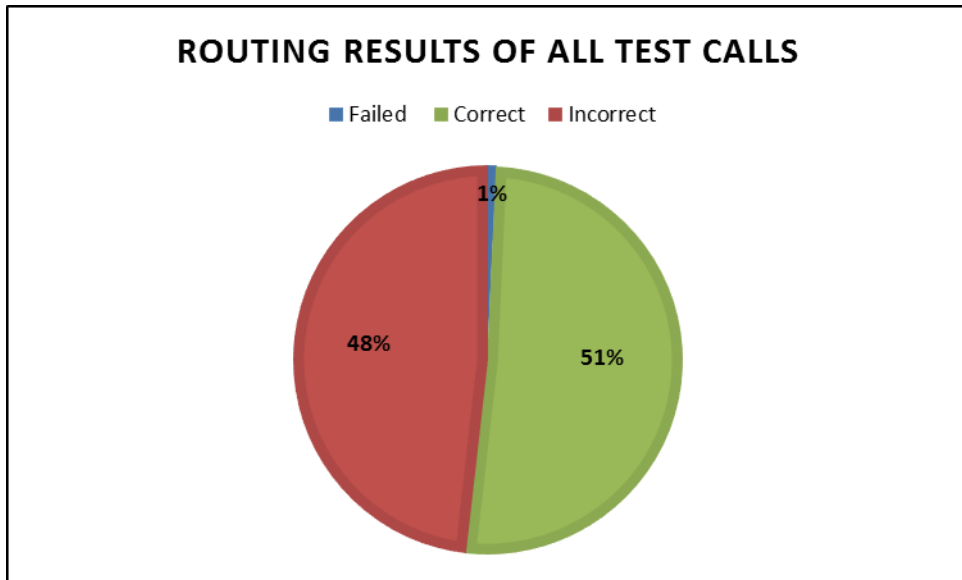


Figure 4: Test Calls Routing Results

Figure 4 above shows the routing results for all of the test calls that were conducted; in Appendix A, the routing results are broken down by county, while Figure 5 below breaks down the call-processing issues that were encountered, and Figure 6 identifies routed call accuracy for each of the carriers. In addition, Table 4 below offers test call details for each of the wireless carriers.

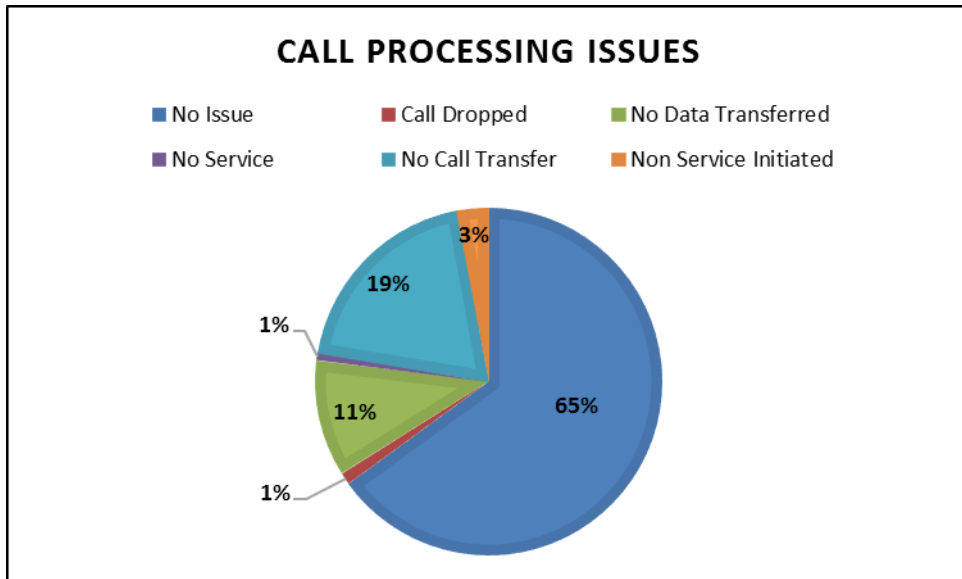


Figure 5: Call Processing Issues

Table 3: Test Call Details

Wireless Provider	Total Test Calls	Number of Calls Correctly Routed	Number of Calls Misrouted to Incorrect Agency
AT&T	70	36	34
Sprint	50	34	16
T-Mobile	20	9	11
U.S. Cellular	50	20	30
Verizon	78	42	36
Viaero	10	1	9
TOTAL	278	142	136⁵

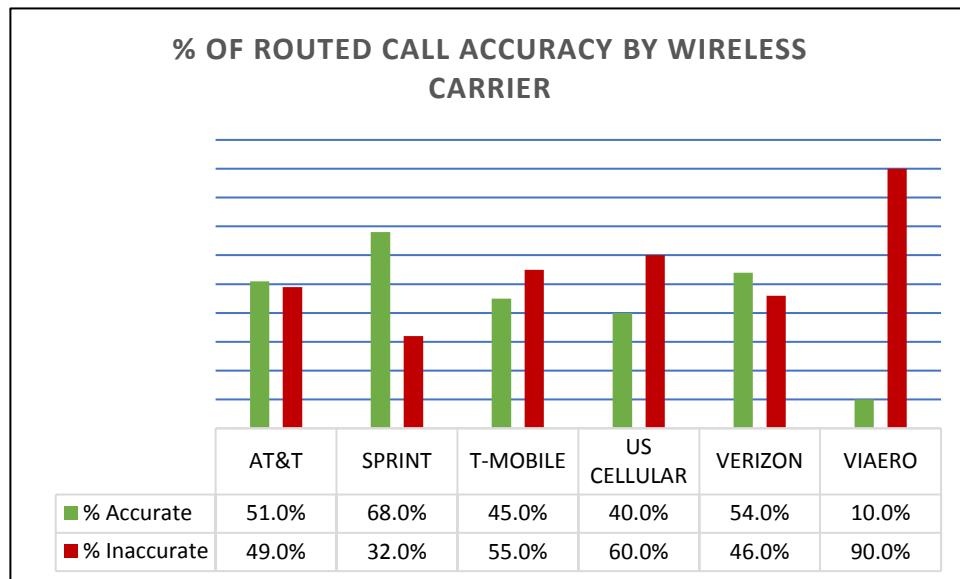


Figure 6: Wireless Carrier Routed Call Accuracy

3 Identified Problems

After it was determined that a call was routed to the wrong location, the telecommunicators then were responsible for transferring the call to the appropriate PSAP. This task was not always successful for

⁵ Includes two dropped calls, one on the AT&T network and one on the U.S. Cellular network.

several reasons. When asked to transfer the test call, telecommunicators sometimes reported they were unable to complete the transfer. Reasons provided fall into the following categories:

- Training and skill maintenance
- Reference availability
- Technological or equipment limitations
- Policies and call handling agreements

4 Solution Strategies

4.1 Solution Options

The problems identified during the test align with commonly known industry issues, therefore the solutions to these problems are derived from industry best practices.

Test all lines frequently

Testing all lines frequently, including 9-1-1 trunks and administrative lines, is beneficial, especially if you are experiencing lower-than-usual call volume.

Establish a communications rhythm

Be sure to have a communications rhythm established with allied agencies so that staff members are made aware of any outside phone issues that may prevent the center from receiving or transferring calls.

Announce transferred calls

Transferring calls to an unexpected party creates issues. Ensure that telecommunicators on the receiving end are aware that they could possibly receive 9-1-1 calls. Additionally, develop language for when calls are transferred and have telecommunicators stay on the line until the call has been answered by the receiving agency.

Establish training and continuing education

Establish comprehensive initial training for all staff members with the responsibility of answering 9-1-1 calls so that they understand protocol for properly handling transfers. Mandate the training and ensure that participants can demonstrate proficiency. Conduct a monthly practicum test that must be completed by all telecommunicators for them to demonstrate their knowledge on call transfers. A supervisor should sign off on the test results, and remedial training should be offered if a telecommunicator is unsuccessful.

Establish reference links and instructions

Having reference links to frequently transferred numbers readily available in a customer premises equipment (CPE) address book feature or at a console, with instructions on how to properly transfer calls, eliminates the need for a telecommunicator to search for information in an emergency situation. Frequently used transfers should be easily available (printed out and attached to the console somewhere).

Practice using CPE features

Management must be familiar with the CPE's additional features and capabilities. Asking for one-touch and/or star-code transfers to be integrated into the CPE during initial installation eliminates the need for a process. Once installed, those transfer methods need to be practiced by telecommunicators, tested regularly and maintained. Quick transfers, i.e., star-code transfers, need to be set up and exercised.

Comply with state laws

Some state laws prohibit certified dispatchers from releasing emergency calls to anyone who does not have an equal or higher certification level. PSAPs should become familiar with state laws regarding call transfers and follow them. Following these laws reduces or eliminates the risk of negligence that can arise if a telecommunicator is not able to provide pre-arrival instructions or post-dispatch instructions.

Make sure a policy is established for charges incurred

Some transferred calls and received transfers incur fees that may not align with an agency's desired protocol or budget. PSAPs must establish policies and procedures about transferred calls, including all associated fees, ahead of the scenario. PSAPs should establish how the funding model will work, especially in jurisdictions where revenue disbursement is based on the location of the originally answered call.

4.2 Wireless Carriers

Affected jurisdictions must meet with wireless carriers to discuss issues that were discovered during the testing process. The carriers are responsible for issues such as dropped calls and calls that are identified as business class, no service, or non-service initiated (NSI). The carriers also must review wireless translation. During the testing phase, two calls could not be completed because they originated in a bad coverage location (Thurston and Sarpy Counties). Additionally, eight calls showed up as the call originating from an NSI phone. No calls should have been received as NSI because all of the phones used in the testing phase were initiated.

4.3 Training

As discussed in Section 4.1, Solution Options, telecommunicator training is key to decreasing the number of calls that are not properly transferred. In addition to the training of telecommunicators in the PSAPs, management should be trained in basic understanding of the following:

- Call-routing diagrams by county tower sector
- Single-button transfer scenarios and CPE configurations
- Initiating transfers to 10-digit numbers
- Star codes set-up and use
- How to review LATA⁶ boundaries

⁶ Local access and transport area.

All training should be included in the basic telecommunicator training program and should be a subject of continuing education as processes are not always used frequently enough to ensure practical proficiency.

4.4 Interstate MOU Development

MOUs must be developed to clarify how each bordering state plans to operate or complete the transfer of misrouted 9-1-1 calls. This discussion must address the logistical and financial implications at hand with transferring calls. Ahead of this discussion, each state should familiarize itself with the various interoperability models, such as the NG9-1-1 Interstate Playbook⁷ and the SAFECOM Model⁸. The NG9-1-1 Interstate Playbook, for instance, provides: “guidance and technical support framework to help the states achieve their collective vision through coordination of discussion, technical subject matter expertise, project planning and implementation testing coordination and process management.” Consulting established models and molding agreements based upon them helps to develop detail-oriented agreements with neighboring states. Nebraska should begin to communicate with its six border states (Iowa, Missouri, Kansas, Colorado, Wyoming and South Dakota) as soon as possible to ensure alignment.

5 Recommendations

Both Nebraska and Iowa have expressed a desire and a willingness to address the issues of wireless call processing along their borders. The results of the border testing effort have produced numerous recommendations that can help improve the prompt and efficient handling of wireless 9-1-1 calls between these two states.

5.1 Joint Meeting of Nebraska and Iowa 9-1-1 Administrative Leadership

MCP recommends that the state of Nebraska 9-1-1 Director meet with the state of Iowa 9-1-1 Program Manager. Prior to the meeting it will be necessary to validate, with CenturyLink, the current configuration between the Council Bluffs and West Des Moines selective routers. In addition, it also may be useful to secure the list of PSAPs connected to each selective router to fully understand the opportunities and limitations for transfer capabilities between the border PSAPs.

At this joint leadership meeting, the focus should be on the results of the border testing and report with a purpose of reaching agreement on a collaborative action plan.

Additionally, the coordination of a joint meeting hosted by the Nebraska 9-1-1 Director and the Iowa 9-1-1 Program Manager should bring together the local leadership of the border PSAPs. This meeting would keep these PSAPs informed of the progress that is being made to resolve the border transfer issues and to

⁷ Interstate Playbook. <https://www.911.gov/docs/NG911-Interstate-Playbook-FINAL-111516.pdf> last accessed May 18, 2017.

⁸ SAFECOM Writing Guide for a Memorandum of Understanding (MOU). <https://www.dhs.gov/sites/default/files/publications/Writing%20Guide%20for%20a%20Memorandum%20of%20Understanding.pdf> last accessed May 18, 2017

encourage the PSAPs, as individual agencies, to establish policies, procedures and best practices when dealing with the task of transferring calls when necessary.

5.2 Action Plan Development

An action plan of steps that the states, and their respective PSAPs will undertake to address the issues and concerns of cross-border transfer of wireless calls will help to outline for all parties the responsibilities and necessary actions. At a minimum, the plan of action should include:

- Sharing the border testing results with each PSAP
- Sharing administrative numbers for each border PSAP combination, and if appropriate, all administrative numbers for all PSAPs along the border to accommodate potential misrouted calls beyond the expected jurisdiction
- Creating mutually acceptable MOUs for the states and, if appropriate, border PSAP jurisdictions
- Hosting potential joint meetings with wireless carriers to explore:
 - Any agreed-upon routing changes on a per-sector basis
 - Current misrouting issues identified in the testing
 - Evaluation of audio problems encountered in the testing and possible solutions
 - Agreement on annual review, reassessment and reevaluation of routing and performance experience
- Creating a training program to refresh operational knowledge of proper transfer methods and the tools that are available to the PSAP when a call needs to be transferred to an alternate PSAP

5.3 Memorandum of Understanding

As noted in Section 4.4, Interstate MOU Development above, an MOU can be an effective tool to codify the agreements between agencies or states regarding a particular process or requirement. Agencies use an MOU as the formal documentation of how they will work together on an agreed-upon project or meet an agreed-upon objective. The main purpose of such a document is to establish a written understanding of the responsibilities and expectations of each party. The MOU should be a legal document that is binding and holds the parties responsible to their commitments.

A sample MOU is provided in Appendix B of this document as a starting point for discussion with Iowa.

MCP recommends that Nebraska presents a sample MOU to Iowa and request that the states negotiate a border process that is mutually agreeable. This recommendation will involve legal support either from the states or the PSAPs and may take time to collaborate on agreeable language. However, such agreements are necessary to clearly establish responsibilities, identify financial obligations of the parties, define communication processes, and a change management process when changes to the agreement are warranted. Alternatively, the MOU may be negotiated individually between each border PSAP and its neighboring PSAP if that process is preferred by the states.

5.4 Standard Operating Procedures Updates

Once a training program has been designed, the SOPs for the PSAP will need to be updated and modified. The revised SOPs should reflect the proper handling of wireless 9-1-1 calls that have been agreed to by

the states and neighboring PSAPs. Review of the revised SOPs should be documented for each call-taker on staff in each PSAP, and that documentation should become part of the employee's training file.

MCP recommends that Nebraska create a sample SOP to share with each of the PSAPs as a model or template that can be modified and used locally for their own operations.

5.5 Training Program Refresh

MCP recommends that the state of Nebraska develops and implements a training program to refresh operational knowledge of proper transfer methods and the tools that are available to the PSAP when a call needs to be transferred to an alternate PSAP. It is important that PSAP personnel know how to transfer calls out and how calls will be coming into their center.

5.5.1 Training Program Content

The training program should include background information regarding how wireless calls are routed, sufficient information from the border test results to identify the problem for the PSAP, operational best practices for handling wireless 9-1-1 calls, the transfer capability process specific to their own CPE functionality, and the parameters of the agreed-upon MOU, if applicable, to ensure that the legal agreement is followed. Supervisors must observe telecommunicators demonstrating understanding and functional ability to carry out the proper transfer of a wireless 9-1-1 call.

5.5.2 Federal Communications Commission Rules

The current FCC rules for wireless carriers should be incorporated into the training program to enhance the call-takers' awareness and understanding of the current system performance, in terms of usefulness and consistency of location data delivered to the PSAP as necessary for effective dispatch of emergency services and locating the wireless caller.

5.5.3 Call Routing

Call-routing diagrams specific to the PSAP should be included as part of the training package. Wireless tower locations by sector should illustrate for the call-takers how the call might be routed to them, but really need to be dispatched by a different state PSAP.

5.5.4 Call-Processing Tools and Configuration

Tools for the call-taker—such as single-button transfer scenarios, use cases, and administrative number lists, including star codes, if appropriate, for neighboring PSAPs—should be provided as part of the training.

5.5.5 Demonstration of Call-Handling Knowledge

Practical application of the learning objectives, including demonstration of call-taker knowledge and understanding also should be part of the training.

5.5.6 Standard Operating Procedure Updates

SOPs should be reviewed and, if appropriate, rewritten, updated with additional information, procedural changes or other changes should be formally acknowledged through written documentation by the trainer and the trainee.

5.5.7 Updates to Standard Training Curriculum

Incorporation of the training into the regular training curriculum for ongoing training and evaluation of all call-taking staff— as well as a demonstration of their capabilities as part of the call-taker's annual review— would be beneficial.

MCP recommends that this training program be developed following the meeting with the state of Iowa.

5.6 Meeting with Wireless Carriers and Representatives

MCP recommends that Nebraska and Iowa state 9-1-1 administrative staff, along with the border PSAP management, meet with wireless carrier representatives to review the test results, especially as they relate to the wireless carrier's network and current routing of cell sectors. Carriers should be asked to supply propagation maps and testing validation worksheets (TVW), or routing spreadsheets, so that any changes to routing decisions can be discussed fully and assessed for operational improvements.

The goals of the carrier meetings should be to explore the value of routing changes, as well as the state of new towers, sector realignment, and changes to existing cell sectors' direction, in addition to gaining agreement regarding PSAP-notification processes and defining for all parties the entity that has authority for routing changes.

A secondary goal of the carrier meetings should be to address the poor audio experienced during testing along the border.

5.7 Develop Process for Annual Review of Wireless Routing and Associated Data

MCP recommends that the state of Nebraska sanction and encourage all PSAPs to conduct an annual review of wireless call routing with the wireless carriers in their jurisdictions. This is a best practice for any PSAP and is not just limited to those who share borders with other states. APCO's *Wireless 9-1-1 Deployment and Management Effective Practices Guide*, ANS 3.103.2 2013,⁹ has an established guideline that the wireless service provider (WSP) and the agency should maintain regular communication and collaborative efforts with associated neighboring PSAPs regarding a data- and routing-maintenance process, and should commit to continual review with associated follow-up.

⁹ <https://www.apcointl.org/doc/911-resources/apco-standards/188-wireless-9-1-1-deployment-and-management-effective-practices-guide/file.html>

The APCO guideline goes on to illustrate that the most-effective means of avoiding urgent wireless calls from arriving at unintended destinations is to actively participate in the continuing management discussions and decision-making related to call-routing plans. In addition, post-deployment adjustments and processes to define and execute valid changes should be developed prior to the first instance of a problem that may have caused a delay in response to a wireless 9-1-1 caller.

To provide the most-effective 9-1-1 service delivery, responsibility is shared between the local 9-1-1 authority the WSP, and its contractors. This obligation continues long after the initial deployment and becomes part of the expected quality of service management function of the agency, on behalf of the consumers and responder groups.

Further, APCO ANS 3.103.2 2013 Guideline #380767 states that the agency and the WSP should collaborate on a process for the reconciliation of system performance anomalies, including wireless 9-1-1 calls that are received at unintended locations. The annual reconciliation process should include well-defined responsibility for notification of problems with specific action items, as well as reasonable timelines for remedy. Post-deployment adjustments and processes should be expected as the experience of wireless call volume, as well as consistency and value of location data, are continually assessed by the agency.

APCO ANS 3.103.2 2013 Guideline #380768 recommends that the agency should request cell and routing data contained in the MPC or gateway mobile location center (GMLC) for its service area and perform annual reviews. Upon completion, results should be furnished to the WSP for its review and response, if appropriate. It is recommended that the agency seeks to review the cell and routing data maintained at the MPC or the GMLC, or current equivalent, within the deployed system of each WSP on a regularly scheduled basis. The review should be viewed by all parties as a legitimate/responsible inquiry and effective practice by the agency to maintain service quality.

The review seeks to prevent service issues by identifying pre-event data and existing rules that may be subject to change within these systems.

The agency and WSP also should have a well-defined process developed for resolving any issues that arise from such reviews. These actions are an integral part of any meaningful direct service partnership that should exist between the agency and WSP.

6 Conclusion

The border routing testing that was completed in Nebraska offers a snapshot of a much larger problem in the state. Because cellular phones do not recognize borders between states or counties. It should be the objective of 9-1-1 Authorities and the wireless carriers to ensure wireless 9-1-1 calls are delivered to the right jurisdiction for dispatch. The initial routing to the correct PSAP is essential so that the need to transfer emergency calls, when seconds count, is minimized. Nebraska is in a unique situation because it borders more states than most other states in the country—it is possible that the state could receive calls for as many as six states. This test, where 278 test calls resulted in 134 calls being routed to the incorrect PSAP, and 28 of those calls being routed to the wrong PSAP and wrong state, is reason for concern.

The Nebraska testing revealed numerous inconsistencies concerning wireless best practices that should be addressed:

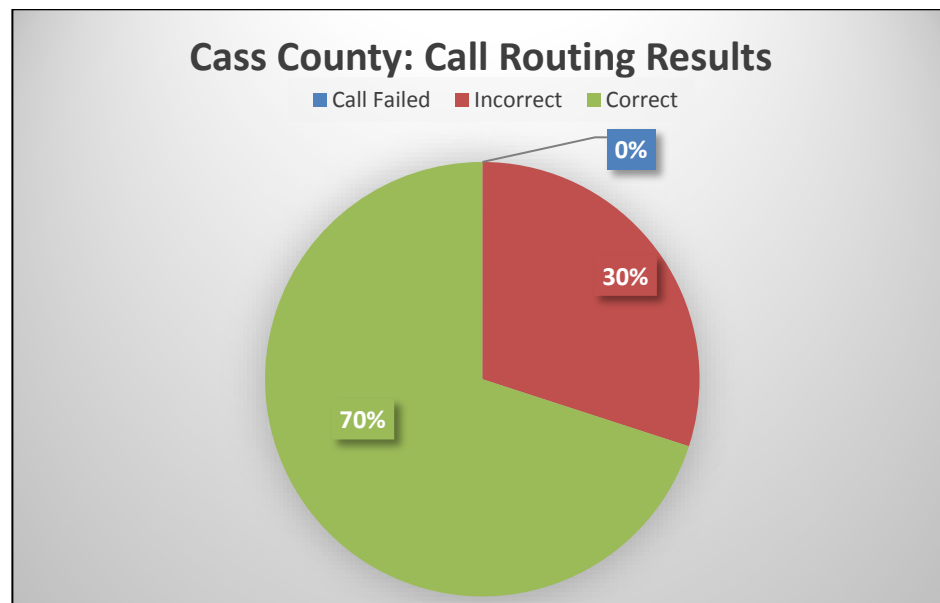
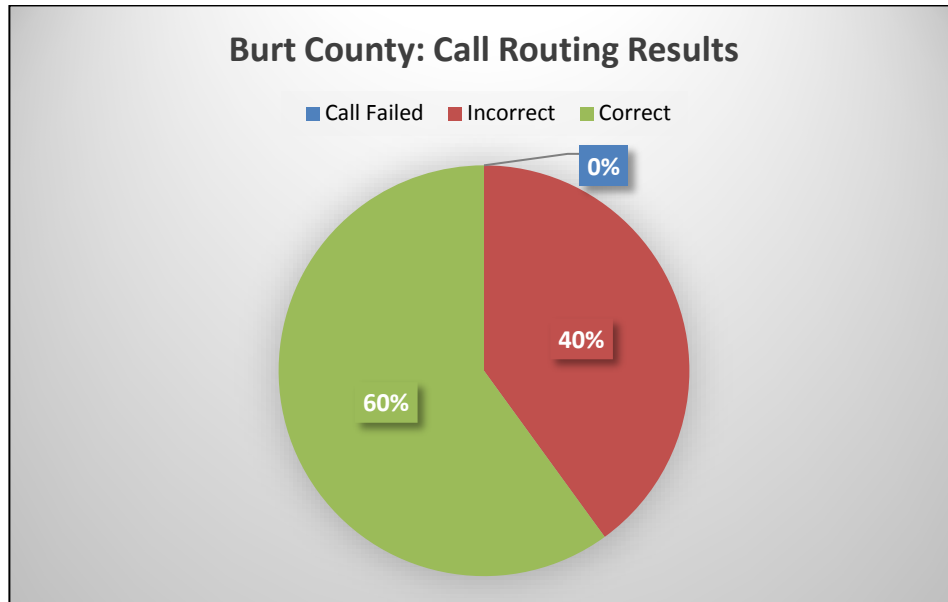
- Telecommunicators retraining on the process of transferring calls to enhance proficiency should be considered
- References such as Administrative line telephone numbers should be shared among jurisdictions to ensure their availability when needed for manual transfers in situations that do not have single button transfer capabilities
- Single-button or star-code transfer configurations should be validated by the PSAP and if necessary by the CPE vendor
- Inoperable technology should be reported and corrected
- Policies that optimize effective call handling should be reviewed, updated if necessary and reissued to telecommunications staff
- MOUs between jurisdictions that allow for effective call processing should be negotiated between PSAP jurisdictions

To help eliminate the high probability of calls not reaching the correct destination, either by initial route or transfer, the state's 9-1-1 leadership should take steps to increase the probability that the citizens of Nebraska are reaching the right location the first time they call 9-1-1. Next steps include:

- Hosting meetings, first with state leadership, then with bordering jurisdictions and ultimately wireless carriers, to develop an action plan
- Establishing MOUs so that there is understanding among all parties, and a vetted process is in place to facilitate successful call routing
- Executing training program revisions and updates so that all telecommunicators are well trained to perform in the most critical moments
- Meeting with the wireless carriers to ensure that all parties understand their individual responsibilities in the wireless 9-1-1 call process
- Developing an action plan with the wireless carriers to define the actions to be taken to correct faults
- This action plan should include frequent testing, training and continuing education; continual communication with neighboring PSAPs; agreements and policies that ensure transferred calls are announced, and that call details are passed to the receiving agency and adequate references are available to PSAP personnel; familiarization with CPE capabilities; and testing of equipment used in call transfers
- Establish an annual review process to ensure that all controllable variables that could hinder successful call routing and transferring are minimized.

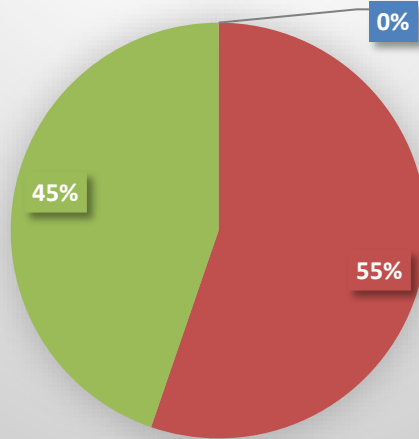
These steps will help to refresh everyone's understanding of the nuances of wireless 9-1-1 calls and optimize effective call handling for improved outcomes and service to the public.

Appendix A – Call Routing Results by Counties



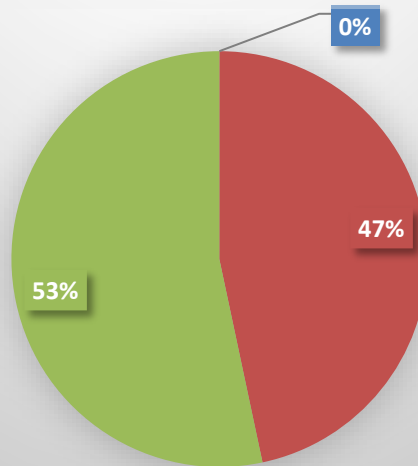
Dakota County: Call Routing Results

■ Call Failed ■ Incorrect ■ Correct



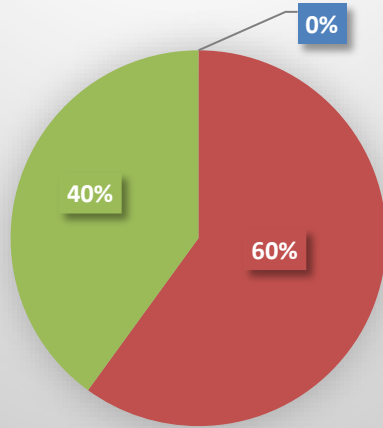
Douglas County: Call Routing Results

■ Call Failed ■ Incorrect ■ Correct



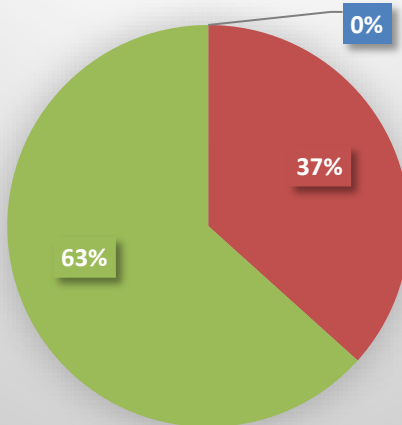
Nemaha County: Call Routing Results

■ Call Failed ■ Incorrect ■ Correct



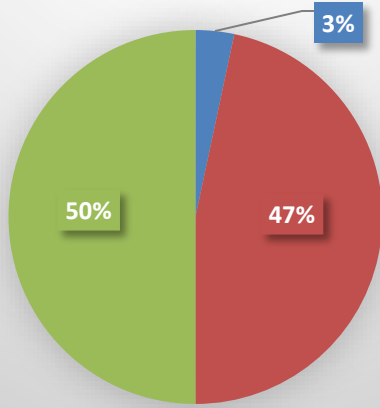
Otoe County: Call Routing Results

■ Call Failed ■ Incorrect ■ Correct



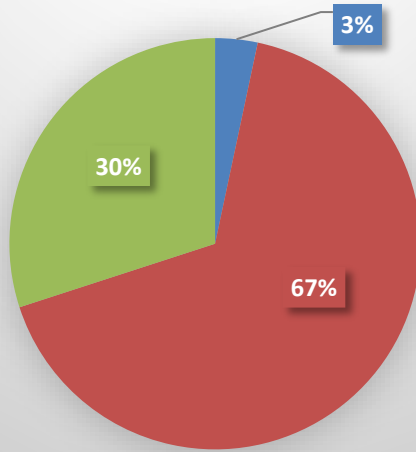
Sarpy County: Call Routing Results

■ Call Failed ■ Incorrect ■ Correct



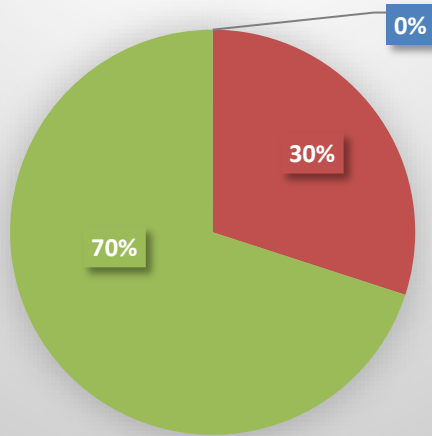
Thurston County: Call Routing Results

■ Call Failed ■ Incorrect ■ Correct



Washington County: Call Routing Results

■ Call Failed ■ Incorrect ■ Correct



Appendix B – Sample MOU (SAFECOM Model)

Sample Memorandum of Understanding Template

Memorandum of Understanding

Between

(Partner)

and

(Partner)

This Memorandum of Understanding (MOU) sets for the terms and understanding between the (partner) and the (partner) to (insert activity).

Background

(Why partnership important)

Purpose

This MOU will (purpose/goals of partnership)

The above goals will be accomplished by undertaking the following activities:

(List and describe the activities that are planned for the partnership and who will do what)

Reporting

(Record who will evaluate effectiveness and adherence to the agreement and when evaluation will happen)

Funding

(Specify that this MOU is not a commitment of funds)

Duration

This MOU is at-will and may be modified by mutual consent of authorized officials from (list partners). This MOU shall become effective upon signature by the authorized officials from the (list partners) and will remain in effect until modified or terminated by any one of the partners by mutual consent. In the absence of mutual agreement by the authorized officials from (list partners) this MOU shall end on (end date of partnership).

Contact Information

Partner name

Partner representative

Position

Address

Telephone

Fax
E-mail

Partner name
Partner representative
Position
Address
Telephone
Fax
E-mail

_____ Date:
(Partner signature)
(Partner name, organization, position)

_____ Date:
(Partner signature)
(Partner name, organization, position)