

Northern Virginia's 911 Service Down for Four Days

December 2012

Late in the evening of Friday, June 29, 2012, a quick and violent derecho storm swept through Northern Virginia in the U.S., leaving millions of customers without power. Landline and wireless phone services were cut. Disastrously, the storm left 2.3 million residents in Northern Virginia without access to 911 emergency services. 911 services were not fully restored until four days later, on July 3rd.

The most likely time for a 911 system failure is during a disaster. The most likely time that 911 services will be needed is during a disaster. This puts a specially important onus on the reliability of 911 systems and their ability to survive natural and manmade disasters. Equally important is the disaster response plan to provide emergency services should a 911 system fail. The public has to feel comfortable that it can get emergency aid, no matter what.

The U.S. 911 Emergency Call Centers

If emergency services are required in the U.S., they can be accessed from anywhere in the country by simply dialing 9-1-1. (Many other countries have a similar service using 9-9-9 or other numbers.) Providing the call is being made from a land line, the 911 system knows the location of the caller and routes the call to an appropriate 911 jurisdiction along with the location information. A 911 operator can then dispatch whatever aid is required to the calling location.

If technical problems prevent a call from being routed to the appropriate jurisdiction, the call is rerouted to a neighboring jurisdiction. The intent is to route a call to a 911 operator somewhere no matter what network problems might be encountered.

Work is now underway to extend location identification to mobile phones via GPS tracking.

The 911 function is so critical that it is a criminal offense in many states to make non-emergency calls using 911.

What's a Derecho?

According to NOAA's Storm Prediction Center, a derecho (deh-REY-cho) is a rare, widespread, long-lived wind storm that is associated with a band of rapidly moving thunderstorms. In order to qualify as a derecho, the storm must extend more than 240 miles and have wind gusts up to 58 miles per hour.

The derecho that hit Northern Virginia on June 29th originated in Illinois and carried wind gusts up to 90 mph.

The Derecho Hits

The derecho hit Northern Virginia at 10:30 PM in the evening of June 29th. Residents saw the bad weather coming in on television, but no one expected the ferocity of the winds associated with the storm. The speed with which the storm moved and its wind velocity were unprecedented.

911 call centers were immediately swamped with calls of downed wires and trees, felled poles, and roof damage. The emergency calls reached a level over five times the normal volume. Police took over manual traffic control at intersections that had lost their signals. Fire crews went on rescue calls.

It took three hours for the derecho to pass through, which it did at 1:30 AM, June 30th.

The 911 Failure

At 4 AM, officials shut down the storm's response center since the volume of calls had significantly decreased. They braced for an expected fresh wave of emergency calls when residents woke up and realized the full extent of the damage to their properties.

But eerily, no calls came. Verizon had not notified emergency officials of any problems in its 911 network except for a cryptic message at 6:30 AM saying that there were problems at its Arlington communications center. There was no reference to any impact on 911 services as a result of these problems.

It now became apparent that not only were the emergency lines out, but nonemergency lines, administrative lines, and cell-phone service were dead as well. All of the alternate 911 centers in the area were down. The few emergency calls that did get through had no location information.

It took another three hours for Verizon to admit that they did indeed have communication problems affecting the entire area's 911 services. In fact, Verizon knew this nine hours earlier, but for some reason decided not to communicate the problem.

The Efforts to Respond

At this point, callers with medical and other emergencies received either busy signals, recorded messages saying the line was inoperative, or simply dead silence.

Local officials made extraordinary efforts to alert residents that the 911 system was down. They informed residents by radio, television, Web sites, Facebook, Twitter, and neighborhood email lists to call alternate nonemergency phone numbers or to send emails. If that didn't work, residents were told to go to the nearest police or fire station for help. Staffing was increased at these facilities to handle the expected flood of walk-ins. Interestingly, there was little of this.

The Failure of Verizon's Arlington Central Office

Verizon later explained the outage with the following description:

"External power failures affected more than 100 Verizon locations. At each of these locations, batteries and nearly all the backup generators worked as designed, allowing us to continue service. However, at two of these locations, generators failed to start, disabling hundreds of network transport systems, and causing Verizon to lose much of its visibility into its networks in the impacted area."

Two generators failed to start and the entire 911 network in Northern Virginia went down? Clearly, there had to be more to the story than this!

It turned out that the two facilities taken down by generator faults were Verizon's Fairfax and Arlington offices. At Fairfax, the generator's auto-start mechanism failed. The Fairfax failure had no far-reaching effects.

Arlington was a different story. A subsequent investigation showed that air had gotten into the generator's fuel lines. Fuel could not be pumped to the generators, so they could not run. Arlington continued running for five hours on batteries, but it closed down at 5 AM the morning of June 30th.

Arlington is a Verizon major communications backbone for the Northern Virginia area and is responsible for funneling emergency 911 calls to the proper jurisdictions. With Arlington down, no emergency calls could be routed, and the 911 system went dead.

Compounding the problem, Arlington's failure disabled Verizon's network monitoring capabilities. No longer did it have visibility into its network to localize problems such as broken wires due to fallen trees. It was impossible for Verizon to assess damages and make repairs.

This is why it took four days to completely restore 911 services to the area.

Lessons Learned

This is not the first failure of 911 services in the Northern Virginia area. It has had eleven such outages in the preceding two year period, including faults due to blizzards in January 2010 and 2011 and to Hurricane Irene.

This widespread 911 failure elicited strong responses from officials and politicians, all the way to Congress. The U.S. Federal Communications Commission, the Virginia State Corporation (the state's regulatory body), and the Virginia governor's office all launched investigations.

Several recommendations came out of these investigations, and Verizon is implementing them all:

1. Verizon is signing on to the National Incident Management System (NIMS) model to assess future incidents (used in the United States to coordinate emergency preparedness and incident management among various federal, state, and local agencies)
2. It is implementing a reverse notification phone-call system to give notice about a 911 failure. Verizon will extend its current email notification system to texting and will establish correct contact lists.
3. It will develop a semiannual drill with each jurisdiction on actions to be taken in the event of a 911 outage.
4. It will provide monthly a current contact list for each jurisdiction, including escalations up to the vice presidential level
5. It will have a representative present at each jurisdiction's Emergency Operations Center to provide accurate information on 911 services and outages.
6. It is improving generator maintenance, reliability, and redundancy.

In addition, the State of Virginia is assembling an interjurisdictional 850 MHz talk group for 911 events. This radio facility is designed to not interfere with police or fire mutual aid radio systems. It will provide an independent communications path for 911 operations.

It is clear that these actions will not prevent future 911 outages. However, they will improve the response to outages to minimize their effects on the populace.

Acknowledgements

The material for this article was taken from the following resources:

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911 failure affected 2.3 million in Northern Virginia, *Washington Post*, July 11, 2012.

Lessons Learned from Derecho 911 Problems, *ARLnow*; August 20, 2012.

Virginia investigates 911 phone system failure, *WTOP*; September 11, 2012.

Report criticizes Verizon response to 911 failure, *WTOP*; November 14, 2012.

911 System Has Failed Multiple Times in Maryland, Virginia, *WAMU*; December 3, 2012.