Colorado Legislative Council Staff

Room 029 State Capitol, Denver, CO 80203-1784
(303) 866-3521 • FAX: 866-3855 •TDD: 866-3472
www.colorado.gov/lcs
E-mail: lcs.ga@state.co.us

M E M O R A N D U M

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TO: 911 Task Force on 911 Oversight, Outage Reporting, and Reliability

FROM: Amanda Hayden, Fiscal Analyst, 303-866-4918
            Conrad Imel, Research Analyst, 303-866-2756
            Katie Ruedebusch, Research Analyst, 303-866-3001

SUBJECT: 911 Outages

Summary

This memorandum discusses how 911 outages occur, what parties are involved in reporting and repairing an outage, and how outages can be mitigated.

How 911 Outages Occur

911 outages can occur any time cables or other system infrastructure are compromised. Outages can occur within the originating service provider's network,[1] within the basic emergency service provider (BESP) network, or within the public safety answering point (PSAP) network.

The most common causes of 911 outages are construction crews, system failures, weather events, and wildlife. Construction crews cause 911 outages by accidentally cutting underground cables. System failures usually occur at a central office when equipment breaks down or overheats or when power outages occur without backup. These types of failures can occur within the originating service provider's network, the BESP network, or at a PSAP facility. Weather events can bring down above-ground lines or wash out underground cables, while wildlife causes outages most commonly by chewing through wires and cables. Rarely, planned outages occur as systems are intentionally taken offline so that equipment can be repaired or replaced.
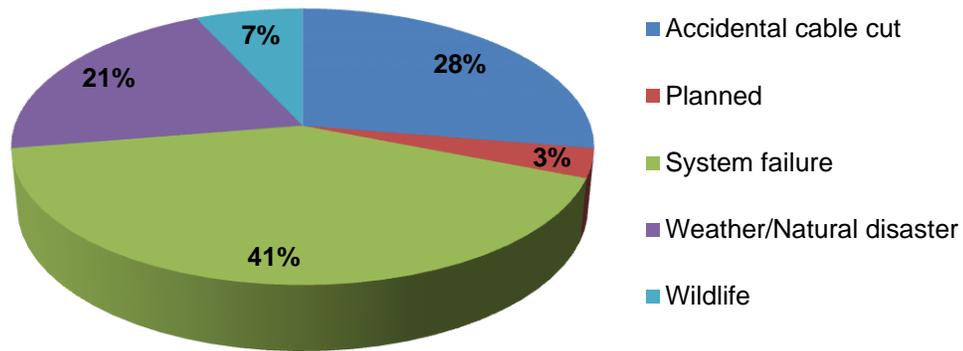
Figure 1 on the next page shows outage causes in Colorado by type for 2016 (through August 25).

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[1]Originating service providers include landline, wireless, and voice over internet protocol (VoIP) providers.

Figure 1
Outage Cause by Type, 2016 YTD

Legend:
- ■ Accidental cable cut
- ■ Planned
- ■ System failure
- ■ Weather/Natural disaster
- ■ Wildlife

Pie chart values: 28%, 3%, 41%, 21%, 7%

Source: Colorado Public Utilities Commission.

Reporting an Outage

Typically, originating service providers are the first parties to become aware of an outage. The BESP, CenturyLink, may become aware of an outage through its own internal monitoring or from reports from carriers. The Federal Communications Commission (FCC) requires carriers to inform PSAPs of an outage lasting at least 30 minutes in duration and potentially having an impact of 900,000 user-minutes or more. In addition to notifying the PSAPs, landline carriers and the BESP must notify the Colorado Public Utilities Commission (PUC). As of October 3, 2016, there have been approximately 31 outages reported to the PUC this calendar year.

Wireless and voice over internet protocol (VoIP) carriers may or may not notify the PUC of an outage, but are required by federal law to notify the FCC. Carriers submit reports through the FCC's Network Outage Reporting System (NORS), a web-based filing system, or through the Disaster Information Reporting System (DIRS), a voluntary system providers can use during times of crisis. The FCC considers reports in either system confidential.

Typically, the customers served by a network experiencing an outage are not informed unless the PSAP or local 911 authority makes an announcement through radio or television. Landline callers attempting to reach 911 during an outage may hear a busy signal, while wireless callers may have no signal to make a call or may have trouble getting a call to connect to 911, depending on the source of the outage. During an outage originating within the BESP network or at a PSAP facility, emergency services providers may ask callers to reach them using the seven-digit direct phone number rather than 911. During an outage within the originating service provider's network, landline or wireless callers may be unable to make any calls whatsoever.

Repairing an Outage

Usually, the carrier that owns the portion of the network where the failure occurred will repair the outage. Repairing an outage can entail unearthing and splicing fiber optic cable, repairing downed above-ground cable lines, or replacing equipment in a central office. Carriers may have technical teams working to identify the source of an outage while operational teams deploy as quickly as possible to begin repairing it. Some may even send trucks with equipment to provide an area with temporary service until the system can be restored.

Generally, the owner of the infrastructure pays for the repairs. In urban areas, carriers tend to own the cables that service their networks, making them responsible for repairs to those cables in the event of a failure. In rural areas, smaller carriers may lease the cables from other entities, such as energy companies, in which case the carrier would not make repairs to the cables in the event of an outage. Though outages may be more common in urban areas, especially where construction activity is high, outages in rural areas may take longer to repair, owing to the geographic challenges that accompany some more remote areas of the state.

How 911 Outages Can Be Mitigated

Network diversity. Network diversity helps minimize 911 outages. The more cables that serve the customer, the BESP network, and the PSAPs, and the more geographically dispersed those cables are, the better the chance of avoiding an outage or overcoming it more quickly. For example, if a mountain town is served by only one fiber optic line running west, and that line is compromised, the town may experience an outage. The addition of a second line running south would create network diversity and decrease the chances of a disruption of 911 services. Similarly, fiber optic cable rings, such as the ring running through rural areas in northeast Colorado, increase network diversity. Information may generally run between two points on that ring in a clockwise direction. If there is an issue with the cable between those two points, however, the information can be sent in a counter-clockwise direction, ensuring that the information reaches its intended destination despite damage to another part of the cable.

NextGen 911 and network redundancy. The switch to NextGen 911 may minimize the frequency or duration of future 911 outages. Because NextGen 911 utilizes an internet protocol (IP)-based platform, it may be easier to reroute calls around failure points or to reach an alternate PSAP if the failure has occurred at the caller's designated PSAP. This flexibility is not easily achieved using current 911 technology.

Despite the flexibility inherent in an IP-based system, NextGen 911 systems are still constrained by diversity and redundancy issues. If only one fiber optic line serves a community, any damage to that cable could cause a 911 failure, even with NextGen capabilities. Using the switch to NextGen 911 as an opportunity to diversify cable networks may be the greatest advantage in minimizing future 911 outages. Nevertheless, the advantages of upgrading technology and diversifying cable networks must be balanced against the time and resources required to do so, including potentially substantial costs for rural or mountainous areas.

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