



UTC
Washington Utilities
and Transportation
Commission

Investigation Report

CenturyLink Communications, LLC

UT-181051

Staff Investigation

Consumer Protection and
Regulatory Services

December 2020

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PURPOSE, SCOPE, AND AUTHORITY

Purpose

The purpose of this investigation is to determine the compliance of CenturyLink Communications, LLC¹ (CenturyLink or Company) with Washington state law and the Washington Utilities and Transportation Commission's (Commission) rules during a December 2018 outage of the state's emergency 911 system that lasted 49 hours and 32 minutes.

Scope

The scope of this investigation focuses on issues concerning the technical functionality of the statewide 911 network, as well as CenturyLink's business practices prior to, during, and following the outage. Conclusions and recommendations contained in this report are those of staff and not the commissioners.

Authority

Commission staff (staff) undertakes this investigation pursuant to Revised Code of Washington (RCW) 80.01.040 (General powers and duties of commission) and RCW 80.04.070 (Inspection of books, papers, and documents), which grants the Commission authority to regulate in the public interest and regulate the rates, services, facilities, and practices of all entities operating under public service laws. Staff also conducts this investigation pursuant to RCW 80.04.380, which authorizes the Commission to penalize public service companies for violations of Commission rules and other requirements.

Staff Contacts

Jacque Hawkins-Jones, Consumer Protection
(360) 664-1105
Jacque.Hawkins-Jones@utc.wa.gov

Rebecca Beaton, Regulatory Services
(360) 664-1287
Rebecca.Beaton@utc.wa.gov

¹ All Commission-registered names are as follows: CenturyLink Communications, LLC; CenturyLink, CenturyTel of Washington, Inc.; CenturyTel of Inter Island, Inc.; CenturyTel of Cowiche, Inc.; United Telephone Company of the Northwest; and Qwest Corporation, dba CenturyLink QC.

EXECUTIVE SUMMARY

Beginning early on the morning of Dec. 27, 2018, Washington residents experienced a major outage affecting wireline telecommunications companies, wireless cellular providers, and Voice over Internet Protocol (VoIP) providers. The outage also affected the state's Enhanced 911 (E911) system, severely disrupting emergency, and public safety communications in Washington state. The E911 system failed for 49 hours and 32 minutes over a three-day period, with a complete outage from 12:40 a.m. PST on Dec. 27, until 8:36 p.m. PST on Dec. 28, 2018. Sporadic outages throughout the state continued until all services were restored at 9:01 p.m. PST on Dec. 29, 2018.

The outage resulted in a loss of access to the state E911 system in all 39 counties across 62 Primary Public Safety Answering Points (PSAP) in Washington state. The outage affected a total of 7,427,570 Washington state residents.

Staff undertook this investigation to determine the following:

- What caused the statewide E911 system outage;
- Whether CenturyLink's restoration efforts in Washington were sufficient;
- Whether communication to affected Washington CenturyLink customers was timely and effective during the outage; and
- Whether CenturyLink and CenturyLink's E911 vendor's facilities were adequate to provide service as required by state law.

Staff contracted with a subject matter expert, Jeffrey Wheeler,² to assist in the investigation into the cause of the outage and to evaluate the Company's restoration efforts.³

In addition to examining the cause of the outage and the steps taken, or not taken, by CenturyLink to fulfill its public safety obligations, one goal of this investigation is to prevent a serious and potentially life-threatening outage from reoccurring.

Staff recognizes that CenturyLink has provided E911 service in Washington state for many years. Staff anticipates the heightened focus on the specific root cause of the outage investigated by CenturyLink and its successor, TeleCommunication Systems, Inc., d/b/a Comtech Telecommunications Corp., (Comtech),⁴ state and local government officials, and the information collected pursuant to staff's investigation, will materially reduce or eliminate the possibility of a reoccurrence of the statewide E911 outage of the scope and duration experienced by Washington residents in December 2018.

² A copy of Jeffrey Wheeler's resume is attached as Appendix A.

³ Staff also intended to work with Jeffrey Wheeler to prepare an additional description of the outage root cause from a technical perspective. However, unforeseen medical issues have prevented Wheeler from completing the report as of the time of filing this staff report and associated complaint. Staff will continue working with Wheeler to complete his additional report as soon as possible.

⁴ Telecommunication Systems, Inc. is the company's Commission registered name. Comtech Telecommunications Corp. is its parent company.

Staff Findings

CenturyLink's E911 vendor, West Telecom Services, LLC (West)⁵ operates two Emergency Communications Management Centers (ECMC) located in Englewood, Colorado, and Miami, Florida. On Dec. 27, 2018, CenturyLink first became aware it was experiencing a major network outage after receiving an inquiry from a customer in Louisiana at 12:56 a.m. PST. During the December 2018 outage, Colorado ECMC nodes (where E911 data enters and exits the network) stopped processing E911 calls placed by Washington residents due to four malformed packets that continuously transmitted across the network,⁶ which resulted in a never-ending feedback loop, or packet flooding. This packet flooding caused a disruption in the nodes which led to the nodes' failure to route and transmit data across CenturyLink's network. The nodes were supplied by Infinera Intelligent Transport Networks (Infinera), a vendor that provides equipment and services to CenturyLink, including nodes and cards. Eventually, CenturyLink identified and removed the faulty packets, restoring most of the network to normal function after 49 hours and 32 minutes.⁷

Based on Infinera's response, coupled with information gleaned from CenturyLink and other sources, staff determined that the emergency system design and implementation failed to perform as required. Furthermore, the severity of the E911 outage was exacerbated by a network configuration error in CenturyLink's devices that handle the Company's infrastructure, data, and call flows.

After several requests of CenturyLink to provide all failed call data, staff was forced to utilize other methods to determine the number of emergency calls in Washington state placed to 911 that went unanswered. The Washington Military Department (WMD), with assistance from Comtech, provided staff the approximate number of E911 calls transmitted over the Next Generation 911 (NG911) Emergency Services IP Network from January 2020 through October 2020.⁸ Staff used this E911 call data and averaged the number of calls per 24-hour period, which was approximately 12,000 completed E911 calls. PSAPs reported a network outage or a fast-busy signal for an unknown length of time due to the network periodically restoring and crashing during the December 2018 outage. The E911 system failed for 49 hours and 32 minutes, therefore based on the average 12,000 complete E911 calls per day, staff estimates up to 24,000 E911 calls were affected by the December 2018 outage.

CenturyLink used Infinera nodes within its E911 system to provide optical fiber switching to send traffic to the correct pathway.⁹ CenturyLink did not configure the nodes' management channel to

⁵ West Telecom Services, LLC changed its name to Intrado Communications, LLC, with the Commission effective May 1, 2020.

⁶ A block of data transmitted over a packet-switched network, which is the common architecture of all local area networks (LANs) and most wide area networks (WANs) such as the Internet. Packets are mostly TCP/IP packets, because TCP/IP is the global networking standard.

⁷ The restoral period continued for an additional 12 hours as staggered services were brought back online and tested.

⁸ A copy of January 2020, through October 2020, WMD data is attached as Appendix B.

⁹ Each node provides optical fiber switching, a process that ensures that network traffic is directed towards the intended network path, between networks components called line modules. Line modules provide the connection points between nodes. Internal to each node, a component called a switching module transfers packets from inbound line modules to outbound line modules.

prevent inaccurate traffic routing or packet flooding.¹⁰ If CenturyLink had those safeguards in place, the statewide outage would have been shorter in duration. CenturyLink and Infinera have subsequently made changes to the networks to prevent this type of outage from reoccurring by replacing faulty equipment and disabling the channel that enabled the packet flooding.

As a result of this investigation, staff finds that CenturyLink violated the following state laws and Commission rules:

- RCW 80.36.080, Rates, services and facilities
- RCW 80.36.220, Duty to transmit messages—Penalty for refusal or neglect
- WAC 480-120-450(1), Obligations of local exchange companies
- WAC 480-120-412(2), Major outages - Notification to public safety answering points (PSAP)

Penalty Recommendation

Staff recommends the Commission issue a formal complaint against CenturyLink and assess a penalty up to \$7,215,000 for 72,015 violations of Commission laws and rules. The elements of the penalty recommendation are as follows:

- Up to \$100 for each of the 24,000 violations of WAC 480-120-450 for failing to provide E911 services to Washington state customers as the designated local exchange carrier, for a potential penalty of \$2,400,000.
- Up to \$100 for each of 24,000 violations of RCW 80.36.080 for failing to maintain reasonable oversight of its restoral efforts and failing to implement systems to provide awareness of outages and restoration of service, contributing to 24,000 potentially incomplete E911 calls for a potential penalty of \$2,400,000.
- Up to \$100 for each of 24,000 violations of RCW 80.36.220 for failing to transmit E911 calls as required, for a potential penalty of \$2,400,000.
- Up to \$1,000 for each of 15 violations of WAC 480-120-412 for failing to promptly notify the PSAPs of a major outage, for a potential penalty of \$15,000.

Report Format

This staff investigation report is divided into five sections:

1. Background;
2. Investigation: Failed E911 Calls to Emergency Services;
3. Investigation: State Network and Transmission Requirements;
4. Investigation: Communication During the Outage; and
5. Staff's Recommendations.

¹⁰ A copy of the December 27, 2018, CenturyLink Network Outage Report, A Report of the Public Safety and Homeland Security Bureau, Federal Communications Commission, August 19, 2019 at 6, is attached as Appendix C.

BACKGROUND

Company Information

CenturyLink is the major incumbent Local Exchange Carrier (LEC) offering telephone, data, and other services in the state of Washington. Additionally, CenturyLink maintains statewide responsibility for the underlying network and infrastructure elements of the state's E911 system, including inter- and intrastate E911 data and call transmission from other carriers and service providers.

In 2004, Qwest Corporation contracted with West to provide E911 services in Washington and other states. The contract required both Qwest and West to comply with all applicable state, federal, county, and local ordinances, regulations, and codes.

In June 2009, the Emergency Management Division within the WMD, contracted with CenturyLink to develop and maintain an Internet Protocol-enabled Emergency Service Information Network infrastructure (ESInet 1).

On March 14, 2011, the Commission issued Final Order 14 in Docket UT-100820, approving and adopting, subject to conditions, a multiparty settlement agreement authorizing CenturyLink to acquire indirect control of Qwest Corporation, Qwest LD Corp. and Qwest Communications Company LLC.¹¹ CenturyLink assumed all of Qwest's responsibilities under the contract.

Compliance History and Communications Plan

San Juan Island County – Docket UT-132234

On Nov. 5, 2013, a fiber cable was severed between Lopez Island and San Juan Island in San Juan County, Washington, resulting in a 10-day interruption of all long distance and 911 services. The Commission assessed a \$173,210 penalty against CenturyLink. The Commission agreed to suspend all but \$50,000 for violations of WAC 480-120-412 related to notification requirements of a major outage.¹²

As part of a settlement agreement, CenturyLink agreed to develop emergency communications plans for San Juan County and for the state of Washington in collaboration with staff and the Public Counsel Section of the Washington Office of the Attorney General (Public Counsel). The purpose of the plans is to ensure CenturyLink complies with the Commission's notification requirements for major outages as found in WAC 480-120-412. The Commission approved both plans in Order 05, entered May 2, 2016.¹³

Englewood, Colorado Switch Failure – Docket UT-140597

On April 9 and 10, 2014, a switch failure in Englewood, Colorado, caused a statewide outage of

¹¹ *In re Quest Communications International Inc. and CenturyTel, Inc.*, Docket UT-100820, Order 14 (March 14, 2011).

¹² *Wash. Utils. and Transp. Comm'n v. CenturyTel of Inter Island, Inc., d/b/a CenturyLink*, Docket UT-132234, Order 03, 19, ¶¶ 54-55 (October 20, 2015).

¹³ *Id.*, Order 05 (May 2, 2016).

Washington's E911 system. The E911 system failed at 11:54 p.m. on April 9, 2014, and was restored just over six hours later, at 6:06 a.m., on April 10, 2014. This outage affected all 39 Washington counties, 56 primary PSAPs, and 12 secondary PSAPs. On Feb. 22, 2016, in Order 03, the Commission approved a settlement agreement in which CenturyLink admitted to violations of RCW 80.36.080, Rates, services, and facilities; WAC 480-120-450, Enhanced 911 (E911) obligations of local exchange companies; and WAC 480-120-412, Major outages; and agreed to pay penalties in the amount of \$2,854,750.¹⁴

The Dalles, Oregon Switch Failure

On Nov. 6, 2016, CenturyLink experienced a switch failure in The Dalles, Oregon, which resulted in an outage of 911 services over a two-day period, affecting 100,000 customers in Klickitat and Skamania counties. CenturyLink failed to notify the Commission or the State E911 Coordinator's Office within the Emergency Management Division of the Washington Military Department until 28 hours after the outage occurred, thus violating WAC 480-120-412 and the Washington State Outage Communications Plan.

As a result, on June 1, 2017, the Commission entered Order 06 in Docket UT-132234, which imposed suspended penalties from the San Juan outage proceeding in the amount of \$123,210.¹⁵

Englewood, Colorado Software Update – Docket UT-190209

On July 12, 2017, a software update in Englewood, Colorado, disrupted the delivery of 222 calls to E911 from eight unique wireline numbers. The E911 system failed at 5:52 a.m. on July 12, 2017, and was restored at 8:39 a.m. On July 12, 2017, at 4:31 p.m., WMD notified staff by email of the E911 system failure. On July 14, 2017, CenturyLink sent a courtesy email to staff for notification of a non-major outage.

The Commission found that the partial E911 outage was due to a network malfunction that was not foreseeable and occurred during a planned upgrade. The Commission found that CenturyLink and West promptly detected and fixed the network outage. The Commission did not find CenturyLink violated RCW 80.36.080 and WAC 480-120-450(1) and dismissed the complaint against the Company.

911 System Network Description

AT&T developed the 911 system in the 1960s for responders to address emergency needs. In emergency or public safety situations, consumers dial '9-1-1' from any telephone to be connected to a PSAP emergency dispatch center that, depending on the situation, utilizes information provided by the caller and certain location information to dispatch emergency responders to the caller's location. In virtually all areas of the country, the E911 system automatically pairs a caller's telephone number with the physical address or location of a caller's location. Emergency E911 services are overseen by governmental entities in a majority of jurisdictions nationwide and funded through state and county taxes. The actual elements of E911 networks that receive E911 calls and

¹⁴ *Wash. Utils. and Transp. Comm'n v. Qwest Corporation d/b/a/ CenturyLink QC*, Docket UT-140597, Order 03, 11, ¶ 42 (February 22, 2016).

¹⁵ *Wash. Utils. and Transp. Comm'n v. CenturyTel of Inter Island, Inc., d/b/a CenturyLink*, Docket UT-132234, Order 06, 3, ¶ 10 (June 1, 2017).

dispatch emergency personnel are directly operated by governmental bodies, often county governments; while transmission, routing, and call completion functions are provided under contract with telecommunications providers such as CenturyLink.

The WMD, Emergency Management Division, oversees all E911 services in Washington state. In 2009, it contracted directly with CenturyLink to provide E911 services through ESInet 1.

CenturyLink has contracted some functions of the E911 network to Colorado-based West, CenturyLink's E911 Automatic Location Identification (ALI) database provider. In fulfilling its contractual obligations to CenturyLink in Washington and other states, West operates two ECMCs, located in Englewood, Colorado, and Miami, Florida. The ECMCs provide varying levels of E911 services for more than 3,000 of the nation's approximately 6,000 PSAPs, including the PSAPs in Washington state.

CenturyLink and Comtech Agreement

In June 2016, WMD's Emergency Management Division, contracted with Comtech to build, maintain, and operate a National Emergency Number Association (NENA)¹⁶ compliant Next Generation 911 Emergency Services Internet Protocol Network (ESInet 2) and assume responsibility for processing E911 calls in Washington state. This required a service agreement between Comtech and CenturyLink to provide cooperation and ongoing support during the three-phase transition.

WMD implemented a three-phase migration approach to transition Washington's 62 PSAPs from CenturyLink's ESInet 1 to Comtech's ESInet 2. Phase one of the transition involved switching or "migrating" PSAPs from CenturyLink's network to Comtech's network.¹⁷

During phase one, E911 service was provided in a segmented manner, where the termination of E911 calls to PSAPs was split between PSAPs still "connected" to CenturyLink's ESInet 1 and those PSAPs "connected" to Comtech's ESInet 2. As the originating service provider, CenturyLink

[REDACTED]
[REDACTED]
[REDACTED].¹⁸ Furthermore, regardless of whether a PSAP was receiving service from CenturyLink or Comtech, during phase one [REDACTED]
[REDACTED]
[REDACTED]

¹⁶ National Emergency Number Association (NENA) is an American National Standards Institute (ANSI) accredited standards development organization.

¹⁷ An overview of the transition project is attached as Appendix D. The third and final phase of the transition project was completed in August of 2020 (Confidential).

¹⁸ CenturyLink WMD Contract, E09-196, Amendment M ([REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]).

¹⁹ Appendix D.

On Dec. 27, 2018, CenturyLink was still in phase one of the transition and 47 PSAPs had transitioned to Comtech’s ESInet 2 network. The following table shows the transition status each PSAP at the time of the outage:²⁰

CenturyLink managed PSAPs (15)	Comtech managed PSAPs (47)
Klickitat Sheriff's Office 911 Center	RiverCom 911
Northeast King County Regional Public Safety Communications Agency	WHITCOM 911
Valley Communications Center	Columbia County Public Safety Communications
Puyallup Communications South Sound 911	Lewis County 911
Whatcom County Communications Center	Okanogan County Sheriff's Office
Stevens County 911	Pend Oreille County 911
Spokane County 911 Emergency Communications	Lincoln County Sheriff's Office
Fairchild Air Force Base	Issaquah Police Dept.
Colville Tribal Police Dept.	Enumclaw Police Dept.
Yakima County Backup	Redmond Police Dept.
King County Sheriff's Office	Washington State Patrol - Bellevue
Spokane County 911 Emergency Communications Backup	Kitsap County Central Communications
Multi Agency Communications Center	Kittitas County 911
SNOPAC911	Washington State Patrol - Spokane
SNOCOM 911	Southeast Communications Center
	Port of Seattle Police/Fire Communications
	TCOMM 911
	Wahkiakum County Sheriff's Office
	Seattle Fire Dept.
	Cowlitz County 911 Center
	Pacific County Sheriff's Office Communications
	Grays Harbor E911 Communications
	Island County Emergency Services Communications Center
	Mason County Emergency Communications
	Adams County Communications Center
	Garfield County Sheriff's Office
	King County Test PSAP

²⁰ A copy of CenturyLink’s Jan. 30, 2019, response is attached as Appendix E.

	University of Washington Police Department
	Joint Base Lewis McChord
	Washington State Patrol - Wenatchee
	Bothell Police Dept.
	Seattle Police Dept.
	Skamania County Sheriff's Office
	Ferry County E911
	Washington State Patrol - Marysville
	San Juan County Sheriff's Office
	Walla Walla Emergency Services Communications Center
	South Sound 911,
	Washington State Patrol - Yakima
	Skagit 911 Center
	Clark Regional Emergency Services Agency
	Yakima Public Safety Communications Center
	Washington State Patrol - Vancouver
	Washington State Patrol - Tacoma
	Peninsula Communications
	JEFFCOM 911 Communications
	Washington State Patrol - Bremerton

In Washington state, when a customer dials 9-1-1, the call is carried to an end office and is then transported to either the Spokane or Seattle gateway and then handed off to West. Each gateway contains two switches, a primary and a secondary switch, that provide redundancy if one switch fails. After a E911 call reaches the appropriate gateway, the call is handed off to West's network. The call is sent through that system to a router in the Colorado ECMC where the E911 ALI database, which houses the physical address of the party calling for 911 assistance, is queried by West to obtain the caller's address.

The address information associated with the telephone number used by the E911 caller is then sent back through CenturyLink's network to an appropriate PSAP giving the E911 attendant the caller's location for potential dispatch of emergency or public safety personnel.

2018 Investigation Information

Between January 2019 and August 2020, staff submitted five data requests to CenturyLink seeking technical information about the state E911 system and the December 2018 statewide E911 outage.

In response, the Company provided information about maintenance, network reliability, reporting, and CenturyLink's E911 contracts with vendors and WMD.

During the investigation, staff reviewed information collected from: CenturyLink; Comtech; Infinera; the WMD; Washington counties; Washington PSAPs; and outage reports filed in the Federal Communications Commission (FCC) Notification Outage Reporting System (NORS). Staff also reviewed information provided by public comments from consumers, public safety officials, and community officials.

The FCC also initiated an investigation to examine the circumstances surrounding the statewide E911 outage as well as the E911 outage that occurred in other states during the same timeframe.²¹

²¹ Appendix C.

INVESTIGATION: FAILED E911 CALLS TO EMERGENCY

On four separate occasions, staff requested CenturyLink provide the number of Washington customers affected by the December 2018 outage. On three occasions, CenturyLink failed to provide customer data because it claimed no services under the Commission's jurisdiction, including E911 service, were affected.

On the last occasion, CenturyLink provided data on all emergency service calls that it was to deliver to Comtech during the December 2018 outage and whether those calls were transferred successfully. [REDACTED].²²

On Jan. 14, 2019, Comtech filed its major outage report with the Commission.²³ The report provided [REDACTED]. Staff reviewed these time periods and compared them to the data CenturyLink provided regarding failed calls, referenced above. [REDACTED]

While staff believes this shows at least [REDACTED] E911 calls failed during the December 2018 outage, it only accounts for the E911 calls that CenturyLink failed to transmit to Comtech. Based on the data that CenturyLink provided, staff is unable to determine the total number of failed E911 calls that should have been transferred to PSAPs still receiving service from CenturyLink. At the time of the outage, CenturyLink still managed PSAPs located in some of the state's highest populated counties, including Snohomish, King, and Spokane counties.

Based on Comtech's responses and the limited amount of data that CenturyLink was willing to provide, staff was left with no other option but to utilize other sources to determine the number of potentially failed E911 calls during the 49 hour and 32 minute Dec. 2018 outage.

Staff requested current E911 call statistics from the WMD to determine if the historic numbers were in line with current call data. The WMD accessed the NG911 network and provided staff the approximate number of transmitted E911 calls from January 2020 through October 2020. Staff used this E911 call data and averaged the number of calls per 24-hour period, approximately 12,000 completed E911 calls. Given that the outage lasted just over two days, the data suggests that as many as 24,000 E911 calls were not delivered to PSAPs in Washington state during the outage.

Based on the failed-call data submitted by CenturyLink and compared to Comtech's time periods and current E911 call data collected by WMD, staff determined that the number of failed E911 calls during the December 2018 outage ranges between [REDACTED] and 24,000.

²² [REDACTED]

²³ A copy of Comtech's Major Outage Report, Jan. 14, 2019, is attached as Appendix G (Confidential).
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Impact to the Public's Safety

All 7.4 million residents of Washington state were potentially impacted by the December 2018, statewide E911 outage because they lost the ability to access E911 in the event of an emergency. A call to 911 may be the most important one a person can make. The inability to access local emergency responders can be life-threatening. The following are a few of the publicized or reported events that occurred during the outage:

- **King County Sheriff's Office**

KIRO 7 News reported that King County Sheriff's Office did not receive a call from an alarm company regarding a break-in at a bank in SeaTac that occurred during the December 2018 outage.²⁴ Staff confirmed with the King County Sheriff's Officer who was quoted in the article that the information in the article is true and accurate.

- **Chelan Co. (RiverCom)**

The PSAP received a call from Northern911, a Canadian 911 call center, with a report that an individual called and hung-up twice. Northern911 provided the phone number of the individual. The PSAP called and spoke with a man who said he tried calling 911 numerous times from a cell phone and a landline but could not get through. His child was having a medical emergency and he made the decision to transport the child to a local hospital in his personal vehicle.²⁵

- **Thurston Co.**

An individual said their significant other was having breathing issues on the morning of Dec. 28, 2018. The individual and their teenage child tried contacting 911 but only received a busy signal. The individual called the local number provided to call and received a busy signal. The night before, Dec. 27, the individual wrote down the local number recommended to call in emergencies because their mother has medical issues and wanted to be prepared. The individual transported their significant other to a local hospital where he remained for about one week.²⁶

- **Skagit Co.**

An individual reported they attempted to call 911 when a prowler was caught in their yard upon returning home. They said they called 911 multiple times only to receive a busy signal each time. The individual's significant other chased the prowler away before the police arrived.²⁷

- **Benton Co.**

An individual reported driving in the early morning hours on Dec. 28, and his vehicle hit a patch of ice and rolled the vehicle three times. The individual was unable to connect to 911

²⁴ A copy of the KIRO 7 news article regarding the break-in at the bank is attached as Appendix H.

²⁵ A copy of the complaint regarding a child's medical emergency received by the Washington State Office of the Attorney General received in response to a published new release on Jan. 8, 2019, is attached as Appendix I.

²⁶ A copy of the complaint regarding an individual's breathing issues received by the Washington State Office of the Attorney General received in response to a published new release on Jan. 8, 2019, is attached as Appendix J.

²⁷ A copy of the complaint regarding a prowler received by the Washington State Office of the Attorney General received in response to a published new release on Jan. 8, 2019, is attached as Appendix K.

after multiple attempts and had a family member contact Washington State Patrol through the non-emergency line. The individual only reported minor injuries.²⁸

²⁸ A copy of the complaint regarding the rollover car crash received by the Washington State Office of the Attorney General received in response to a published new release on Jan. 8, 2019, is attached as Appendix L.

INVESTIGATION: STATE NETWORK AND TRANSMISSION REQUIREMENTS

911 System Outage and Service Restoral

In a data request dated Jan. 30, 2019, CenturyLink provided the following general response regarding the cause of the outage:

CenturyLink experienced a network event impacting a national transport network operated by [CenturyLink]. The incident impacted voice (primarily voice over internet protocol), other internet protocol-based services, and transport services for some CenturyLink customers in various parts of the country, including Washington. The event also impacted CenturyLink's visibility into our network management system, impairing our ability to troubleshoot and prolonging the duration of the outage. The outage was caused by a third-party equipment vendor's faulty network management card that triggered invalid traffic replication.

To be clear, the event did not cause a nationwide outage involving CenturyLink's 911 service or a CenturyLink 911 service-related outage in Washington for those Public Safety Answering Points ("PSAPs") served by CenturyLink. During 2018 most Washington PSAPs had their respective 911 Service transferred from CenturyLink to Comtech.²⁹

In a separate data request dated Feb. 1, 2019, staff asked Comtech about service restoral during the outage. Comtech stated:

[REDACTED]

On Aug. 19, 2019, the FCC published a report detailing the events that took place in Dec. 2018.³¹ According to the FCC, on December 27, 2018, four malformed management packets were spontaneously generated by a switching module in CenturyLink's Denver, Colorado node.³² The FCC stated that the malformed packets had characteristics that allowed the packets to pass through network filters. As a result, "the packets were transmitted along the enable and unconfigured proprietary management channel."³³ The FCC further explained:

Due to the packets' broadcast destination address, the malformed network management packets were delivered to all connected nodes. Consequently, each subsequent node receiving the packet retransmitted the packet to all its connected

²⁹ Appendix E.

³⁰ A copy of Comtech's data request response dated March 25, 2019, is attached as Appendix M (Confidential).

³¹ Appendix C.

³² Appendix C at 6-7. Malformed packets are packets that, while not rare, are not typically generated on a network and are usually discarded immediately due to characteristics that indicates that the packets are invalid. Despite internal investigation, neither CenturyLink nor Infinera know how or why the malformed packets were generated.

³³ Appendix C at 7.

nodes, include the node where the malformed packets originated. Each connected node continued to retransmit the malformed packets across the proprietary management channel to each node with which it connected because the packets appeared valid and did not have an expiration time. This process repeated indefinitely.

The exponentially increasing transmittal of malformed packets resulted in a never-ending feedback loop that consumed processing power in the affected nodes, which in turn disrupted the ability of the nodes to maintain internal synchronization. Specifically, instructions to line out modules would lose synchronization when instructions were sent to a pair of line modules, but only one line module actually received the message. Without this internal synchronization, the nodes capacity to route and transmit data failed. As these nodes failed, the result was multiple outages across CenturyLink's network.³⁴

The FCC stated that Comtech became aware of the outage through its internal alarms and reports from PSAPs in Washington state and the outage affected enough of Comtech's system that it was unable to process 911 calls to send them to PSAPs or reroute the calls around the outage.

Based on Comtech's response and information gathered from CenturyLink and other sources, staff has determined that the statewide E911 network outage was caused by CenturyLink's failure to configure the channel module to prevent inaccurate traffic routing or packet flooding. If CenturyLink had those safeguards in place, the statewide outage would have been shorter in duration. CenturyLink and Infinera have subsequently made changes to the networks to prevent this type of outage from reoccurring by replacing faulty equipment and disabling the channel that enabled the packet flooding.

State Network Requirements

RCW 80.36.080 requires telecommunications companies to provide service "in a prompt, expeditious and efficient manner and the facilities, instrumentalities and equipment furnished by it shall be safe, kept in good condition and repair, and its appliances, instrumentalities and service shall be modern, adequate, sufficient, and efficient." Commission rules require companies to make reasonable provisions to minimize the effects of major outages and prioritize outages affecting PSAPs and emergency response agencies to be restored as soon as possible. Both RCW 80.36.080 and the Commission rules appear to anticipate that outages may occur through no fault of the companies, *e.g.*, cables cut by contractors or damaged by storm damage, etc. Therefore, companies are expected to use "best efforts" to repair the damage.

Additionally, RCW 80.36.220 requires telecommunication companies to receive, exchange, and transmit each other's messages without delay or discrimination, and receive and transmit messages for any person.

³⁴ Appendix C at 7-8.

CenturyLink customers were denied the most basic telecommunication service, which is an ability to dial 9-1-1 and have that call routed directly to public safety resources, as provided for in WAC 480-120-450(1).

Staff's investigation applied the "modern, adequate, sufficient, and efficient" standard of the law. It is vitally important that Washington state's E911 provider and WMD safeguard the critical nature of E911 service. To protect networks from equipment failure and transmit the essential E911 calls, West provides multiple routes and two ECMCs to ensure the E911 system continues in the event of an equipment failure.

Findings

The E911 system is a vital part of Washington's emergency and public safety service to the residents of the state of Washington. On Dec. 27, 2018, Washington experienced a statewide outage of its E911 system, lasting 49 hours and 32 minutes, denying emergency services to E911 callers. The full impact of this outage failure will never be known.

The Dec. 2018 outage was caused by a combination of the malformed packets and CenturyLink's failure to configure its vendor's internodal management channel, resulting in a feedback loop that consumed the CenturyLink network's processing power and disrupted the network's ability to properly route calls.

CenturyLink did not provide its customers the most basic telecommunication service, which is an ability to dial 911 and have that call routed directly to public safety resources, as required by WAC 480-120-450(1). Due to the service interruption, the safety of Washington residents was severely threatened, and loss of life could have occurred because of this statewide E911 outage. Therefore, based on a review of CenturyLink's failed call data, WMD E911 call information, and in the absence of more precise information from CenturyLink, staff finds that the Company committed up to 24,000 violations of WAC 480-120-450(1) over the 49 hour and 32 minute outage.

CenturyLink is required by RCW 80.36.080 to provide service that is safe, modern, adequate, sufficient, and efficient. As a result of its investigation, staff finds CenturyLink and its E911 vendor, Infinera, failed to provide safe and efficient E911 service, resulting in up to 24,000 failed calls during the December outage. Staff finds up to 24,000 violations of RCW 80.36.080.

Additionally, CenturyLink is required by RCW 80.36.220 to transmit messages from other telecommunication companies, as well as messages for any person. As a result of its investigation, staff finds CenturyLink failed to transmit messages up to 24,000 calls to PSAPs that still received service from CenturyLink and to Comtech during the December outage. Staff finds up to 24,000 violations of RCW 80.36.220.

INVESTIGATION: COMMUNICATION DURING THE OUTAGE

External Communication during the Outage

In response to a data request regarding the Company's external communication efforts, CenturyLink responded that it did not have any communication to provide, as it was not aware of any E911 service outages in Washington experienced by any entity to which CenturyLink provided E911 service during the time of the outage.

Social Media Posts

Without any response from CenturyLink about its external communication, staff visited the Company's various social media accounts to gather what was communicated to its customers during this major outage.

Facebook

CenturyLink posted the following to its Facebook page at 2:32 p.m., on Dec. 27, 2018.³⁵ This was the first of several posts on its Facebook page regarding the network outage:

“Our network is experiencing a disruption affecting customer services. We understand some customers are currently unable to generate tickets through the CenturyLink help portal. We know how important these services are to our customers and we are working to restore services as quickly as possible.”

Staff's review of CenturyLink's Facebook page documents that the Company posted a message at 8:33 p.m., on Dec. 27. The posted notice failed to provide alternate telephone numbers for the public to call in an emergency.

CenturyLink made the following Facebook post at 10:14 a.m., Dec. 28, 2018:³⁶

“We are aware of some 911 service disruptions affecting various areas through the United States. In case of an emergency, customers should use their wireless phones to call 911 or drive to their nearest fire station or emergency facility. Technicians are working to restore services.”

CenturyLink also made the following Facebook post at 11:44 a.m., on Dec. 28, 2018:³⁷

“While our network is experiencing service disruptions, where CenturyLink is the 911 service provider 911 calls are completing.”

The following is the last Facebook post that CenturyLink references E911 and it was made at 6:09 p.m., on Dec. 28, 2018:³⁸

³⁵ A copy of CenturyLink's Dec. 27, 2018, Facebook post is attached as Appendix N.

³⁶ A copy of CenturyLink's Dec. 28, 2018, Facebook post is attached as Appendix O.

³⁷ A copy of CenturyLink's Dec. 28, 2018, Facebook post is attached as Appendix P.

³⁸ A copy of CenturyLink's Dec. 28, 2018, Facebook post is attached as Appendix Q.

“As you are aware, CenturyLink has been dealing with a network event. We take all service interruptions seriously and have had teams working around the clock to restore affected services. All consumer services impacted by this event, including voice and 911, have been restored. Some consumers may continue to experience limited latency, but those issues will clear in the next few hours. If you are experiencing service issues, please contact CenturyLink’s repair department.”

At 8:57 p.m., on Dec. 28, 2018, KING 5 TV News reported on its Facebook page that CenturyLink customers are receiving a fast-busy signal when calling E911 and provided a complete list of alternate numbers to call in an emergency on its webpage.³⁹

Staff located no further postings related to the outage posted on CenturyLink’s Facebook page.

Twitter

Staff found the messages posted to CenturyLink’s Twitter account were identical to the two Facebook messages posted on the morning of Dec. 28.

Communication with Staff

Staff’s first communication with CenturyLink about the E911 outage occurred late on December 27, 2018.⁴⁰ A CenturyLink representative informed staff that [REDACTED]

CenturyLink followed up with an email at 8:22 a.m., on Dec. 28, to the Commission with ticket notes regarding the outage.⁴¹ The notes state [REDACTED]

Communication with PSAPs

CenturyLink’s response to staff’s data request (noted below) shows that the Company did not directly notify Washington PSAPs of the outage, as CenturyLink was “unaware of any 911 service outages in Washington experienced by any entity to which CenturyLink provided 911 service during the outage.”⁴² Staff submitted a data request to Comtech for all external communication with stakeholders regarding the entire December 2018 outage. The following is a summary compiled by staff of Comtech’s communication with PSAPs on Dec. 27, 2018:⁴³

³⁹ A copy of KING 5 TV News article is attached as Appendix R.

⁴⁰ A copy of staff email on Dec. 28, 2018, is attached as Appendix S (Confidential).

⁴¹ A copy of CenturyLink email sent at 8:22 a.m. on Dec. 28, 2018, is attached as Appendix T (Confidential).

⁴² Appendix E.

⁴³ Appendix M, Exhibit B (Confidential).

[REDACTED]

WMD created an open telecommunication conference call bridge on Dec. 27, 2018 and sent an email to all Washington state PSAPs notifying them that the bridge was open. The bridge allowed the PSAPs to call in to report and receive outage updates. The WMD provided the PSAPs a status update on CenturyLink and Comtech on Dec. 28, 2018.

Staff has no documentation that CenturyLink contacted any of the PSAPs still under its

management during the time of the outage.

CenturyLink failed to notify staff, the PSAPs still under its management, or Comtech of the major outage.

Major Outage Report

CenturyLink released the following summary to the Commission on Jan. 24, 2019, 25 days after cessation of the E911 outage:⁴⁴

[REDACTED]

CenturyLink also provided areas of impact and listed the following:

[REDACTED]

⁴⁴ A copy of CenturyLink’s Multi-State Outage Report submitted on Jan. 24, 2019, is attached as Appendix U (Confidential).

Communications Plan

In response to a staff data request, CenturyLink referenced a communication plan stipulated as a part of the settlement agreement in Docket UT-132234, the same communications plan submitted to the Commission by CenturyLink in response to the San Juan Islands data and service outage that occurred Nov. 5, 2013.⁴⁵ CenturyLink stated that it did not follow the communication plan because CenturyLink “was not aware of any 911 service outages in Washington experienced by any entities to which is provided 911 service during the incident.”⁴⁶

Commission-Referred Consumer Complaints and Inquiries

Consumer protection staff did not receive any complaints related to the December 2018 outage.

Major Outage Requirements

WAC 480-120-021 defines a major outage as “a service failure lasting for thirty or more minutes that causes the disruption of local exchange or toll services to more than one thousand customers; total loss of service to a public safety answering point or emergency response agency; intercompany trunks or toll trunks not meeting service requirements for four hours or more and affecting service; or an intermodal link blockage (no dial tone) in excess of five percent for more than one hour in any switch or remote switch.”

WAC 480-120-412(2), Major Outages, provides that, “When a company receives notice of or detects a major outage, it must notify the Commission and any PSAP serving the affected area as soon as possible.”

Findings

Commission rules require that telecommunications companies take steps to minimize the effects of service failures, including the failures affecting E911 service, and report on them. WAC 480-120-412(2) requires telecommunication companies to notify the Commission and any PSAP when a company receives notice of or detects a major outage as soon as possible.

As reflected in the CenturyLink’s data request response, CenturyLink did not notify the 15 PSAPs under its management of the December 2018 major outage. Staff finds 15 violations of WAC 480-120-412(2).

⁴⁵ Appendix E.

⁴⁶ Appendix E.

RECOMMENDATIONS

Staff's investigation finds that CenturyLink's E911 system failed due to a foreseeable and preventable technical error and related deficiencies. As a result, the residents of Washington state lost access to E911 service and could not reliably call for emergency assistance using E911 for 49 hours and 32 minutes. Staff believes that the severity of the outage and the risk it posed to the public warrants a significant penalty.

Staff typically recommends a "per violation" penalty against a regulated company where the violations result in serious consumer harm; for repeat violations of a rule after the company receives technical assistance; or for intentional violations of Commission laws or rules.

Per the *Enforcement Policy of the Washington Utilities and Transportation Commission* (Docket A-120061), staff considered the following factors to determine the recommended penalty amount:

1. How serious or harmful the violation is to the public.

The statewide E911 outage that occurred Dec. 27, 28, and 29, 2018, stretched over a 49-hour 32-minute period. Every person in Washington was affected because the ability to access E911 was sporadic and unreliable. Additionally, the average person does not know the 10-digit number needed to reach a local first responder if E911 is not available. The inability to reach emergency services through E911 is a serious and potentially fatal event. In the case of this particular service outage, the potential impact was mitigated only by the fact that no major natural or human-caused disasters or incidents occurred during the timeframe of the outage.

It will likely never be known the true extent of the harm to the public. Thousands of members of the public in Washington state reached out for help through emergency services through E911 and did not receive it.

2. Whether the violation is intentional.

Although the E911 outage itself was unintentional, the evidence supports a finding that it was foreseeable and preventable.

Staff also believes the evidence supports a finding that CenturyLink's poor communication with Commission staff, WMD, PSAPs, and its customers was avoidable. The Company knew, or should have known, that such an outage was possible and therefore should have had procedures in place for notifying regulators and other stakeholders about the nature and extent of the outage.

This is not the first time that staff has found CenturyLink's external communications lacking. Staff's investigation found that this was also a key failure by the Company during its 10-day 2013 service outage in San Juan County.

3. Whether the company self-reported the violation.

On Dec. 27, 2018, at 10:19 a.m., WMD notified staff that Washington state was experiencing an E911 service interruption. As of 10:25 a.m. on Dec. 27, 2018,

CenturyLink had not provided staff an outage report. CenturyLink's first electronic notification to the Commission about the E911 outage was at 8:22 a.m. on Dec. 28, 2018, through an outage summary sent to the Commission's telecom outage email address.⁴⁷ In a subsequently filed outage summary, CenturyLink stated that [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]⁴⁸

On Dec. 29, 2018, CenturyLink notified staff that the multi-state network event had ended, and that as far as they knew based on the information it had at that point, CenturyLink believed it did not have a reportable E911 outage.⁴⁹

4. Whether the company was cooperative and responsive.

The Company was generally responsive throughout the investigation, however the Company refused to cooperate with staff and provide the number of E911 calls that failed during the December 2018 outage. CenturyLink responded on several occasions that there was no outage involving CenturyLink's E911 services.

5. Whether the company promptly corrected the violations and remedied the impacts.

After the outage was resolved, CenturyLink began working with Infinera to identify and correct the cause. CenturyLink replaced the faulty card and had it analyzed by Infinera. To date, Infinera is unable to replicate the malformed packet creation that triggered this outage. The Infinera product manual has been updated to recommend disabling the proprietary communications channel if it is not to be used to prevent the packet looping, as experienced in the December 2018 outage. CenturyLink updated its ethernet policer⁵⁰ to reduce the chance of transmitting malformed packets across the network. Additionally, CenturyLink also implemented monitoring and auditing improvements for its network engineers to increase visibility into issues such as this.

6. The number of violations and the number of customers affected.

Every Washington resident was affected by this outage, whether or not they were a customer of CenturyLink. Staff found 24,000 E911 calls potentially failed during the outage. Without the actual telephone number of every caller, it is impossible to know how many unique callers attempted to call E911 during the outage.

7. The likelihood of recurrence.

Unfortunately, another E911 outage is possible. Although CenturyLink completed the PSAP migration to Comtech in August 2020 and is no longer responsible for the processing of E911 calls in Washington state, the Company maintains an underlying network used to fulfill emergency services obligations in Washington state.

⁴⁷ Appendix T (Confidential).

⁴⁸ Appendix U (Confidential).

⁴⁹ Appendix T (Confidential).

⁵⁰ A computer device that controls traffic in a network.

8. The company's past performance regarding compliance, violations, and penalties.

In August 2014, staff released its investigative report on CenturyLink's November 2013 voice and data outage in the San Juan Islands. Staff recommended the Commission impose more than \$170,000 in penalties for nearly 16,000 violations of Commission laws and rules. The Commission agreed to suspend all but \$50,000, for violations of WAC 480-12-412, related to notification requirements of a major outage. As a part of a settlement agreement CenturyLink was ordered to collaborate and produce a statewide Communications Plan that outlines the Company's notification requirements during major outages in Washington state as found in WAC 480-120-412.

In December 2014, staff released its investigative report on CenturyLink's April 2014 outage of the state's emergency E911 system. Staff recommended the Commission order more than \$2,900,000 in penalties for more than 11,700 violations. In February 2016, the Company was ordered a \$2,854,750 penalty amount due to the nature and extent of the violations which affected all 39 counties and PSAPs in Washington state.

On Nov. 6, 2016, CenturyLink failed to notify the Commission or the State E911 Coordinator's Office within the Washington Military Department until 28 hours after the November 2016 outage occurred, which violated WAC 480-120-412 and the Communication Plan agreed to and approved in 2014. As a result, the Commission ordered the suspended penalties of \$123,210 from the November 2013 outage be imposed, a total.

9. The company's existing compliance program.

Staff is not aware of any existing compliance program.

10. The size of the company.

The Company reported to the Commission total intrastate operating revenues of \$245,079,768 in 2019.

Penalty Recommendation

Staff recommends the Commission issue a formal complaint against CenturyLink and assess a penalty of up to \$7,215,000 for 72,015 violations of Commission laws and rules. The elements of the penalty recommendation are as follows:

- Up to \$100 for each of the 24,000 violations of WAC 480-120-450 for failing to provide E911 services to Washington state customers as the designated local exchange carrier, for a potential violation of \$2,400,000.
- Up to \$100 for each of 24,000 violations of RCW 80.36.080 for failing to maintain reasonable oversight of its restoral efforts and failing to implement systems to provide awareness of outages and restoration of service, contributing to 24,000 potentially incomplete E911 calls for a potential penalty of \$2,400,000.
- Up to \$100 for each of 24,000 violations of RCW 80.36.220 for failing to transmit E911 calls as required, for a potential penalty of \$2,400,000.

- Up to \$1,000 for each of 15 violations of WAC 480-120-412 for failing to promptly notify the PSAPs of a major outage, for a potential penalty of \$15,000.

Staff acknowledges that no amount of penalties and reporting can guarantee that another E911 outage will not occur, but believes the penalties will incentivize CenturyLink to carry out its public safety responsibilities and ensure appropriate monitoring involved with any component of Washington's E911 system. The recommended reporting requirements would provide the Commission with periodic information to proactively review actions and changes CenturyLink undertakes to the state's E911 system.

Additionally, staff recommends that CenturyLink closely review this report and the violations cited herein, which constitute technical assistance. Future violations will result in additional enforcement action, which may include escalated penalties.