

March 31, 2022

Via Web Portal

Ms. Amanda Maxwell
Executive Director and Secretary
Washington Utilities & Transportation Commission
621 Woodland Square Loop SE
Lacey, Washington 98503

**Re: Docket No.: UT-181051
Confidential Response Testimony of CenturyLink
Communications, LLC**

Dear Ms. Maxwell:

Attached is the Confidential Response Testimony of Steven E. Turner, along with its supporting exhibits on behalf of CenturyLink Communications, LLC:

Sincerely,



Adam L. Sherr
Assistant General Counsel

ALS/jga

Enclosure(s)
cc: Service List

BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION,

Complainant,

v.

CENTURYLINK COMMUNICATIONS, LLC,

Respondent.

DOCKET NO.: UT-181051

RESPONSE TESTIMONY

OF

STEVEN E. TURNER

ON BEHALF OF

CENTURYLINK COMMUNICATIONS, LLC

March 31, 2022

1 not have experienced an outage because the redundant signaling links on another
2 physically diverse network would have provided the signaling messages needed to reply
3 with the ACM. The communication between the Comtech RCL and the STPs would
4 have taken place, the voice path for the 911 calls would have been established, and the
5 911 calls attempted during this network event would have completed.

6 **Q. IS COMTECH'S STP LINK ENGINEERING ERROR EQUIVALENT TO THE**
7 **FAILURE TO USE THE "B-SIDE" POWER CONNECTION AS YOU**
8 **DESCRIBED AT THE BEGINNING OF THIS TESTIMONY?**

9 A. It is. Comtech knew that it was supposed to provide redundancy in its signaling network.
10 It knew that this capability existed to allow for redundancy even when one network for its
11 signaling links was affected. However, Comtech simply did not utilize this capability,
12 just as the network design in the power arrangement example did not use the "B-Side"
13 power arrangement in parallel with the "A-Side" power arrangement. As such, when the
14 network event occurred, Comtech lost the connectivity between its RCLs and its STPs.
15 This was a completely unnecessary outage caused by poor engineering judgment on the
16 part of Comtech.

17 **Q. ARE THERE OTHER INDICATIONS THAT COMTECH WAS WELL AWARE**
18 **OF THE PRECARIOUS SITUATION IT WAS PLACING 911 SERVICE IN BUT**
19 **CHOSE NOT TO ALTER ITS NETWORK CONFIGURATION?**

20 A. Yes. Email exchanges from August/September 2018,³⁰ several months before the outage,

³⁰ See Exhibit SJH-12C, Comtech response to DR CTL-4 Attachment.

1 are extremely insightful. On August 28, 2018 (4 months before the outage), TNS sent
2 Comtech an email asking whether Comtech was still looking to modify its SS7 network.
3 Comtech responded that it would like to transition two of the links for “redundancy
4 advantages” but on August 31, Comtech personnel said they had to keep the existing
5 circuits for a period of time or pay early termination charges.³¹ Early termination charges
6 come into play when a carrier (or customer) purchases a circuit for a fixed term.
7 Normally, agreeing to a long term provides for discounts in the cost of the circuit.
8 However, if the carrier (or customer) cancels the circuit early, it must pay early
9 termination charges. Comtech was liable for such fees until March 22, 2021. In other
10 words, it appears that Comtech had an opportunity to obtain true route diversity on its
11 signaling links (replacing two TDM circuits with two IP connections) in September 2018,
12 but elected to use its flawed network design in order to save money.

13 Then in September 2018 – over three months before the outage – Loree Parker, Senior
14 Telecom Engineer for Comtech acknowledges that there was a problem with the
15 signaling links between the TNS STPs (which Comtech was relying upon) and its RCL
16 switches:

17 The details of your last email aren’t entirely accurate, as a few weeks ago
18 Sprint disconnected the remaining TDM circuits terminating to Comtech
19 facilities. Currently, all four existing circuits are from CenturyLink, at
20 least on Comtech’s side of the network. ***This is obviously not an ideal
21 situation, and was intended to be extremely temporary.*** [REDACTED]
22 [REDACTED]

³¹ See Exh. SJH-12C, Comtech Response to CTL-DR4 Attachment.

³² See Exh. SJH-12C, Comtech response to DR CTL-4 Attachment. This document also validates the problem I highlighted above regarding having two separate vendors responsible for

1 This is tantamount to an admission that Comtech knew its signaling network lacked route
2 diversity and decided to ignore the known problem so it could avoid the early termination
3 expense. As noted above, Ms. Parker ultimately concluded that Comtech would “need to
4 keep the new circuits in place until 3/22/21 to avoid early termination charges.”³³

5 **Q. DO THE WITNESSES IN THIS PROCEEDING AGREE WITH YOUR**
6 **EXPLANATION FOR THE 911 OUTAGE?**

7 A. While there is not complete agreement, Staff witness James D. Webber agrees with the
8 point made above that without the signaling call set-up, you cannot establish the voice
9 call path between CenturyLink/Intrado and Comtech. Mr. Webber testifies as follows:

10 **Q. If the SS7 component of an ESInet is disrupted by an outage,**
11 **can voice calls still be completed?**

12 A. No. Without a successful call setup, which the SS7 component
13 must undertake, the originating voice calls cannot be routed
14 anywhere and will fail to connect. The situation is roughly
15 analogous to what can happen on a railroad when the system that
16 notifies train engineers that the rails ahead are free for their use:
17 when that system goes down, the trains cannot move anywhere (or
18 else risk collisions), even though the tracks and the trains
19 themselves may be in perfect working order.³⁴

ordering the signaling links. This document makes clear that until September 18, 2018, TNS was unaware that CenturyLink was the provider of all four signaling links. Because TNS was providing two of the existing STP links, Comtech should have been particularly careful in communicating with TNS and with its transport provider for the remaining two links to ensure that route diversity could be achieved. Clearly, Comtech did not take these necessary measures.

³³ See Exhibit SJH-12C, Comtech response to DR CTL-4 Attachment.

³⁴ Direct Testimony of James D. Webber (Dec. 15, 2021), Exhibit JDW-1CT (“Webber Direct Testimony”), p. 36 ll. 20-27.

1 The failure of the signaling network is what caused the voice calls (911 in this case) to
2 stop being processed. But the network engineering error here was that Comtech did not
3 implement the redundancy that is required for these types of systems.

4 Similarly, Public Counsel's witness, Mr. Brian Rosen admits that the network "failure
5 occurred because all four links used the same optical network. In building 9-1-1 systems,
6 I generally advise that supplier diversity be used to guard against the kind of failure that
7 occurred here. In this case, there was no supplier diversity."³⁵

8 **VIII. APPLICATION OF AMENDMENT M TO THE WMD 911** 9 **CONTRACT**

10 **Q. HOW DOES AMENDMENT M AFFECT 911 SERVICE RESPONSIBILITY?**

11 A. Amendment M to the contract between the Washington State Military Department and
12 CenturyLink and its predecessors for provision of 911 services specifies the role of
13 "Covered 911 Service Provider" during the transition of 911 service to Comtech. A
14 "Covered 911 Service Provider" is defined, in pertinent part, in the Code of Federal
15 Regulation (CFR) as follows:

16 ***Covered 911 service provider:***

17 (i) Any entity that:

18 (A) Provides 911, E911, or NG911 capabilities such as call routing,
19 automatic location information (ALI), automatic number identification
20 (ANI), or the functional equivalent of those capabilities, directly to a

³⁵ Direct Testimony of Brian Rosen (Dec. 15, 2021), Exh. BR-1CT ("Rosen Direct Testimony"), at 20-21.

1 public safety answering point (PSAP), statewide default answering point,
2 or appropriate local emergency authority as defined in § 9.3.³⁶

3 In short, Amendment M makes clear that CLC is the “Covered 911 Service Provider” for
4 the PSAPS that have not been migrated to Comtech. It also states that Comtech is the
5 “Covered 911 Service Provider” for the PSAPs that have been migrated to Comtech:

6 11. AMENDMENT TERMS AND CONDITIONS:

7 1. The existing contract is modified to add the following language to
8 the Transition Services:

9 a) Covered 911 Service Provider during PSAP Migration. The
10 Department is transitioning the ESINet services to a successor
11 provider via a phased cutover of PSAPs from Contractor’s
12 ESInet I to New Contractor's ESInet II (“PSAP Migration”).
13 Prior to this cutover, Contractor shall route calls over ESInet I
14 to the appropriate PSAPs and, as such, during this time,
15 Contractor is a Covered 911 Service Provider as defined in 47
16 C.F.R. § 12.4(a)(i)(A) (“Covered 911 Service Provider”) for all
17 PSAPs in the State. Upon the Department's cut over of one or
18 more PSAPs to ESInet II (“Migrated PSAPs”), the
19 Department’s successor provider shall be a Covered 911
20 Service Provider for such Migrated PSAPs and shall be solely
21 responsible for routing calls from the Demarcation Point
22 between ESInet I and ESInet II to such Migrated PSAPs.
23 During the PSAP Migration, Contractor remains responsible
24 for routing calls to PSAPs that have not migrated to ESInet II
25 (“Unmigrated PSAPs”), and for routing calls intended for
26 Migrated PSAPs to the Demarcation Point at ESInet II, at
27 which point the successor provider assumes responsibility for
28 delivering such calls to Migrated PSAPs and is therefore the
29 Covered 911 Service Provider.³⁷

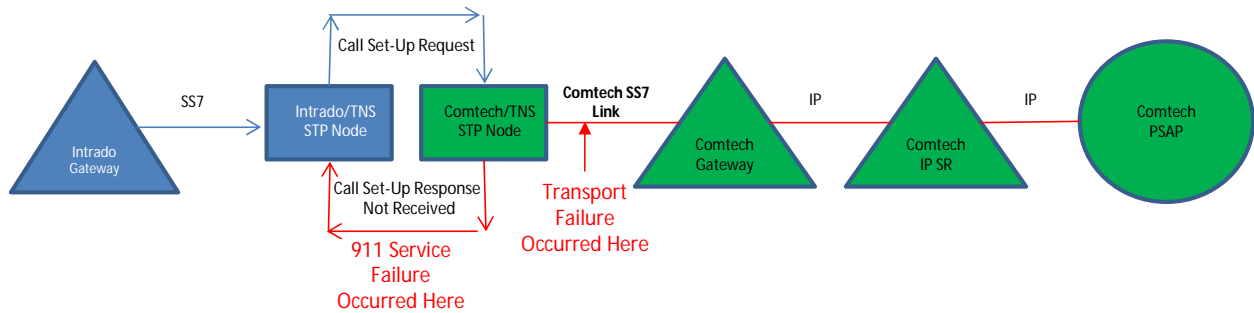
30 **Q. WHAT IS A DEMARCATION POINT?**

³⁶ 47 CFR §9.19 (a)(4)(i)(A).

³⁷ See Exhibit SJH-9C, E09-196 and E09-196M, Amendment M.

1 A. Amendment M above uses the term “demarcation.” A demarcation point, or “demarc” in
2 industry parlance, is a point where one party’s responsibility ends and another’s begins.
3 We will again use the figure below to discuss demarcation.

4 **Figure 8**
5 **Network Demarcation**



6

7 As discussed above, during the outage, CenturyLink successfully sent a call set-up IAM
8 request message. At that point, the ball is in Comtech’s court to respond and set up the
9 call. By Comtech’s own admission, the demarcation for both the transport and the 911
10 service failure occurred on Comtech’s “side of the network.”³⁸

11 **Q. DO YOU AGREE WITH PUBLIC COUNSEL’S INTERPRETATION OF CLC’S**
12 **RESPONSIBILITIES IN LIGHT OF AMENDMENT M?**

13 A. No. In response to discovery, Public Counsel has said:

14 **DATA REQUEST NO. 18.**

15 In response to CTL-15(b)-(c), you interpreted the contract as holding
16 CenturyLink responsible for providing certain 911 functionality in the

³⁸ See Exhibit SJH-12C, Comtech response to DR CTL-4 Attachment.

1 **Q. DID YOU REVIEW ANY OTHER DOCUMENTS THAT PROVIDED INSIGHT**
2 **INTO WHERE THE DEMARCATION POINT WAS BETWEEN CLC AND**
3 **COMTECH?**

4 **A.** Yes. Comtech developed a document entitled “State of Washington E-911 Transition
5 Call Flows between CenturyLink/West-Intrado and Comtech TCS ESInets.”⁴³ In this
6 document there is a very clear identification of where the demarcation is between
7 CenturyLink and Comtech: [REDACTED]

[REDACTED]

[REDACTED] Comtech was unable to respond to the IAM message (the equivalent of
15 the INVITE message) because of the lack of diversity in its signaling network as
16 discussed at length above. But this was on Comtech’s side of the demarcation and not
17 the responsibility of CTL.

18 **IX. REBUTTAL TO THE DIRECT TESTIMONY OF BRIAN F. ROSEN**

19 **Q. WHICH POINTS MADE BY MR. ROSEN DO YOU WISH TO REBUT?**

20 **A.** Mr. Rosen makes the following points in his Direct Testimony:⁴⁶
21 • CenturyLink required the use of outdated technology to interconnect the two
22 companies during the transition, which subjected the connection to the known
23 failures of the older technology.

1 to pay early termination charges.⁵³ When Comtech ordered all four 911 circuits from
2 CenturyLink, Comtech failed to identify the circuits as 911 SS7 circuits or to specify the
3 need for route diversity in the ordering process.⁵⁴ As the ordering party, Comtech (or
4 TNS acting on its behalf) is responsible for specifying the need for diversity in situations
5 that are critical, as were the facilities providing the signaling network between TNS and
6 Comtech. Comtech did not do so. Had they specified diverse routing, my understanding
7 is that CenturyLink could have routed facilities on multiple CenturyLink transport
8 networks.⁵⁵

9 **Q. MR ROSEN DISCUSSES THE DEMARCATION POINT DISCUSSED ABOVE.**
10 **IS HE ACCURATE?**

11 **A.** As described above, Figure 7 shows the signaling demarcation identifying where the 911
12 failure originated. Because of the transport failure that occurred on “Comtech’s side of
13 the network”⁵⁶ (caused by lack of route diversity in its signaling links), the signaling
14 failed and voice calls could not complete. CLC properly sent its IAM message to set up
15 the call. The Comtech RCL failed to respond to CLC’s IAM with an ACM message to
16 set up the call. Therefore, the signaling failure and consequent 911 service failure
17 occurred on Comtech’s side of the network. In contrast, Mr. Rosen cites: “Finally,
18 WMD understood the demarcation point to be the Comtech RCL, beyond the location at

⁵³ See Exhibit SJH-12C, Comtech response to DR CTL-4 Attachment.

⁵⁴ See Exhibit SET-5, CLC Response to Staff DR 9, June 25, 2021.

⁵⁵ Valence Response Testimony, p. 7.

⁵⁶ See Exhibit SJH-12C, Comtech response to DR CTL-4 Attachment.

1 which the outage affected the connection between CenturyLink and Comtech.”⁵⁷

2 **Q. DOES THIS QUOTE DEFINITELY STATE THAT THE WMD THOUGHT**
3 **THE DEMARCATION POINT WAS THE COMTECH RCL?**

4 **A.** No, the Discovery Response that Rosen quotes does not definitively say the WMD had
5 evidence proving that the demarcation point was at the Comtech RCL. The quote goes
6 on to state:

7 However, because it is our understanding that CenturyLink, either directly
8 or through a reseller, was the actual underlying provider of all, or at least
9 portions, of the interconnections, the demarcation point of the actual
10 circuits is *likely*, the Comtech RCL (LNG), as shown on the CenturyLink
11 provided diagram, numbered CLC-001454.⁵⁸

12 Further, WMD has agreed that there actually is no demarcation point identified in the
13 contract stating that “no specific demarcation points were identified for the
14 interconnecting trunks.”⁵⁹ Finally, as I have shown, the demarcation of the signaling
15 network was on Comtech’s side of the interconnection and the 911 outage was caused by
16 Comtech’s failure to send a call set-up response. As noted above, Comtech seems to
17 admit this. Comtech’s email describes all four signaling links as being on its “side of the
18 network.”⁶⁰ This is common parlance for saying on Comtech’s side of the demarcation
19 point. The root cause of the outage was Comtech’s failure to order route diversity for its
20 STP signaling links.

⁵⁷ Rosen Direct Testimony, p. 34 ll. 3-5.

⁵⁸ Exh. SET-6, WMD Response to DR PC-4, December 8, 2021 (emphasis added).

⁵⁹ See Exh. SJH-4, WMD Response to DR CTL-7(a), January 27, 2022.

⁶⁰ See Exhibit SJH-12C, Comtech response to DR CTL-4 Attachment.

1 bytes or less, they would have been blocked from entering the IGCC. If the malformed
2 packets had not had header information that looked valid, they would have been blocked
3 from entering the IGCC. Instead, these factors worked together to create the
4 unforeseeable “perfect packet storm.”

5 **C. THE ROOT CAUSE OF THE 911 SERVICE OUTAGE WAS THE LACK OF**
6 **DIVERSITY IN FOUR SS7 CIRCUITS – COMTECH WAS AT FAULT**

7 **Q. WHAT WAS THE ROOT CAUSE OF THE DECEMBER 2018 911 SERVICE**
8 **OUTAGE IN WASHINGTON?**

9 **A.** Mr. Webber’s focus on the IGCC issue is misplaced. Regardless of the cause of the
10 CenturyLink Infinera Green network switch outage, the cause of the *911 Service Outage*
11 was Comtech’s failure to seek and obtain a diverse route (including switching and
12 transport diversity) for its SS7 signaling network. Route diversity is a key component of
13 most network designs, particularly with regard to signaling networks and 911 networks.
14 Comtech failed to live up to industry standards by ordering four STP links that had a
15 single point of failure: the Infinera equipment in the Green network. Outages
16 unfortunately do happen, and best practice is to design a network such that a failure in
17 one area of the network does not cause a complete outage.

18 I understand that Comtech did attempt to order diverse routing by ordering from different
19 suppliers (also known as “supplier diversity”).⁷⁸ It could no longer use Sprint facilities
20 and AT&T could not meet Comtech’s deadline.⁷⁹ However, Comtech could have easily

⁷⁸ As I described above, “supplier diversity” does not guarantee “route diversity.” If one of the suppliers wholesales facilities from another supplier, the route using those resold facilities may not be diverse.

⁷⁹ See Exh. SJH-12C, Comtech Response to CTL-1(a), February 10, 2022.

1 ordered diverse routing on one of the other CenturyLink networks.⁸⁰ As I understand it,
2 this is precisely how CenturyLink created route diversity on its signaling network
3 dividing the signaling links between the Qwest and Green networks which are only two
4 of many separate fiber optic networks available to CenturyLink.

5 **Q. PLEASE SUMMARIZE YOUR TESTIMONY.**

6 **A.** After reviewing the information in this proceeding, and based on my many years of
7 experience working in the telecommunications space, I have reached the following
8 conclusions and opinions with respect to the final assignment above:

- 9 • SS7 technology is commonly used by the industry in 911 network
10 architecture, and the use of SS7 to support the 911 network connecting
11 CenturyLink and Comtech PSAPs was not the cause of the outage.
- 12 • According to industry standards, the 911 service provider is responsible for
13 the efficacy and stability of the network (both voice and signaling networks),
14 including route diversity. As the 911 service provider, Comtech should have
15 specified its requirements for network diversity when ordering transport
16 facilities from CenturyLink for use for its SS7 signaling links. Importantly,
17 the use of diversity for SS7 links is fundamental to SS7 network design. All
18 four links ordered by Comtech and connecting the 911 networks between
19 Comtech and CenturyLink used the same Green Infinera switching network
20 that experienced an outage. This is a serious mistake created by Comtech,
21 which directly caused 911 calls destined to PSAPs that had transitioned to
22 Comtech to fail.
- 23 • Comtech knew before the service outage that it did not have sufficient
24 diversity in its signaling link transport facilities between its switch and its STP

⁸⁰ Mr. Webber refers to a trouble ticket dated September 6, 2018 that he says shows that CenturyLink knew TNS was the customer of DS1 23394948, which is one of the four transport network elements that CenturyLink provided for Comtech. While that may be accurate, that is after the fact; the circuits were already installed. Further, to expect a technician in a maintenance center to scrutinize each trouble ticket and ask a question such as: "I wonder if that circuit used by TNS is diverse from other circuits in the interconnection?" is not credible or reasonable, from an operations perspective. See JDW-22C (C), Attachment B.