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BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

In the Consolidated Matter of: The Applications of E Fiber Moab, LLC and E Fiber San Juan, LLC for a Certificate of Public Convenience and Necessity to Provide Facilities-Based Local Exchange Service and Be Designated as a Carrier of Last Resort in Certain Rural Exchanges	Docket No. 20-2618-01

DIRECT TESTIMONY OF JOHN H. HANSEN

Citizens Telecommunications Company of Utah d/b/a Frontier Communications ("Frontier") hereby submits the pre-filed Direct Testimony of John H. Hansen in this docket.

DATED this 25th day of September, 2020.

JAMES DODGE RUSSELL & STEPHENS, P.C.

Phillip J. Russell
Attorneys for Frontier Communications

Certificate of Service

Docket No. 20-2618-01

I hereby certify that a true and correct copy of the foregoing was served by email this 25th day of September, 2020, on the following:

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BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

In the Consolidated Matter of: The Applications of E Fiber Moab, LLC and E Fiber San Juan, LLC for a Certificate of Public Convenience and Necessity to Provide Facilities-Based Local Exchange Service and Be Designated as a Carrier of Last Resort in Certain Rural Exchanges	Docket No. 20-2618-01

Direct Testimony of John H. Hansen

On Behalf of

Citizens Telecommunications Company of Utah d/b/a Frontier Communications

Frontier Exhibit 2.0

September 25, 2020

INTRODUCTION

Q. PLEASE STATE YOUR NAME, POSITION AND BUSINESS ADDRESS.

A. My name is John H. Hansen. I am Vice President of Network Engineering for Frontier Communications Corporation, of which Citizens Telecommunications Company of Utah d/b/a Frontier Communications ("Frontier") is a wholly owned subsidiary. My business address is 805 S. Central Expressway, Allen, TX 75013.

Q. PLEASE STATE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I have a Bachelor of Science (Telecommunications Engineering Technology – Management) from Rochester Institute of Technology (1999). I have over 20 years of experience in the telecommunications industry with multiple incumbent local exchange carriers ("ILECs") and competitive local exchange carriers ("CLECs"). These roles include Director of Systems Engineering at PAETEC Communications where my team and I were responsible for the engineering and provisioning of Time Division Multiplexing ("TDM") switch and Voice over Internet Protocol ("VoIP") platforms. At Windstream Communications, I held similar responsibilities but also oversaw central office space and power engineering and Voice Traffic engineering.

Q. PLEASE DESCRIBE YOUR CURRENT RESPONSIBILITIES WITH FRONTIER COMMUNICATIONS.

A. My responsibilities with Frontier include Network Engineering for Frontier's Internet Protocol ("IP") Backbone and Voice Switches. This includes the IP/Multi-Protocol Label Switching ("MPLS") backbone (core routers, and peering), VoIP infrastructure (call

feature servers, gateways, and network servers), TDM switch infrastructure (sustaining engineering, routing, and translations), Internet Service Provider ("ISP") systems (hosting and application engineering for Domain Name System, Network Time Protocol, and Dynamic Host Configuration Protocol), SS7/AIN networks (Signal Transfer Point engineering, link engineering, and Advanced Intelligent Network system administration) and Network Cost management for services purchased from other providers.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THIS COMMISSION?

A. No

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS DOCKET?

A. The purpose of my testimony is to address the issues raised by the Applications and testimony filed by E Fiber Moab LLC and E Fiber San Juan LLC in these consolidated dockets concerning whether their proposed voice services are VoIP or IP-enabled services. In my testimony, I'll refer to E Fiber Moab, LLC ("E Fiber Moab") and E Fiber San Juan, LLC ("E Fiber San Juan") collectively as the "Applicants."

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. First, I briefly describe how Frontier provisions its Plain Old Fashioned Telephone Service ("POTS") over copper facilities in Utah. Second, I describe how POTS can be provisioned over fiber facilities. Third, I explain what VoIP is. Fourth, based upon Applicants' responses to various data requests in this matter, I set forth how their proposed voice services will be technically structured and provisioned at the customers' premises and within the Applicants' networks as IP-enabled services under state law

(Utah Code § 42-19-102(1)) and VoIP services under state law (Utah Code § 54-19-102(2)) and federal law (47 U.S.C. § 153(25) and 47 C.F.R. § 9.3).

Q. PLEASE IDENTIFY THE DOCUMENTS YOU REVIEWED IN PREPARING THIS TESTIMONY.

A. In preparing my testimony, I reviewed the following documents:

1. Responses of E Fiber Moab, LLC and E Fiber San Juan, LLC to Frontier Communications' Second Set of Data Requests (which is attached hereto as Exhibit A);

2. Applicants' Exhibit FTR DR 2.6 (which is attached hereto as Exhibit B);

3. Responses of E Fiber Moab, LLC and E Fiber San Juan, LLC to the Office of Consumer Services' Second Set of Data Requests (which is attached hereto as Exhibit C); Responses of E Fiber Moab, LLC and E Fiber San Juan, LLC to the Division of Public Utilities' Second Set of Data Requests (which is attached hereto as Exhibit D); and

4. Applicants' Exhibit DPU DR 1.7 – Services Over Fiber (which is attached hereto as Exhibit E).

HOW FRONTIER PROVISIONS POTS

Q. PLEASE DESCRIBE HOW FRONTIER PROVIDES PLAIN OLD TELEPHONE SERVICE ("POTS") IN UTAH?

A. POTS is a voice service that is provided using Time Division Multiplexing ("TDM") to transmit telephone calls within the public switched telephone network ("PSTN"). To deliver a call to its destination, a circuit-switched network must create a dedicated pathway that covers the entire distance from the calling party to the called party and must maintain that pathway for the duration of the call. To that end, a service provider must

either build or lease TDM transmission facilities and deploy a network of switching equipment devoted to call processing.

Frontier uses copper to provide the circuits over which to carry voice services in Utah. A single copper "access line" or local loop consists of a series of two-wire electrical circuits or "pairs" running from a central office to the customer's premises in a path consisting of several integrated parts. In the central office, individual pairs run from switching equipment to a main distribution frame, where they are connected to outside plant cable pairs. These cable pairs are bound in groups of 25 and wrapped in insulation (called binder groups). The outside plant cables pass through a cable vault and outside the central office building through an underground conduit into a manhole. From the manhole, feeder cables run to a serving area interface, where they connect with distribution cables, which then branch out to customer neighborhoods and buildings. Distribution cables connect to the customer's serving terminal at a utility pole, pedestal or within the customer's building. At the serving terminal, an individual customer's drop wire is directly connected to a cable pair. The drop is then connected to the network interface device ("NID") at the customer's premises, which connects to the customer's inside wire.

PROVISIONING POTS OVER FIBER

Q CAN FIBER BE UTILIZED TO PROVIDE POTS?

A. POTS can be delivered over either fiber or copper facilities, using the same TDM based circuit switches to transmit telephone calls to the PSTN. Fiber facilities also can carry IP traffic, including VoIP calls.

Q. HOW DOES POTS SERVICE WORK ON FIBER FACILITIES?

A. Whenever fiber-optic cable is used to transport POTS service, an electronic device is needed at both ends of the cable to generate the communications signals. For decades, the most common device has been a multiplexer, which performs several functions, including converting electric analog signals to digital electric signals, organizing/combining individual digital signals into a higher speed signal, converting the higher speed signals into light and transmitting the light signal through the fiber cable. At the other end of the fiber cable, a paired multiplexer will perform the opposite functions: it will receive the light signal, break it down and convert it to electric and then further break it down and convert it back to an analog signal. In a TDM protocol, each of the individual signals (or voice conversations) is assigned a specific time slot in the high speed signal. Thus, many individual signals /conversations can be carried in one high-speed light signal, each with its own assigned time-slot in the high-speed signal.

Where fiber cable is extended directly to a customer's home, a device called an Optical Network Terminal ("ONT") is placed at the premises to process the communication signals. The ONT performs many of the same functions described for a multiplexer. For voice applications, the ONT functions to sample the analog voice conversation from the customer's phone set and convert it to digital. It then converts the digital voice signal to an optical signal, which is transmitted back to the central office. At the central office, every ONT is paired to an Optical Line Terminal ("OLT") that receives the optical signal, converts it to an electrical signal and then hands off the various

components to the appropriate support platform. For voice, the OLT sends the voice signal (in digital format) to the PSTN for processing and routing.

Q. ARE THERE ANY DIFFERENCES BETWEEN THE SERVICES, CAPABILITIES, AND FUNCTIONALITIES OF VOICE TELECOMMUNICATIONS SERVICE PROVIDED OVER COPPER OR FIBER?

A. A copper POTS line receives its power from the subscriber's switch and the provider's central office. It will continue to operate without any battery backup if the subscriber's premises loses power. With a fiber POTS line, the required ONT receives its power from the customer's premises. The ONT must, therefore, have a battery backup connected to it at the customer's premises to maintain service during a power disruption to the customer's home or business.

VOIP

Q. ARE THERE ANY DIFFERENCES BETWEEN THE SERVICES, CAPABILITIES, AND FUNCTIONALITIES OF POTS VOICE SERVICES AND IP-BASED VOICE SERVICES?

A. Yes. The technology and network facilities that route and carry Internet Protocol traffic work in a different way than circuit-switched networks. IP is a set of 20 standards that permit computers and networks to connect, communicate, and transfer data between them. IP networks transmit information in packets of data. VoIP encodes an analog voice signal into data packets and enables the set-up and transmission of voice calls over IP networks such as the Internet and private IP networks.

Unlike the PSTN, an IP network does not need a dedicated physical pathway to carry a call all the way from the caller to the called party. In addition, the layers of switches that separate PSTN calls into local, tandem and interexchange segments are eliminated. Rather, routers on an IP network will direct the data packets carrying a voice call along multiple pathways that may be constantly changing. The first router receiving the data packets will decide how best to forward them based on a number of network considerations, such as pathway availability. The router may send some of the packets to one router and other packets to one or more different routers. Each of those routers in turn decides how best to forward the packets it receives the next step of the way, and so on until all of the packets are reassembled at their destination. Routers make different choices over time, so data packets do not necessarily follow the same pathways traveled by packets earlier in the same call. Routers and the other physical infrastructure comprising an IP network can carry voice traffic, as well as video and non-voice data.

Q. WHAT IS VOIP?

A. VoIP is a service that enables real-time, two-way voice communications originating from or terminating to an end user in Internet Protocol format. VoIP also uses a broadband connection at the end user's location (i.e., her home). VoIP converts a customer's voice into digital data packets and routes the packets over IP networks. As explained in more detail below, the Applicants' proposed voice services will be VoIP services.

Q. DOES FRONTIER OFFER ANY VOIP PRODUCTS IN UTAH?

A. No, because of the rural nature of Frontier's markets in Utah, it would not be economically feasible for Frontier to build the network infrastructure, including the fiber backbone, necessary to provide retail (residential or small business) VoIP services.

Q. DO ANY FRONTIER AFFILIATES OFFER VOIP SERVICE IN OTHER STATES?

A. Yes, for example, Frontier's affiliates in California, Texas, Florida, and Indiana provide a VoIP service called Frontier FiOS Digital Voice ("FDV") in some of our larger markets where it was economically feasible for them to build out the necessary network infrastructure. Frontier's affiliates provision FDV to their customers in substantially the same manner as Applicants intend to provision their voice services according to Applicants' Exhibit FTR DR 2.6 (which is attached hereto as Exhibit B).

APPLICANTS' PROPOSED SERVICES ARE IP-ENABLED AND VOIP SERVICES

Q. ARE APPLICANTS' PROPOSED VOICE SERVICES AS DESCRIBED IN THEIR EXHIBIT FTR DR 2.6 IP-ENABLED SERVICES OR VOIP SERVICES AS DEFINED BY UTAH CODE §§ 42-19-102(1) AND (2)?

A. Yes. While I am not an attorney, I understand that Utah Code § 42-19-102(1) defines IP-enable service as "any service, functionality, or application that uses Internet protocol or a successor protocol that enables an end-user to send or receive voice, data, or video communications."

Similarly, Utah Code 42-19-102(2) defines VoIP service as any service that:

(a) enables real time, two-way voice communications originating from or terminating at the user's location in Internet protocol or a successor protocol;
(b) uses a broadband connection from the user's location; and
(c) permits a user to receive a telephone call that originates on the public switched telephone network or to terminate a call to the public switched telephone network.

As an experienced network engineer reviewing the plain language of these definitions (and not offering a legal opinion), it is clear to me that the Applicants' proposed voice services fit squarely within these definitions. Indeed, with respect to the definition of IP-enable service, the Applicants acknowledge that their customers' "voice traffic will be converted at the ONT to IP data packets, will be given a private IP address, and will be routed through a separate [virtual local area network]." (See Exhibit C, Response 2.9).

Similarly, Applicants' proposed voice services will enable real time two-way voice communications that originate or terminate in IP at the customer's location (i.e., her house) using a broadband connection (i.e., the IP connection running from the ONT installed on or in, and powered by, her house to the fiber). When a customer served over Applicants' proposed fiber facilities makes a call, the ONT that connects the fiber to the customer's premises or location will set up the call using an IP signaling protocol. The IP signals will travel over the broadband connection from the ONT attached to or in the customer's home to the Applicants' IP network to reach their application servers. The application servers will authenticate and set up the call with the carrier that serves the called party. The called party may be on the PSTN or she may be a VoIP or wireless

customer. After the call is set up and answered by the called party, the software in the ONT converts the customer's speech into IP packets.

Those packets containing the actual conversation will be routed from the customer's premises or location over the ONT's broadband connection and to the Applicants' IP networks, which in turn, will route the call for delivery to the called party. If the called party is not a VoIP customer, equipment in the Applicants' networks will convert the IP packets into the protocol used by the PSTN, thus enabling Applicants' voice customers to make calls to and to receive calls from customers on the PSTN.

Q. ARE APPLICANTS' PROPOSED VOICE SERVICES AS DESCRIBED IN THEIR EXHIBIT FTR DR 2.6 INTERCONNECTED VOIP SERVICES AS DEFINED BY 47 U.S.C. § 153(25) AND 47 C.F.R § 9.3

A Yes. Again, I am not an attorney, but based on my extensive telecommunications network engineering experience, I understand that 47 U.S.C. § 153(25) and 47 C.F.R. § 9.3 define interconnected VoIP service as any service that:

(i) Enables real-time, two-way voice communications;

(ii) Requires a broadband connection from the user's location;

(iii) Requires internet protocol-compatible customer premises equipment (CPE); and

(iv) Permits users generally to receive calls that originate on the public switched telephone network and to terminate calls to the public switched telephone network.

In addition, I understand that 47 U.S.C. § 153(16) defines CPE as "equipment employed on the premises of a person (other than a carrier) to originate, route, and terminate telecommunications."

As explained in my previous answer, the Applicants' proposed voice services will enable real-time, two way communications, will utilize a broadband connection from the user's location, will require the use of IP-compatible ONTs installed on or in the customer's home to originate, route, and terminate calls, and will allow the customer to receive calls that originate on the PSTN and to terminate calls to the PSTN.

I understand that the Applicants have taken the position that the ONT does not constitute CPE because they retain ownership of it and consider to be part of their networks. However, as a layman (and offering no legal opinion), I must note that the federal statute's definition of CPE makes no reference to who owns or controls the equipment. Instead, it only requires that the equipment be installed on the premises of a person other than the carrier. And, here, the Applicants have repeatedly acknowledged that they will install ONTs either in or on their customers' homes.

Also, based upon my experience with FDV, the customer generally exercises a level of control over ONTs that she does not maintain over typical network equipment. For example, before a Frontier affiliate installs an ONT on a customer's home to provide FDV, it must first obtain the customer's permission. Moreover, as with fiber POTS service, the ONT is connected to the home's power source; it does not receive power from the affiliate's central office as is the case with a copper POTS line.

Q. DOES THIS CONCLUDE YOUR TESTIMONY

A. Yes.