

**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF SOUTH DAKOTA**

IN THE MATTER OF DETERMINING PRICES )  
FOR UNBUNDLED NETWORK ELEMENTS (UNEs) )  
IN QWEST CORPORATION'S STATEMENT )  
OF GENERALLY AVAILABLE TERMS (SGAT) )

DOCKET NO. TC01-098

**REBUTTAL TESTIMONY**

**OF**

**PHILIP LINSE**

**QWEST CORPORATION**

**JULY 28, 2003**

**TABLE OF CONTENTS**

|             |  |           |
|-------------|--|-----------|
| <b>I.</b>   | <b>IDENTIFICATION OF WITNESS.....</b>                        | <b>1</b>  |
| <b>II.</b>  | <b>PURPOSE.....</b>  | <b>2</b>  |
| <b>III.</b> | <b>ENGINEERING OF SWITCHING CAPACITY IS USAGE BASED.....</b> | <b>2</b>  |
| <b>V.</b>   | <b>CONCLUSION.....</b>                                       | <b>12</b> |

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21

**I. IDENTIFICATION OF WITNESS**

**Q. PLEASE STATE YOUR NAME, EMPLOYER AND BUSINESS ADDRESS.**

A. My name is Philip Linse. I am employed by Qwest Corporation (“Qwest”) as a Director, Technical Regulatory in the Local Network Organization. My business address is 700 W. Mineral Ave., Littleton, Colorado, 80120.

**Q. PLEASE DESCRIBE YOUR WORK EXPERIENCE, TECHNICAL TRAINING, AND PRESENT RESPONSIBILITIES.**

A. I received a Bachelors degree from the University of Northern Iowa in 1994. I began my career in the telephone communications industry in 1995 when I joined the engineering department of CDI Telecommunications in Missoula, Montana. In 1998, I accepted a position with Pacific Bell as a planner with responsibility of analyzing network capacity. In 2000, I accepted a position with U S WEST as a Manager, Tactical Planning. In 2001, I was promoted to a staff position in Technical Regulatory, Interconnection Planning for Qwest. In this position, I developed network strategies for interconnection of Unbundled Signaling System 7 (“SS7”), Unbundled Switching and other switching related products. In addition to my strategy responsibilities, I provided network evaluation of new technologies, and represented the network organization in interconnection agreement negotiations with CLECs as the subject matter expert. As a subject

1 matter expert on switching and signaling issues, I have gained extensive  
2 knowledge regarding switching theory and switch engineering.

3  
4 **II. PURPOSE**

5  
6 **Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?**

7 A. The purpose of my testimony is to respond to switching issues raised in the direct  
8 testimony of Public Utilities Commission Staff witness Peter J. Gose regarding  
9 Qwest's unbundled switching product and proposed usage based rates. My  
10 purpose is to address these issues from a technical, engineering perspective in  
11 order to assist the Commission and the parties in understanding the nature of  
12 Qwest's unbundled switching product, and to demonstrate that, from an  
13 engineering perspective, a significant portion of switching costs are caused by  
14 usage demands placed on the switch.

15  
16 **III. ENGINEERING OF SWITCHING CAPACITY IS USAGE BASED**

17  
18 **Q. ON PAGE 32, LINE 5 THROUGH LINE 10, MR. GOSE CONCLUDES**  
19 **THAT QWEST'S SWITCHING COSTS ARE NOT USAGE-BASED. DO**  
20 **YOU AGREE WITH HIM?**

1 A. No, I do not. Mr. Gose's conclusion is far too broad. It is certainly true that some  
2 aspects of switch costs are not based on usage. But to suggest, as Mr. Gose does,  
3 that usage is completely irrelevant to switch costs is untrue and unrealistic. There  
4 is a clear relationship between some switching costs and usage, as reflected by the  
5 fact that switch vendors sell switch processors with different usage capacities at  
6 different prices. The variable factor in those prices and other associated costs of  
7 engineering new switches and for switch growth is the level of usage. While the  
8 costs for some parts of the switch (e.g., line ports) are caused by the number of  
9 lines, costs for other parts of the switch (e.g., trunk ports and central processor)  
10 are directly caused by usage. The size of a switch and the ultimate cost of  
11 switching bears a direct relationship to the levels of usage by customers who use  
12 the switch; the trunking and processing components of switches are engineered  
13 based on usage requirements. In fact, Mr. Gose acknowledges that Qwest  
14 employs switches with different usage design<sup>1</sup>.

15 **Q. HOW IS THE TERM "USAGE" DEFINED IN THE CONTEXT OF**  
16 **TELEPHONE ENGINEERING?**

17 A. "Usage" has a specific meaning in the context of telecommunications networks. It  
18 refers to the length of time a call is in place over a period of time. Telephone  
19 engineers rely on usage statistics and data to plan and design the network. The

---

<sup>1</sup> Direct Testimony of Peter J. Gose Public Utilities Commission Staff witness Docket NI. TC01-098 Page 32 & 33 describes Qwest's switches to be purchased at different levels of CCS which is a measure of usage.

1 amount of anticipated usage indicates the amount of trunking and switch central  
2 processor capacity an engineer will include in a network design or plan and, in  
3 turn, the amount of capital a company will need invest to add the required level of  
4 switching capacity to the network.

5

6 **Q. HOW IS USAGE MEASURED?**

7 A. Usage is measured Centum Call Seconds ("CCS") or one hundred call seconds. A  
8 line or trunk that is in use for one hour is being used for 3600 seconds, or 36  
9 hundred call seconds, or 36 CCS. As stated in Newton's Telecom Dictionary,  
10 "One hundred call seconds or one hundred seconds of telephone conversation.  
11 One hour of telephone traffic is equal to 36 ccs ( $60*60=3600/100=36$ ) which is  
12 equal to one erlang."<sup>2</sup>

13

14 **Q. ON PAGE 32, LINES 11 THROUGH 16 OF HIS DIRECT TESTIMONY,**  
15 **MR. GOSE CONCLUDES THAT SWITCHING CAPACITY IS**  
16 **CONSTRAINED BY THE NUMBER OF ACCESS LINES. IS THIS**  
17 **TRUE?**

18 A. No, it is not. While the number of access lines is a factor that must be considered  
19 in switch engineering, it is not the determining engineering factor. Many other

---

<sup>2</sup>Newton's Telecom Dictionary, Volume 17 February 2001 page 131.

1 factors, such as switch software features used by existing access lines, are also  
2 important in switch engineering. I am not aware of any industry or vendor  
3 engineering standard, principle, or practice that does not design and engineer  
4 switching processors, initially or under growth circumstances, based on usage, as  
5 expressed in terms of CCS. In addition, the number of trunks engineered in a  
6 switch directly relates to usage (CCS) requirements.

7  
8 **Q. MR. GOSE CONTENDS THAT QWEST'S VENDOR CONTRACTS DO**  
9 **NOT DIFFERENTIATE BETWEEN BUSINESS AND RESIDENTIAL**  
10 **LINES, AS WELL AS URBAN AND RURAL LINES.<sup>3</sup> IS THE USAGE OF**  
11 **RESIDENCE/BUSINESS AND RURAL/URBAN CUSTOMERS TAKEN**  
12 **INTO CONSIDERATION WITH THE ENGINEERING AND DESIGN OF**  
13 **A SWITCH?**

14 A. Yes. All usage is taken into consideration. Qwest monitors its switches so that  
15 the switch usage capacity can be maintained. Qwest uses this information to  
16 determine the usage capacity required for switch installations, replacements and  
17 upgrades. Regardless of the user category, it is the usage characteristics of the end  
18 user customers that drive the cost of Qwest switches. As I have explained above,  
19 the increased usage of end users requires additional switch resources.

20

1    **Q.     MR. GOSE ALSO CONTENDS THAT THE VOLUME OF CALLS HAS**  
2           **NO RAMIFICATION FOR SWITCHING COSTS AS FAR AS VENDORS**  
3           **ARE CONCERNED. DOES THE VOLUME OF CALLS DEFINE USAGE?**

4    A.    No. The volume, or number of call attempts, is what defines peg count, not usage.  
5           As I have explained above, usage is defined as the length of time a call is in place  
6           over a period of time and has no direct relation to peg count. As customers' usage  
7           demands increase, switch processing capacity must be increased to accommodate  
8           the increased usage demand. Also, there are processing and trunking implications  
9           associated with usage levels and increased usage requires increased processing  
10          and trunk requirements. Regardless of the volume, or number of call attempts, it  
11          is the customer usage demand that impacts switching costs.

12  
13   **Q.     HOW IS THE END USER RELEVANT TO SWITCH USAGE?**

14   A.    The switch usage of the end user using each line is highly relevant because the  
15          aggregate usage by all end users ultimately determines how much central  
16          processing capacity must be purchased by Qwest and deployed for the use of those  
17          customers. In other words, the amount of central processor capacity needed is a  
18          direct function of switch usage—it is not a direct function of the number of lines.  
19          Put another way, lines are relevant to the amount of switch processor capacity that

---

<sup>3</sup> Direct Testimony of Peter J. Gose Public Utilities Commission Staff witness Docket NL  
TC01-098, page 35



1 is required, but usage is the overriding factor, or as Mr. Gose puts it, the  
2 “constraining factor.”

3

4 **Q. ON PAGE 30, LINES 9 THROUGH 11, AND AGAIN ON PAGE 31, LINES**  
5 **29 THROUGH 31, MR. GOSE CONTENDS THAT QWEST’S SWITCHES**  
6 **ARE PURCHASED WITH THE LINES THAT ACCOMMODATE FOR**  
7 **ALL USAGE OF END USER CALLERS. CAN SWITCH USAGE**  
8 **INCREASE WITHOUT ADDING ADDITIONAL ACCESS LINES AND**  
9 **THEREFORE REQUIRE ADDITIONAL EQUIPMENT?**

10 A. Yes, it can. If the usage per access line increases, the total usage can increase with  
11 no change in line quantities. In this case, additional equipment must be added,  
12 even though access lines do not increase. This occurs because much of the switch  
13 is engineered based on usage, not lines. A graphic example of how usage can  
14 increase much faster than line growth is the phenomenal growth in dial-up  
15 Internet traffic in the past few years. In addition, increased South Dakota switch  
16 usage is demonstrated in Staff discovery request number 177.

17

18 **Q. HOW DOES DIAL-UP INTERNET TRAFFIC CREATE ADDITIONAL**  
19 **SWITCH USAGE?**

20 A. From a network perspective, a dial-up Internet call looks the same as a voice call.  
21 However, there is a critical difference. It is commonly recognized in the

1 telecommunications industry that the average duration, or hold time, of a voice  
2 call is about three minutes, while the average hold time of a dial-up Internet call is  
3 20 to 30 minutes or more<sup>4</sup>. Many of these calls last for many hours and  
4 sometimes even for days. When a customer initiates and connects such a call to  
5 its Internet Service Provider (ISP), the local switch must be used to make sure that  
6 the call is routed to the ISP (sometimes more than one switch is involved).  
7 During the entire duration of the call, some of the capacity of the switch continues  
8 to be used. Thus, dial-up Internet traffic has caused substantial increases in  
9 network usage. This increased usage has led to the need for Qwest to increase the  
10 capacity of the South Dakota network, including its switching central processor  
11 capacity. In light of that, Mr. Gose's proposal for a flat-rated approach to usage-  
12 based switching is illogical; it simply fails to account for the relationship between  
13 usage and switching costs.

14  
15 **Q. HOW HAS THE INCREASED USAGE RESULTING FROM DIAL-UP**  
16 **INTERNET CALLS CAUSED QWEST TO INCREASE ITS NETWORK**  
17 **CAPACITY?**

---

<sup>4</sup> Impacts of Internet Traffic on LEC Networks and Switching Systems , AmirAtai,Ph.D., James Gordon, Ph.D., Telcordia Technologies, RedBank, Newjersey, June 1996; Architectural Solutions to Internet Congestion Based on SS7 and Intelligent Network Capabilities, A Telcordia Technologies Perspective by Dr. James Gordon; The Internet & the Public Switched Telephone Network – A troubled Marriage, Edward E. Cohen, Albert A. Fredericks, Charles D Pack,1997

1 A. The increased usage caused by dial-up Internet traffic has required Qwest to make  
2 significant additions to its network in South Dakota, both in trunking and  
3 processing capacity. These additions are needed because as long as a dedicated  
4 path is held up, the switch is performing functions to make sure the call stays up  
5 until the customer requests a disconnect.

6

7 **Q. IF THESE TYPES OF USAGE REQUIREMENTS WERE NOT PLACED**  
8 **ON THE NETWORK, WOULD THE VENDOR ENGINEERING COSTS**  
9 **ON A PER LINE BASIS BE LOWER?**

10 A. Yes, they would. Switch usage is considered by all switch vendor engineers when  
11 they engineer the central processing capacity needed, not only for the number of  
12 access lines assigned to the switch, but also for the switching resources available  
13 to these access lines. In fact, as noted in Mr. Gose's testimony, Qwest pays  
14 switch vendors a higher rate when higher CCS requirements exist in any given  
15 switch.

16

17 To use Mr. Gose's computer analogy,<sup>5</sup> the switch can be thought of as a large  
18 computer. The lines and trunks can be analogized to peripheral equipment such as  
19 printers, floppy and CD drives, and the terminal screen. In both cases, the number  
20 of lines and trunks and the number of peripherals attached are relevant to capacity,

1 but they are not determinative. Just as the need to upgrade personal computers is  
2 not primarily driven by the number of peripheral devices connected to the  
3 computer, the need to increase central processing capacity is not driven primarily  
4 by the number of lines and trunks connected.

5  
6 In both cases, the determinative factor leading to a need to upgrade is driven by  
7 the increased demands to use the capacity of the central processor. Likewise, the  
8 primary driver of increases in central processor capacity is not the number of  
9 lines, as claimed by Mr. Gose, but the amount of *usage* customers are demanding  
10 from those lines.

11  
12 **Q. ON PAGES 36 AND 37, MR. GOSE USES AN ANALOGY OF SWITCH**  
13 **USAGE AND CAR RENTAL COMPANIES. DOES HIS ANALOGY**  
14 **ACCURATELY REPRESENT SWITCH USAGE?**

15 A. No. Mr. Gose is confusing usage with payload capacity. Payload could be  
16 analogized to bandwidth but not usage. The amount of information that is  
17 transported across a line is not at issue here. Usage, or the length of time that end  
18 users are using the bandwidth, is at issue here and is measured in terms of CCS.  
19 The rental car companies also apply this concept when renting cars. The longer a  
20 car is rented and the more the car is driven the more use is realized. The two key

---

<sup>5</sup> Direct Testimony of Peter J. Gose Public Utilities Commission Staff witness Docket NL.

1 measures are length of the rental and the number of miles driven—both are  
2 relevant measures of usage. The rental car industry charges by the number of days  
3 a car is rented and in many cases by the number of miles driven.

4  
5 Similar to the engineering of switching based on the busy hour, car rental  
6 companies must size their fleets based on the usage demand. For example a rental  
7 car company may have a fleet that serves the Sioux Falls airport. The fleet size is  
8 based on the number of customers renting cars and the length of time that those  
9 customers use the cars. Based on an increase in usage (i.e., increase in the length  
10 of time the customers use the car) the rental company may increase the size of the  
11 fleet to serve the same number of customers. If the rental car company does not  
12 have enough cars to accommodate the customers' usage demand, then customers  
13 will be unable to rent a car. Further, the number of miles the average customer  
14 drives the car will determine the need to turn the cars over with new inventory. In  
15 other words, the combination of the two measures of usage (number of days and  
16 number of miles) has a direct impact on the costs of the rental car company. The  
17 same holds true with a switch. When customers hold calls for longer periods of  
18 time, then usage increases and the switch usage capacity has to be increased.

19

1

**III. CONCLUSION**

2

3 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

4 **A. Yes it does.**