BEFORE THE
WASHINGTON UTILITIES AND TRANSPORATION COMMISSION

In the Matter of the Review of:	**)**	
Unbundled Loop and Switching Rates;	**)**	
the Deaveraged Zone Rate Structure; and	**)**	
Unbundled Network Elements,	**)**	**DOCKET NO. UT–023003**
Transport, and Termination	**)**	
	)	
	)	

JOINT DIRECT TESTIMONY OF

JOSEPH GILLAN

AND

RICHARD CHANDLER

ON BEHALF OF

AT&T COMMUNICATIONS OF THE PACIFIC NORTHWEST, INC., AND WORLDCOM, INC.

June 26, 2003

I. INTRODUCTION

Q. Please state your names, business addresses and occupations.

A. Our names are Joseph Gillan and Richard Chandler. Mr. Gillan's business address is P.O. Box 541038, Orlando, Florida 32854. Mr. Gillan is an economist with a consulting practice specializing in telecommunications. Mr. Chandler is a Senior Vice President of HAI Consulting, Inc., with a business address of 1355 S. Boulder Road, #184, Louisville, Colorado 80027.

Q. Please briefly summarize Mr. Gillan's educational background and related experience.

A. Mr. Gillan is a graduate of the University of Wyoming and holds B.A. and M.A. degrees in economics. From 1980 to 1985, Mr. Gillan was on the staff of the Illinois Commerce Commission where he had responsibility for the policy analysis of issues created by the emergence of competition in regulated markets, in particular the telecommunications industry. In 1985, Mr. Gillan left the Commission to join U.S. Switch, a venture firm organized to develop interexchange access networks in partnership with independent local telephone companies. At the end of 1986, Mr. Gillan resigned his position as Vice President-Marketing/Strategic Planning to begin a consulting practice. Over the past twenty years, Mr. Gillan has provided testimony before more than 35 state commissions, five state legislatures, the Commerce Committee of the United States Senate, and the Federal/State Joint Board on Separations Reform. Mr.

Gillan currently serves on the Advisory Council to New Mexico State University's Center for Regulation.

Q. Please summarize Mr. Chandler's background and experience.

A. Mr. Chandler holds BSEE and MSEE degrees from the University of Missouri and an MBA from the University of Denver. Mr. Chandler has also completed additional graduate study in electrical engineering at the University of Colorado, and worked as an electronic engineer at the Institute for Telecommunication Sciences studying microwave and optical propagation and analyzing radar systems. Mr. Chandler worked at Bell Laboratories in the exploratory and advanced development of customer switching systems. While at Bell Labs, Mr. Chandler worked extensively on packet switching and circuit switching technologies. Mr. Chandler transferred to AT&T, where he was a product manager working on, among other things, product strategies for advanced circuit and packet switching systems. After working at AT&T, Mr. Chandler joined a startup mobile satellite company as vice president of network engineering. In that role, Mr. Chandler developed the ground system network architecture, which included switching and signaling functions, for the proposed system.

At HAI (and its predecessor, Hatfield Associates, Inc.), Mr. Chandler has been the principal developer of the Hatfield/HAI cost models. In addition, Mr. Chandler has analyzed a range of telecommunications technologies and systems for a number of clients. Many of these investigations have involved the study of packet switching technologies. Mr. Chandler has also taught graduate-level telecommunications technology courses in digital switching, including circuit and packet switching, basic telephony, and cellular and wireless communications, at the University of Colorado, the University of Denver, and Pace University.

Q. On whose behalf are you testifying?

A. We are testifying on behalf of AT&T Communications of the Mountain States, Inc. ("AT&T") and WorldCom, Inc ("MCI"). Although sponsored by these two companies, our perspective is that of consultants, each of whom has been actively involved in the technical and economic evolution of the telecommunications industry for 20 years.

Q. What is the purpose of your testimony?

A. The purpose of our testimony is to explain, from an economic and engineering perspective, why it is appropriate for the Commission to adopt a flat-rate structure for the unbundled local switching network element. Such a structure would recover the cost of unbundled local switching entirely through its port charge, with no separate rate for usage. As we demonstrate below, the usage-based pricing of local switching is an anachronism, traceable to pricing and technological circumstances than no longer exist.

The unbundled local switching (ULS) network element is far different than the types of switching "services" that state commissions have reviewed in the past. Traditional switching cost models have attempted to "allocate" the cost of the local switch to the various services (such as local, access and calling features) that use this facility. When a CLEC leases the ULS network element, however, it purchases the ability to offer all of these services, no different than the incumbent when it purchases the switch from the manufacturer. Just as Qwest purchases its switching capacity from vendors paying a flat-rate, entrants should lease capacity in these same switches from Qwest under a flat-rate structure.[1]

Moreover, the underlying cost structure of a modern switching system has changed over the years as advances in microelectronics have essentially rendered usage irrelevant as a design constraint. Unlike prior generations, best-in-class modern circuit switches, such as the Lucent 5ESS and Nortel DMS-100, are designed to reach capacity limits based on the number of lines connected to these switches, not the usage through them. As a result, forward-looking engineering principles support the elimination of a separate usage charge on CLECs leasing local switching UNEs.

[1] Although the testimony refers only to Qwest, we believe that the engineering, pricing, and technical conclusions apply equally to Verizon (or any other ILEC for that matter). As such, the Commission should understand our testimony to apply generally to unbundled local switching, even though much of it is styled as applying to Qwest.

II. THE ULS NETWORK ELEMENT AND LEGACY COST MODELS

Q. Please describe the ULS network element.

A. The ULS network element represents the lease of switching capacity on a per-port basis to an entrant. The ULS network element enables multiple carriers to offer exchange services, proportionally sharing the switching facility according to the number of line ports leased to each carrier (or used by the incumbent). For each port leased by an entrant, the entrant obtains the right to access all of the local switch port's features, functions and capabilities:

> [A] carrier that purchases the unbundled local switching element to serve an end user effectively obtains *the exclusive right* to provide all features, functions, and capabilities of the switch, including switching for exchange access and local exchange service, for that end user.[2]

In effect, the ULS network element provides its purchaser a "lock, stock and barrel" ability to provide *all* services to its end-users' lines, treating the capacity and potential of the switch as a common resource to be used by multiple exchange carriers.

[2] *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98, Order on Reconsideration, 11 FCC Rcd 13042, ¶11 (1996), *aff'd in part and remanded, AT&T v. Iowa Utils. Bd.*, 119 S. Ct. 721 (1997), *aff'd, Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98, Third Report and Order and Fourth Further Notice of Proposed Rulemaking, FCC 99-238, ¶ 245 (rel. Nov. 5, 1999).

Q. Is this a different perspective on the "local switch" than that typically underlying the traditional ILEC cost modeling?

A. Yes. The ULS network element is a significant departure from the traditional view of a local switch as a "multi-product" investment. As a multi-product investment, ILECs have historically been interested in estimating the cost of *individual* switch uses (such as access, toll or a specific optional feature) so that a price for each of these "partial" uses could be established. The usage sensitive pricing of local switching stems from this traditional perspective that "every use must have its own cost, so that every use may have its own price."

The Commission can easily appreciate the difficulty, however, of trying to apportion switch investment among different uses, so that distinct retail prices could be justified. This task resulted in ILEC-sponsored switching cost models that became quite complex, with a predisposition towards using usage as a means to allocate cost, whether or not there was a causal link.

Q. Are legacy cost models "biased" by this retail orientation (and the incumbents' desire to assign costs to particular services?

A. Yes. The "granddaddy" of switching cost modeling is the Switching Cost Information System ("SCIS") model developed by BellCore (now Telcordia). SCIS was developed in the 1970s to estimate the cost of (then new) optional features and services that were being introduced by local telephone companies.

Although Qwest does not use SCIS, the US WEST "equivalent" model (developed in the mid-1980's) was based on the same overall approach, and is similarly designed to allocate switching investment to services and features.

Given the problem that these models were intended to solve – i.e., how to apportion common investment among individual features and functions of a switch – it should be expected that the initial architects would rely heavily on "relative use" as a way to allocate investment. Such a relative-use perspective leads to (i.e., rationalizes) the allocation of switching resources among different uses.[3]

Q. What design theory did the cost-modelers invoke to justify using usage to allocate the cost of the switch to different services?

A. To justify allocating cost based on "usage," ILEC cost models adopted the *assumption* that switch-processor and other "getting started" costs are driven by usage (as opposed to the number of lines and trunks connected to the switch).[4] This step was based on the view that a switch would reach capacity because of usage, and therefore would need to be replaced due to "usage-based" exhaust. By

[3] For instance, the basic SCIS documentation makes clear that a primary motivation in the design of that model was to treat costs as usage-related. According to Bellcore itself, SCIS was developed to meet four objectives, including the objective that "*…cost results would be based on usage*." (Switching Cost Information System, Bellcore Description, page 3). Said directly, the cost model produced a usage-cost because its architects preordained the result – a design goal for the model was a result that portrayed switching cost as a usage-sensitive investment.

[4] In blunt terms, the easiest way to *establish* causality is to *assume* causality.

this "logic," the fixed costs of a new switch could be "attributed" to usage. Armed with this assumption, cost models were developed that tried to "reverse-engineer" the switch price from the manufacturer (that was *not* based on usage) to determine how the manufacturer's price *might* have varied, had switches capable of accommodating different traffic requirements been purchased.[5] Of course, this logic (for lack of a better term) completely breaks down if the predicate – that switches plausibly exhaust based on usage – is false.

III. THE BASIC ARCHITECTURE OF A MODERN CIRCUIT SWITCH

Q. Please describe the basic architecture of a modern circuit switch.

A. Switching system architectures are generally organized into three functional divisions: control structure, switching network (sometimes referred to as the switching "fabric" or "matrix"), and "periphery." The periphery is where lines and trunks are connected to the switch. In their early implementations a few decades ago, stored-program-controlled switches were usage-limited – that is, the switches were designed to handle expected calling volumes and switches that were designed for greater "usage" could require additional investment.

---

[5] The inherent oddity of this step in the process is sometimes overlooked. Switching "cost models" generally start with a *known* answer – i.e., the price that a manufacturer charges for a particular switch – then attempt to estimate *why* the manufacture established that price. This approach is roughly equivalent to modeling *why* General Motors sells the H2 for $45,000, by using a model that attempts to determine what an H2 *would* cost if it could carry fewer passengers, and then telling your friends your H2 cost $35,000 plus $5,000 a head.

Q. What is meant by the term "usage" when discussed in the context of switching systems?

A. There are two separate and largely independent measures of "usage." One is the number of times an average user "requests service" (or places a call attempt) during a specified busy period, which is generally referred to as the "busy hour." The other is the total holding time (i.e., "off-hook" time, or time engaged in conversation) sustained by the average subscriber during the busy hour. Each of these usage components affects different parts of the generalized switching system structure. Although the undifferentiated term "usage" is frequently used in its abbreviated form, it is important to appreciate that only busy-hour usage is relevant to switch design.[6]

Q. Please describe the switch control structure.

A. The control structure is responsible for basic call processing functions, feature processing, maintenance, and other functions. The call processing function includes such responsibilities as detecting and processing call originations and terminations for both trunk and line ports, processing subscriber features, determining routing of interoffice calls, formulating and processing signaling messages for interoffice calls, and controlling the switch fabric.

---

[6] We note that usage outside the busy-hour is immaterial to this discussion because it impacts resources that would otherwise be idle.

Q. What is the role of the switch fabric?

A. The switch fabric provides connection paths between ports; it connects lines to lines, lines to trunks, trunks to lines, and trunks to trunks. In a forward-looking switch, the fabric transmits signals in a digital form. The fabric may consist of a time-slot interchange (TSI), a time-multiplexed space switch (TMS), or some combination of both.[7]

A single-module Lucent 5ESS, for example, includes a TSI as the basic switch fabric. A larger 5ESS consisting of several switching modules contains TSIs in each of the modules (which contain the line and trunk interfaces) and a TMS to interconnect the modules. This architecture is generally known as a T-S-T structure, because it contains "time" switches in the modules serving subscribers and trunks, and a "space" switch (or stage) that then interconnects these modules.[8]

---

[7] A time slot interchange (TSI) "switches" by transferring the information from one time slot in a multiplexed data stream to another time slot in another multiplexed data stream. A space switch "switches" by connecting one physical switch port to another. A time-multiplexed space switch (TMS) connects a specific set of physical switch ports during one time slot interval and then reconfigures itself during the next time slot period to connect different physical ports together. TSIs and TMSs can be combined to provide very flexible switching configurations at very low or zero blocking levels as well as allow the basic switching system architecture to address a wide range of line sizes.

[8] An *intra*office call between lines terminated on different modules in this architecture would first traverses a time switch in the module serving the originating line, then a "space" switch that interconnects the modules, and then another time switch in the module serving the destination line.

Q. What is a switch's "periphery"?

A. The "periphery" is the part of the switching system where lines, trunks, and (typically) "service" circuits such as tone generators, digit receivers, and announcement sets are physically connected. These interfaces are usually known generically as "ports." The shelves, or carriers, in which the line, trunk, and other circuit boards are mounted include "backplane" connections to the switching fabric and control structure. These connections allow, for example, the control structure to detect requests for service from port circuits and to invoke control functions such as reading decoded dialed digits from digit receivers, applying and removing ringing voltage from line circuits, etc. Another set of backplane connections provides access to the switch fabric so that the line and trunk interface circuits can be "switched" to other line or trunk appearances.

Q. How do these different functional divisions affect switching system capacity?

A. The capacity limits of these functional divisions are essentially independent of each other and are usually separately addressed.[9]

Q. What limits the control structure capacity?

A. The control structure is most heavily involved in a call during the call setup process. Its capacity is thus most strongly affected by call attempts and feature activations; when a call is "stable," that is, when the connection has been established between the calling and called parties, the control structure has

[9] *See, e.g., LSSGR: Traffic Capacity and Environment*, GR-517-CORE, Telcordia Technologies (formerly Bellcore), Issue 1, December, 1998, ("*LSSGR*"), at 2-1 through 2-3.

minimal involvement. The control structure's capacity limit is therefore typically expressed in terms of busy-hour call attempts (under some specified definition of the busy hour) and is often referred to as the switch's "real-time capacity."[10] Holding time (call duration) has little effect on the real-time capacity.

Q. What limits the switch fabric capacity?

A. The switch fabric is limited by the number of simultaneous connections it can support. Its capacity limit is thus affected by traffic and is usually expressed in traffic terms, either Erlangs or CCS.

Q. How is the switch periphery limited in capacity?

A. The peripheral (or port) limit is imposed by the physical design of the switch and is often expressed as the maximum number of ports (lines plus trunks) that can be physically connected (or, sometimes, just as the maximum number of lines that can be served).

Q. Has the nature of switching system capacity limits changed over time?

A. Yes. When stored-program-controlled (SPC) end-office switches were first introduced forty years ago, their effective capacity was generally limited by

---

[10] The term "real time" derives from the fact that switch control structure operate under what amount to "real time" operating systems in which certain control functions must be activated and completed within specified time boundaries. When the control structure effectively runs out of time to complete its required tasks, it is said to have exhausted its available "real time."

processor performance. The processor and memory technology used in the early SPC switches was very "slow" by today's standards. As digital technology improved over the years since the first introduction of the Number 1 ESS in 1962, switch processor performance has gradually improved to the point where it no longer limits the effective capacity of forward-looking switching systems. The components used to construct switch processors have benefited from the same profound improvements in microprocessor performance and architecture that have vastly improved the performance of personal computers over the past several years.

Q. Can you provide an example of improvements in switch processor performance over time?

A. Yes. When the 5ESS was introduced in 1982, it had a processor capacity of about 100,000 busy-hour call attempts.[11] Improvements in component technology and in the overall architecture of the switch's processor complex improved performance to 1,500,000 call completions per hour in 1998, and further improvements to increase the capacity beyond 2,500,000 call attempts per hour were reported that year.[12]

---

[11] Lucent uses "busy hour call completions" instead of "busy hour call attempts" as a measure of processor real-time capacity. This arguably is a more conservative statement of capacity.

[12] Richard Singer, Lucent Technologies, "Overview of 5ESS®-2000 Switch Performance," Workshop on Software and Performance (WOSP98), Santa Fe, New Mexico, October 12-16, 1998, p 9.

Q. How does this increase in processor capacity compare to subscriber calling behavior?

A. Subscribers typically attempt about three to four calls in the busy hour.[13] In a forward-looking switch serving 100,000 such subscribers, the total busy-hour calling rate is therefore 300,000 to about 400,000 busy-hour attempts, which is well under half the real-time capacity of, say, a 5ESS as described above. Even with a very high, if not extreme, *average* calling rate of eight busy-hour call attempts per line, the switch could still handle those 800,000 calls per hour, which is just over *half* the capacity of the 5ESS control complex as stated over four years ago. Typical subscriber calling behavior thus does not begin to approach forward-looking processor capacity limits, even on very large switches.

Q. Do other switch manufacturers state similar performance figures?

A. Yes. Obviously, as one would expect, switches offered by competing vendors for similar applications will exhibit similar performance characteristics. Nortel, for example, advertised in 1999 a real-time capacity for its XA-Core processor, used in the DSM-100 and DMS family switches, of greater than 1.3 million busy-hour call attempts.[14]

---

13 *LSSGR*, p 6-8. These values pertain to average busy season busy hour (ABSBH).

14 Nortel Networks Product Brief, "DMS SuperNode System XA-Core," 50250.02/12-99, 1999.

Q. Does the fabric of a forward-looking switching system limit the practical capacity of the switch?

A. No. In fact, the switch fabric has generally never been the component limiting the performance of a switch. Switch fabric capacity is relatively inexpensive and, as a result, switch developers have designed switches with much greater traffic capacity than that required by subscribers. This fact simplifies the engineering of switches for specific installations.

Q. What is the implication of the above to the fundamental cost-model "assumption" that usage is a binding constraint (and, as a result, investment costs should be allocated based on usage)?

A. Today, forward-looking switches are generally considered "nonblocking" or "essentially nonblocking." A "nonblocking" switch fabric design effectively guarantees that any port can be switched, or can be assigned a "talking path," regardless of the state of any of the rest of the ports on the switch. Thus, the probability that a talking path will not exist for a given port (the "blocking" probability) is zero. In an "essentially nonblocking network," the blocking probability is generally a small fraction of one percent, say, one ten-thousandth of one percent or less.

Q. Then what constitutes the practical capacity limit of a forward-looking switch?

A. Because neither processor usage nor switch fabric usage limits the performance of a forward-looking switch, the practical switch capacity is imposed by the maximum number of lines that a carrier is comfortable serving from a single switch. As one ILEC made clear:

> Modern digital switches are designed to be port-limited. That is, enough switch fabric and processor capability is provided so that the normal peak call usage from the anticipated number of working ports, of all types on the switch, can be served within acceptable blocking criteria .... Put another way, there are enough usage-sensitive switch resources (but no more than are necessary) to handle all the minutes of use that the ports are forecasted to deliver in the normal peak period.[15]

Q. In a forward-looking switch, do realistic subscriber usage characteristics have any bearing on the overall capacity of the switch?

A. No. Forward-looking switches contain very robust control and switch fabric capacities that are not exhausted by realistic subscriber usage.[16] These switches

---

[15] Testimony of J. Gansert, NYNEX, New York Case 95-C-0657, 94-C-0095 and 91-C-1174 consolidated, page 24.

[16] There are certain minor switch components, such as digit receivers, that are "engineered" according to certain design rules to serve expected demand. These devices, however, are relatively inexpensive and can easily be added to the switch if increased demand requires it. A shortage of digit receivers, for example, can lead to increased dial-tone delay. This is easily remedied by equipping more such components. Any usage cost attributable to such components is minuscule and would not warrant the additional investment required in tracking and billing the usage of such inexpensive components. Other types of service circuits, such as conference circuits, also are "engineered." In the specific case of a conference circuit, any corresponding usage cost will again be very small and will normally be recovered through separate charges to the subscriber electing conference services (such as "three-way calling").

are limited in size only by the maximum *number of subscribers* (or lines), and not the behavior of those subscribers, that carriers choose to serve by a single switching system.

Q. Is it still necessary for service providers to "engineer" forward-looking switches?

A. Yes. For reasons unrelated to busy-hour usage, an ILEC will not install switches with maximum capacity in all wire centers. Although a modern switch may physically be able to support well over 100,000 subscriber lines, carriers usually to not serve that many lines on one switch. Even though telephone switching systems are usually designed with fully-redundant control structures and switch fabrics and large-scale failures are rare, they can still occur, and carriers correctly avoid exposing more than several tens of thousands of users to a potential full-office outage.

The actual traffic load on the switch, however, is less relevant. The processing and switching capacities of forward-looking switches are such that even heavy subscriber usage will generally not exhaust them even at maximum practical line sizes. Subscriber traffic behavior has been exhaustively analyzed and thoroughly characterized for many decades, and an ILEC will use well-established procedures to install suitably-sized switches to serve specific local demand. The principal point here is that the real-time and traffic capacity of such switches will not be approached by subscriber demand.

IV. IMPLICATIONS FOR THE PRICING OF THE UNBUNDLED LOCAL SWITCHING NETWORK ELEMENT

Q. What does the above discussion mean for the appropriate rate structure of the unbundled local switching network element?

A. It is important that entrants pay prices to *lease* unbundled local switching that parallel, as closely as possible, the manner in which the *cost* is incurred. As explained above, the historic rationale to impose usage charges for switching no longer exist. Moreover, as Qwest's switch-purchase contracts have become available for review in a number of cost proceedings across its region, it is clear that Qwest does not pay for its switches through a usage rate.

If a flat-rate structure is good enough for the company *selling* the switch, and it is good enough for the company *buying* the switch, how can it not be good enough for a CLEC *leasing* it? In order for CLECs to pay a cost-based rate for local switching, the appropriate rate structure should recover this cost through a flat-rate per switch port.

Q. Is the switching rate structure issue competitively significant?

A. Yes. This is no small debate – the rate structure Qwest recommends would impose on CLECs a cash-outlay, for each and every minute, of each and every call, that their customers make, even though Qwest would incur no such cost. This would create very different cost-implications for CLECs than Qwest for calls that are identical, introducing a serious distortion to the market. This is particularly critical in a local market where the dominant provider (Qwest) offers flat-rate service and the market is moving towards *more* flat-rate offerings.[17] Moreover, it is generally the residential customer that has a higher usage per line. In such an environment it is absolutely critical that CLECs not be penalized through a contrived usage rate for local switching. Usage-sensitive pricing of unbundled local switching is not only not justified, it acts as a deterrent to residential competition.

Q. Does Qwest purchase switches by paying manufactures a "usage rate"?

A. No. In other states where Qwest vendor contracts have been evaluated, that review demonstrates that Qwest purchases switching by paying a flat rate, albeit a flat-rate that may nominally increase as the capability of the switch increases.[18]

---

[17] For instance, consider the recently announced MCI Neighborhood, which even eliminates usage pricing of long distance service. These types of pricing plans are being very well received by customers, and will likely become the competitive-norm in short order.

[18] SBC-Ameritech has also confirmed that switching costs are invariant to usage at or below design-levels. (*See* Direct Testimony of William Palmer, ICC Docket 96-0486, Ameritech-Illinois Exhibit 3.3). Moreover, SBC-Ameritech clearly purchases switching capacity on a per-line basis:

> By the terms of the [switch vendor] contracts, Ameritech buys switching equipment by paying a one-time price for each line that it demands. The line prices do not vary with the number of lines purchased, or with the year of purchase, nor with the state in which the equipment is to be installed; the contracts are region-wide.

The fact that Qwest's pays more (on a flat rate basis) for a switch with more capability than another switch, however, is not a reasonable basis to impose a usage cost on CLECs sharing those *same* switches each and every time their subscriber makes (or receives) a call.

Q. Doesn't a variation in per line prices in Qwest's switching contracts according to the level of usage engineered in the switch indicate that switching costs are incurred on a usage sensitive basis?

A. No. Qwest made that argument in proceedings before the Minnesota and Utah Commissions, and it fundamentally misses the point. Switches, like other equipment or facilities, are constructed to have a certain capacity. Not surprisingly, switches with greater capacity cost more on a per line basis than switches with less capacity. The same, however, is true of loop plant and other facilities. DS3 circuits, for example, have a greater capacity and are more costly than DS1 circuits, but that does not mean that loops are usage sensitive simply because they are engineered to have different capacity. A variation in costs based on the level of capacity does not justify charging a usage sensitive rate – it would only affect the level of the appropriate flat charge per port.[19]

Ameritech Ohio Exhibit 2.4, page 1, Public Utility Commission of Ohio, Case No. 96-922-TP-UNC.

[19] We note, moreover, that even if "busy-hour" usage may have influenced initial switch design, that would never justify a non-differentiated usage rate that applied to every minute, at all times of the day. As we explain, there is no reason to adopt any usage rate, while Qwest's response (at most) would only justify a rate applicable to peak usage at the busy hour. The rate structure Qwest recommends, even under its own cost-theory, however, would misprice usage 23

Q. But if usage of an existing switch increases, doesn't Qwest incur greater costs to increase switch capacity?

A. No. As we previously discussed, modern switches are engineered with capacity far above that required to serve well-characterized per-subscriber usage. The only legitimate capacity limitation is the number of lines served by the switch, which reflects the number of telephone subscribers, not the extent to which those subscribers use the switch.

Q. Don't Qwest's switch contracts also include charges for trunks in addition to per line prices for the switch?

A. Yes, but again, that fact does not mean that switching costs in general are usage sensitive. Qwest's vendors charge Qwest the vast majority of Qwest's switching costs on a per line basis. Trunks are the portals for connections between switches, which permit customers served by one switch to make calls to customers served by a different switch. Qwest engineers its network to ensure that the ratio between the lines and the trunks served by a switch are sufficient to accommodate all inter-switch calls. Thus, it is quite simple to include expected trunk costs in the per-line charge that we recommend. Moreover, where Qwest does augment trunks, that action is driven primarily by the need to interconnect with other carriers, including CLECs, long distance carriers, and wireless carriers, and Qwest

---

hours out of the day. While we do not believe that a time-of-day rate structure is appropriate, it is useful to note that Qwest never recommends the rate structure that matches its own cost-theory.

is separately compensated for such interconnection. Qwest seldom must augment trunk capacity to accommodate inter-switch calls between its own customers, and even then, such costs are insignificant compared with Qwest's other switching costs.

Q. Might not CLEC customers have higher usage levels than current Qwest customers, increasing the demand on (and correspondingly the cost of) Qwest's switches?

A. No. This is yet another red herring that Qwest has raised in other states. First, as discussed above, modern switches are engineered to accommodate more usage than any subscribers – CLEC or Qwest – are reasonably likely to have.

Second, there is no reason to expect (a priori) that the usage profile – particularly the *peak* usage profile – of a CLEC's subscribers served using unbundled local switching would systematically differ from the usage profile of Qwest's customers served by that switch. Unbundled local is principally used by CLECs to compete for mass-market customers – the exact *same* customers that are served by these switches today.[20] Thus, the design limits of the local switch are unlikely to be more affected by individual CLECs (or their customers) than they are by Qwest.

[20] A primary reason that CLECs use unbundled local switching is because it offers the same footprint as the incumbent and permits for customer migrations without manual reconfiguration to alternative switching facilities. Consequently, there would be no reason for a CLEC to serve different customers than the incumbent serves using unbundled local switching.

Because CLECs will be serving the same customers that are served by the switch today, each CLECs' expected contribution to peak demand should correlate closely with the proportion of the lines that it serves. Consequently, a per-line charge on CLECs should approximate a CLEC's proportional responsibility to peak usage at least as well as the CLEC's total usage.

Q. Has Qwest itself acknowledged the fact that forward-looking switches are in fact not usage-sensitive?

A. Yes. Qwest witness Paul McDaniel stated the following in a filing at the Colorado Public Utilities Commission in October, 2002:

> The nature of switching costs has changed significantly over time with advances in digital technology. Switching costs today are more line-driven than traffic-sensitive. It is not unreasonable to model switching costs now as depending entirely on the number of line-side ports and the number of trunk-side ports. Switching costs in such a model can be reasonably recovered entirely as fixed monthly charges.[21]

---

[21] Direct Testimony of Paul R. McDaniel, "IN THE MATTER OF THE JOINT APPLICATION FOR APPROVAL OF A PLAN TO RESTRUCTURE REGULATED INTRASTATE SWITCHED ACCESS RATES AND PETITION FOR A COMMISSION ORDER DECLARING THE PLAN TO BE APPLICABLE TO ALL LOCAL EXCHANGE CARRIERS IN COLORADO," October 4, 2002, at p 19. Furthermore, Mr. McDaniel's testimony contains the following footnote: "From the perspective of a carrier or large end user, however, the costs may be traffic sensitive because additional traffic may require the use of more trunks or lines, respectively." Mr. McDaniel's "clarification," however, underscores our position by demonstrating the relationship between end-user lines and usage.

Moreover, Qwest witness Harry M. Shooshan III used precisely the same language in testimony before the Arizona Commission in July, 2002.[22] Finally, we would note that Qwest generally opposes the deaveraging of local switching prices, noting "switching costs do not vary in any significant way between zones."[23] Of course, given the fact that switch usage would vary, the only reason that costs would not vary would be the fact that switching costs are not sensitive to usage.

Q. Have other states concluded that the ULS network element should be flat-rated?

A. Yes. Minnesota and Utah, states in which Qwest is the incumbent local provider have ruled on the issue and both have adopted flat-rated UNE local switching.[24] Outside the Qwest region, the Illinois Commission also conducted an extensive examination of the cost-justification for usage charges associated with the ULS network element. At the conclusion of that proceeding, the Illinois Commission rejected Ameritech-Illinois' proposal to impose a usage charge:

> Because Ameritech incurs switching costs on a predominantly per-line [i.e., per line-port] basis, we find it consistent with the

22 The Investigation of the Cost of Telecommunications Access, Docket Number T-00000D-00-0672, page 25.

23 *See*, for instance, Brigham Direct Testimony, DOCKET NO. 01-049-85, Utah Public Service Commission, page 27.

24 *Order Setting Prices and Establishing Procedural Schedule*, MPUC Docket Nos. P-421/CI-01-1375, *et al.* (October 2, 2002). *Report and Order*, Utah PSC Docket No. 01-049-85 (May 5, 2003).

> fundamental principles of cost causation that the ULS subscriber should also pay the ULS element primarily on a per line basis.[25]

More recently, the Illinois Commission again rejected SBC-Ameritech's efforts to impose a usage sensitive rate, finding that:

> Our extensive investigation of Ameritech's ULS cost structure conclusively demonstrated that Ameritech's switch costs are not usage sensitive, and Ameritech's attempt to unilaterally reclassify the local switch as usage sensitive is a blatant violation of our TELRIC Order.[26]

In addition, the Wisconsin Commission has voted to adopt a flat rate for the unbundled local switching element, recognizing that it is more cost-based,[27] as well as the Indiana Commission.[28]

Q. But haven't AT&T and MCI previously advocated usage sensitive pricing for UNE local switching?

A. Yes, that is our understanding. However, as we noted above, the usage based pricing of unbundled local switching is an industry *practice* whose justification has disappeared with advances in technology and as the regulatory focus has shifted from "retail service" to the "wholesale network element" at issue here. The fact that it took some time for this change to occur within AT&T and MCI is

---

25 *Second Interim Order,* ICC Docket 96-0486 and 96-0569 Consolidated, Illinois Commerce Commission, February 17, 1998, page 59.

26 Order, Illinois Commerce Commission Docket 98-0396, page 68.

27 Open Meeting, December 13, 2001, Docket 6720-TI-161.

28 Order, Cause No. 40611-S1, Phase I, March 28, 2002, page 42.

regrettable, but understandable (given the size of the organizations). As we explained above, prior efforts at determining the appropriate "allocation" of switch investment between fixed and usage charges has been difficult precisely because it sought the answer to a question that made no sense. The very exercise of trying to determine the "percentage" of switch investment that should be "allocated" to usage led to different and shifting answers over time because the exercise was inherently arbitrary.[29] All new ideas start as *new* ideas, and we recommend that this idea be judged on the merits as we have explained them. The Commission should adopt a flat-rate structure for unbundled local switching in this phase of the proceeding.

Q. Does this conclude your testimony?

A. Yes.

---

29 In a sense, efforts to divine the usage-sensitive component of unbundled local switching was akin to trying to find a black cat in a dark room under circumstances where *there was no cat.*