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ORIGINAL

BEFORE THE IDAHO PUBLIC UTILITIES COMMISSION

IN THE MATTER OF LEVEL 3 COMMUNICATIONS, LLC'S PETITION FOR ARBITRATION PURSUANT TO SECTION 252(B) OF THE COMMUNICATIONS ACT OF 1934, AS AMENDED BY THE TELECOMMUNICATIONS ACT OF 1996, AND THE APPLICABLE STATE LAWS FOR RATE, TERMS, AND CONDITIONS OF INTERCONNECTION WITH QWEST CORPORATION	**Case No. QWE-T-05-11**

BEFORE THE IDAHO UTILITIES COMMISSION

DIRECT TESTIMONY OF ROGIER R. DUCLOO

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I. Introduction

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

A. My name is Rogier R. Ducloo. I am a Director with Level 3 Communications, LLC. My business address is 1025 Eldorado Blvd, Colorado, 8021. I am filing this testimony on behalf of Level 3 Communications, LLC of Broomfield, CO.

Q. PLEASE REVIEW YOUR EDUCATION AND RELEVANT WORK EXPERIENCE.

A. I received a Bachelor of Science in Business and Management from the University of Amsterdam, the Netherlands in 1996. I've worked at Level 3 since 1998. Most of my experience with Level 3 has been with the company's network group. I've worked in network provisioning, network engineering & design, and network planning & project management of network deployment. Since 2002, I have worked in network planning and regulatory support. Prior to joining Level 3 I worked in business development and international institutional sales.

II. Statement Of Scope And Summary

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. I am testifying on behalf of Level 3 Communications, LLC ("Level 3"), regarding interconnection agreement terms and conditions between Level 3 and Qwest that we have been unable to resolve during negotiations. I will address various technical issues to provide a network and engineering perspective for the issues that are in dispute in this case. As part of my presentation, I will also address some high-level technology policy issues

that are embedded in the nation's communications laws, as I understand them, and how those policies relate to this case.

Q. PLEASE SUMMARIZE YOUR TESTIMONY, INCLUDING YOUR CONCLUSIONS AND RECOMMENDATIONS.

A. Level 3 is a facilities-based Competitive Local Exchange Carrier ("CLEC"). To facilitate fair competition, and for Level 3 to meet customer demands, Level 3 must be permitted to interconnect with Qwest on reasonable terms, rates and conditions. Moreover, because of Level 3's experience operating the largest next-generation, end-to-end Internet Protocol ("IP")-based network in the United States, Level 3 is uniquely positioned to propose terms that are not only reasonable and technically sound, but also consistent with the overall public interest in the continued technical advancement of the nation's communications infrastructure.

Qwest, in contrast, takes an extremely limited and one-sided view of interconnection. The Qwest-sponsored provisions to which Level 3 objects would cause inefficiencies in the network by, among other things, requiring technically unnecessary trunks and facilities, as well as changes to efficient interconnection architecture. As a result, Qwest's proposals are detrimental to overall network efficiency, quality, and to Level 3's ability to offer services in furtherance of the public interest in facilitating and developing a competitive telecommunications market. As summarized here and as explained in greater detail below, Qwest's one-sided proposals cause problems at several levels.

First, Qwest proposes to place a number of restrictions on switching and trunking operations. It does this through the definitions of

various terms in the Agreement. None of these restrictions has any technical basis. In each case, Qwest would impose engineering inefficiencies on Level 3 (and in some cases on Qwest itself as well) for no reason other than, as far as I can tell, to impede Level 3's growth or to extract extra revenues from us. These definitional issues affect the outcome of Issues 1 and 2 and I deal with the definitional concerns in the course of discussing the relevant issues.

Second, the companies disagree on the how to divide the traffic we send each other into different trunk groups. We agree that when total traffic between Level 3 and a particular Qwest end office switch reaches a certain reasonable volume, we will establish a direct trunk group between that end office and Level 3. The technical and engineering efficiency of both parties' networks will be maximized by including all traffic between Level 3 and the affected Qwest switch on a single large trunk group. Qwest, however, wants us to establish multiple trunk groups between each pair of switches, with the traffic divided based on regulatory classifications that have no engineering significance. This is, pure and simply, inefficient. I understand that governing law requires the terms and conditions of interconnection to be "reasonable." From an engineering perspective, what Qwest is proposing is patently unreasonable. Level 3 fully recognizes that different regulatory "types" of traffic might be subject to different rates; but we have a proposal for dealing with that situation simply and efficiently, without degrading network efficiency and imposing needless costs, discussed below.

Third, in Issue 4 Qwest is arguing that certain types of Enhanced Service Provider ("ESP") traffic, including specifically VoIP traffic, should be included within the regulatory category of switched access traffic. My understanding is that the status of traffic as ESP traffic depends on certain technical characteristics of the entities that provide it, so that entities that qualify as ESPs are entitled to have their traffic rated on an end-user basis, as opposed to on a carrier basis. I understand that there are legal and regulatory considerations affecting this issue which Level 3's lawyers will address in our filings. From a technical perspective, however, it is clear that VoIP traffic is a form of information service, that is, the VoIP providers that Level 3 serves meet what I understand to be the relevant criteria for having their traffic treated as end-user, as opposed to carrier, traffic. In this regard, and irrespective of how this traffic is rated (reciprocal compensation versus access), Qwest also seeks to have ESP traffic, including VoIP traffic, routed over distinct trunk groups and perhaps over distinct facilities. For the reasons noted above, this is grossly inefficient and patently unreasonable.

In Issue No. 3 the ISP/RUF (VNXX) issue, Qwest is trying to shift the financial responsibility for maintaining its own network, on its side of the Point of Interconnection ("POI"), to Level 3. As a contractual matter, the parties agree that the cost of facilities used to connect their networks will be split based on relative use, so that cost responsibility follows in proportion to which party originates which portion of traffic on the affected facilities. But what Qwest seeks to do is to exclude from the calculation the overwhelming majority of traffic that it sends to Level 3.

As a simple matter of mathematics, this sleight-of-hand would relieve Qwest of cost responsibility for facilities that Qwest uses (in the sense of originates traffic over) much, much more than Level 3 does. In certain cases (so-called "VNXX" traffic), Qwest would go even farther, and would send Level 3 bills for originating intrastate access charges. Again, Level 3's lawyers will address the legal flaws in Qwest's position, but from an engineering perspective, treating VNXX calls like intrastate toll traffic is absurd.

The **LIS NRC** section continues the issue of who is responsible for the cost of interconnection, and explains why Qwest should not be able to pass the cost of installation and maintenance of its own network to Level 3.

Finally, the section of the **Determination of Traffic Types** provides a description of how Level 3 proposes to calculate the traffic mix on trunks. The section also explains a dispute over the new way that Qwest is proposing to determine whether a call is "local" or not. New contract language is proposed in this section to specify Level 3's proposal on how to calculate and manage traffic factors for billing purposes.

Q. TO PROVIDE SOME BACKGROUND, PLEASE GIVE A BRIEF OVERVIEW OF THE DIFFERENCE BETWEEN THE QWEST CIRCUIT SWITCH-BASED NETWORK AND LEVEL 3'S SOFTSWITCH-BASED NETWORK.

A. Qwest's network is comprised of circuit switches connected to each other by fiber and copper transmission paths, and to end user customers largely by means of copper loops. Qwest's Class 4 (tandem) and Class 5 (end

office) switches are the "brains" of its network. Like the traditional PSTN of which it is a part, the Qwest network operates using a centralized architecture which evolved starting more than 50 years ago with the introduction of automatic (originally, mechanical) circuit switching. The entire design objective of the PSTN was to do just one thing — deliver voice calls — very, very well. This design objective led to the old Bell System's implementation of computerized switches in a hierarchical architecture, the development of time-division multiplexing for use initially on copper and later on optical fiber, as well as the design of customer premises equipment and the specification of the interfaces between that equipment and the PSTN. The goal, and the result, of this focus was a network in which end-to-end network resources are devoted to the completion of large volumes of plain old voice telephone calls.

Level 3's network is quite different, arising not out of the hierarchical, circuit-switched PSTN but instead out of the distributed, open architecture of the Internet. The Internet evolved as a scientific, educational and military network outside the PSTN, beginning in the 1960s. The Internet uses packet switching, not circuit switching. Rather than devoting end-to-end network resources to communicate information (voice or otherwise), a packet switched network breaks the information down into pieces (packets) and then separately routes the packets to their destination, often by very diverse routes, based dynamically on which switches (called "routers" on the Internet) and links are free or busy on a near-instantaneous basis. The packets are then reassembled into the proper order at the destination, so that the information is properly delivered.

Using Internet Protocol technology, Level 3 operates a distributed softswitch architecture. All internal connections between nodes on Level 3's network are by means of high-capacity optical fiber. Level 3's softswitch- and IP-based network is based on an open architecture that optimizes the use of computing technology to maximize the efficiency of the network infrastructure transport layer. Softswitch technology is able to bridge the gap between legacy circuit-switched technology and more advanced IP-based networks. Because it knew that its customers would need to interface with the PSTN, Level 3 retro-engineered its network — from one perspective, "dumbed it down" — to be able to exchange IP-based traffic with the PSTN.

A simple metaphor illustrates the difference. Qwest's network is like a funny kind of highway system. Imagine dedicated roads leading traffic from one point to another on fixed highways with multiple lanes, like the real highway system. On a circuit-switched network like Qwest's, however, when there is a car running down one lane of the highway — say on a trip from Seattle to Phoenix — no other car is allowed be in its lane, all the way from Seattle to Phoenix. Only when the first car has completed its journey can any other car use "its" lane.

In contrast, Level 3's softswitch and router based network is like the human brain. It is a smart, highly interconnected network that functions in parallel, so that traffic can take many different paths to get to the same place, and packets containing bits from different conversations can travel the same path at the same time for part, or all, of the route.

From Level 3's perspective, the technical superiority of its flexible, IP-based network is obvious — even for the traditional mainstay of the PSTN, voice calls. From both an engineering and business perspective, this is extremely threatening to PSTN operators like Qwest, who have enormous amounts of money and expertise invested in what is manifestly an old-fashioned and increasingly obsolete way of doing things. It is only natural that those with such a heavy investment in old technology and old knowledge would do everything possible to delay the day when they are overtaken by the new. For that reason, it is understandable why Qwest would want to shoe-horn Level 3's operations, as much as possible, into network architectures, regulatory classifications, and business models that Qwest understands, and that are in harmony with Qwest's own network and operations. But the entire point of introducing competition into the telecommunications business — at least from my technical perspective — is to make it possible for consumers to enjoy the benefits made possible by newer and more technically sophisticated networks. In assessing what constitutes "reasonable" terms for interconnection in this proceeding, therefore, I urge the Commission to recognize and take account of this fact. I submit that on the issues I address, Qwest is acting primarily to avoid the impact of new technology-based competition on its legacy network, not in the best interest of the citizens of Idaho.

Q. WHERE DOES LEVEL 3 FIT INTO THE BROADER COMMUNICATIONS INDUSTRY?

A. Level 3 is not a traditional competitive local exchange carrier ("CLEC"). In broad terms, many of the CLECs that were created following the 1996 Act had a business model that boiled down to, "do what the incumbent does, only 5% better." As the regulatory authorities have come to appreciate the need to encourage competition based on investment in competing facilities, this business model has become increasingly unviable. Many of the CLECs that have gone into bankruptcy or been acquired by rivals had placed key reliance on this now-superseded business model.

Level 3, however, takes a very different approach. Level 3's business focuses not only on the traditional public switched telephone network (PSTN), but also — in fact, even more directly — on the Internet. As noted above, Level 3's entire network architecture arose out of the architecture of the Internet. The Internet uses packet switching, mainly developed in the 1970s, as opposed to circuit switching, developed, essentially, in the 1870s. (When the original, 19th Century version of "Ernestine the Operator" plugged a line into her circuit board, she was doing just what circuit switches do today: creating a dedicated path between two customers for the duration of their call.)

While Level 3 certainly functions as a "local" exchange carrier, in fact Level 3's operations are nationwide, and more, in scope. Level 3 has billions of dollars invested in its network, which consists of an all fiber-optic backbone connected to 68 markets in the U.S. and 17 markets in Europe. Level 3 has over 16,000 route miles of fiber in the US and an additional 3600 route miles in Europe. Riding on this fiber backbone,

Level 3 maintains a separate, private IP network, composed of high-speed links (carried over the fiber optic facilities) and core routers (which direct enormous volumes of packetized traffic to the appropriate destinations). The Level 3 IP backbone is connected to the public Internet by means of hundreds of peering arrangements with other large Internet entities, located in approximately 30 different metropolitan areas.

One key technical contrast between Level 3 and an ILEC is that, unlike the ILECs, Level 3 embraces and seeks out robust interconnection with other networks. As a result, Level 3 is extensively interconnected with such networks. Its central offices are state-of-the-art facilities in the heart of 70 major metropolitan areas, which range in size from 50,000 to 550,000 square feet of equipped floor space. In these locations, Level 3 terminates both local and intercity fiber networks, as well as locates its high-speed transmission equipment, routers, and Softswitch equipment. (Softswitch technology bridges the gap between legacy circuit-switched technology and more advanced IP-based networks.)

Level 3 believes that, while other entities in the communications business —such as, frankly, Qwest — struggle to adapt to change, Level 3, to quote a former President, ***is*** the change.

1 **Q. AT A VERY HIGH LEVEL, WHAT CONSIDERATIONS OF**
2 **TECHNOLOGY POLICY SHOULD GUIDE THE COMMISSION'S**
3 **DECISIONS IN THIS CASE?**
4 A. From a high-level perspective, I believe that three key technology policies
5 are embedded in the nation's communications laws and have a direct
6 bearing on this case.
7 First, at a high level, the Commission should make decisions that
8 encourage development and deployment of new technology and
9 innovative, new services. The history of the telecommunications industry
10 is one of sustained — one might even say unrelenting — technical and
11 service-oriented innovation. On some level, each decision the
12 Commission makes here will either facilitate and encourage such
13 innovation, or will tend to preserve the *status quo*. The 1996 Act is not
14 about preserving the *status quo*. It is about bringing new and innovative
15 services to all segments of the industry.
16 Second, the Commission should promote and encourage the
17 unfettered growth of the Internet. Section 230 of the Communications
18 Act, and any number of FCC pronouncements, embody a clear policy to
19 promote the growth and development of the Internet and consumer access
20 to it. We are now so accustomed to contacting friends by email, finding
21 information from Google or Yahoo or MapQuest, and downloading our
22 favorite music from iTunes or RealNetworks, that it is easy to forget that
23 these and other incredibly useful services and applications did not just
24 magically appear, and the environment in which they grew and developed
25 was not some stroke of luck. To the contrary, the wide-open environment

that made these services possible was the result of conscious policy choices to keep regulation away from the Internet. As Internet applications such as Voice over Internet Protocol ("VoIP") services are beginning to make inroads on incumbents' businesses, the policy of keeping the Internet unregulated is coming under increasing assault.

Third is to encourage competition in telecommunications markets. The Commission, therefore, should in each case ask whether deciding for or against Level 3 would encourage the development of competition. Although on some level this is an "economic" rather than "technology" policy consideration, in fact there is an intimate link between promoting competition and promoting the development and deployment of new technology. Incumbent monopolists have very little incentive to deploy new technology. New technology disrupts settled ways of doing things. It requires capital expenditure at the outset even if it saves money in the long run. People have to be trained in how to best use it. And, because it is new, it is in some sense inherently risky in that it might not work entirely as anticipated, it might affect other markets in which the business is operating, etc. Businesses in general will avoid these "hassles" if they can. A competitive environment, however, is a situation in which these things cannot be avoided and where, to the contrary, businesses are forced to invest and innovate in order to survive and prosper. So, from this perspective, promoting competition is an important way to promote the development and deployment of new technology.

Q. HOW DO THESE POLICIES RELATE TO EACH OTHER?

1 A. While they may conflict in some situations, from the perspective of
2 promoting technological development, these policies are mutually
3 reinforcing. As just noted, promoting competition creates an environment
4 in which firms are free to innovate and deploy new technology. The
5 development and deployment of new and innovative technology, of
6 course, stimulates and enables competition. And the flexible, advanced
7 capabilities of the Internet simultaneously depend on and enable both
8 competition and technical innovation.
9 **Q. AS YOU UNDERSTAND IT, HOW DO THESE POLICY**
10 **CONSIDERATIONS RELATE TO THE LEGAL AND**
11 **REGULATORY CONTEXT OF THIS CASE?**
12 A. While I am not a lawyer, I am generally familiar with the provisions of the
13 1996 Act and FCC rulings relating to telephone competition — both of
14 which have a strong technology policy component. With that perspective,
15 I would note that several of the key issues separating the parties relate to
16 interconnection of their networks, under Section 251(a)(1) and Section
17 251(c)(2) of the Communications Act. Section 251(c)(2) requires that
18 terms and conditions of interconnection be "reasonable." That is a
19 relatively open-ended standard, so it is helpful to articulate some specific
20 policy considerations that should guide the Commission in determining
21 what is and is not "reasonable."
22 Second, as I understand it, under Section 251(d)(3), the
23 Commission is allowed to impose requirements regarding interconnection
24 that are not specified in the federal law, as long as those additional
25 requirements are "consistent with the requirements of" Section 251. In

1 considering the question of whether a particular obligation not literally set
2 forth in the Act is "consistent with the requirements" of Section 251, to
3 understand the policies and objectives that underlie that portion of the law
4 — which, I believe, the policies articulated above clearly do.
5 **Q. HOW DOES LEVEL 3'S APPROACH TO THE INDUSTRY**
6 **RELATE TO THE KEY POLICIES AT ISSUE IN THIS CASE, AS**
7 **YOU HAVE DESCRIBED THEM ABOVE?**
8 A. Level 3's network embodies innovation and new technology. Its services
9 facilitate and encourage access to and development of the Internet. And, it
10 provides competition across a wide spectrum of telecommunications
11 markets. From Level 3's perspective, its entire business plan is consistent
12 with, and dependent on, the pro-technology policies underlying the 1996
13 Act.
14 **III. ISSUE 2: <u>Combining Different Traffic Types on Interconnection</u>**
15 **<u>TrunksStatement of the Issue</u>:**
16 **Qwest wants Level 3 to provision separate trunk groups for different**
17 **types of traffic, thus forcing Level 3 to set up duplicate, inefficient**
18 **trunk groups to every Qwest end office and tandem office switch.**
19 **Q. WHAT IS LEVEL 3'S POSITION ON THIS ISSUE?**
20 A. Level 3 and Qwest should not be required to set up different trunk groups
21 for different regulatory "types" of traffic. Instead, all types of traffic
22 going from Level 3 to Qwest (local and toll, interLATA and intraLATA,
23 interstate and intrastate, "telecommunications service" or "information
24 service," circuit switched end-to-end or IP-enabled) should be combined
25 on the same trunk group along a given route. I understand that regulatory

rules might require that different types of traffic be subject to different rating regimes, but that is no reason to degrade network efficiency by handling technically equivalent traffic in different ways as a matter of network engineering and architecture. I note in this regard that Level 3 has agreements with the 3 other RBOCs, covering 39 states and the District of Columbia that allow for the most network-efficient exchange of all types of traffic. Qwest is a real outlier on this issue.

Q. WHAT IS QWEST'S POSITION?

A. Qwest wants Level 3 to order and provision multiple, separate trunk groups to every tandem and end office in the state. They want one set of trunk groups for local and IntraLATA traffic, and another set of trunk groups for InterLATA traffic. If they will accept IP-enabled traffic at all — which they appear to contest — they want that on separate trunks too. From an engineering perspective, setting up all these separate trunk groups for traffic going to and coming from the same place is grossly inefficient. I submit that it cannot be considered a "reasonable" condition of interconnection.

Q. WHAT IS A TRUNK?

A. A trunk is a logical connection between two switches, provisioned by means of physical facilities between those two switches. The physical facility is not the trunk. It may be any appropriate medium — copper, optical fiber, microwave radio, coaxial cable, etc. The trunk is the logical path ***carried on*** the physical facility. The term "trunk" arises from within the PSTN, so, not surprisingly a trunk refers to a single voice-grade connection, capable of carrying one voice call between two switches.

Q. WHAT IS A TRUNK GROUP?

A. A trunk group is a collection trunks, normally (but not necessarily) provisioned over the same physical facility connecting two switches, configured to operate as a cohesive unit when delivering multiple voice connections between the two switches. You can think of the physical facility carrying a trunk group as completely unmarked road — just a wide concrete path between two cities. Each individual lane that we paint on the highway is a trunk. All the lanes going together in the same direction are a trunk group. The wider the highway, the more lanes it has, and the more traffic it can carry.

Q. HOW DO YOU MEASURE THE CAPACITY OF TRUNK GROUPS?

A. A single trunk — that can carry a single voice conversation — is known as a "DS0." Putting 24 DS0s together creates a DS1, which is the basic unit of carrier-to-carrier trunking in the PSTN. Putting 28 DS1s together creates a DS3, which is equivalent to 672 DS0s. (For historical reasons, there is no "DS2.") DS0s, DS1s and DS3s can all be carried on any normal transmission medium (copper, fiber, or radio).

More modern, high-capacity networks exchange traffic using optical fiber connections. The data-carrying capacity of optical fiber utterly dwarfs the capacity of copper wires. The smallest normal unit of capacity on an optical network is an OC-3, which is the equivalent of three DS3s. Other common capacity measures for optical networks are the OC-12 (12 DS3s), the OC-48 (48 DS3s), and the OC-192 (192 DS3s).

1 **Q. HOW DO TELECOMMUNICATIONS ENGINEERS DECIDE**
2 **HOW MUCH CAPACITY TO PUT INTO PLACE BETWEEN TWO**
3 **SWITCHES?**
4 A. At a very high level, the more traffic that will flow between the switches,
5 the bigger the trunk group you will put into service. But it is actually
6 more complicated than that.
7 Think about the highway example discussed above. Imagine that
8 you are trying to design a highway between a large city and a populous
9 suburb. You would not look at the number of cars driving between the
10 city and the suburb at 3:00 on Sunday morning. And, although perhaps
11 not as obvious, you would not just look at the total number of cars that
12 travel that route over the course of a day or week or month. Instead, to
13 properly design the highway, you would look at how many cars are trying
14 to travel that route at the very same time, at rush hour on the busiest day of
15 the week. That way, you would know how much traffic your new road
16 will need to be able to handle when it is at its busiest. ***That*** will tell you
17 how big to make your highway.
18 This same principle applies to deciding how big to make trunk
19 groups between switches. Different routes that serve different types of
20 customers have different "rush hours" (called "busy hours" in the
21 telecommunications business). A route between switches that mainly
22 serve business customers might have a busy hour between 9:00 and 10:00
23 a.m. when people arrive at their offices for work. On the other hand, a
24 route between switches that mainly serve residential customers might have
25 a busy hour between 3:00 and 4:00 p.m. as children get home from school

and they and their parents start calling each other to discuss homework, social events, or the evening's plans.

There is a final, but critically important, consideration in determining how large trunk groups should be. This issue is known as "trunking efficiencies."

Q. WHAT DO YOU MEAN BY "TRUNKING EFFICIENCIES?"

A. For reasons which I will briefly explain below, it turns out that, while the number of trunks that you need in a trunk group to carry a given amount of busy hour traffic definitely increases as the amount of traffic increases, the number of trunks goes up at a ***slower rate*** than the traffic goes up. If the current amount of traffic is carried on a single DS1 (24 DS0s), it will ***not*** require three DS1s to carry three times as much traffic. Instead, it will require, perhaps, only two DS1s. Moreover, this effect continues as the traffic growth get larger, so that ten times as much busy hour traffic will not require anything near a 10-fold increase in the number of trunks. In practical terms, this means that carriers can greatly conserve on the number of trunks they need to establish between two switches, by combining as much of the interswitch traffic as possible onto a single, large trunk group.

Q. WHAT TRUNKING IS AT DISPUTE IN THIS ISSUE?

A. There are several issues. The first has to do with handling incoming (to Qwest) interLATA traffic. The bulk of traffic between Level 3 and Qwest is "local" interconnection traffic. However, Level 3 also has some InterLATA traffic that it carries for IXCs that must be delivered to Qwest customers. Today, Level 3 routes this traffic to 3rd parties (IXCs) for

completion to Qwest. These 3rd party IXCs price this service at relatively high rates, causing this to be an expensive solution for Level 3. Level 3 would like to complete this traffic directly to Qwest. Unfortunately, Qwest wants to require Level 3 to use separate trunk groups for this traffic, rather than simply to deliver this traffic on existing interconnection trunks.

Q. IS LEVEL 3 TRYING TO AVOID PAYING ACCESS CHARGES ON THIS IXC TRAFFIC?

A. Absolutely not. Level 3 agrees that this traffic is subject to access charges, and has language in its proposed agreement that provides for the payment of those access charges. However, for the reasons explained briefly above, it would be technically much more efficient to include this traffic on the same trunk group that Level 3 uses to deliver "local" traffic to Qwest. That would allow Level 3 (and Qwest) to take advantage of the trunking efficiencies discussed above.

Q. WHAT OTHER TRUNKING ISSUES EXIST BETWEEN LEVEL 3 AND QWEST?

A. Qwest seems reluctant to accept incoming IP-enabled traffic (that is, traffic that originated by means of a broadband data connection as opposed to a normal telephone) at all. To the extent that it will accept the traffic, however, it wants that traffic, too, to be on trunks other than the existing "local" interconnection trunks. In addition, Qwest may even want separate trunking for some calls from its customers to ISPs served by Level 3.

Q. IS THERE ANY TECHNICAL REASON TO REQUIRE SEPARATE TRUNK GROUPS FOR LOCAL, INTRALATA, INTERLATA, ISP-BOUND, AND/OR IP-ENABLED CALLS?

A. No. Although various kinds of calls might begin in non-PSTN format, or be transported some or all of the way along their journey in a non-PSTN format (such as IP-enabled), Level 3 delivers all of its traffic bound for Qwest subscribers in standard PSTN circuit switched format and standard SS7 signaling, and receives all traffic from Qwest in that same, standard format. (As I mentioned above, one of the capabilities of our softswitches is precisely to do the necessary conversions from IP to PSTN format and vice-versa). So, all traffic coming from Qwest is obviously in normal PSTN format, and by the time we deliver any of this traffic to Qwest, it is all in that same format as well — no matter what transformations and changes it may undergo at other parts of its journey.

Now, not surprisingly, Qwest and Level 3 have some disputes about the proper charging regime to apply to traffic that might fall into different regulatory categories. But no matter how those disputes might turn out, there is absolutely no technical reason to carry these different regulatory "types" of traffic on different trunk groups. Yet, that is what Qwest is proposing to require.

Q. WOULD IT BE EFFICIENT TO BUILD TWO HIGHWAYS RIGHT NEXT TO EACH OTHER, BOTH GOING TO THE SAME PLACE?

A. No. One large highway is, obviously, more efficient than two smaller highways with the same number of lanes. As noted above, car traffic on a highway behaves in the much the same way as traffic on a telephone

network. The same types of traffic engineering calculations are used to size both. The same types of congestion, blocking and capacity are common to both. Again, though, that is what Qwest's language would seem to require.

Q. WHAT ARE SOME OF THE REASONS WHY A SINGLE LARGE TRUNK GROUP IS BETTER THAN MULTIPLE SMALLER TRUNK GROUPS?

A. As alluded to above, requiring multiple trunk groups along the same path between two switches is unnecessary, inefficient, costly, and can harm network performance. For example, one key problem is that using multiple trunk groups will lower the blocking Grade of Service (GOS), unless additional trunks are installed.

Q. WHY WOULD THE REQUIREMENT FOR SEPARATE TRUNK GROUPS CAUSE LEVEL 3 TO BUILD SEPARATE NETWORKS?

A. To meet the Qwest requirement, Level 3 would need to order, build and provision multiple trunk groups from the Level 3 switch serving the state to each Qwest tandem, and over time to each end office. Essentially, Level 3 would need to build a separate network for each type of traffic that Qwest requires to be split out. Each separate network would be composed of transport facilities and switching facilities between the Level 3 switch to all Qwest tandems and eventually to virtually all Qwest end offices. Over time, this would require needless duplication of both transport and switch facilities, for both Level 3 and Qwest.

Q. WHY IS THIS INEFFICIENT?

A. From a network point of view, it is always preferable to combine as much traffic as possible on single trunk groups. Large single trunk groups are much more efficient than multiple smaller trunk groups. For example, one trunk group with four DS1s will handle much more traffic than two trunk groups, each with two DS1s. To handle the same amount of traffic, the two trunk groups would need to contain 3 DS1s each to have the same capacity. This would require a total of six DS1s to do the same job as four DS1s on one trunk group. "Breakage" of a single trunk group into multiple trunk groups always requires additional trunks to carry the same traffic load with the same blocking grade of service.

Q. EARLIER YOU MENTIONED "BLOCKING GRADE OF SERVICE." WHAT DOES THAT TERM REFER TO?

A. Blocking Grade of Service ("GOS") is the measure of call blocking on a trunk group. Blocking is generally measured at the busy hour and is given as a percent of the calls that are blocked due to insufficient trunk capacity. A standard, acceptable blocking GOS would be 2% end-to-end. This means that for every 100 calls that customers try to make that would be carried on that route, group, two calls will be blocked due to insufficient capacity. When 2% call blocking is desired end-to-end, an allocation is made to various facilities and equipment to achieve the 2%. Typically, a trunk group between two switches is allocated 1% blocking level so that 2% can be maintained end-to-end. This is due to the fact that many calls involve more than one switch and thus more than one trunk group. There are also small probabilities of blocking on digital loop carrier equipment and associated loop transport. (Within the traditional PSTN, you would

1 know that you had encountered blocking on a trunk group when you heard
2 a "fast busy" signal, or a recording telling you that "all circuits are busy.")
3 **Q. WHAT IS THE IMPACT ON BLOCKING GOS WHEN A LARGE**
4 **AMOUNT OF TRAFFIC MUST BE BROKEN DOWN INTO**
5 **MULTIPLE TRUNK GROUPS?**
6 A. If a large trunk group (say, 48 DS0s, or 2 DS1s) is split into multiple trunk
7 groups with the same total size (two groups of 1 DS1 each), the overall
8 carrying capacity of the multiple smaller trunk groups is smaller than the
9 carrying capacity of the original one trunk group. The laws of trunk
10 engineering dictate that the total number of trunk members in multiple
11 trunk groups must be significantly larger in order to carry the same
12 amount of traffic. The effect is like congestion on the highway. One four-
13 lane highway will carry considerably more traffic than two, 2-lane
14 highways. For example, a single trunk group with 48 members (two
15 DS1s) can carry about 15% more traffic than two trunk groups with 24
16 members each.
17 **Q. IS THERE ANOTHER TYPE OF INEFFICIENCY WITH**
18 **RESPECT TO SPLITTING A LARGE TRUNK GROUP INTO**
19 **MULTIPLE SMALLER TRUNK GROUPS?**
20 A. Yes. Earlier I mentioned "breakage." This term is used to describe the
21 problem when facilities with discrete sizes must be divided into smaller
22 facilities. As I noted earlier, the DS1 (24 DS0s, or 24 simultaneous calls)
23 is the smallest normal unit in which trunks between switches are ordered
24 and provisioned. This is because the DS1 is the most common size of
25 "port" on switching and transport equipment. This makes the practical

effect of the inefficiencies of breaking a large trunk group down into two or more smaller trunk groups even worse.

For example, suppose that if a trunk group needs a total capacity of 30 DS0 trunks. Because trunks are ordered and provisioned in DS1 units, two DS1s must be used (that is, 48 DS0s). Even though the need is only for 6 DS0s above the first DS1, two complete DS1s will be established, because the switching and transport gear accepts trunk groups in DS1-sized "chunks."

Now, if this trunk group must be divided to handle two different call types on two different trunk groups, it is quite possible that the ratio between the two call types is not 50/50. If the trunk requirement is larger than a multiple of 24 (even if it is only one trunk member larger – say 25 DS0s) a new DS1 must be provisioned and the associated equipment added to terminate the new DS1. Coupled with the need for additional capacity to maintain the same blocking GOS, this leads to significant increases in the overall number of DS1s needed for a given traffic volume when the trunk groups must be split. Taking this factor and the blocking factor into account, one trunk group with 48 members cannot be replaced with two trunk groups of 24 members. To get the same blocking grade of service using two trunk groups, both trunk groups would need to have two DS1s. So the effect of splitting the large trunk group into two is actually to ***double*** the total number of DS1s needed — to carry the ***exact same amount of traffic!***

Q. WHAT COST ELEMENTS ARE ADDED TO THE NETWORK WHEN MULTIPLE SEPARATE TRUNK GROUPS MUST BE MAINTAINED?

A. In physical terms, to establish a DS1 trunk group between two switches requires, essentially, the following. First, each switch must be programmed to separately identify the traffic bound for the particular trunk group and to direct that traffic to the appropriate "port" on the switch. Second, there must actually ***be*** a trunk port (a separate physical device) available on the switch to accommodate the new DS1 trunk group. The capacity of switches to accommodate new trunk ports is limited; at some point it is necessary to add new switch modules (that contain more ports) in order to add new trunk groups, and, for any given switch, at some point the total number of ports is reached and the only way to establish a new trunk port is to add a new switch.

The same holds true for the transmission medium (in Level 3's case, typically optical fiber) used to carry a DS1 trunk group between Level 3 and Qwest. The DS1 trunk physically runs from the Level 3 switch to a device known as a digital cross-connect system (DCS) – which has its own DS1 ports and port-capacity limits – and then on to the fiber optic terminal (FOT) that actually sends and receives the laser signals used to convey information over optical fiber. The FOT also has its own DS1 ports and port-capacity limits. Adding DS1s, therefore, sooner or later requires the purchase of additional trunk ports on switches, DCSs, and FOTs, eventually requiring that these devices be "grown" or that new

1 switches, DCSs, and/or FOTs be purchased. Obviously, over time this
2 will greatly increase the capital requirements of operating the network.
3 Finally, although obviously much of the operation of a modern
4 telecommunications network is automatic, behind the scenes a large
5 number of people are required to monitor, maintain and operate the
6 system. Provisioning and maintaining additional trunk groups and the
7 resultant facilities requires additional staff time as well.
8 From Level 3's perspective, when it is necessary to incur these
9 costs due to growth in traffic volume, we of course do so. But at the same
10 time, if it is ***not*** necessary to incur these costs in order to carry a given
11 volume of traffic, we obviously do not want to do so. This is why the
12 issue of using efficient trunking arrangements is so important to Level 3,
13 and why we believe that it is entirely unreasonable to allow Qwest to
14 require that traffic be broken down into multiple, smaller trunk groups if
15 there is no technical reason for doing it.
16 **Q. WOULD QWEST FACE THE SAME INEFFICIENCIES FROM**
17 **MULTIPLE TRUNK GROUPS THAT YOU HAVE DESCRIBED**
18 **ABOVE FOR LEVEL 3?**
19 A. Yes. Just like Level 3, Qwest would need to dedicate DS1 ports on its
20 FOTs, DCSs, and switches to the additional DS1 trunk groups made
21 necessary by inefficient, multiple trunk groups.
22 **Q. WHY WOULD QWEST WANT TO IMPOSE SUCH**
23 **INEFFICIENCIES ON ITSELF?**
24 A. I obviously can't say for sure. That said, it is well known among
25 telecommunications engineers that traffic is migrating off the traditional

landline PSTN. Some normal voice traffic is just "disappearing" as end users communicate via email and instant messaging, rather than making telephone calls at all. Some PSTN voice traffic is migrating to wireless, as people use their cell phones to make calls that would otherwise have been made over the landline network. Some PSTN voice traffic (although not as much as Qwest might want the Commission to believe, at least in the short run, as Mr. Gates describes) is migrating to VoIP services such as those offered by Vonage or Skype. Unless Qwest had perfect foresight, it is quite possible that it overestimated its own needs for capacity and could well have over-invested in switch, DCS, and/or FOT capacity. (Of course, since Level 3 is a relatively new and still-growing carrier, Level 3 is not sitting around with excess capacity on its switches, FOTs, etc. Level 3 has to spend capital dollars to meet growing demand.) In that situation, Qwest might see it as advantageous to ***require*** a competitor like Level 3 to use an inefficiently large number of trunks. If Qwest already has the excess capacity on hand — which it would, if total demand for its services was shrinking — then it could impose large capital and other costs on Level 3, with little or no new cost to itself, simply by convincing this Commission that there was some reason to require multiple, inefficient trunk groups.

Q. ARE THERE STILL OTHER POTENTIAL PROBLEMS WITH QWEST'S PROPOSAL?

A. Yes. Taking essentially the reverse of the situation described above, if Qwest does ***not*** have excess capacity, Qwest might actually not be able to add the necessary trunk ports in a timely fashion. This would put an effective limit on the rate at which Level 3 could grow and make

competitive inroads in the market. At least from the perspective of the industry as a whole, this is not hypothetical. As I understand it, in a case within the last year or so, the FCC found that Verizon had violated the Communications Act by reason of having insufficient capacity to permit interconnection with a competitor (Core Communications) to grow. If a true industry giant like Verizon did not invest in enough capacity to handle growth in interconnection requirements, it is of course possible that Qwest would be in the same position.

Q. WILL THERE BE ANY INCREASE IN MISROUTED CALLS IF "LOCAL," "TOLL," AND OTHER "TYPES" OF ARE CARRIED ON A SINGLE, LARGE TRUNK GROUP?

A. No, not at all. Briefly, to determine how to route a call, the switches looks at the first six digits of the telephone number (the "NPA-NXX"). Part of the human staff effort described above in administering trunk groups is properly programming the switch to know that, if the NPA-NXX of the called number on an outgoing call is "208-348," the call gets routed to "Trunk Group XX," but if the NPA-NXX is "208-555," the call gets routed instead to "Trunk Group YY."

Of course, in actual practice it's a bit more complicated than that. For example, if the called number has been ported from its original carrier to a competing carrier, the switch doesn't look at the NPA-NXX of the number that was actually ***dialed,*** it looks at the "NPA-NXX"-equivalent portion of the "Location Routing Number," or LRN. And, if the NPA-NXX in question is subject to "thousands-block pooling," it will be necessary to look not only at the first six digits of the number (the NPA-

NXX), but also at the seventh digit — essentially, the NPA-NXX-X — as well.

But the point is that none of this activity involved in routing a call outbound from Qwest to Level 3, or vice versa, is affected in any way by any regulatory overlay that classifies a call as "local" or "toll" or "intraLATA" or "IP-enabled" or "ISP-bound" or "interstate" or "intrastate." What matters is the dialed number or, for ported numbers the LRN. The rest of the regulatory stuff has literally no impact at all on call routing.[1] The network will have no trouble correctly routing any type of calls, no matter how many are combined on the same trunk group. While there will always be some small numbers of misrouted calls in the network, this number will not increase when these traffic types are combined on the same trunk group.

Q. DOES COMBINING DIFFERENT REGULATORY "TYPES" OF TRAFFIC (SUCH AS LOCAL AND ACCESS TRAFFIC) ON THE SAME TRUNK GROUP RESULT IN AN INCREASE IN THE POSSIBILITY OF FRAUD OR INTENTIONAL MISROUTING OF CALLS?

A. No. Any company can intentionally misroute calls to perpetrate fraud, whether or not traffic is combined on a single trunk group. Dishonest carriers can change the SS7 call identification information to make access

[1] In fact, even if there ***is*** a regulatory requirement to treat some class of traffic differently for ***routing*** purposes, such a requirement is basically impossible to implement unless the requirement can be translated into handling calls with different NPA-NXXs differently. For example, that's how interLATA calls are routed to a customer's presubscribed long distance carrier. Originating ILEC switches contain a list of NPA-NXXs that are "local" to the switch contained in their programming, along with a particular trunk port assigned for outgoing calls to each "local" NPA-NXX. If a customer dials an NPA-NXX that is not on that list, either the call will be sent to the customer's presubscribed IXC or, in areas where "1+" dialing is required for toll calls, directed to a recording saying that the call "cannot be completed as dialed" or some similar message.

1 traffic appear to be local traffic if they so choose. This can be done
2 whether the traffic is put on separate trunk groups or on a single trunk
3 group. Level 3 always pays the appropriate access charges for access
4 traffic and has no intention of changing call information or inappropriately
5 routing calls to avoid access charges. But requiring separate trunk groups
6 to prevent so-called "call laundering" is no more useful or effective than it
7 would be to require banks to provide one copy of everyone's bank
8 statement on plain white paper, and then an extra copy on special yellow-
9 and red-striped paper, be to prevent "money laundering." You can
10 establish such a requirement — obviously at an increased cost — but
11 doing so has nothing to do with preventing the problem at issue.
12 **Q. PLEASE DESCRIBE THE PROCESS BY WHICH PROPER BILLS**
13 **FOR INTERCARRIER COMPENSATION ARE DEVELOPED.**
14 A. Normally billing for intercarrier compensation is accomplished in several
15 stages. First, the SS7 signaling network transmits data about an incoming
16 call, such as the identification of the carrier delivering the call, the calling
17 number, the dialed number, the LRN if the dialed number has been ported,
18 etc. The switch receiving the traffic generates a record, known as an
19 "AMA" record in traditional PSTN circuit switches, that records this
20 information, along with other information such as the time (to the second)
21 that the call starts and stops, perhaps the specific trunk on which the call
22 was received, and other switch-specific information. These "AMA"
23 records are then processed through what is known as a "mediation" system
24 into industry-standard "EMI" (or "electronic message interchange")
25 records. The EMI record basically takes the AMA or equivalent data and

puts it into an industry-standard format (sometimes known as a "CDR," or "call detail record"). These records are then run through a billing system that applies programmed logic to the data in the records to determine whether, how much, and who to bill.

This process normally occurs on a call-record-by-call-record basis. So, it doesn't actually matter, for LEC-to-LEC traffic exchange, whether the traffic on a given trunk is subject to different charging regimes or the same; each call is (or can be) rated individually.

Q. IS THAT THE WAY ALL CARRIERS ACTUALLY BILL FOR THIS TYPE OF TRAFFIC EXCHANGE?

A. No. First, some carriers have less capable mediation or billing systems than others, so not all carriers are capable of performing the call-by-call review. Another carrier might have a bill-and-keep arrangement with respect to much or all of the traffic exchanged with interconnected LECs, and so not need to go through the call-by-call process. Second, carriers can establish a Percent Local Use (PLU) and Percent Interstate Use (PIU) for calls on a trunk group, updating the information periodically to assure that it is correct. Basically, instead of reviewing the call-by-call data on a monthly basis for billing, all or a sample of a month's traffic is reviewed periodically to determine what percent of traffic falls into which billing category. In this regard, Level 3 has offered to track the Percent of IP Use (PIPU) to measure the percent of IP-Enabled traffic that is exchanged between the parties.[2] This information can be audited if there is any doubt as to its validity. These two methods are being used today by various

[2] See Intercarrier Compensation Sections 3.2.2.4 -3.2.2.5, Issue IC-2.See Intercarrier Compensation Sections 3.2.2.4 -3.2.2.5, Issue IC-2.

CLECs and ILECs to manage the combining of different traffic types on trunk groups.

Q. HOW DOES LEVEL 3 PROPOSE TO CALCULATE THE PLU FACTOR?

A. I describe the process in detail below in Section XI of this testimony, "Determination of Traffic Types." This process is being used by Level 3 in all of the Bell South states, SBC states, and Verizon states, and similar processes are used by other CLECs with the ILECs.

Q. HAVE OTHER COMPANIES DEALT WITH THE BILLING ISSUES ASSOCIATED WITH COMBINING DIFFERENT TYPES OF TRAFFIC ON INTERCONNECTION TRUNKS?

A. Yes. Other CLECs have been using factors in many states for more than five years. Several IXCs with CLEC affiliates combine different traffic types on FGD trunks with Qwest, using PLU to handle carrier billing. These IXCs started off with an FGD network for the purpose of exchanging intrastate and interstate access traffic. As their business strategy changed and these carriers decided to enter the local market, they made use of the FGD network that was already in place to handle the exchange of all their traffic. Similarly, Level 3 started out with a "local" network established for the purpose of exchanging "local" traffic. As described above, there is no technical or "billing"-related reason that Level 3 should not be able to use those same trunks for terminating FGD and other types of traffic. In this regard, the distinction between local and toll services is fast disappearing. Level 3's customers are demanding packaged services that include the termination of intrastate and interstate

1 access traffic. Level 3 would like to be able to make most efficient use of
2 the network that is already in place today. Qwest and Level 3 will be able
3 to do so if Qwest is required to allow the exchange of all traffic over the
4 existing "local" trunks.[3]

5 **Q. DOES QWEST USE A PLU FOR DISTINGUISHING LOCAL AND**
6 **INTRALATA TOLL TRAFFIC ON INTERCONNECTION**
7 **TRUNKS?**

8 A. Yes. That is, Qwest already permits the combination of local and
9 intraLATA toll traffic — normally subject to different charging regimes
10 — on a single trunk group, and uses PLU factors for determining how
11 many minutes are subject to access charges and how many are subject to
12 reciprocal compensation. In other words, even Qwest allows mixed traffic
13 on the same trunk group today. To distinguish the traffic that is subject to
14 reciprocal compensation from the traffic that is subject to intrastate access,
15 it provides on a quarterly basis, a PLU factor to the terminating carrier.
16 Likewise, it expects any carrier originating traffic that terminates to Qwest
17 to provide a PLU factor to Qwest. It is neither technically challenging nor
18 in any way unreasonable to extend that process to include a PIU or other
19 factors to determine the distribution of traffic among whatever different
20 regulatory traffic "types" might end up existing under our final contract.

[3] Qwest calls these "LIS" trunks, for "Local Interconnection Service," but that is actually a misnomer. Qwest and Level 3 are co-carriers; although each is responsible for the transport and termination of traffic delivered by the other, Qwest is not providing Level 3 a "service" in the normal sense, any more than Level 3 is providing Qwest a "service." Rather, in order for each carrier to provide full "service" to its respective customers, the two carriers enter into interconnection arrangements.

Q. HAS LEVEL 3 AGREED TO SEND ONLY "LOCAL" TRAFFIC TO QWEST'S "LOCAL ONLY" TANDEM SWITCHES?

A. Yes. Most Qwest switches are currently carrying both local and toll traffic. These switches can easily handle trunk groups that carry both local and toll traffic. Where Qwest has a tandem switch that currently only handles local traffic, however, as an accommodation, Level 3 has agreed to send only local traffic to such switches. However, I would emphasize that Level 3 agreed to this not because it thinks this is good network engineering. To the contrary, for all the reasons discussed above, it is not sensible to separate traffic into different types and trunk groups if not required. Because the amount of affected traffic is small in this case, however, Level 3 chose not to continue to dispute with Qwest on this topic in the limited circumstance of "local only" tandems.

Q. HAS LEVEL 3 AGREED NOT TO SEND TOLL TRAFFIC THAT DOESN'T TERMINATE TO QWEST END USERS OR UNE/RESALE CUSTOMERS TO QWEST END OFFICE SWITCHES?

A. Yes. Qwest has told Level 3 that is expects difficulty with Independent Telephone Companies ("ITCs") and other CLECs that expect to receive recording data from the Qwest tandem switch when an IXC terminates traffic to such other carrier's through Qwest's network. Because Qwest has chosen to configure its so-called "LIS" trunks without the same recording capabilities as FGD trunks have, Qwest will not be able to provide such data to these carriers. This would create a situation in which these 3rd party LECs would receive traffic as to which they would

legitimately be entitled to charge access rates, but as to which they would have inadequate information to actually render an access bill. To avoid this situation, for the relatively limited amount of IXC traffic that Level 3 will deliver to Qwest for further delivery to ITCs or other CLECs, Level 3 has agreed to send such traffic only to Qwest's toll tandems where adequate recordings for the 3rd parties can be made. Again, Level 3 is making this accommodation to Qwest because its impact is relatively small. The fact that we are doing so does not mean that it would be sensible to generally carve out different types of traffic for separate trunking, for all the reasons discussed above.

Q. QWEST STATES THAT LEVEL 3 MUST DESIGN ITS INTERCONNECTION TO COMPORT WITH QWEST'S EXISTING NETWORK AND NOT INTERCONNECT IN A MANNER THAT RISKS EXHAUSTING QWEST TANDEMS. ARE THESE STATEMENTS JUSTIFIED?

A. Qwest is completely wrong to suggest that Level 3 is or should be required to design any part of its network to mirror, match, duplicate, or conform to Qwest's network design. Put aside the fact, as discussed above, that Level 3 is a new carrier without any need (yet) for a ubiquitous network such as Qwest's; and put aside the fact that Level 3's customer base differs from that of Qwest, which would lead to a different network design. The fact is that network technology has changed so much since Qwest started deploying its network in Idaho that if ***Qwest*** were building a new network today, to serve its own existing customer base, ***Qwest itself*** would not re-generate the same network that it actually has today. It makes no

engineering or technical sense to suggest that there is anything sacrosanct, or even particularly efficient or optimal, about Qwest's existing network. There is not.

Now, that said, Qwest does have a legitimate technical concern that neither Level 3 nor any other interconnected carrier should deliver such large amounts of traffic to Qwest's tandem that the capacity of the tandem itself would be overloaded. It is standard practice in the circuit-switched telephone industry to establish direct trunks between switches when the level of traffic between them exceeds a certain level. Given this, Level 3 is perfectly willing to work with Qwest to avoid the problem of tandem overload by jointly engineering separate trunk groups that go directly between Level 3 and those Qwest end offices with enough traffic to justify the direct trunking. These are known in the industry as "Direct End Office Trunks," or DEOTs.

Q. DOESN'T ESTABLISHING DEOTS LEAD TO THE CREATION OF MULTIPLE TRUNK GROUPS, WHICH YOU HAVE TESTIFIED ABOVE ARE INEFFICIENT?

A. To a certain extent, yes. However, all network engineering involves making tradeoffs. There is, to coin a phrase, no such thing as a free lunch. While looking at trunking alone, it is more efficient for both Qwest and Level 3 to connect their networks with a single, massive trunk group from Level 3 to Qwest's tandem, that requires that all traffic between the parties be switched by Qwest twice, once at the end office, and once at the tandem. In addition, it requires Qwest to make use of three trunk ports for all traffic between the networks: one at the "Level 3" side of Qwest's

tandem, to accept incoming traffic and send outbound traffic to Level 3; another at the "Qwest Network" side of Qwest's tandem, to connect the tandem to trunks bound for particular end offices; and then a third trunk port at the end office itself, to connect that end office to the tandem. With DEOTs, even though the total number of trunks will be higher than would be the case in a single massive trunk group, Qwest is able to avoid the use of tandem switching and to cut down on the total number of trunk ports it has to use. Level 3 is certainly willing to work with Qwest to permit Qwest to obtain those network efficiencies.

Q. GIVEN THESE TECHNICAL CONCERNS WITH ESTABLISHING MULTIPLE TRUNK GROUPS ALONG THE LINES QWEST IS SUGGESTING, HOW DO THE KEY TECHNOLOGY POLICIES YOU IDENTIFIED EARLIER IN YOUR TESTIMONY RELATE TO THE QUESTION OF ESTABLISHING MULTIPLE TRUNK GROUPS TO THE SAME QWEST SWITCH OR SWITCHES?

A. From a high-level policy perspective, on this issue, Qwest is trying to drag Level 3 back into the past. Level 3 proposes to deliver traffic to each Qwest switch on a single, efficient, combined trunk group. Qwest, however, is not concerned about technical efficiency. Instead, because it thinks that different kinds of traffic fall into different regulatory buckets, it wants those types of traffic sent on separate trunk groups. This is anticompetitive, because, as described above, it will impose needless costs on Level 3. It is also contrary to the development and encouragement of new services, in that it forces Level 3 to classify traffic in accordance with the old, existing service classifications with which Qwest seems most

comfortable. And, particularly in the case of VoIP traffic (addressed below), the inefficiencies imposed by Qwest's suggested requirement of separate trunking for different "types" of traffic will act to directly suppress the development of this exciting Internet-based innovative service.

Q. IN ORDER TO BE PERFECTLY CLEAR, HOW DOES THE ISSUE OF ESTABLISHING SEPARATE TRUNK GROUPS FOR DIFFERENT TYPES OF TRAFFIC RELATE TO THE QUESTION OF ESTABLISHING NEW, PHYSICAL POINTS OF INTERCONECTION — THAT IS, NEW TRANSMISSION FACILITIES — BETWEEN LEVEL 3 AND QWEST?

A. As noted above, physical transmission facilities and trunk groups are two different things. One way to look at it is to consider a physical highway running between two cities. Looking just at the one city-to-city route, the transmission "facility" is the physical slab of concrete and asphalt that the cars and trunks will drive on. Setting up a trunk group is analogous to drawing lane lines on the concrete, indicating that some lanes are for traffic going northbound, some for traffic going southbound, some for trucks only, some for passenger cars only, etc.

As between two communications networks, a single, high-capacity fiber optic facility between the two networks can easily contain dozens of different trunk groups. One trunk group might be traffic directed to the ILEC tandem. Another trunk group might be traffic directed to a specific ILEC end office switch. Still another trunk group might carry traffic bound for the ILEC's operator service network. But whatever might lead

the carriers to establish different trunk groups (such as traffic bound for different switches), that is a totally separate question from any need to establish different physical facilities linking the carriers' networks. The idea behind setting up a physical "meet point" between two networks is that each carrier is responsible for all the switching, transmission and related facilities on its side of the meet point. The two carriers then cooperate with each other to establish whatever trunk groups need to be established, ***carried over that meet point interconnection facility.***

Given this, it is important to recognize that the establishment of separate direct end office ***trunks*** does not at all mean that it makes sense to establish any separate ***facilities*** linking Level 3 with Qwest end offices. To the contrary, the ***facilities*** to carry the trunks from the Qwest tandem location (where Level 3 will normally physically interconnect in a LATA) to the affected end office already exist; they are the same facilities (normally optical fiber) that carry the traffic from the tandem to the end office before the DEOT is established. The new DEOT trunk group will ride the same fiber optic interconnection facility between Qwest and Level 3 that all other traffic rides, at the parties' single POI in the LATA.

All that said, it makes no sense at all to suggest, as Qwest does, that putting local, toll, or other types of traffic on a single combined trunk group will risk exhausting Qwest tandems in any way. What avoids exhausting Qwest's tandem is establishing DEOTs to carry ***all*** the traffic from Level 3 to a Qwest end office on an efficient basis. Level 3 is willing to do this. Simply provisioning several inefficient trunk groups of separate "types" of traffic to Qwest's tandem will not only not help with

tandem exhaust, it will cause the tandem to exhaust its trunk port capacity more rapidly than keeping the different types of traffic together in the same trunk group. Again, the solution to tandem exhaust is DEOTs — which separate traffic out based on ***destination switch*** — not separate trunk groups for different "types" of traffic.

Q. HOW DO THE KEY TECHNOLOGY POLICIES YOU IDENTIFIED EARLIER IN YOUR TESTIMONY RELATE TO THE PROSPECT OF LEVEL 3 BEING REQUIRED TO ESTABLISH ADDITIONAL PHYSICAL POIs — THAT IS, ADDITIONAL PHYSICAL TRANSMISSION FACILITIES BETWEEN LEVEL 3 AND QWEST?

A. Each of the three pro-technology policies identified above supports allowing Level 3 to interconnect by means of a single POI until and unless Level 3 itself believes additional POIs are needed. For this issue, the primary policy is the promotion and encouragement of competition. Although Level 3, as noted above, has invested billions of dollars in its advanced, fiber-optic, IP-based network, that does not mean that it can or should be called upon to mirror or duplicate the local network architecture of the ILECs with which it interconnects and competes. To the contrary, it would be extraordinary to conclude that a competitor like Level 3 would have any rational interest in duplicating the incumbent's network architecture.

The essence of Level 3's local business plan is to identify customers with high levels of Internet-based communications, either incoming, outgoing, or both, and provide highly efficient links for such

customers both "upstream" to the Internet itself and "downstream" to the PSTN. Level 3 has no independent business reason — and certainly no engineering reason — to try to re-create Qwest's local network architecture. Instead, what Level 3 primarily needs from Qwest in order to serve its customers is efficient, seamless interconnection between Level 3's network and Qwest's network. It seems plain that efficient interconnection of this type will be degraded if Level 3 is subject to regulatory obligations to establish multiple physical interconnections with Qwest, above and beyond those that are necessary to Level 3's business and that Level 3 will put into place itself.

As I note elsewhere in my testimony, Level 3 is not averse to establishing multiple physical points of interconnection in a LATA when traffic levels and other factors so warrant; but ***requiring*** Level 3 to interconnect at multiple points on Qwest's network really boils down to punishing Level 3 — in the form of needless mandated capital expenditures — for not having the same network, the same customer base, and the same business plan as Qwest. This is contrary not only to the policy of encouraging competition, but also to the policy of encouraging the deployment of new, innovative services and network architectures. Clearly, as a policy matter, Qwest is simply wrong in insisting that Level 3 should have to establish more than one physical POI within a LATA.

Q. WHAT IS LEVEL 3 ASKING THIS COMMISSION TO DECIDE ON THIS ISSUE?

A. Level 3 is asking this Commission to rule that Qwest must allow Level 3 to use single interconnection trunk groups between the carrier's switches

instead of multiple trunk groups, using PLU, PIU and PIPU for carrier compensation and billing purposes. This will preserve network efficiency, maintain reasonable call blocking standards, and minimize the trunking and switching equipment both parties need for interconnection. The language that Level 3 is proposing for this issue is fair and balanced and will allow the efficient use of trunks by both companies.

IV. ISSUE 5: ESP Traffic - VoIP TrafficStatement of the Issue: Whether QWEST may prohibit Level 3 from utilizing local interconnection facilities to terminate Internet-enabled traffic, specifically for VoIP traffic.[4]

Q. WHAT IS INTERNET-ENABLED TRAFFIC?

A. Internet-Enabled traffic is meant to be a broader term for Enhanced Service Provider (ESP) traffic. Internet-Enabled traffic includes VoIP and other forms of enhanced communications capabilities made possible by the Internet and IP technology.

Q. WHAT IS THE INTERNET?

A. The Internet is an open-ended, network of networks that allows virtually anyone with a computer and a high speed or low speed link to connect to anyone or any business in the world. Historians debate about when the Internet really began. It had its roots in the 1970s and 1980s with research, government and business networks. The "Internet" as such was opened to the public for commercial purposes around 1995. The Internet has grown quickly in less than a decade to include hundreds of millions of

[4] The following paragraphs in the agreement are covered by the testimony in this issue: Interconnection Trunking Requirements Appendix, Section 13.1, Intercarrier Compensation, Sections 3.1, 4.5, 4.7-4.7.2.1, 7.1, 7.2, 16.1. DPL Issues ITR 19; IC 1, 4, 8, 9, 14.

computers worldwide and has become a major factor in the global economy.

Q. HOW DOES THE INTERNET DIFFER FROM THE PSTN?

A. The PSTN is a closed network, controlled by large telephone companies, including ILECs, ICOs, IXCs, CLECs and CMRS operators. Access to the PSTN is through a variety of equipment such as dial-up phones, PBXs and more lately cordless phones and cellular phones. All terminal devices on the PSTN must be connected through a switch controlled by one of the phone companies. In fact, to be "on" the PSTN basically means that you have a telephone number assigned by one of the entities noted above. That telephone number is, in effect, a "network address" on the PSTN. In contrast to the PSTN, the Internet is comprised of (among other things) hundreds of thousands of routers and switches owned by tens of thousands of different companies. Routers and switches with new networks attached are added to the Internet every day. Anyone who abides by the standards and protocols used on the Internet can set up a new network and connect themselves or their customers to the Internet without any detailed application process or regulatory scrutiny.

Q. WHAT IS VOICE OVER INTERNET PROTOCOL, OR VoIP?

A. One of the basic protocols of the Internet is called "IP," which means (sensibly enough) "Internet Protocol." Another basic protocol is called "TCP," or "Transaction Control Protocol." There are many, many protocols that work with these basic protocols to define how the Internet performs various functions. These include SMTP (Simple Mail Transfer Protocol, used for email); FTP (File Transfer Protocol, used to allow the

retrieval of files from remote locations); HTTP (Hyper-Text Transfer Protocol, used for transmitting web pages and establishing web links); and many others. All of these different protocols rely on the basic TCP/IP protocols to permit different applications (email, file transfer, world-wide web, etc.) to function on the Internet.

Voice over Internet Protocol, or VoIP, refers to various specific protocols that use the basic TCP/IP system to treat voice communications like any other Internet application. With VoIP, telephony signals, including voice signals, are digitized and transmitted as packets to their destination, just as with an email, streaming video, or any other kind of IP transaction. While the PSTN, as noted above, was designed with a laser-sharp focus on one thing — delivering voice calls — the Internet focuses equally sharply on something very different — delivering data packets, no matter what those data packets might represent. This means that while the PSTN treats data as some unusual thing that requires special treatment, the Internet treats all data the same — even if the data in question happens to represent a voice call. As a result, the Internet essentially destroys the old distinctions between "voice" and "data" that are a standard part of PSTN thinking.

Indeed, because the information associated with any particular application is broken down into packets of bits and does not re-assume its original form (i.e. sound, text or pictures) until it is reassembled at the terminating end, it is virtually impossible to assign the transmission of packets to any particular service classification at any point other than origin or destination. An IP network provider, for example, can be

1 carrying real-time two-way voice packets without actually offering voice
2 service to any end-user customer.
3 When a VoIP call starts with a computer or with some device on a
4 broadband data network (such as a DSL line or a cable modem service),
5 and then is delivered to the PSTN, the protocol, or format, of the
6 transmission has clearly and fundamentally changed. Specifically, a net
7 protocol conversion is required to convert the packetized IP data into the
8 Time Division Multiplexed (TDM) signal that is used on the PSTN.
9 Today, VoIP applications come in many forms. Some resemble traditional
10 phone service, from the point of view of the end user, more than others.
11 But the application as a whole clearly entails changing the form (and
12 perhaps even the content) of the signals at issue. As I understand the
13 relevant regulatory classifications, this means that VoIP is properly
14 viewed as an "information service" rather than a "telecommunications
15 service."
16 **Q. IS VoIP, AS FACILITATED BY LEVEL 3, A**
17 **TELECOMMUNICATIONS SERVICE?**
18 A. No. Level 3 performs many functions for its various customers. For
19 example, Level 3 is a CLEC that performs telecommunications functions
20 for its customers — transmission of traffic between points specified by the
21 customer; assigning telephone numbers and switching calls to and from
22 them, etc. But the service that Level 3 provides to VoIP entities is a
23 translation or protocol conversion service that allows communications
24 between end users of the PSTN and the Internet. This service enables
25 customers to have oral communications over the Internet that may seem to

be the similar to ordinary telephone calls, but in fact are very different. Access to Level 3-provided VoIP is through high-speed data lines, not phone lines with phone numbers; and the terminal equipment is not a telephone, but a computer or computer phone. In this regard, the PSTN itself is not compatible or interoperable with the Internet. Frequently, communications from end users ***to*** the Internet are carried by means of PSTN services — this happens every time a customer dials up a connection to his or her ISP. But the only way that the PSTN can be actually ***connected*** to the Internet in any meaningful sense is by means of a protocol conversion of the signal from Time Division Multiplexing (TDM) on the PSTN to Internet Protocol (IP) for the Internet. Level 3 does a net (or complete) protocol conversion from TDM to IP to enable VoIP users to communicate with the end users of PSTN services.

Q. WHAT IS NET PROTOCOL CONVERSION?

A. Net protocol conversion occurs when the media stream that uses one protocol, native to one particular type of network, is converted into a different media stream using a different protocol on a different type of network. In the case of VoIP, a voice call originating on the PSTN using TDM must be converted to IP by packetizing the data, generating the Internet protocol and sending out the result on the packet network.

Q. IS NET PROTOCOL CONVERSION NECESSARY ON VoIP CALLS BETWEEN LEVEL 3 AND QWEST?

A. Absolutely. All VoIP calls that begin with a Level 3 customer and terminate to a Qwest customer require a net protocol conversion. Likewise, calls that begin with a Qwest customer and terminate to a Level

3 customer also require a net protocol conversion. The reason for this is simple. Level 3 has no PSTN-like, TDM-using, circuit switches on its network. Any and all media streams generated by Level 3 will originate in an IP format and must be converted to TDM for terminating on the PSTN. The reverse is also true. A call originating from a Qwest end user (on the Qwest network) must be converted to IP in order for Level 3 to move the signal through its network. In this regard, Level 3 has had to backwards-engineer its network to be able to facilitate the conversion from TDM based services offered on the PSTN to IP based services offered Level 3's (and others') next generation networks. Finally, Level 3 receives and terminates services to its ESP customers in an IP format – the media originated in TDM on the PSTN is ***not*** converted back to TDM by Level 3 before hand-off to its ESP customers. Thus, a net protocol conversion occurs – media streams go from IP to TDM or vice versa depending on whether Level 3 originates or terminates the call.

Q. DOES NORMAL CELLULAR TELEPHONY REQUIRE A PROTOCOL CONVERSION?

A. No. The cell phone uses modulation and compression techniques in the over the air channel (from the cell phone's antenna to the cell site's antenna), but there is no protocol conversion at the cell site. The signal is demodulated and decoded as any radio signal would be. The cell phone and cell site are merely using an efficient means of radio communication. The cell site operates in the TDM domain and is part of the Public Switched Telephone Network. This is quite distinct from the protocol conversion that occurs between the IP domain and the TDM domain.

Q. WHAT TYPE OF CUSTOMER PREMISES EQUIPMENT IS NEEDED FOR VoIP?

A. VoIP requires specialized Customer Premises Equipment (CPE). Standard Touch Tone or dial pulse phones will not work on a VoIP network, unless they themselves are connected to a computer or similar device that ***can*** handle VoIP format. Special phones, called "SIP" phones ("SIP" stands for "Session Initiation Protocol," and is another Internet-related protocol like FTP, SMTP, and HTTP) can be used for VoIP. These phones have small computers built into them that packetize the voice data and generate SIP messages. Computers with headsets and microphones can also be used for VoIP.

Q. CAN A VoIP CUSTOMER MOVE HIS OR HER SIP PHONE OR COMPUTER PHONE TO DIFFERENT LOCATIONS, WHILE STILL MAINTAINING THE SAME PHONE NUMBER?

A. Yes. A SIP phone or computer phone can be plugged into any broadband connection to receive VoIP service. The end user could send and receive calls from any location with this type of broadband connection. This gives VoIP users a degree of mobility that is not available to users of PSTN service. This type of mobility is coming to be known in the industry as a "nomadic" service, in order to distinguish it from more traditional "mobile" service of the kind provided by normal wireless phones.

Q. IS THERE CURRENTLY ANY WAY TO DETERMINE WHERE A VOIP USER IS LOCATED WHEN THEY MAKE A CALL?

A. No. At present, the geographic location of a VoIP user is indeterminate. They can take a computer from one location to another and make VoIP

calls in either location. Since the "telephone number" is resident in the computer terminal or SIP phone, the calling number is the same whether the device is located in Minnesota or Idaho. Of course, as one might imagine, an indeterminate location makes it challenging for VoIP services to function properly in connection with location-based E911 services. The VoIP industry is working on this issue, and the FCC recently required VoIP services that use normal telephone numbers and that meet certain other criteria to find a way to supply "normal" 911 capabilities to their users.

Q. CELLULAR TELEPHONES CAN BE USED IN ANY LOCATION. DO CELLULAR PROVIDERS AND ILECS HAVE THE SAME PROBLEM WITH GEOGRAPHIC LOCATION AS VoIP SERVICE?

A. No. The location of a cell phone user is always known within a pretty small geographic area. The cell phone registers with all cell sites that are nearby and service is provided by a particular cell site that has a definite location. So if a cell phone user travels from a home location in Minnesota to a location in Idaho, the cell phone system will automatically "know" that they are in Idaho and not Minnesota when they make a call. This is fundamentally different from the VoIP situation, where the geography of a call is not known by the ESP that provides the service or carrier that completes the call. Indeed, the broadband service provider to which a VoIP user connects his or her SIP phone in most cases probably has no idea that the packets going back and forth to that particular node on

the network represent voice communications as opposed to email, web site traffic, or any other Internet activity.

Q. PLEASE DESCRIBE THE LEVEL 3 FIBER AND IP NETWORKS.

A. Level 3 has a large all fiber-optic backbone network that connects 68 markets in the U.S. and 17 markets in Europe, with over 16,000 route miles of fiber in the US intercity network and 3600 route miles in Europe. Exhibit 107 shows the current configuration of the Level 3 fiber network that is installed and operational in the US. Riding on this Fiber Backbone, Level 3 maintains a large IP network that it manages as a separate network, composed of high-speed links and core routers. Exhibit 107 shows the current configuration of Level 3's IP network. The Level 3 IP backbone is run as a private network and is connected to the public Internet via hundreds of peering arrangements at Level 3 Gateways, located in 29 metropolitan areas.[5] Level 3 central office facilities are state-of-the-art facilities in the heart of 70 major metropolitan areas. As noted earlier, these facilities range in size from 50,000 to 550,000 square feet of equipped floor space. This is where both local and intercity fiber networks terminate, where high-speed transmission equipment is situated, and where routers and Softswitch equipment is located.

Q. IS LEVEL 3 A FACILITIES BASED CARRIER IN IDAHO?

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[5] Peering arrangements, as used here, refer to locations at which Level 3 exchanges traffic with other providers of Internet connectivity. Suppose an end user connected to an ISP that uses Level 3 for its Internet connectivity seeks to download information from a web site that is hosted by an ISP that uses some other entity (say, UUNet) for its Internet connectivity. For the information to get from the UUNet network to the Level 3 network, there must be connections between them. That is what the peering arrangements are.

A. Yes. Level 3 has fiber facilities in Idaho as well as Points of Interconnection (POIs) with Qwest. Exhibit 107 shows the fiber route, fiber regeneration facilities, POIs and serving areas in Idaho.

Q. HOW HAS THE LEVEL 3 NETWORK BEEN OPTIMIZED FOR IP?

A. The Level 3 network was designed as a high-speed packet network for carrying IP traffic. It is composed of IP routers instead of PSTN type switches, and all of its facility links are IP-based.

Q. WHAT IS THE BASIC DIFFERENCE BETWEEN THE PSTN AND LEVEL 3'S IP BASED NETWORK?

A. As noted above, the PSTN was designed to carry voice traffic. The PSTN is made up of circuit switches and facilities linking them that carry circuit-based phone traffic. The Level 3 IP network is a data network, not a voice network. It is made up of IP routers and IP data links between the routers.

Q. WHAT TYPES OF CUSTOMERS DOES LEVEL 3 SERVE AND WHAT TYPES OF SERVICES DO THEY USE?

A. Level 3 serves ESPs and ISPs, a subset of ESPs. ISPs require local connectivity to the PSTN and transport and termination services from Level 3, including modem banks and collocation space. ESPs and ISPs use the Level 3 network to pass all types of data, including email, web download services, computer-to-computer data transfer, VoIP and other streaming media. Level 3 also serves cable companies, DSL providers some large enterprise companies and other carriers with transport and termination of VoIP and TDM traffic.

1 **Q. DO LEVEL 3 CUSTOMERS NEED LEVEL 3 TO PROVIDE THEM**
2 **WITH THE ABILITY TO RECEIVE TRAFFIC FROM THE PSTN**
3 **AND TO ORIGINATE TRAFFIC BOUND FOR THE PSTN?**
4 A. Yes. Traditional ISPs need to receive dial-up modem access from the
5 PSTN. Though high-speed service from cable and DSL is becoming
6 increasingly popular, there are still a great number of customers who
7 utilize dial-up modems to access the Internet from the PSTN, in part
8 because the costs of high-speed access to the edge of the network are still
9 too expensive for many customers. Many Qwest customers today call
10 Level 3's ISP customers for dial up Internet service. Level 3's VoIP
11 customers today need Level 3 to complete calls to Qwest end users and to
12 receive calls from Qwest end users bound for Level 3's customers' end
13 users.
14 **Q. CAN YOU GIVE A GENERAL DESCRIPTION OF WHAT**
15 **HAPPENS WITH A VoIP CALL?**
16 A. Exhibit 107 shows a high level depiction of a VoIP connection. In this
17 example an end user sitting at a VoIP terminal requests a connection to a
18 Qwest customer. The VoIP terminal uses a broadband connection to
19 access a VoIP Feature Server ('FS"). The VoIP terminal and the FS
20 negotiate features and functionality, giving the user a wide variety of
21 options. The VoIP terminal initiates signaling protocol that is passed
22 through the FS, through the Level 3 IP network, and on to the Level 3
23 Softswitch and SS7 Gateway. The Level 3 SS7 Gateway turns the SIP
24 messages into SS7 messages and thru the SS7 Signaling Transfer Points
25 ("STP") passes them on to the Qwest network, where appropriate trunking

is negotiated. When this call set up has been completed, the VoIP phone begins passing packetized voice data to the Level 3 IP network. The Level 3 IP network sends the packets on to the Level 3 Media Gateway ("MG"), which completes a net protocol conversion on the packetized voice to turn it into Time Division Multiplex (TDM) signals that are recognized by the Qwest trunks and switches. The Qwest switch sends the call on to the Qwest end user. In this example voice type data is passed between the end users.

Q. DOES THE QWEST NETWORK NEED TO TERMINATE VoIP CALLS IN A MANNER THAT IS DIFFERENT FROM THE TERMINATION OF NORMAL PSTN BASED LOCAL TELEPHONE CALLS?

A. Qwest terminates VoIP calls to its end users in the same manner they would use to terminate regular PSTN based local calls to their end users. There are no extra processes, no additional transport, and no additional switching. This is possible because Level 3 itself has already done the work of converting the IP-format data stream into a TDM-format circuit-switched voice call that Qwest's network is capable of recognizing and handling.

Q. HOW DO THE KEY ISSUES OF TECHNOLOGY POLICY THAT YOU DISCUSSED EARLIER IN YOUR TESTIMONY RELATE TO THE ISSUE OF VoIP CALLS?

A. At a high level, VoIP is an innovative Internet application that turns the voice-centric world of the PSTN on its head by treating voice communication as just another data-oriented application on the worldwide

Internet. From a long-run industry perspective, it represents the triumph of data networks over voice networks. While the PSTN can provide only a limited, low-bandwidth form of data communications (basically, dial-up access to the Internet at 56 kilobits per second), the Internet can do everything the PSTN can do, and more. In my view, it is only a matter of time before the entities that comprise and operate the PSTN convert to IP-based communications, as indeed, Qwest and other PSTN entities are already beginning to do.

One of the features of the Internet is that distance and location are largely irrelevant. As the FCC has noted, the contents of a single web page can come from a variety of different servers in a variety of different locations. Most of us familiar with modern business travel have learned that our email can reach us anywhere, either downloaded to a computer in a hotel room by means of now-ubiquitous broadband connections offered by business hotels, or to wireless devices such as a Blackberry.
VoIP is an Internet application first and a voice application second. By this I mean that VoIP partakes in the distance-insensitive, location-insensitive characteristics of Internet applications. No matter what telephone number might be assigned to a VoIP customer (if any number is assigned at all), the customer might be participating in a call from next door or from around the world.

It is obviously challenging from a regulatory perspective to figure out what to do with VoIP traffic. The FCC has a number of ongoing proceedings trying to sort it out. But one thing is clear: whatever VoIP is, it is not traditional "telephone toll service," where the end user makes a

call from some fixed location, completes it to some distant location, and is charged a separate toll charge for the privilege. In both economic and technical terms, VoIP calling is *sui generis.*

In these circumstances, the choice between assessing traditional access charges or lower and more economical reciprocal compensation rates on this traffic should actually be very clear. This is a new and innovative service that we should all want to encourage. That means that we should impose the lowest reasonable charges on it, when it needs to interface with the PSTN. That means that as a policy matter this traffic should be subject to reciprocal compensation rates, not access charges.

Basically, all three of the policies I articulated at the beginning of my testimony point to this same conclusion. Permitting VoIP traffic to be terminated at reciprocal compensation rates will encourage competition. VoIP is exactly the kind of new and innovative service that we should be trying to encourage, so it should not be subject to high access charges when lower reciprocal compensation rates provide adequate compensation to Qwest. And, VoIP is the latest innovative service to arise from the Internet, which should be encouraged for independent policy reasons. As a policy matter, therefore, VoIP traffic should be subject to reciprocal compensation, not access charges.

XI. Determination of Traffic Types

Q. WHAT ISSUES MUST BE RESOLVED FOR THE PROPER DETERMINATION OF TRAFFIC TYPES?

A. First, in order to efficiently combine traffic on single interconnection trunk groups, a Percent Local Use must be calculated to determine traffic types

for billing. Second, Qwest is proposing a new, technically infeasible method of determining whether traffic is local or toll.

Q. HOW DOES LEVEL 3 PROPOSE TO CALCULATE THE PLU, PIU AND PIPU FACTORS?

A. Level 3 maintains local calling area tables as does Qwest. Over a given period of time, Level 3 can collect all call data on calls exchanged between the parties. Once this data is collected Level 3 will, per industry standard, calculate and report the Percent Interstate Usage (PIU). The remaining traffic is a combination of local and Intrastate traffic. Level 3 will then once again compare the remaining call data with call tables and from this calculation determine the PLU as the percent of local traffic compared to the percent of intrastate traffic. So, by first determining the percentage of interstate traffic from the total traffic and then determining the local traffic from the remaining traffic, you end up with the traffic that is intrastate toll and the traffic that is local. For IP-Enabled traffic, Level 3 will create a Percent IP Use (PIPU) for both originating and terminating traffic. This will allow Qwest and Level 3 to properly compensate each other for IP traffic. Alternatively, Level 3 has proposed to attach an Originating Line Identifier (OLI) code to the call record to identify calls that originate as IP-Enabled traffic.

Q. WHAT IS LEVEL 3'S PROPOSAL FOR THE USE OF THE OLI FIELD IN THE IDENTIFICATION OF IP-ENABLED TRAFFIC?

A. The OLI field is part of the SS7 protocol. It is currently used to identify calls from payphones, from prisons and for other purposes. Level 3 would like to use the OLI field to identify IP-Enabled traffic. It is reasonable to

assume that IP-Enabled traffic may be handled differently for purposes of compensation over time; thus, the companies need a way to identify IP-Enabled calls. Level 3 can identify IP-Enabled calls and can set a unique identifier in the OLI field for each IP-Enabled call. This would help Qwest to identify the traffic if they so choose. Level 3 is offering to mark the OLI field for each IP-Enabled call so that Qwest can track IP-Enabled traffic.

Q. IS THERE A DISPUTE OVER THE USE OF THE OLI FIELD FOR THE IDENTIFICATION OF IP TRAFFIC?

A. There is currently no guideline or standard that calls for the use of the OLI field in SS7 messages for the identification of IP traffic, though this is one of the mechanisms that is being reviewed nationally. Qwest is reluctant to commit to the use of the OLI field, and a particular identifier, before national guidelines are set. Level 3 believes the OLI field is an excellent way to identify IP traffic.

Q. IS THERE PRECEDENT IN THE INDUSTRY FOR USING OPTIONAL SS7 FIELDS OR UNUSED IDENTIFIERS BEFORE NATIONAL GUIDELINES ARE SET?

A. Yes, there is precedent in the industry for carriers to agree on the use of optional or unused SS7 fields and codes and billing format fields and codes for legitimate business uses. SBC, for example, does this in many areas of billing, where they have customized billing formats for their own purposes and now ask carriers who exchange bills with them to use the customized formats with the optional fields. For example, my understanding is that SBC wants CLECs to use what are known as

"Category 92/99" records. The use of Category 92/99 records is entirely unique to SBC's Southwest region.

Q. IF LEVEL 3 PROVIDES QWEST WITH PIPU FACTORS FOR THE COMPENSATION OF IP TRAFFIC, IS THERE ANY NEED FOR THE IDENTIFICATION OF IP TRAFFIC WITH THE OLI FIELD?

A. Not really. The use of PIPU will allow the companies to correctly compensate each other for IP traffic without the use of the OLI field. The OLI field identifier for IP traffic is only needed if the companies want to track every IP call. The PIPU factor makes such identification unnecessary.

Q. CAN LEVEL 3 ACCURATELY CALCULATE THE PLU, PIU AND PIPU?

A. Yes. The calculation of PLU, PIU and PIPU is accurate and can be used for billing purposes on traffic that is originated by Level 3. Qwest can perform the same calculations on the calls that it originates. Level 3 can create PIPU for both originating and terminating traffic, as is discussed below in our proposed contract language.

Q. DOES BELLSOUTH HAVE A PROCEDURE FOR ADMINISTERING PLU WITH LEVEL 3 AND OTHER CLECS?

A. Yes. BellSouth has agreed to allow Level 3 to combine different traffic types on interconnection trunks, and they have established a procedure for administering the PIU and PLU. I am including the Bell South procedure for PLU below for comparison:

PLU – Percent Local Usage

This factor is the percentage of intrastate terminating usage that is categorized as Local Jurisdiction. For purposes of this guide the total intrastate usage includes intrastate local usage and intrastate non-local usage. The local jurisdiction is applicable to Competitive Local Exchange Carriers (CLECs) that are terminating local traffic from their network to the BellSouth network. CLECs that totally utilize resale or unbundled network elements to provision local services are not required to report PLU factors. Interexchange Carriers that do not terminate local traffic as a CLEC are not required to report PLU factors. The local jurisdiction is normally defined per Local Interconnection contractual agreements and is calculated as follows where MOUs are billed minutes of use: *Total Local MOUs [divided by] Total Intrastate MOUs.* The total intrastate minutes can be determined by multiplying the total minutes by (1- PIU). Therefore the PLU may also be calculated as follows:

Total Local MOUs [divided by] (Total MOUs) x (1-TPIU)

This factor is calculated on a statewide basis by Access Carrier Name Abbreviation (ACNA).

Q. DOES LEVEL 3 HAVE CONTRACT LANGUAGE THAT IT IS PROPOSING FOR THE CALCULATION OF PLU, PIU AND PIPU AND FOR THE TRANSMISSION AND ASSURANCE OF ACCURACY OF THESE MEASURES?

A. Yes, Level 3 is proposing contract language for definition and calculation of PLU, PIU and PIPU as well as language for the transfer and verification of these traffic factors on a monthly basis. That language is contained in Level 3's proposals for Section 7 of the Interconnection Agreement.

Q. DO THESE CONTRACT PROVISIONS ADEQUATELY CODIFY THE ACCURATE COLLECTION OF DATA, CALCULATION OF FACTORS, EXCHANGE OF FACTORS AND VERIFICATION BY THE PARTIES THAT IS NECESSARY FOR PROPER BILLING OF CALLS?

A. Yes. I am not an attorney, but I can read and use the English language. Based on a review of the attached contract provisions, it seems clear that they spell out the responsibilities of Level 3 in generating accurate factors and Qwest's right to verify and audit the results. By using these procedures, the companies can bill each other for access charges and reciprocal compensation for all types of traffic flowing over the interconnection trunks.

Q. **HOW DO THE TRAFFIC CALCULATIONS WORK WHEN INTERCONNECTION TRUNKS CARRY LOCAL, INTRALATA, INTERLATA AND IP TRAFFIC?**

A. The calculation of factors is spelled out in the language contained in Traffic data is collected for one month. When the traffic is evaluated to calculate the factors, first the IP-Enabled traffic is taken out and its percentage calculated. The Level 3 network can determine whether an originating or terminating call is IP-Enabled or not by looking at how the calls is originated or terminated (end points can be certified as IP or TDM). When the call is IP originated the SIP signaling will reflect that, and one of the SS7 call set up message parameters (OLI) is set to a particular value (65) to flag the call as enhanced to Qwest. From this process PIPU is tabulated. Next, interstate traffic is separated from

intrastate traffic by calculating the PIU factor. This is done by examining call records against a database that can tell whether the calling number and the called number are in the same state. Phone numbers are traditionally associated with a geographic area (rate center). Rating of TDM based services is done based on the geographic assignment of the phone numbers. If the terminating phone number is associated with a rate center that is outside of the state that the originating phone number is associated with, then the call is rated as interstate and the call counts towards the calculation of PIU. Finally, the PLU factor is calculated on the remaining traffic by using a state specific database that looks at whether the calling number and the called number are associated with rate centers in the same applicable local calling area. This is a simplified description of the process that is used to put traffic in the correct buckets for proper compensation. The creation of PLU and PIU factors is a process that is done throughout the industry. Level 3 is leading the industry in the ability to create the PIPU factor.

Q. IS THERE A BASIC DISPUTE BETWEEN QWEST AND LEVEL 3 ON HOW TO DETERMINE WHETHER TRAFFIC IS "LOCAL"?

A. Yes. As I understand it there is a fundamental disagreement between the parties with respect to what traffic is properly characterized as "local" and what is not. I recognize that there are legal and policy aspects to this disagreement. However, I will relate the technical aspects of this dispute. That said, the dispute is basically this: Level 3 contends that since the only thing the PSTN "knows" about a call is the originating and terminating telephone number, the status of traffic as "local" should be determined

1 based on the geographic area associated with the telephone numbers of the
2 calling and called parties. Qwest, by contrast, seeks to change that
3 traditional arrangement and to attempt to assess the status of a call as
4 "local" or not based on the actual physical location of the calling and
5 called parties.

6 **Q. WHAT IS QWEST'S POSITION ON HOW TO CHARACTERIZE**
7 **TRAFFIC AS "LOCAL" OR NOT?**

8 A. As noted, Qwest maintains that the definition of a local call should be
9 changed to reflect the geographic location of both the calling and called
10 party premises as opposed to the originating and terminating phone
11 numbers that have traditionally been used.

12 **Q. DOES LEVEL 3 AGREE WITH THIS NEW METHOD?**

13 A. No. There are a number of technical problems with the method that Qwest
14 is promoting.

15 **Q. HAS THE CUSTOMER PREMISES LOCATION BEEN THE**
16 **DETERMINING FACTOR IN THE DEFINITION OF A LOCAL**
17 **CALL IN THE PAST?**

18 A. No. As I described above in connection with routing calls, the PSTN uses
19 the calling party's number and the called party's number to determine if a
20 call is a local call.

21 **Q. DO LOCAL SWITCHES KNOW THE LOCATION OF THE**
22 **PARTIES WHEN A CALL IS MADE?**

23 A. No. Circuit switches have no way of knowing the geographic location of
24 the calling or called party end user. The switch is programmed with a list
25 of which numbers are "native" to its area and treats calls to and from such

numbers accordingly (i.e., it routes them on trunks to other switches to which it is connected, based on the NPA-NXX dialed). Calls that it recognizes as "toll" are routed to the caller's presubscribed IXC. Older circuit switches have a limited geographic range within which it can serve end users and maintain its quality standards. Before Local Number Portability ("LNP") and number block pooling, a process by which 10,000 number NPA-NXXs blocks are divided across multiple carriers and switches in increments of 1000 number blocks (NPA-NXX-X) to make more efficient use of numbering resources, each phone number assigned from a given circuit switch fairly reasonable correlated to the geographic location of the end user. This is simply because the phone number can only be assigned to end users within that limited geographic range from the circuit switch. With the introduction of newer technology switches, soft-switches and now VoIP those distance limitations are fading, phone numbers can be assigned to end users anywhere within the country or world, and switches have no way of knowing the geographic location of the end user.

Q. HOW ARE CALLS ROUTED IN THE PSTN?

A. Local calls are routed between switches according to the routing tables in each switch. Depending on the number dialed (putting aside number portability), a switch either handles a call entirely on its own (such as a call between next-door neighbors); or it sends the call off to some other switch by routing it outbound on a particular trunk port. Toll calls — that is, calls carried by IXCs — are routed according to the Local Exchange Routing Guide (LERG). The LERG is a database that identifies switches

1 and numbers associated with those switches, based on the NPA NXX
2 codes of the North American Numbering Plan (NANP), as well as specific
3 physical locations at which traffic bound for particular switches may be
4 delivered. Thus, for example, in the normal course within the PSTN, the
5 LERG would indicate that a call to a number within the "208" NPA
6 should be delivered to a particular carrier, at a particular location in Idaho.
7 Which carrier and which location will depend on the "NXX" of the dialed
8 number. Switches within a local calling area know which numbers are
9 associated with the local calling area and which numbers are not.
10 **Q. SO CALLS BETWEEN TWO LOCAL NUMBERS ARE TREATED**
11 **AS LOCAL CALLS?**
12 A. Yes. As noted above, each end office switch has a table of NPA-NXXs
13 that the particular switch views as "local." For all such NPA-NXXs, the
14 switch has to make only one decision: "Is this call 'mine' or do I need to
15 send it to some other switch?" If the dialed number "belongs" to the
16 originating switch, as noted above, the call stays there. But if the dialed
17 number "belongs" to some other switch, the only thing the originating
18 switch needs to know is which trunk port to send the call out on.
19 Note that, from this network perspective, the only truly "local" calls are
20 calls that begin and end in the same physical switching device. Long ago,
21 however, retail local calling plans grew to include customers served by
22 many different switches. As a result, what constitutes a "local" call for a
23 retail customer is not really a technical matter at all. It is simply a retail,
24 marketing decision by the originating carrier. From a technical
25 perspective it is essentially an arbitrary decision which NPA-NXXs to

include on the programmed list of "local" calls and which to exclude (which means, usually, that the customer has to dial a "1" before the NPA-NXX-XXXX in order to complete the call).

Q. FROM A TECHNICAL NETWORK PERSPECTIVE, IS THERE ANY LIMITATION ON THE DISTANCE THAT A "LOCAL" CALL CAN TRAVEL, THE SIZE OF A "LOCAL" CALLING AREA, OR THE NUMBER OF CUSTOMERS IN A "LOCAL" CALLING AREA?

A. None at all. And, in fact, the size and scope of "local calling areas" varies greatly from place to place around the country. Some states have large local calling areas; others have small local calling areas. Again, from this perspective, the technical network personnel have no basis to care one way or another. The carrier's marketing and/or regulatory personnel just have to tell the engineers which NPA-NXXs to include on the "local" list for any given switch. The originating switch does not "care" (in the sense of doing anything at all technically different) where it is actually sending a "local" call to a number served by some other switch; and the terminating switch does "care" (in the same sense) where a "local" call is coming from. These are retail marketing questions, not technical questions.

Q. HOW WOULD SWITCHES IMPLEMENT THE QWEST IDEA OF USING THE GEOGRAPHIC LOCATION AS THE DETERMINATION FOR A LOCAL CALL?

A. I have no idea. A switch has no way of storing information regarding the premises location associated with a phone number assigned to that switch, and no way of receiving or storing information about the premises location

assigned to a phone number calling someone served by that switch. The SS7 protocol that sends information between switches for call set-up and billing purposes does not have any parameters to identify the premises locations of calling or called parties. I have asked engineers that have worked in switch design for 25 years and no one has ever heard of a feature that would store the geographic location associated with a phone number in the switch or in any peripheral that is accessible by a switch. If Qwest were to design such a feature in a peripheral device, it would no doubt be expensive to implement since each call would need to reference a database, and the database itself would need to be created and maintained. As I pointed out above, moreover, the status of any given call as "local" or not is an arbitrary marketing-oriented retail choice, not anything that affects or is driven by any relevant network technology. So, from my network engineering perspective, it seems to me that Qwest, by pressing its premises-location-based notion of what constitutes a "local" call, is just trying to impose its own retail marketing choices onto Level 3. There is certainly no technical basis for Qwest's position that I can see.

Q. EVEN IF THE SWITCHES, OR AN OUTBOARD DATABASE, COULD UTILIZE CUSTOMER LOCATION INFORMATION, HOW WOULD THIS INFORMATION BE UPDATED AND KEPT CURRENT?

A. Today, local routing tables must be updated in the switches when a new NXX code is activated in a rate center. This updating is a labor-intensive process, but fortunately is only needed when new codes are required. The thought of managing and updating a database that would hold each

customer's geographic location is daunting. Instead of dozens of changes per year there would be hundreds of thousands in a large LATA. Each time a customer moved in or out of a house or apartment the database would need to be changed, and each carrier would have changes for each of their customers who moved.

Q. WHAT IS FOREIGN EXCHANGE (FX) SERVICE?

A. FX is a service that has been offered by phone companies for many years. The service allows an end user to be assigned a phone number from a switch that serves a different local calling area than the one in which they are located. This allows customers in the calling area from which the FX number is assigned to call the FX customer without incurring toll charges. On the other hand, if the FX customer's next-door neighbor called, it ***would*** be a toll call. In traditional FX service, the customer pays the providing carrier for an arrangement (a special trunk or other facility) that connects them to the switch covering the distant area, a.k.a. "foreign exchange". The customer is assigned a phone number out of a switch in the distant area so that end users in that foreign local calling area can call them by dialing a local phone number. FX numbers have been popular in the past with airlines and other companies who desired a method for people to call them using a local number without having to maintain call centers everywhere.

Q. HOW ARE FX CALLS ROUTED?

A. FX calls are routed between the local switches as normal local calls, or as toll calls, depending on whether the NPA-NXX of the FX number being called is included in the calling switch's table of "locally dialable" NPA-

NXXs. Neither the originating nor terminating switch has any way to know where the end user with the FX line is actually located, nor does it matter for proper switching and delivery of the traffic. The switch that hosts the FX customer has a circuit coming in that it associates with phone service, providing dial tone and other local services. The switch has no way to know whether the customer loop is 500 yards, 2 miles, or 200 miles long.

Q. HOW ARE FX CALLS BILLED?

A. When a customer of one phone company places a call to a customer of another phone company and the originating and terminating phone numbers are assigned to rate centers which are rated as "local" to each other by the originating carrier, the call is rated as a local call and there is no toll charge. It does not matter if the calling or called party is 500 yards, 2 miles, or 200 miles from the end office out of which the number is assigned. The FX line is paid for separately by the FX customer to the FX providing carrier. No toll charges are applied to calls to the FX number from numbers assigned within the same local calling area as the FX number. Interestingly, When the FX customer with a phone number assigned to a foreign exchange receives a call from some who is physically within the same exchange — like a next door neighbor — toll charges are applied. Intercarrier compensation is based on the originating and terminating phone numbers.

Q. IS QWEST'S INTERCONNECTION TRUNKING THE SAME NO MATTER WHERE THE LEVEL 3 END USER CUSTOMER IS LOCATED?

A. Yes. Qwest's trunking is always to the POI, no matter where the Level 3 end-user customer is located. It doesn't matter if the Level 3 customer is 500 yards, 2 miles, or 200 miles from the POI. Level 3 carries the traffic to its end-user customer, no matter where they are located. Qwest's interconnection trunking to the POI is the same no matter where the Level 3 customer that they are calling is actually located.

Q. SO THE DISTANCE QWEST TRANSPORTS TRAFFIC IS THE SAME WHETHER THE LEVEL 3 CUSTOMER IS 500 YARDS, 2 MILES, OR 200 MILES FROM THE POI?

A. Yes. Qwest transports calls that it originates to the POI, regardless of where the Level 3 customer is located. The location of the Level 3 customer or end user is immaterial to Qwest's call transport or for Qwest's costs for that matter. Mr. Gates will discuss in his testimony how Qwest's costs are the same no matter where the Level 3 end user is located.

XII. Conclusions

Q. HAVE YOU REVIEWED THE CONTRACT LANGUAGE PROPOSED BY LEVEL 3 AND QWEST IN THIS CASE?

A. Yes, I have.

Q. FOR THE ISSUES YOU HAVE ADDRESSED, WHICH LANGUAGE IS MORE CONSISTENT WITH THE POINTS YOU HAVE MADE IN THIS TESTIMONY?

A. Level 3's language is reasonable and balanced from a technical and engineering standpoint and is consistent with the FCC's orders from an engineering point of view. Adoption of Qwest's language, by contrast, would require the parties to degrade the efficiency of their networks,

1 imposing substantial costs on Level 3 and possibly on Qwest as well,
2 while at the same time potentially permitted Qwest to bill Level 3 for costs
3 and charges for functions that Qwest itself should perform without a
4 charge to Level 3.
5 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**
6 A. Yes

CERTIFICATE OF SERVICE

I hereby certify that on the 12th day of August, 2005, I caused to be served, via the method(s) indicated below, true and correct copies of the foregoing document, upon:

Jean Jewell, Secretary Idaho Public Utilities Commission 472 West Washington Street P.O. Box 83720 Boise, ID 83720-0074 jjewell@puc.state.id.us	Hand Delivered U.S. Mail Fax Fed. Express Email	☑ ☐ ☐ ☐ ☐
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