BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF SOUTH DAKOTA

IN THE MATTER OF THE PETITION OF SPRINT COMMUNICATIONS COMPANY L.P. FOR ARBITRATION PURSUANT TO THE TELECOMMUNICATIONS ACT OF 1996 TO RESOLVE ISSUES RELATING TO AN INTERCONNECTION AGREEMENT WITH BROOKINGS MUNICIPAL UTILITIES D/B/A SWIFTEL COMMUNICATIONS	Docket No. TC06-176

Direct Testimony of Larry Thompson

On Behalf of Brookings Municipal Utilities D/B/A Swiftel Communications

February 2, 2007

DIRECT TESTIMONY OF LARRY THOMPSON
ON BEHALF OF BROOKINGS MUNICIPAL UTILITIES D/B/A SWIFTEL COMMUNICATIONS

Q1. Please state your name, employer, business address and telephone number.

A1. My name is Larry Thompson. I am the Chief Executive Officer of Vantage Point Solutions ("Vantage Point"). My business address is 1801 North Main Street, Mitchell, South Dakota, 57301.

Q2. On whose behalf are you testifying?

A2. I am testifying on behalf of Brookings Municipal Utilities d/b/a Swiftel Communications (Swiftel). Based on my experience working with Swiftel for nearly 10 years, I know that Swiftel provides local telephone exchange service and exchange access services in South Dakota and is engaged in the provision of general telecommunications services in the State of South Dakota subject to the jurisdiction of the South Dakota Public Utilities Commission ("Commission").

Q3. Generally, what types of services does Vantage Point perform?

A3. Vantage Point is a telecommunications engineering and consulting company whose services include long range communication plans and feasibility studies, emerging technology analysis and migration studies, telecommunications electronic equipment engineering, outside plant engineering, field services engineering and regulatory consulting.

Q4. What are your duties and responsibilities at Vantage Point?

A4. I am responsible for providing consulting and engineering services to clients in a wide array of technical and regulatory areas associated with telecommunications.

Our client base consists of small Independent Telephone Companies such as Swiftel. We have 72 fulltime employees on staff. I am also responsible for the normal duties you would expect from the chief executive officer for a company of our size.

Q5. What is your educational background?

A5. I have a Bachelor of Arts in Physics from William Jewell College in Liberty, Missouri, and both Bachelors and Masters degrees in Electrical and Computer Engineering from the University of Kansas in Lawrence, Kansas.

Q6. Do you hold any professional engineering licenses?

A6. Yes. I am a licensed professional engineer in Colorado, Georgia, Iowa, Idaho, Indiana, Michigan, Minnesota, Missouri, Nebraska, New York, Ohio, South Dakota, Utah, Washington, Wisconsin and Wyoming. I am also a member of the National Council of Examiners for Engineering and Surveying (NCEES).

Q7. Do you have a resume of your experience?

A7. Yes, it is attached to my testimony as Exhibit LT-D-1.

Q8. What is the purpose of your direct testimony?

A8. The purpose of my direct testimony is to support Swiftel's position in the arbitration Petition[1] filed by Sprint Communications Company L.P. ("Sprint") in connection with technical and regulatory issues.

[1] Petition for Arbitration and Request for Consolidation of Sprint Communications Company L.P., In the Matter of Sprint Communications Company L.P.'s Petition for Consolidated 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 City of Brookings Utilities d/b/a Swiftel Communications, Before the Public Utilities Commission of the State of South Dakota, Docket No.TC06-176 (referred to herein as the "Petition")

Q9. To your knowledge, does Sprint have the facilities to provide transport and termination of local exchange traffic to customers in the Brookings exchange?

A9. No, Sprint has stated that MCC provides the local loop access to the customer within the Brookings exchange. I believe switching is provided by both MCC and Sprint as discussed in more detail later in my testimony.

Q10. Are you familiar with how the network Sprint is proposing would be used to provide voice services?

A10. Yes. Sprint has provided a rudimentary diagram showing the basic network elements used by Sprint to provide the voice services. This diagram is attached as Exhibit LT-D-2 and is titled, "Sprint Attachment POD 8." This diagram shows some of the basic network elements used to provide voice services over a CATV network and I am quite familiar with the components shown. As identified in Exhibit LT-D-2, all the facilities from the headend and headend electronics to the customer are being provided by MCC. For purposes of my discussion, I have provided a functionally equivalent diagram in Exhibit LT-D-3. This diagram is more complete than the one provided by Sprint and will be used for my discussion purposes herein.

Q11. Is an IP Telephony service a Voice over IP (VoIP) service like Vonage?

A11. No. Although they both rely on similar protocols for transporting the voice signal, a "closed" IP Telephony network as is being proposed by Sprint does not rely on the public Internet for transporting the signals. In addition, a VoIP service such as Vonage allows the customer to roam and access their service nearly anywhere they can access the Internet. Sprint has stated that the MCC service will be provided at a fixed location at the customer premises.

Q12. Are you familiar with how a hybrid fiber-coaxial system can provide telecommunications services?

A12. Yes. Vantage Point Solutions provides comprehensive engineering services to both traditional telephone companies as well as CATV service providers. Vantage Point is very familiar with modern CATV design. As mentioned previously, Exhibit LT-D-3 shows a block diagram of the components required for a CATV system to support voice, video, and data. As illustrated, voice and data from the home are aggregated by an Embedded Multimedia Terminal Adapter (E-MTA) and inserted onto the hybrid fiber-coax CATV plant that also carries video to the home. At the headend, the voice and data are then separated from the video signal and routed to the Cable Modem Termination System (CMTS). The CMTS connects the hybrid fiber-coax cable plant to a local Internet Protocol (IP) data network. A router connected to this network normally separates the voice signals from data signals. While still in an IP format, the data signals are routed to the Internet and the voice signals are routed to their destination.

Q13. Are industry standards defined for the handling of voice and data on a CATV system?

A13. Yes. The industry standard specifications for such a system are known as Data-Over-Cable Service Interface Specifications (DOCSIS). They were developed and tested by Cable Television Laboratories (CableLabs). There are currently three versions of DOCSIS that are deployed today. These standards are accepted by national, regional, and international standards development organizations such

as the Society for Cable Telecommunications Engineers (SCTE), the European Telecommunications Standards Institute (ETSI), and the International Telecommunications Union (ITU). These versions are DOCSIS 1.0, 1.1, and 2.0. DOCSIS 1.0 was the initial release that was deployed in the mid 1990s to establish vendor interoperability between cable modems and cable modem termination systems (CMTS). DOCSIS 1.1 and 2.0 were released later to improve operational flexibility, security, Quality-of-Service (QoS), and to allow for services such as packet telephony. DOCSIS 3.0 is currently under development but is not yet released. It will provide enhancements that include channel bonding for increased bandwidth, IPv6 support as well as enhanced security and network management features. In addition to DOCSIS, CableLabs has also developed three main versions of a set of specifications known as PacketCable 1.0, 1.5, and 2.0. These specifications are built on top of DOCSIS to further enable advanced multimedia services such as IP telephony. The most recent Packet Cable 2.0 replaced the Media Gateway Control Protocol (MGCP) IP Telephony format with Session Initiation Protocol (SIP).

Q14. Can you explain IP Telephony?

A14. Yes. As its name properly implies, "IP Telephony" is a method of voice communications that uses the Internet Protocol (IP) as the transport mechanism. From a customer's perspective, an IP Telephony service may look very similar to a traditional telephone voice service. Although IP Telephony is technically another method for delivering voice traffic, widespread deployment has been

hampered by issues associated with effective E-911 service, reliability in a commercial power outage, privacy, and quality concerns.

Q15. How is signaling performed on a IP Telephony network?

A15. Similar to how the traditional telephone network uses Signaling System 7 (SS7) as the signaling protocol, IP Telephony networks have their own methods for signaling on their network. The three common protocols IP Telephony networks utilize are H.323, MGCP, and SIP. SIP has become the most common protocol in new networks. SIP is a signaling protocol for initiating, managing, and terminating voice between two or more endpoints in an IP network. The protocol is maintained and development continues under the SIP working group. The latest version of the specification is the Internet Engineering Task Force (IETF) RFC 3261 and can be found at their website[2]. SIP supports five facets of establishing and termination multimedia communications. They are as follows:

- User Location: Determination of the end system to be used for communication
- User Availability: Determination of the willingness of the called party to engage in communication
- User Capabilities: Determination of the media and media parameters to be used
- Session Setup: Ringing, establishment of session parameters at both called and calling party

[2] http://www.ietf.org/rfc/rfc3261.txt

- Session Management: Including transfer and termination of session, modifying session parameters, and invoking services

Most modern telecommunications access and switching vendors have already implemented or have plans to implement SIP in some method or another.

Q16. Do you understand how one CATV voice customer can call a CATV customer on the same network and how CATV voice customer can call customers of another local provider?

A16. Yes. Exhibit LT-D-2 entitled "IP Telephony Building Blocks", depicts a simplified block diagram of a packet telephony network architecture that would be deployed by a typical CATV service provider. The call flow for one CATV customer calling another CATV customer traverses the network over several network elements. The customer making the call uses a standard Plain Old Telephone (POTS) telephone and dials the phone number of the desired party. The IP Telephony signaling network then provides an IP address for the dialed party's E-MTA. Voice signals are transmitted via IP packets over the network to the CMTS and router at the headend where the call is routed back through the CMTS and to the called party E-MTA's IP address. It is here that the IP Telephony is converted back to analog POTS. The E-MTA then rings the called party's standard POTS telephone. The call flow for one CATV customer calling a customer of another provider is very similar to what was described above. The difference in this case is the IP Telephony initiated call would be sent from the router to the Media Gateway where a protocol conversion would occur to convert the IP stream to time division multiplexing (TDM). The call content would then

be forwarded to the Public Switched Telephone Network (PSTN) where it would be connected to the called party.

Q17. Are there any other network elements that could be included in the call flow progression?

A17. Yes. The service provider's private data network could have several nodes with various firewalls, routers, Ethernet switches, and Session Border Controllers (SBCs) deployed. Without a detailed network diagram from both MCC and Sprint detailing all of the data network equipment deployed in the network, the actual call flow progression cannot be accurately described for a specific call type as discussed above. For example, if a Session Border Controller (SBC) is added to the network, there are additional switching functions including, but not limited to such functions as Network Address Translation (NAT) Traversal, Network Topology hiding, Denial of Service (DoS) Attack protection, packet filtering, and Communications Assistance for Law Enforcement Act (CALEA) compliance.

Q18. What function does the CMTS have in the CATV network?

A18. The CMTS is essentially the access equipment found in the CATV provider's headend. The CMTS' function is to convert data and IP Telephony signals between the local IP network and the CATV hybrid fiber-coax network. The CMTS also provides a switching function. Based on the IP address of the received packet, the CMTS makes a decision as to how to route the packet so that it is delivered to the correct E-MTA. In addition to providing a physical interface transition (twisted pair/fiber to coaxial plant), the CMTS also administers Quality-of-Service (QoS), and records usage of resources. On the network side, the

CMTS interfaces to a router or switch via an Ethernet or ATM connection. On the subscriber side, the combined traffic is interfaced to the CATV system via coaxial cable. The CMTS communicates with the E-MTA at the customer premises.

Q19. What function does the E-MTA perform in the network?

A19. The Embedded Multimedia Terminal Adapter (E-MTA) is a DOCSIS based customer premises device that is similar to a traditional cable modem with the exception that it allows for the delivery of both high-speed Internet and voice services (via IP Telephony) by communicating directly to the CMTS. It is common that these devices will have one or two voice ports and at least one Ethernet data port. To ensure that telephone service will still function in a power outage, some E-MTAs are deployed with battery backup.

Q20. Do you know what functions the Media Gateway, Media Gateway Controller, and Call Agent provide?

A20. Yes. These elements are the primary components of a next generation switching platform or "soft switch" model. The Media Gateway provides the physical connectivity to the outside network. In addition, the Media Gateway converts between the traditional TDM telephone network and an IP network. It also bridges between analog line equipment to IP networks and processes voice/data/fax connections. In other words, it performs protocol mediation between ATM, IP, and TDM traffic types. Typically it can be configured to allow large bandwidth connections (DS1, DS3, STS, OC-3, and Ethernet) into the switching platform. The Media Gateway does not retain knowledge of the call state, but merely follows the instructions delivered by the Media Gateway

Controller. The Media Gateway Controller's primary function is to control the subtending Media Gateways. It provides call control, connection control, signaling, routing, gateway management and control, security, call detail record generation, service intelligence, and other centralized functions. The Call Agent works with both the Media Gateway and the Media Gateway Controller. It provides central configuration and feature software (if not provided by an external feature server) of the whole distributed Media Gateway system for easier system management. It provides the processing power to execute switching translations. Many vendors offering a cohesive next generation solution have combined the Call Agent functions with the Media Gateway Controller. The actual association of a Media Gateway, Media Gateway Controller, and its controlling Call Agent is set up as part of the network configuration and is dependent upon the vendors utilized.

Q21. Do you know where switching is performed in the proposed Sprint network?

A21. Yes. Switching is defined as "a communications method that uses temporary paths rather than permanent connections to establish links or to route messages between stations. In the normal telephone dial-up network, the switch path in the central office is established during the initial call setup process and is maintained throughout the session. In a message switching and packet switching networks, the connection is established only for the duration of the packet or message."[3] According to this definition, switching is performed in various elements throughout the network, including the Sprint switch, the MCC router, the MCC

[3] Hargraves Communications Dictionary, IEEE Press Marketing, 2001

media gateway, and even the MCC E-MTA. Based on my understanding of the Sprint and MCC networks, MCC is providing some of the switching functions.

Q22. Are you familiar with the interconnection rules, pursuant to Sections 251 and 252 of the Telecommunications Act?

A22. Yes. I have assisted in interconnection negotiations and am familiar with these two sections.

Q23. What type of connection is used to interconnect a local exchange carrier to a CLEC?

A23. Sprint has requested to interconnect with Swiftel's network. Interconnection between two local carriers normally utilizes what are commonly referred to as Local Interconnection Service (LIS) trunks.

Q24. What is the function of a LIS trunk?

A24. Generally, a LIS trunk is a connection between the Incumbent Local Exchange Carrier (ILEC) and CLEC for the purpose of exchanging local traffic within the competitive exchange area. The trunk type is generally a TDM DS1 connection using SS7 based ISUP signaling. It allows the CLEC's local subscribers to locally connect with the ILEC's local subscribers (and vice versa). Simply put, it is a trunk for the exchange of local traffic within the competitive exchange and local calling scope. LIS trunks may be used for more than one local exchange carrier, but are intended to be used only for local traffic.

Q25. If Sprint and Swiftel were interconnected through LIS trunks and Sprint utilized these trunks for another carrier's traffic, would this create any billing concerns?

A25. Yes. Anytime there is traffic other than local traffic terminating across a LIS trunk, the terminating carrier is placed in the position that it needs to begin

analyzing all of the terminating calls on this trunk in order to determine proper billing of the calls. This is a significant administrative burden placed on the terminating carrier. Therefore, the commingling of other carriers' traffic onto the LIS trunks lends itself to billing concerns that would not exist otherwise.

Q26. So, why couldn't Swiftel simply bill the other carriers in the above scenario?

A26. Often call detail information necessary for billing purposes are not forwarded to the terminating carrier. Even with Sprint's proposal to populate certain SS7 fields, it is likely that some traffic will not have enough information identified for the terminating carrier to bill it appropriately. It is apparent that Sprint anticipates this happening also. Sprint's proposed wording in the interconnection agreement would allow for potentially five percent (5%) of the traffic delivered to the POI without the Calling Party Number ("CPN") and/or Automatic Number Identification ("ANI"). Further, at Section 5.6.2 of the proposed Agreement, Sprint states:

> 5.6.2 If the terminating Party is not able to measure and accurately identify the jurisdiction of the Traffic, the other Party shall provide factors necessary to appropriately jurisdictionalize the Traffic.

The methods to determine these factors are not discussed in the proposed agreement. If CMRS traffic is allowed on the LIS trunks, it is possible that some CMRS traffic may appear to be local when it is not. Since there is no industry standard to identify the location of a wireless caller, traffic originating from a CMRS carrier could be improperly identified. This

could cause the factors to be incorrect and may further intensify the Phantom Traffic problem as Parties could end up disputing the factors themselves.

Q27. Can you explain further what Phantom Traffic is?

A27. Yes. Traffic on the telephone network that lacks sufficient information in order to determine the originating carrier or the jurisdictional nature of the traffic on calls being established into or transiting a carrier's network for billing purposes is often referred to as Phantom Traffic. In my capacity as a consultant, I have routinely reviewed traffic of our clients. As one would expect, common trunks, i.e., trunks that are used by multiple carriers and/or for different types of traffic (local, interstate switched access, intrastate switched access, wireless originated, VoIP originated, etc.) are the greatest source of phantom traffic.

Q28. Is Phantom Traffic a minor problem that affects only small rural local exchange carriers in South Dakota?

A28. No. It is an industry-wide problem recognized by numerous organizations nationwide, most notably the FCC[4], the South Dakota Public Utilities Commission, and the South Dakota Legislature[5].

Q29. What signaling should be required to ensure Swiftel can properly identify and jurisdictionalize the traffic terminating to their network?

[4] On November 6, 2006, the Supporters of the Missoula Plan, which are comprised of more than 350 carriers representing Regional Bell Operating Companies (RBOCs), non-rural carriers, and small and medium rural carriers, filed an ex parte with the FCC requesting an interim solution be approved immediately. The FCC has requested comments and reply comments regarding this interim Phantom Traffic solution proposal.

[5] SDCL 49-31-109 to 49-31-115

A29. The following call detail fields will help in allowing each party identify the specific calls traversing their networks:

1. All 10-digits of Calling Party Number
2. Charge Number
3. Jurisdictional Information Parameter (JIP)
4. Call Start and End Times
5. Conversation Start and End Times
6. Call Date
7. Called Party Telephone Number
8. Sending Carrier ID (OCN or Local Routing Number [LRN])

Q30. Would there be any unique issues if the LIS trunks were to be used by Commercial Mobile Radio Service (CMRS) carriers?

A30. Yes. CMRS carriers are subject to different local calling areas than ILECs. A CMRS carriers' local calling scope includes the entire Major Trading Area (MTA), which is much larger than the local calling area of a wireline carrier. The FCC has ruled that CMRS calls within a single MTA are subject to reciprocal compensation while calls between MTAs are subject to access. Since the CMRS customer is mobile, one must know the location of the caller at the start of the call to determine if a CMRS call is interMTA or intraMTA. If interMTA, a determination must be made if the call was interstate or intrastate. Since the location of the caller is not passed as part of the SS7 message, it is not possible for Swiftel to determine the correct amount to bill for this call. As one can see, the introduction of CMRS traffic onto a trunk intended for local traffic significantly complicates the billing process. CMRS traffic in South Dakota often has high

amounts of interMTA traffic since there are three (3) MTAs in the state as can be seen in Exhibit LT-D-4.

Q31. Does that conclude your testimony?

A31. Yes. However, I wish to reserve the opportunity to supplement this testimony in the future, if necessary.