Exhibit No.:
Issues: Network and Technical
Witness: Raymond W. Drause
Type of Exhibit: Rebuttal
Sponsoring Party: Southwestern Bell Telephone Company, d/b/a AT&T Missouri
Case Nos.: TC-2012-0331and TO-2012-0035

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

Case Nos. TC-2012-0331 and TO-2012-0035

Rebuttal Testimony of Raymond W. Drause
On Behalf of AT&T Missouri

June 19, 2012

AFFIDAVIT OF RAYMOND W. DRAUSE

STATE OF SOUTH CAROLINA)
) SS
COUNTY OF GREENVILLE)

I, Raymond W. Drause, of lawful age, being duly sworn, depose and state:

1. My name is Raymond W. Drause. I am Senior Wireless Engineer at McCall-Thomas Engineering Company, Inc.

2. Attached hereto and made a part hereof for all purposes is my Rebuttal Testimony.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct to the best of my knowledge and belief.

Raymond W. Drause
Raymond W. Drause

Subscribed and sworn to before me this 14TH day of June, 2012.

Notary Public

My Commission Expires: 7/21/2016

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

A. My name is Raymond W. Drause. I hold the position of Senior Wireless Engineer at McCall-Thomas Engineering Company, Inc. I provide engineering support to various independent telephone companies and electric co-operatives. My business address is 845 Stonewall Jackson Boulevard, Orangeburg, South Carolina.

Q. PLEASE STATE YOUR EXPERIENCE AND EDUCATIONAL BACKGROUND.

A. I am a Registered Professional Engineer. I graduated with honors from Herzing University, in Madison, Wisconsin, with an Associate of Science in Electronics Engineering Technology degree. I have worked for over 42 years in the telecommunications engineering field. I have been employed by McCall-Thomas Engineering Company for the past five years as Senior Wireless Engineer. My experience includes the design, installation and operation of switching, transport, fiber optic, wireless, video and power systems.

My work assignments over the past 42 years have ranged from large and well established companies, such as AT&T and Southwestern Bell, cutting edge regional companies in the CLEC industry, such as NewSouth Communications and NuVox Communications, as well as telecommunications providers serving single communities. My responsibilities on these assignments have ranged from detailed engineering of individual telecommunications systems to the overall engineering management of entire multi-state telecommunications networks. A more detailed summary of my work experience is included as Schedule RD-1.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of AT&T Missouri.

Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A. I will address portions of the testimony of Russ Wiseman and Robert Johnson, both of which were filed on behalf of Halo Wireless, Inc. ("Halo") on June 4, 2012.

Q. HAVE YOU PREVIOUSLY TESTIFIED?

A. Yes. I had never testified in a regulatory proceeding before these cases involving Halo. As of the date of this testimony, however, I have submitted pre-filed testimony in state commission cases similar to this one in Wisconsin, South Carolina, Georgia, Louisiana, Illinois and Florida, and I testified at the evidentiary hearings in all of those states except Florida, where the hearing has not yet occurred.

Q. WHAT MATERIALS HAVE YOU REVIEWED IN ORDER TO PREPARE YOUR TESTIMONY?

A. I have reviewed testimony, exhibits and transcripts from this proceeding and parallel proceedings in other state commissions, as well as the Airspan specification documents and technical user guides for the equipment installed at the Halo tower site in Wentzville, Missouri. More specifically, I reviewed the following documents:

1. Pre-filed testimony of Russ Wiseman on behalf of Halo in this docket. I also reviewed Mr. Wiseman's Wisconsin, South Carolina, Georgia, Louisiana, Illinois and Florida testimony.

2. Pre-filed testimony of Robert Johnson on behalf of Halo in this docket. I also reviewed Mr. Johnson's Wisconsin, South Carolina, Georgia, Louisiana, Illinois and Florida testimony. In addition, I attended, by telephone, a deposition of Mr.

Johnson that was taken by AT&T in May, and I have reviewed the transcript of that deposition.

3. The record in the Public Service Commission of Wisconsin ("PSCW") proceeding, *Investigation into Practices of Halo Wireless, Inc., and Transcom Enhanced Services, Inc.,* Docket No. 9594-TI-100, as well as Halo Wireless, Inc., and Transcom Enhanced Services, Inc.'s 2nd Amended Responses to Staff Data Request #1, dated January 11, 2012, and Halo Wireless, Inc., and Transcom Enhanced Services, Inc.'s Amended Responses to Supplemental Staff Data Request #1, dated January 20, 2012 in the PSCW proceeding.

4. January 23, 2012, Transcript of Proceedings before the Tennessee Regulatory Authority in Docket No. 11-00108, *Complaint of Concord Telephone Exchange, Inc.; Humphreys County Telephone Co.; Tellico Telephone Company; Tennessee Telephone Company; Crockett Telephone Company, Inc.; Peoples Telephone Company; West Tennessee Telephone Company, Inc.; North Central Telephone Coop., Inc.; and Highland Telephone Cooperative, Inc. against Halo Wireless, LLC; Transcom Enhanced Services, Inc. and other Affiliates for Failure to Pay Terminating Intrastate Access Charges for Traffic and Other Relief and Authority to Cease Termination of Traffic.*

5. April 18, 2012, Partial Transcript of Proceedings (cross-examination of Robert Johnson) before the South Carolina Public Service Commission in Docket No. 2011-304-C, *Complaint and Petition for Relief of BellSouth Telecommunications, LLC d/b/a AT&T Southeast d/b/a AT&T South Carolina v. Halo Wireless, Inc. for Breach of the Parties' Interconnection Agreement.*

6. April 26, 2012, Transcript of Proceedings before the Georgia Public Service Commission in Docket No. 34219, *Complaint of TDS Telecom on Behalf of its Subsidiaries Blue Ridge Telephone Company, Camden Telephone & Telegraph Company, Inc., Nelson-Ball Ground Telephone Company, and Quincy Telephone Company, Against Halo Wireless, Inc., Transcom Enhanced Services, Inc., and Other Affiliates for Failure to Pay Terminating Intrastate Access Charges for Traffic and for Expedited Declaratory Relief and Authority to Cease Termination of Traffic.*

7. Equipment Lease between SATNet, LLC and Halo Wireless, LLC, dated June 1, 2010.

8. Proffer of Testimony of Russ Wiseman on behalf of Halo Wireless, Inc., the Debtor in Case No. 11-42464-BTR-11, In Re: Halo Wireless, Inc., Debtor, before the United States Bankruptcy Court for the Eastern District of Texas, Sherman Division.

9. Product Specification: Airspan WiMAX MiMAX-Pro V-Series.

10. HiperMAX Product Specification.

11. HiperMAX Technical User's Guide - HiperMAX Commissioning - SDR-micro.

12. HiperMAX Base Station Data Sheet.

I was aided in my understanding of the documents by the experience I have acquired while providing engineering type work for communications projects that utilize Airspan WiMAX and pre-WiMAX systems.

Q. HAVE YOU VISITED A HALO TOWER SITE?

A. Yes. An AT&T attorney arranged a visit to a Halo tower site in another state, and I spent about one hour and twenty minutes there earlier this year. I had a chance to look at and photograph the Halo and Transcom Enhanced Services, Inc. ("Transcom") equipment I describe in this testimony, and to get a good look at the site. Halo has agreed that the tower site I visited is sufficiently representative of the Halo tower site in Wentzville, Missouri, for all relevant purposes, so that my visit to that site was equivalent to a visit to the Halo site in Wentzville.

Q. PLEASE GIVE AN OVERVIEW OF THE STRUCTURES AT THE HALO TOWER SITE.

A. There are three structures: two small buildings and a tower. You can see them on Schedule RD-2, which is a photograph I took during the site visit. (Again, Halo has agreed that the photograph is a fair representation of a Halo site in Missouri.) The concrete building housing the Halo and Transcom equipment is about 24 feet long, 10 feet wide and 10 feet tall. The base of the wireless tower is about 10 feet from the side wall of that building.

Q. BASED ON THE DOCUMENTS THAT YOU REVIEWED AND THE FIELD INSPECTION, DO YOU HAVE AN UNDERSTANDING OF THE EQUIPMENT LOCATED AT THE TOWER SITE IN WENTZVILLE, MISSOURI, AND THE FLOW OF TRANSCOM AND HALO TRAFFIC?

A. Yes. As a result of my field visit and examination of the documents, I have gained a high-level understanding of the equipment used by Halo and Transcom at the tower site serving Missouri, as well as at the other Halo tower sites across the country. The documents I reviewed provided sufficient information to permit me to create a site drawing included with my testimony as Schedule RD-3, that conceptually illustrates the significant pieces of Halo and Transcom equipment located at the tower site. The documents that I reviewed also provided information that describes how a telephone call would enter a tower site and pass between the various pieces of equipment at the tower site before being sent on to a Halo POP for delivery to a tandem switch. I used that call-flow information to populate the site drawing (Schedule RD-3) with lines and arrows that illustrate the manner in which a telephone call would flow through the various pieces of equipment at the tower site. (A "POP" is a point of presence. Robert Johnson, the Transcom representative who testifies on behalf of Halo, has expressed a preference for the term "data center," so I use that term, instead of "POP" in the schedule.) Schedule RD-3 also references equipment and systems installed at other locations that interoperate over unspecified transmission facilities with the tower site equipment. The Dallas soft-switch is illustrated on Schedule RD-3, and is an important system that interoperates with the tower site equipment.

Q. BASED ON THE DOCUMENTS YOU REVIEWED AND YOUR EXPERIENCE IN THE INDUSTRY, HOW WOULD YOU DESCRIBE THE FLOW OF A TELEPHONE CALL THROUGH THE TOWER SITE SERVING MISSOURI?

A. The IP data stream that is carrying the telephone call enters the building at the tower site and passes through a Cisco Router and an Extreme Networks Fast Ethernet Switch (labeled as Switch/Router Cloud on Schedule RD-3) before being sent over a Category 5 ("CAT5") Ethernet cable to Transcom's Airspan MIMAX Pro-V Customer Premise Equipment. The Airspan MIMAX Pro-V takes the IP data stream that is presented to it over the Ethernet cable, converts it to a 3.65GHz radio signal and transmits it to Halo's Airspan SDR-Micro Base Station. The function of the Airspan equipment is simply to transport the IP data stream from one place to another. More specifically, the IP data stream is transported from the Airspan MIMAX Pro-V Customer Premise Equipment that is mounted on a pipe attached to the building near the base of the tower to the Airspan antenna and SDR-Micro Single Channel RF Transceiver that are mounted on the tower and then back down the tower over a fiber optic cable to the Airspan SDR-Micro Base Station that is located in the building.

The Airspan SDR-Micro Base Station system converts the wireless IP data stream that it receives from the Airspan MIMAX Pro-V Customer Premise Equipment back into a form that can be sent over an Ethernet cable. From there, the IP data stream is carried over an Ethernet cable to the Extreme Networks Fast Ethernet Switch and then to the Halo Router located in the building. The IP data stream leaves the Halo Router and is transported over unspecified facilities to the softswitch cloud in Dallas. The IP data stream is handled by the equipment in the Dallas Softswitch Cloud, then leaves the Dallas Softswitch Site and is sent over unspecified facilities to a Halo point of presence ("POP") in Atlanta, Dallas, Los Angeles or New York. At the Halo POP, the IP data stream

carrying the call undergoes a conversion from IP to TDM, and is sent to a tandem switch for delivery to a subtending office where the call terminates.

Q. IN YOUR OPINION, WHAT ENGINEERING PURPOSE IS SERVED BY THE WIRELESS CONNECTION BETWEEN THE TRANSCOM CUSTOMER PREMISES EQUIPMENT AND THE HALO BASE STATION?

A. The only purpose is to include a wireless transportation segment. If we review the call-flow, we discover that the IP data stream carrying the call enters the Ethernet cable connected to the Airspan MIMAX Pro-V Customer Premise Equipment, travels through this customer premises equipment over the 3.65 GHz radio link to the antenna and Airspan Transceiver and then on to the Airspan Base Station. The call-related characteristics of the IP data stream that emerges from the Airspan Base Station are unchanged from the form they were in when they entered the Airspan MIMAX Pro-V Customer Premise Equipment. The Airspan Customer Premises Equipment and Base Station serve no networking purpose other than to carry the IP data from one point within the building to another point within the building. The Airspan equipment does not contain externally controlled, dynamic Ethernet switching apparatus and cannot modify the content of the IP data stream to change call-related routing or signaling information that it may be carrying. If the Airspan equipment were replaced by a piece of Ethernet cable, the call could be completed just as it is today. This was confirmed by Halo witness Robert Johnson in his testimony at hearings in the related cases I mentioned above. Mr. Johnson acknowledged that if the Airspan equipment was replaced with a piece of CAT5 Ethernet cable, calls would still complete as they do today.

Q. HOW FAR DOES THE WIRELESS TRANSMISSION FROM THE BUILDING TO THE TOWER GO?

A. Approximately 150 feet. This is the distance between Transcom's MiMAX Pro-V wireless equipment mounted on a pipe bolted to the wall of the building and Halo's antenna mounted on the tower.

Q. WOULD REPLACING THE AIRSPAN EQUIPMENT WITH A PIECE OF ETHERNET CABLE HAVE ANY EFFECT ON THE RELIABILITY OF THE NETWORK?

A. Yes. By eliminating the Airspan equipment and the wireless leap from the building to the tower, the resulting configuration would actually provide a more reliable level of service. According to the Airspan HiperMAX Product Specification document, the predicted Mean Time Between Failure of hardware in the SDR-Micro Base Station is 115,000 hours. This does not include failures that are caused by lightning, electrostatic discharge, voltage spikes and other harmful electrical events that frequently occur at sites with large towers. An Ethernet copper cable, which unlike the Airspan equipment has no delicate electronic components, is much less subject to failure. Also, all of the packet loss, jitter and latency that are inherent in the wireless connection would be totally eliminated.

Q. IN YOUR OPINION IS THE AIRSPAN MIMAX PRO-V CUSTOMER PREMISE EQUIPMENT CAPABLE OF ORIGINATING A CALL?

A. No. None of the Airspan equipment, including the MIMAX Pro-V Customer Premise Equipment, the Airspan SDR-Micro Single Channel RF Transceiver, and the Airspan SDR-Micro Base Station, contains externally controlled, dynamic Ethernet switching apparatus that might be used for call routing. In other words, all the Airspan Customer Premises Equipment does is convert the IP data stream it receives into a radio signal. This is unlike a wireless handset, which contains intelligence capable of creating the data stream which instructs the wireless network where to send the telephone call.

As I mentioned, Mr. Johnson has acknowledged that if the Airspan equipment was replaced with a piece of CAT5 Ethernet cable, calls would still complete as they do today. The Airspan equipment has the same ability to originate a call as does that piece of CAT5 Ethernet cable that Mr. Johnson acknowledges could replace it – no ability whatsoever.

Q. IS THERE AN ADDITIONAL REASON FOR YOUR CONCLUSION THAT TRANSCOM'S AIRSPAN MIMAX PRO-V CUSTOMER PREMISE EQUIPMENT AT THE TOWER SITE IS NOT ORIGINATING COMMUNICATIONS?

A. Yes. The common understanding in the industry is that a communication is originated when it is launched on the switched network along with instructions to the network as to where the communication is to be delivered. Thus, for example, a user of a regular landline phone or a cell phone originates a call by dialing a phone number. No such process occurs at Transcom's Airspan equipment. On the contrary, the instructions to the network are already present when the communication arrives at that equipment. All Transcom's wireless radio equipment can do, and all it does do, is to carry information that is already on Transcom's network from one point to another. If one accepts the Halo/Transcom position that Transcom terminates calls and then originates further communciations (and I express no view on that legal issue), the origination necessarily occurs not at the tower site in Wentzville, but at one of the four Transcom data centers, in Atlanta, New York City, Dallas or Los Angeles. It is there, if anywhere, that Transcom imparts routing instructions for the communication. The wireless equipment at the tower site merely passes that information along.

My view in this regard was corroborated by Halo witness Johnson, at his deposition in May of this year. As I mentioned above, I attended that deposition by phone, and have also reviewed the transcript. Mr. Johnson stated that Transcom originates communications at its media gateways and session border controllers – pieces of equipment that are housed in the Transcom data centers in Atlanta, New York City, Dallas and Los Angeles.

Q. IS TRANSCOM AN ENHANCED SERVICE PROVIDER ("ESP")?

A. To answer that question, one must apply the law governing enhanced services to the facts concerning what Transcom does. I do not purport to have expertise in the law, but counsel advises that "enhanced service" means "services, offered over common carrier transmission facilities used in interstate communications, which employ computer processing applications that act on the format, content, code, protocol or similar aspects of the subscriber's transmitted information; provide the subscriber additional, different, or restructured information; or involve subscriber interaction with stored information."[1] Counsel advises that the FCC has ruled that the "enhanced" service designation does *not* apply to services that merely facilitate establishment of a basic transmission path over which a telephone call may be completed, without altering the fundamental character of the telephone service. To qualify as an enhanced service, counsel further advises, a service must be "not incidental" to a telecommunications service, but rather must be the essential service provided. Where the enhancement does not, from the end user's

[1] 47 C.F.R § 64.702.

perspective, alter the fundamental character of the communication, the service is not an enhanced service.

Q. BASED UPON ALL THE MATERIAL YOU HAVE REVIEWED CONCERNING TRANSCOM'S OPERATIONS, WHAT ARE THE PERTINENT FACTS FOR DETERMINING WHETHER TRANSCOM IS OR IS NOT AN ESP?

A. I carefully examined the testimonies of Mr. Johnson, and compared his description of Transcom's service platform to that of a softswitch. There is nothing unique in the use of a softswitch; they are widely deployed throughout the telecommunications industry. If the use of softswitch technology is the determining factor in deciding if an entity is an ESP, then Transcom and all other entities utilizing softswitch technology might well claim to be ESPs. The capabilities that Mr. Johnson attributes in his testimony to the Transcom service platform are entirely consistent with those commonly found in softswitches, including:

- Protocol conversion and packet sequencing
- Replacement of missing packets
- Compatibility with Time Division Multiplexing ("TDM")
- Examination of digitized audio stream to determine:
  - If voice signal is present
  - If ambient noise is present
  - If packets that don't contain voice signals should be discarded
- Employ complex algorithms and sophisticated codecs
- Employ sophisticated systems to create sounds
- Create new sound information to enhance communications
- Deliver newly created sound to the end user

Thus, the sound heard by the receiver in any communication involving a softswitch is not exactly the sound transmitted, but rather portions of it have been created by the system to enhance the delivered sound. Pages 69 – 70 of the McGraw-Hill publication titled "Softswitch Architecture for VoIP" (ISBN-13 978-0071409773) explains Softswitch architecture and affirms that the characteristics shown above are those of a Softswitch.

The characteristics of what Mr. Johnson calls Transcom's "enhanced service platform" are identical to the characteristics of a softswitch. A service provider that uses a softswitch to originate, terminate or transport voice traffic is using a system that has been designed to provide the very same capabilities that Transcom is attributing to its "enhanced service platform."

The sophisticated hardware, software and voice-processing algorithms inherent in a softswitch platform are important elements of the call conditioning process, but are not "enhanced services." Transcom has produced nothing – other than its own claims – to substantiate that the audio quality delivered by Transcom is equal to or perceptibly superior to that delivered by other users of softswitch technology. Transcom has not shown that its softswitch modifies the sound that is delivered to a customer in any way that is different than that which is inherently found in an ordinary softswitch. With that being said, there is little to support a claim that an enhanced service is actually being provided or that Transcom is an ESP. The functionalities described by Mr. Johnson are what the rest of the industry refers to as "call conditioning."

Q. MR. JOHNSON, HOWEVER, ARGUES THAT THE PROPRIETARY ALGORITHMS USED IN TRANSCOM'S "ENHANCED SERVICE PLATFORM" ALLOW TRANSCOM TO PUT "NEW AND BETTER INFORMATION INTO THE SAME SIZED 'PIPE' AS THE ORIGINAL INFORMATION WOULD HAVE NEEDED."[2] DO YOU FIND THAT PERSUASIVE?

[2] Pre-filed Testimony of Robert Johnson on Behalf of Transcom Enhanced Services ("Johnson Testimony), at 15, lines 9-11.

A. No, and I will explain why: The range of frequencies that are used by the human voice are quite broad, extending from about 60 Hz to around 7,000 Hz.[3] Therefore, the 'pipe' that Mr. Johnson describes would need to transport this "Enhanced" frequency range, which is a much broader range than the 300 Hz to 3300 Hz range of frequencies (often referred to as the "Voice Band") that typical telephone End Offices and Tandem Switching Offices are capable of passing. Frequencies that are significantly outside the Voice Band simply cannot and do not pass through the Public Switched Telephone Network (PSTN). Therefore, calls delivered to Transcom from the PSTN would typically not contain speech components that are outside of the 300 Hz to 3300 Hz frequency range.

The same limitation applies to calls that are delivered by Transcom to the PSTN for completion. The PSTN network is not capable of passing the expanded range of frequencies that Transcom claims that its Enhanced Service Platform creates. Once Transcom delivers a call to the PSTN for completion, only the Voice Band frequencies would pass through the network and actually reach the end user. The "enhanced" speech components that Transcom claims to add back into the call would be eliminated because they fall in a frequency range that tandem switches and end office switches are unable to pass.

Simply stated, the enhancements that Transcom claims to perform that occur outside of the 300 Hz to 3300 Hz frequency range – to put "new and better information into the same sized 'pipe' as the original information would have needed" – would not be

[3] Cisco suggests that the range might actually be broader than that, extending from 30 Hz up to 18,000 Hz. To transport a human voice that spans this range of frequencies, the "pipe" that Mr. Johnson describes would need to allow all frequencies from 30 Hz to 18,000 Hz to pass through it.

present when the call is delivered to the called party. Transcom's "Enhanced Service Platform" may do things that manipulate the voice stream in the middle of a call that's already in transit, but I see no indication that Transcom does anything that provides any actual benefit to telephone users beyond what occurs with conventional call conditioning.

Q. DO THE CARRIERS ORIGINATING THE TRAFFIC THAT TRANSCOM DELIVERS VIA HALO UNDERTAKE THE TYPE OF CALL CONDITIONING THAT TRANSCOM DESCRIBE THAT IT UNDERTAKES?

A. Carriers that use softswitch and VoIP technology in the origination, delivery or termination of voice-type traffic have the ability to utilize powerful call conditioning capabilities that are comparable to those that Transcom claims are "enhancements." Transcom has presented nothing, so far, in the record of this proceeding or in earlier proceedings to demonstrate that the capabilities it claims are anything more than call conditioning.

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes, thank you.

Raymond W. Drause, P.E.

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PROFESSIONAL SUMMARY

Results-driven Engineering Manager with multi-faceted Telecommunications Engineering and Operations experience. Strong general management qualifications in planning, project management, budgeting and human resources. Extensive experience in Network Planning, Engineering, and Operations in both start-up and large-scale companies.

CAREER EXPERIENCE

McCall-Thomas Engineering Company, Inc. — May 2007 - present
Senior Wireless Engineer

Provide engineering support to various Independent Telephone Companies and Electric Co-ops.

- Develop Point-to-Point and Point-to-Multipoint wireless system designs using UHF and Microwave Radio Systems.
- Coordinate installation and testing of wireless systems.
- Coordinate with the Department of Defense Joint Spectrum Center to facilitate installations of Cellular Mobile Radio System equipment on military facilities.
- Develop fiber optic network designs using Passive Optical Networks (PONs).
- Provide training on National Electrical Safety Code, Providing IPTV over ADSL2+, Central Office Grounding (single point grounding), Network Interface/Optical Network Terminal bonding and grounding, Basic Electronics.
- Develop and present instructional technical programs to SC Telephone Assn., Georgia Telephone Assn., NC Tri-State Telephone Assn. and others.

Telecommunications Consulting Service — May 2006 – April 2007
Owner

Establish a telecommunications consulting service to provide engineering and operations support for a client group founding a new telecommunications company.

- Work jointly with client's IT manager to develop, deploy and operate the core network infrastructure needed to support VoIP and data services.
- Evaluate WiMAX systems. Design, deploy and operate point-to-multipoint wireless systems that link subscribers to client's network. Conduct RF spectrum analyses. Design and deploy custom antenna arrays required to serve targeted coverage areas and null designated areas. Develop "best practices" for equipment installations at customer sites. Conduct field trials to confirm system performance levels.
- Design and install point-to-point microwave systems. Conduct path surveys, negotiate tower leases. Acquire Metro-Ethernet circuits for back haul of traffic from main hub.
- Design backup AC and DC power systems for network and operational support systems.

Nuvox Communications, Greenville, SC — May 2004 (merger) – May 2006

Vice President – Network Planning, Engineering & Optimization
November 2005 – May 2006

Senior executive responsible for leading 7 Director organizations in planning, engineering, budgeting and deploying the equipment, facilities and systems making up the Nuvox Network.

- Deploy Voice and Signaling Gateways, Feature Server, Session Border Controller, and Voice Mail platform required for VoIP implementation. Integrate VitalNet and Empirix Network Performance Management systems into VoIP engineering processes.
- Establish Traffic Engineering and Capacity Management processes providing enhanced visibility to VoIP and Core Data Networks performance.
- Support interoperability testing of VoIP elements.
- Develop Transmission Engineering Standards for SONET/ DWDM designs. Deploy DWDM rings utilizing Lucent DMX and Cisco ONS multiplexers.
- Develop interim growth architecture for legacy TDM network, reducing CAPEX requirements by over 27%. Introduce E911 data warehouse plan yielding ongoing annual OPEX savings of over $1.5 million.
- Create and implement Capacity Management initiative to achieve "zero capacity-related held customer orders".

Vice President – Network Optimization
February 2005 – October 2005

Senior executive responsible for development and implementation of initiatives designed to optimize the financial and operational performance of the Nuvox Network.

- Create new multi-state organization. Direct hiring and training of 100+ contractors and integrate them into a base of 52 employees to execute Network Optimization initiatives.
- Manage a diverse array of Operational Excellence initiatives in 15 state area.
- Implement extensive network changes arising from the FCC TRO rulings. Negotiate changes to ILEC Interconnect Agreements. Responsible for MSS circuit designs, switch and router translations, ILEC circuit ordering and physical grooms at collocation sites and customer locations. Produced recurring annual savings of over $1.45 million.
- Integrate network and customer-specific data residing in two legacy MetaSolv TBS Systems and one internally developed OS into one common data repository (MSS).
- Implement conversion of customer facilities to HDSL2, producing ongoing annual savings of over $1.2 million.

Vice President – Network Engineering
May 2004 – February 2005

Senior executive responsible for engineering, deployment, capacity management and budgeting of the equipment and systems making up the Nuvox Network.

- Integrate the Network Engineering organizations of Nuvox Communications and NewSouth Communications following their merger.
- Manage Network Integration projects designed to capture operational synergies and cost benefits resulting from the merger (Migration of circuits from 5ESS/DMS switches to Sonus switch, deployment of Adtran GR303 equipment to collocation sites).
- Manage initial deployment of Sonus and Cisco VoIP equipment to new markets.

NewSouth Communications, Greenville, SC November 1999 – April 2004 (merger)

***Vice President – Network Engineering* & Technical Services**
July 2000 – April 2004

Senior executive responsible for engineering, deployment, capacity management and budgeting of the equipment and systems making up the NewSouth network.

- Lead 4 Director organizations in the construction and ongoing growth of 13 switch sites and 230 collocation sites located across the Company's 10 state area.
- Manage the engineering and installation of Cisco ATM switches, Lucent 5ESS and Siemens EWSD switches, Alcatel and Tadiran DCSs and all ancillary equipment.
- Establish CAPEX and OPEX budgeting processes for Engineering.
- Establish Capacity Management and Network Data Integrity processes.
- Manage engineering-related activities associated with UCI Communications and Nuvox Communications mergers.

Director – Network Engineering
November 1999 - June 2000

Responsible for the design and build-out of Lucent 5ESS switch sites and collocation sites, including all AC/DC power, data networking, transport equipment, and mechanical systems in the NewSouth Network.

Southwestern Bell Telephone Company, Little Rock, AR 1980 – 1999 (retired)

Area Mgr. - Maintenance & Transmission Engineering
1992 – June 1999 (retired)

- Lead a team of 15 Engineers and support personnel located in Arkansas, Kansas and Oklahoma. Provide advanced technical support for ATM , TDM and Electronic switches and associated transport, power and radio systems in over 360 central offices.
- Develop and implement Operational Test & Analysis Review processes for switch, transport and power equipment. Conduct COE Installation Supplier Quality assessment audits and Network Reliability audits. Conduct grounding and bonding audits.
- Create transmission designs for fiber optic cable routes, and SONET, microwave and VHF/UHF mobile radio systems. Responsible for Network Synchronization.
- Conduct Beta testing during SONET and ATM equipment trials.
- Served on SW Bell/Pacific Bell Merger Team - Developed "Seven State Process" which assessed "Best Practices" used by each company, leading to the adoption of uniform Maintenance & Transmission Engineering processes across the combined company.
- Pioneered use of Infrared Scanners for central office power inspections and use of unlicensed spread-spectrum 2.4 GHz radio for emergency restorations and facility relief.

Area Mgr. - Real Estate & Architecture
1980 – 1991

- Manage and coordinate five teams of architectural project managers, engineers and consultants in planning, designing and implementing central office, radio and administrative building projects. Manage annual CAPEX budget of $7,900,000.
- Select and hire contractors and consultants. Establish performance standards. Develop and direct engineering records mechanization process.
- Manage and supervise the planning, negotiating, purchasing and leasing of land, buildings and floor space. Administer $2,400,000 annual leasing budget. Personally negotiate/administer $1,200,000 in annual leasing and brokerage transactions.
- Conduct economic studies. Develop lease documents and investor solicitation packages for build/lease projects. Represent company in zoning/land-use hearings. Acquire microwave and cellular tower sites.

Wisconsin Bell Telephone Company, 1969 – 1979

Engineer – Central Office Equipment Planning *Milwaukee, Wisconsin*
1978 - 1979

- Conduct Network Planning economic studies involving central office projects.
- As member of Speakers Panel, present company programs to civic clubs and schools.

Assistant Engineer – Central Office Equipment Engineering *Madison, Wisconsin*
1969 - 1977

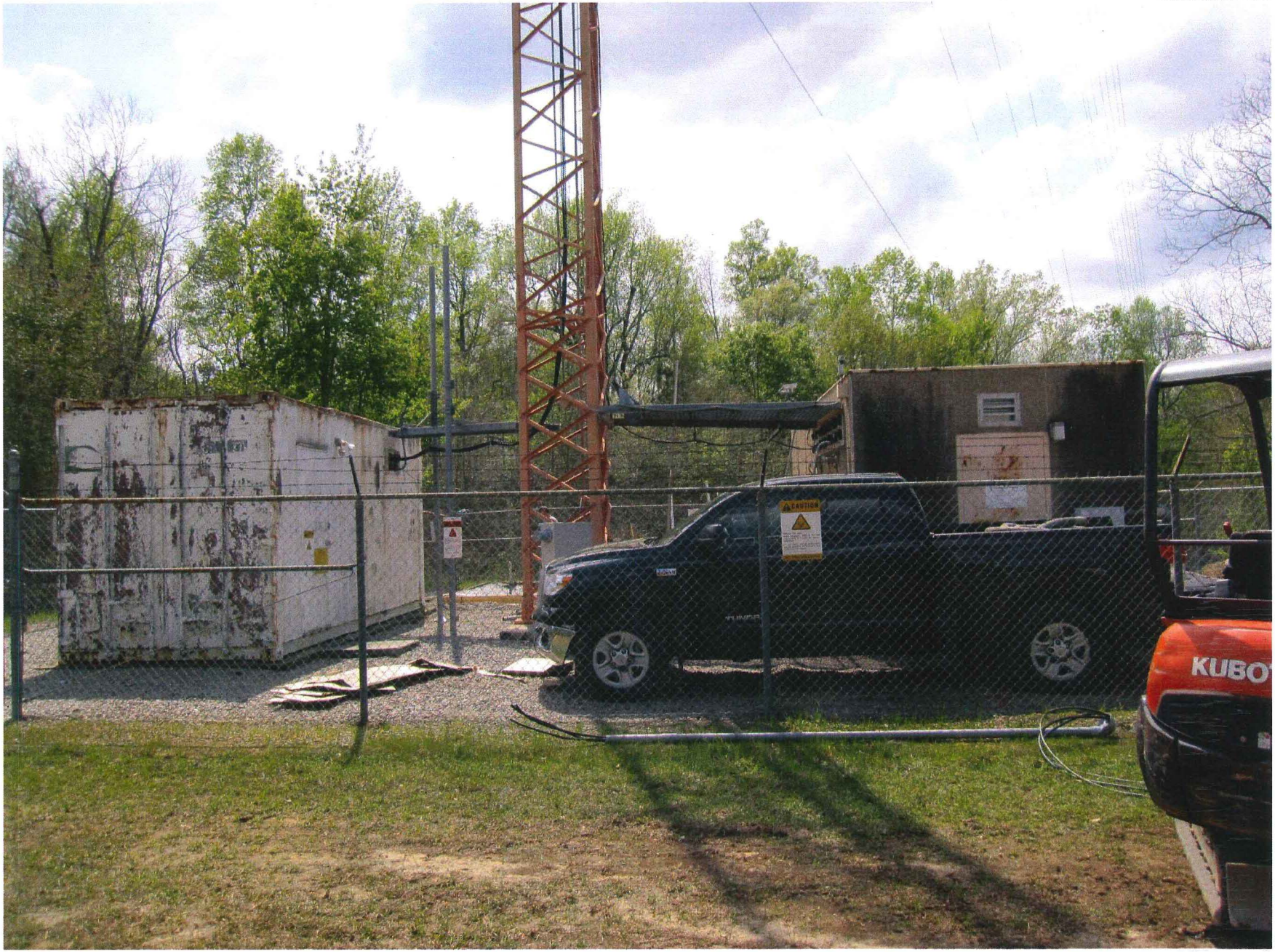
- COE Engineering for switching, transport and power equipment.
- Developed first plan in company for reuse of MDF for dial-to-dial conversions.

Education:
Associate in Science - Electronics Engineering Technology
Herzing College - Madison, Wisconsin

Specialized Training:
Numerous technical, management, building and real estate courses from Greenville Technical College, Nortel, Lucent, Fujitsu, Alcatel, Cisco, Telcordia, Southwestern Bell Center for Learning and others. VoIP Analyst Certification – Spirit Telecom. MS Office proficient.

Professional Licenses:
Registered Professional Engineer (Electrical) - Arkansas
FCC Radio License
Real Estate Broker's License (lapsed)

Affiliations:
National Society of Professional Engineers (lapsed)
Institute of Electrical and Electronics Engineers (lapsed)
American Radio Relay League



Typical HALO Tower Site

Schedule RD-3