BEFORE THE TENNESSEE REGULATORY AUTHORITY

NASHVILLE, TENNESSEE

October 25, 1999

IN RE:	)	
	)	
PETITION FOR ARBITRATION BY ITC^DELTACOM COMMUNICATIONS, INC. WITH BELLSOUTH TELECOMMUNICATIONS, INC., PURSUANT TO THE TELECOMMUNICATIONS ACT OF 1996	)	**DOCKET NO. 99-00430**

REBUTTAL TESTIMONY OF THOMAS HYDE ON BEHALF OF ITC^DELTACOM COMMUNICATIONS, INC.

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

A. My name is Thomas Hyde. I am Senior Manager – Industry Relations for ITC^DeltaCom Communications Inc., ("ITC^DeltaCom"). My business address is 1530 DeltaCom Drive Anniston, Alabama 36202.

Q. ARE YOU THE SAME THOMAS HYDE THAT FILED DIRECT TESTIMONY IN THIS PROCEEDING?

A. Yes.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. I will rebut certain testimony filed by BellSouth in this docket.

Issue 2(b)(ii) - Until the Authority makes a decision regarding UNEx and UNE combinations, should BellSouth be required to continue providing those UNEs and combinations that it is currently providing to ITC^DeltaCom under the existing interconnection agreement previously approved by the Authority?

Q. WITNESS VARNER STATES THAT BELLSOUTH SHOULD BE ABLE TO DECIDE WHICH COMBINATIONS IT WILL OFFER IN SEPARATE COMMERCIAL AGREEMENTS UNTIL THE FCC ISSUES ITS NEW ORDER. DO YOU AGREE?

A. No. First, I believe that the Tennessee Regulatory Authority ("Authority") has all necessary authority to require BellSouth to provide certain Unbundled Network Elements ("UNE") and to combine those UNEs. Second, on September 15, 1999 the FCC issued the following News Release summarizing the FCC's order on UNEs

in the Third Report and Order and Fourth Further Notice of Proposed Rulemaking in CC Docket No. 96-98 (FCC 99-238):

> Washington, D.C. – The Federal Communications Commission (FCC) adopted rules today that specify the portions of the nation's local telephone networks that incumbent local telephone companies must make available to competitors seeking to provide competitive local telephone service. This FCC decision removes a major uncertainty surrounding the unbundling obligations of the Telecommunications Act of 1996 and is expected to accelerate the development of competitive choices in local services for consumers. Unbundling allows competitors to lease portions of the incumbent's network to provide telecommunications services.
> Today's order responds to a U.S. Supreme Court decision which generally affirmed the FCC's implementation of the pro-competition goals of the Telecommunications Act, but which required the Commission to re-evaluate the standard it uses to determine which network elements the incumbent local phone companies must unbundle.
> Today's order adopts a standard for determining whether incumbents must unbundle a network element. Applying the revised standard, the Commission reaffirmed that incumbents must provide unbundled access to six of the original seven network elements that it required to be unbundled in the original order in 1996:
> (1) loops, including loops used to provide high-capacity and advanced telecommunications services;
> (2) network interface devices;
> (3) local circuit switching (except for larger customers in major urban markets);
> (4) dedicated and shared transport;
> (5) signaling and call-related databases; and,
> (6) operations support systems
>
> The Commission determined that it is generally no longer necessary for incumbent LECs to provide competitive carriers with the seventh element of the original list -- access to their operator and directory assistance services. The Commission concluded that the market has developed since 1996 to where competitors can and do self-provision these services, or acquire them from alternative sources.
> The Commission also concluded, in light of competitive deployment of switches in the major urban areas, that, subject to certain conditions, incumbent LECs need not provide access to unbundled local circuit switching for business customers with four or more lines that are located in the densest parts of the top 50 Metropolitan Statistical Areas (MSAs).
> The Commission also addressed the unbundling obligations for network elements that were not on the original list in 1996. The Commission

required incumbents to provide unbundled access to subloops, or portions of loops, and dark fiber optic loops and transport. In addition, the Commission declined, except in limited circumstances, to require incumbent LECs to unbundle the facilities used to provide high-speed Internet access and other data services, specifically, packet switches and digital subscriber line access multiplexers (DSLAMs). Given the nascent nature of this market and the desire of the Commission to do nothing to discourage the rapid deployment of advanced services, the Commission declined to impose an obligation on incumbents to provide unbundled access to packet switching or DSLAMs at this time. The Commission further noted that competing carriers are aggressively deploying such equipment in order to serve this emerging market sector.
Finally, the Commission also concluded that the record in this proceeding does not address sufficiently issues surrounding the ability of carriers to use certain unbundled network elements as a substitute for the incumbent LECs' special access services. The Commission therefore adopted a Further Notice of Proposed Rule Making (NPRM) seeking comment on these issues.

Action by the Commission, September 15, 1999, by Third Report and Order and Fourth Further Notice of Proposed Rulemaking in CC Docket No. 96-98 (FCC 99-238).

It is clear from the FCC's News Release that the FCC has decided which UNEs the ILECs must continue to provide. The only UNEs dropped by the FCC are directory assistance and operator services - UNEs that ITC^DeltaCom have not requested from BellSouth. All other UNEs must continue to be provided by ILECs. An exception was made for the port UNE in the top 50 MSAs <u>but only if the ILEC would provide the type of extended loop used by ITC^DeltaCom.</u>[1]

[1] <u>Circuit Switching</u>. Incumbent LECs must offer unbundled access to local circuit switching, except for switching used to serve business users with four or more lines in access density zone 1 (the densest areas) in the top 50 Metropolitan Statistical Areas (MSAs), provided that the incumbent LEC provides non-discriminatory, cost-based access to the enhanced extended link. (An enhanced extended link (EEL) consists of a combination of an unbundled loop, multiplexing/concentrating equipment, and dedicated transport. The EEL allows new entrants to serve customers without having to collocate in every central

Issue 2(b)(iii) -
a) Should BellSouth be required to provide ITC^DeltaCom extended loops or the loop/port combination?
b) If so, what should the rates be?

Q. WITNESS VARNER HAS STATED THAT BELLSOUTH HAS NO OBLIGATION TO PROVIDE EXTENDED LOOPS. DO YOU AGREE?

A. No. The current interconnection agreement, paragraph IV B14 states:

> The parties shall attempt in good faith to mutually devise and implement a means to extend the unbundled loop sufficient to enable DeltaCom to use a collocation arrangement at one BellSouth location per LATA (e.g., tandem switch) to obtain access to unbundled loop(s) at another such BellSouth location over BellSouth facilities.

There is no way to comply with the provisions of VI B14 except to provide extended loops. I do not understand how BellSouth can reconcile the good faith provisions of the existing Commission approved interconnection agreement and still claim that they have no obligation to continue to provide the service.

BellSouth has provided ITC^DeltaCom more than two thousand five hundred extended loops. It is difficult to comprehend how a company such as BellSouth could provide ITC^DeltaCom more than 2500 extended loops under the provisions of paragraph IV B14 and still claim that it was under no obligation to continue to do so. In order to maintain the status quo, it is necessary for BellSouth to continue to provide extended loops to ITC^DeltaCom.

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office in the incumbent's territory.) From the Summary to the News Release issued by the FCC September 15, 1999 in CC Docket 96-98.

Q. HOW DID ITC^DELTACOM START THE EXTENDED LOOP PROCESS WITH BELLSOUTH?

A. Shortly after the interconnection agreement was signed, ITC^DeltaCom went to BellSouth with our proposed extended loop arrangement. BellSouth accepted that arrangement and began installing service. BellSouth continued to accept orders for extended loops until March of 1999 when ITC^DeltaCom complained about the quality of service being provided.

Q. HAS BELLSOUTH THREATENED TO DISCONNECT ITC^DELTACOM's EXISTING CUSTOMERS SERVED VIA EXTENDED LOOPS?

A. Yes. As I stated above, after ITC^DeltaCom complained about the service quality of the extended loops, BellSouth started rejecting orders for extended loops. BellSouth then threatened to disconnect all existing extended loops. With the threat of loss of service to more than 2500 loops, ITC^DeltaCom had no choice but to file collocation applications for more than 50 BellSouth central offices to prevent disruption of service to ITC^DeltaCom's customers. ITC^DeltaCom was never given any reassurance that BellSouth would leave the existing extended loops in service even long enough to convert to non-extended loops.

ITC^DeltaCom respectfully requests the Authority to maintain the status quo and require the continued provision of extended loops in Tennessee pending the order issuance of the FCC in the UNE proceeding. At the very least, the Authority should require BellSouth to continue providing extended

loops until BellSouth decides whether it will take advantage of the FCC's circuit switching exemption and volunteer to provide extended loops to all CLECs.

Issue 6(b) - What are the appropriate recurring and non-recurring rates and charges for:

a) two-wire ADSL/HDSL compatible loops;
b) four-wire ADSL/HDSL compatible loops;
c) Two-wire SL1 loops;
d) two-wire SL2 loops; or
e) two-wire SL2 loop Order Coordination for Special Conversion Time?

Q. BELLSOUTH'S POSITION ON ADSL RATES IS THAT THE RATES CONTAINED CURRENT AGREEMENT BE APPLIED UNTIL RATES ESTABLISHED IN THE DOCKET 97-01262 FINAL ORDER SHOULD APPLY AND THAT ITEMS C), D), AND E) ARE NOT INCLUDED IN THE CURRENT AGREEMENT. DO YOU AGREE?

A. Not entirely. Rates for items d) and e) are included in the current agreement. The current 2-wire voice grade loop is the 2-wire SL2 and the current non-recurring Charge (NRC) includes the time specific coordination function. In addition ITC^DeltaCom does not believe that the record in Docket 97-01262 contains sufficient data to address the ADSL/HDSL NRCs. The non-recurring charge (NRC) for ADSL should be the NRC for an equivalent voice grade loop plus an incremental cost for checking to see if the loop will meet the ADSL criteria. BellSouth does not provide any conditioning, or additional work of any type beyond that necessary for an equivalent voice grade UNE loop, on the ADSL loop as part of the basic ADSL loop NRC. Any conditioning performed by BellSouth to make a loop ADSL

compatible is charged separately under special construction charges. These special construction charges are usually for removing any load coils and bridge taps from the loop.

Q. HOW IS AN ADSL COMPATIBLE UNE LOOP DIFFERENT FROM ADSL SERVICE OR A VOICE GRADE UNE LOOP, BESIDES THE LARGE DIFFERENCE IN THE RESPECTIVE NON-RECURRING CHARGES?

A. ADSL is an overlay service placed on voice grade facilities. That is correct whether BellSouth provides ADSL on an existing exchange service (via an ADSL compatible loop) or a CLEC provides ADSL on an ADSL compatible UNE loop. The advanced service associated with ADSL is a function of the central office and customer premises equipment, not a function of the loop. The loop itself is old copper technology (BellSouth's first copper pair loop installed over one hundred years ago was ADSL compatible). Since ADSL is only an overlay on voice grade loops, BellSouth's claim that ADSL is always a designed service is based on BellSouth's faulty assumptions. ADSL may be an overlay to an undesigned SL1 loop (as BellSouth chooses to provide for itself) or it may be an overlay to a designed SL2 (as ITC^DeltaCom intends to order). Thus, the appropriate NRC for ADSL is the NRC for an equivalent voice grade loop plus an incremental cost for checking to see if the loop will meet the ADSL criteria.

Q. BELLSOUTH COST STUDIES FOR ADSL ASSUMES THAT A DISPATCH IS ALWAYS REQUIRED ON ADSL UNE LOOPS AND THAT ADSL LOOPS ARE ALWAYS DESIGNED. DO YOU AGREE?

A. No. It is important to note that the dispatch assumed by BellSouth is the same dispatch that is necessary for the installation of a loop regardless of whether or not that loop is the BellSouth retail exchange service loop or a UNE loop. Dispatch of a technician to the customer premises for ADSL alone is more a function of non-regulated customer premises equipment than of the loop itself. If an end user is served by an existing non-loaded copper facility (plain old copper wire), no dispatch is required to convert that end user to ADSL UNE loops. If that end user is <u>not</u> served by an existing non-loaded copper facility, then ITC^DeltaCom will be required to pay special construction charges that will cover any dispatch required to "condition" the loop.

The claim by BellSouth that dispatch is required 100% of the time on ADSL compatible UNE loops also illustrates the lack of a forward-looking cost study. BellSouth assumed in their cost study that there would not be any BellSouth ADSL service that could be lost to competition. At the time the cost study was filed, that may have represented the existing, historical condition. However, today there are BellSouth ADSL customers in Tennessee and a forward-looking study would have allowed for competitive losses to those existing BellSouth ADSL customers. Conversion of an existing BellSouth ADSL service to ADSL UNE loop would <u>not</u> require a dispatch since the loop is already ADSL compatible. Work would only be required in the central office.

BellSouth also failed to take into account those existing BellSouth exchange service customers served by an ADSL compatible (plain old copper) loop that would convert to a CLEC service and add the ADSL capability. These situations would also not require dispatch. In addition, there will be some quantity of idle ADSL compatible loops connected to NIDs that will not require dispatch.

The end result of the position taken by BellSouth is the raising of artificial, anti-competitive barriers to CLEC entry into the ADSL market.

Q. WHY DID YOU REFERENCE THE NRC ASSOCIATED WITH BELLSOUTH'S ADSL SERVICE IN THEIR FCC TARIFF NO. 1?

A. The $50 NRC for ADSL service in BellSouth's FCC Tariff No. 1 contains costs for at least two functions. The majority of the costs are associated with installation of the central office ADSL equipment and connection of that equipment with transport Permanent Virtual Circuits (PVCs). A very small portion of the costs are to verify through loop records that the loop is "plain old copper" without such equipment as load coils and bridge taps. That very small percentage of the ADSL service NRC costs would also apply to ADSL UNE loop NRC costs. BellSouth has not yet furnished those cost studies so I cannot determine the exact amount of the additive, but it could be as low as $1 or $2. This cost should then be added to the appropriate voice grade UNE loop NRC cost.

A comparison should be made between the total NRCs for a BellSouth exchange line with ADSL and an ADSL compatible UNE loop. The NRC for installation of a business exchange line and the ADSL NRC totals $108.50 for the

first line and $81.00 for additional lines ($91.50 for first residence and $68.00 for additional). The NRC proposed by BellSouth in docket 97-01262 for an ADSL compatible loop is more than $500.00. For a $108.50 NRC BellSouth will provide a retail business customer the loop, port and the ADSL central office equipment and transport. For a NRC that exceeds $500.00 BellSouth will provide a CLEC only the loop. The costs for both of these examples are similar (while the NRC cost of a UNE loop may be somewhat higher than an exchange loop, the UNE does not include the NRC costs of the port and central office equipment that is included in the retail. Thus the total retail NRC costs are somewhat higher than the UNE NRC loop costs). As I stated in my analysis of ADSL filed with the Louisiana Commission:[2]

> I will address two aspects of BellSouth's "low speed" ADSL NRC cost study. First, the "low speed" ADSL cost study has worktimes for only two functions. Those functions are service order and connect and test. Worktimes for processing an inquiry to determine if the loop is ADSL compatible are not shown in the study. Therefore, the comparison between ADSL service cost and UNE cost cannot be correctly made as this leads me to believe that BellSouth does not charge for this function in their ADSL service and yet includes these costs in their UNE costs. Second, the current NRC rate in BellSouth's FCC tariff for "low speed" ADSL is significantly below their filed costs.
>
> This below cost NRC rate (below cost even with some of the costs omitted from the study) when compared with the UNE NRC rates which contain not only the missing costs for service inquiry but also include functions that are not required for ADSL (BellSouth has also admitted that ADSL is only an overlay to voice grade facilities) raise a barrier to competitive entry and establish a "price squeeze" between ADSL "service" rates and ADSL UNE rates with benefits accruing only to BellSouth.

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[2] Supplemental Rebuttal Testimony filed 10/1/1999 In Louisiana Public Service Commission Docket U-24204. In Re: Petition for Arbitration of ITC^DeltaCom Communications, Inc with BellSouth Telecommunications, Inc Pursuant to the Telecommunications Act of 1966.

BellSouth also filed a "high speed" ADSL service. There are no differences between the "low speed" ADSL and "high speed" ADSL loops. Both services use the same loop. The difference is in the DSLAM, PVC and ATM capabilities. A "low speed" can be changed to a "high speed" without any work on the loop. Although the "high speed" ADSL NRC rate is above the filed cost, the cost includes functions that are in conflict with BellSouth's responses to ITC^DeltaCom's First Data Requests, Items 21 and 33 in which BellSouth claims that it is inappropriate to average the loop conditioning and that BellSouth does not include loop conditioning in its tariffed rates. BellSouth's cost study and FCC "high speed" ADSL tariff rate does include averaged loop conditioning. I recommend that this Commission direct BellSouth to offer the same loop conditioning that is included in BellSouth "high speed" ADSL service.

The same "price squeeze" situation exists in Tennessee with BellSouth charging below costs rates for their own ADSL service and inflating the UNE rates by including costs for functions in the UNE costs that are neither needed nor, for that matter, even capable of being used.

Q. HAS BELLSOUTH PRODUCED AN APPROPRIATE VOICE GRADE UNE LOOP NRC COST TO APPLY TO ADSL?

A. No. In their recurring ADSL cost study BellSouth has recognized that the extra costs associated with digital loop carrier are not appropriate to ADSL since ADSL will not work with digital loop carrier and also that the ADSL loops are shorter and thus less costly. Those costs are reflected in ADSL recurring rates that are less than voice grade rates. There are extra NRC costs associated with digital loop carriers that must also be removed from any costs associated with ADSL NRCs.

ITC^DeltaCom - and any competing local provider - faces tremendous obstacles in trying to convince a long-standing customer of BellSouth to switch to a new carrier. When the customer experiences problems at the very outset of this

new arrangement, it immediately causes a perhaps already tentative customer to become even more anxious about the decision to go with a new carrier. When these problems occur, it is ITC^DeltaCom that is held responsible - not BellSouth. This is so even though the problem with the transition is BellSouth's problem and acknowledged by BellSouth. ITC^DeltaCom often has to go to great lengths to retain a customer under these circumstances for which it is not compensated by BellSouth. Performance Guarantees are critical to (1) providing BellSouth with the incentive to reduce the incidence of these types of problems and (2) to ensure that ITC^DeltaCom and its customer are compensated for service outages and delays caused by BellSouth.

Issue 1(a) - Should BellSouth be required to comply with the performance measures and guarantees for pre-ordering/ordering, resale, and unbundled network elements (UNEs), provisioning, maintenance, interim number portability and local number portability, collocation, coordinated conversion and the bona fide request processes as set forth fully in Attachment 10 of Exhibit A to this Petition?

Q. WHY ARE PERFORMANCE GUARANTEES NEEDED?

A. Performance guarantees are not a new concept as BellSouth provides such guarantees in its tariffs today.

ITC^DeltaCom believes that it is critical for local competition and for the purposes of executing this interconnection agreement that performance measures and guarantees are included and filed and approved by the Authority at least on an interim basis until the Authority has established a generic ruling.

Issue 2; 2(a)(iv); and 2(b)(I): -

a) What is the definition of parity?
b) Pursuant to this definition, should BellSouth be required to provide the following and if so, under what conditions and at what rates:
1) Operational Support Systems ("OSS");
2) UNES
3) Access to Numbering Resources
4) An unbundled loop using Integrated Digital Loop Carrier ("IDLC") technology; and
5) Priority guidelines for repair and maintenance and UNE provisioning?

Q. WITNESS VARNER CLAIMS THAT PARITY WITH RETAIL IS NOT POSSIBLE BECAUSE BELLSOUTH DOES NOT PROVIDE ITSELF UNEs. IS THIS A VALID OBJECTION?

A. No. As I am sure the Authority is aware, a similar situation occurred with intraLATA toll. Access rates were imputed to the toll rates because the ILECs did not bill themselves access. Access functions are; of course, required for toll to interconnect with the public switched network. The situation is the same with local service. Even though BellSouth does not bill itself UNE rates for the local service they provide, the loop and switch UNE functions are required for any BellSouth retail local service to function. BellSouth realizes that local service is made up of combinations of UNE equivalents since they have gone to great lengths to substantiate their claims that a combination of loop and port UNEs is the same as local retail service. There are other BellSouth retail services that require the transport function in addition to the loop and switch function. Therefore, even if BellSouth does not "provide UNEs to themselves", they provide functionally identical facilities and equipment. Claims to the contrary would amount to using semantics to play games with reality.

The maintenance parameters for UNEs, just as it is with access, should be set at a more stringent level than the end-to-end retail service in order to have equal treatment. ITC^DeltaCom has not requested the maintenance parameters to be set at the more appropriate end link levels, but has held that ITC^DeltaCom could compete effectively with only retail parity.

At this time ITC^DeltaCom is not requesting the Authority to immediately impute UNE rates to local service due to the significant levels of retail rate shock that would occur. However, unless BellSouth demonstrates willingness to provide UNEs at parity with its retail services and at rates that allow meaningful competition to develop, ITC^DeltaCom recommends that the Authority establish a generic docket to consider phasing in the imputation of UNE rates to local services.

Q. BELLSOUTH WITNESSES VARNER AND MILNER STATE THAT LOOP UNEs CANNOT BE PROVIDED VIA IDLC. IS THIS CORRECT?

A. No. BellSouth is currently providing ITC^DeltaCom loop UNEs via the "side door" IDLC methodology that splits the loop off the switch. The quantities are small but are proof that the methodology is valid. BellSouth installed these IDLC UNE loops at their own discretion and ITC^DeltaCom was not informed. ITC^DeltaCom only found out about the IDLC provisioning during tests for service turn-up. However, if it works for these instances, it will work in other instances and should be mandated for more extensive use. BellSouth's claims that the non-IDLC loops that it provides "meets the technical criteria for that loop" is disingenuous since the

technical criteria used is BellSouth's criteria and does not provide the required parity for full competition.

Q. BELLSOUTH CLAIMS THAT IT IS A "FALSE ASSUMPTION" THAT IDLC PROVIDES BETTER SERVICE THAN NON-IDLC. WHAT IS ITC^DELTACOM'S POSITION?

A. There are three conditions in which BellSouth provides non-IDLC loops. The first condition is where BellSouth provides IDLC for their retail customer and changes the loop provisioning to UDLC loops when converting the end user to a CLEC. When UDLC is used there is at least one additional analog to digital/digital to analog conversion added to the loop. Attached as Exhibit TAH-1 is an industry white paper on V.90 modems that states that V.90 modems will not work to full speed if there are more than one analog/digital conversion in the circuit. That additional conversion may cause deterioration of data on the loop and thus provide degraded service to the CLEC thereby reducing the data rate of the service to a level below that offered on IDLC. The second condition involves replacing existing IDLC with excessively long copper loops. These types of loops may have excessive noise and/or excessive loss reducing the quality of service provided to a level below that provided by IDLC. The third condition is where BellSouth uses copper loop to provide service to its end users and makes that loop available to ITC^DeltaCom. The third condition is the only one where ITC^DeltaCom can be assured that it will receive the same level of service as that BellSouth provides to its end users. In addition, BellSouth's claims that the non-IDLC loops that it

provides "meets the technical criteria for that loop" is disingenuous since the technical criteria used is BellSouth's criteria and does not provide the required parity for full competition.

Issue 1(b) - Should BellSouth be required to waive any nonrecurring charges when it misses a due date? If so, under what circumstances and for which UNEs?

Q. BELLSOUTH OBJECTS TO WAIVER OF NON-RECURRING CHARGES WHEN BELLSOUTH MISSES A DUE DATE. HOW DID ITC^DELTACOM DEVELOP THIS CONCEPT?

A. ITC^DeltaCom did not develop the concept of non-recurring charge waiver. BellSouth currently has performance guarantees in its access tariffs. As part of those performance guarantees, BellSouth agrees to waive the non-recurring charges when a due date is missed due to BellSouth faults. ITC^DeltaCom recommends that those same performance guarantees be extended to include all UNEs.

Issue 2(c)(I) - Should BellSouth be required to provide NXX testing capability to ITC^DeltaCom? If so, at what rate?

Q. WHAT IS ITC^DELTACOM'S POSITION ON NXX TESTING?

A. Due to errors and omissions in BellSouth translations of ITC^DeltaCom NXX codes, ITC^DeltaCom has found it necessary to dispatch technicians to remote locations so that they could place test calls through local service provided by BellSouth to insure that the translations have been correctly installed by

BellSouth. A request was made in late 1997 for BellSouth to assist in the testing of translations. BellSouth responded by recommending that ITC^DeltaCom place orders for FX lines or Centrex service to every BellSouth end office if we wanted to gain access to the BellSouth switches to test our NXX codes. Establishing FX or Centrex service to the hundreds of BellSouth end offices is not cost effective for ITC^DeltaCom and would not be cost effective for BellSouth if they were placed in a similar position. ITC^DeltaCom recommends that BellSouth provide access to the existing BellSouth FX test network that BellSouth uses today for responses to trouble tickets until such time as BellSouth provides remote access Remote Call Forwarding at TELRIC prices. At a minimum ITC^DeltaCom should have automated tests of the NXX codes in all end offices with correction of any errors or omissions found during those tests. This level of testing is necessary to assure that the quality of the network is maintained at high levels.

Issue 2(c)(ii) - what should be the installation interval for the following loop cutovers?

a) single

b) multiple

Q. HAS BELLSOUTH CORRECTLY STATED ITC^DELTACOM'S POSITION ON THE ISSUE OF 15 MINUTE CUTOVERS?

A. No. ITC^DeltaCom agrees that the complete cutover may take longer that 15 minutes depending on, among other things, the number of loops involved. ITC^DeltaCom's position is that the customer's service should not be interrupted

longer that 15 minutes between the disconnection of the old service and the connection of BellSouth's facilities to ITC^DeltaCom's collocation space. Any problems occurring in ITC^DeltaCom's facilities or equipment would not count as part of the 15 minute interval. If the proper preparation work is completed prior to disconnecting the customer's existing service, this parameter will not be difficult for BellSouth to meet. This language exists in the current interconnection agreement and should be continued to the new agreement.

Issue 2(c)(iv) - Should the party responsible for delaying a cutover also be responsible for the other party's reasonable labor costs? If so, at what cost?

Q. DO THE PARTIES OPERATE UNDER THIS PROCEDURE TODAY?

A. Yes. The parties have operated with this provision in the existing interconnection agreement for the past two years. I recommend that the Authority require BellSouth to continue this provision from the existing agreement.

Issue 2(c)(vi) - Should each party be responsible for the repair charges for troubles caused or originated outside of its network? If so, how should each party reimburse the other for any additional costs incurred for isolating the trouble to the other's network?

Q. DOES ITC^DELTACOM AGREE TO BEAR THE COST OF TROUBLE ISOLATION TO A THIRD PARTY'S NETWORK

A. ITC^DeltaCom has agreed to this issue with BellSouth.

Q. WHAT IS ITC^DELTACOM'S POSITION ON ADDITIONAL COSTS ASSOCIATED WITH TROUBLE ISOLATION TO BELLSOUTH'S NETWORK?

A. ITC^DeltaCom is pleased to note that BellSouth has now adopted ITC^DeltaCom's position on this issue. According to Witness Varner's testimony (page 25 lines 12-18) costs for subsequent trouble isolation should be borne by the party on whose network the trouble is located.

Issue 2(c)(x) - Under what conditions, if any, should BellSouth be required to reimburse any costs incurred by ITC^DeltaCom to accommodate modifications made by BellSouth to an order after sending a firm order confirmation ("FOC")? If so, what are the costs?

Q. DOES BELLSOUTH EVER MODIFY ITC^DELTACOM'S ORDER AFTER ISSUING AN FOC?

A. Yes. In fact, BellSouth modifies the due date after the FOC on a frequent basis. Often BellSouth modifies the due date on the FOC due date itself after ITC^DeltaCom has dispatched its central office and customer premises technicians to work the order (as well as arranging for third party venders to be dispatched to the customer premises). These types of incurred costs must be reimbursed by BellSouth. These costs are incurred on an Individual Case Basis and should be reimbursed on the same basis.

Issue 2(c)(xiv) -
a) Should BellSouth be required to coordinate with ITC^DeltaCom 48 hours prior to the due date of a UNE conversion?

b) If BellSouth delays the scheduled cutover date, should BellSouth be required to waive the applicable non-recurring charges?
c) Should BellSouth be required to preform dial tone tests at lease 8 hours prior to the scheduled cutover date?

Q. WHAT IS ITC^DELTACOM'S POSITION ON THESE ISSUES?

A. Until BellSouth is able to meet scheduled due dates on a consistent basis, coordination prior to the due date is necessary. By requiring BellSouth to coordinate with ITC^DeltaCom prior to the due date, ITC^DeltaCom will no longer be required to dispatch technicians only to find out that BellSouth is not ready to work the order. Many of the cutover problems could be alleviated if BellSouth coordinated with ITC^DeltaCom 24 to 48 hours prior to the scheduled cutover date and performed any tests ahead of that date to insure that the cutover will work smoothly. If BellSouth delays the cutover date, BellSouth has cost us and our customer time and money. Thus, BellSouth should waive or refund any applicable non-recurring charges associated with that cutover. In addition, in our current contract, the Party responsible for the delay should pay for the other Party's reasonable labor costs. This language is in our existing agreement approved by the Authority.

ITC^DeltaCom will continue to negotiate the issue of dial tone tests with BellSouth.

Issue 5 - Should the parties maintain the same local interconnection arrangements?

Q. HAS BELLSOUTH ADDRESSED ALL ISSUES CONCERNED WITH ATTACHMENT 3 AND LISTED AS UNRESOLVED IN EXHIBIT B?

A. No. At the time of the filing of this petition, BellSouth was reviewing ITC^DeltaCom's proposed language. Thus, in order to preserve these issues, ITC^DeltaCom generally requested the same interconnection language that is in our current agreement as part of issue 5. ITC^DeltaCom then listed each section of the proposed language it provided BellSouth that it understood as open and under review as an unresolved issue in Exhibit B.

Issue 7(b)(ii) - What procedures should ITC^DeltaCom and BellSouth adopt for meet point billing?

Q. PLEASE STATE ITC^DELTACOM'S POSITION.

A. The issue of filing meet point percentages in the NECA tariff raised by BellSouth is irrelevant. Neither the FCC nor NECA require that CLECs to file in the NECA tariffs. BellSouth is free to do so if they desire. However, any "assumed percentage" or "default percentage" should be set at 100% for ITC^DeltaCom and 0% for BellSouth since ITC^DeltaCom either provides those facilities into BellSouth's tandem offices itself or leases the facilities from BellSouth. It is interesting to note that of the many hundreds of CLECs, only about 100 file central office capabilities in NECA FCC Tariff 4 and of those 100 only half file any sort of billing percentage. Since all required ITC^DeltaCom information is contained in the Local Exchange Routing Guide ("LERG"), the only reason that I can determine for BellSouth to demand that CLECs file something in a non-

required and unnecessary tariff is to make BellSouth's CABs billing easier while increasing costs to CLECs.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes. However, I reserve the right to address any issues raised by BellSouth and to supplement my testimony and rebuttal testimony as necessary upon production of any discovery requests.

EXHIBIT TAH-1
TO REBUTTAL TESTIMONY OF THOMAS HYDE

3Com Technical Papers

3Com

3Com V.90 Technology

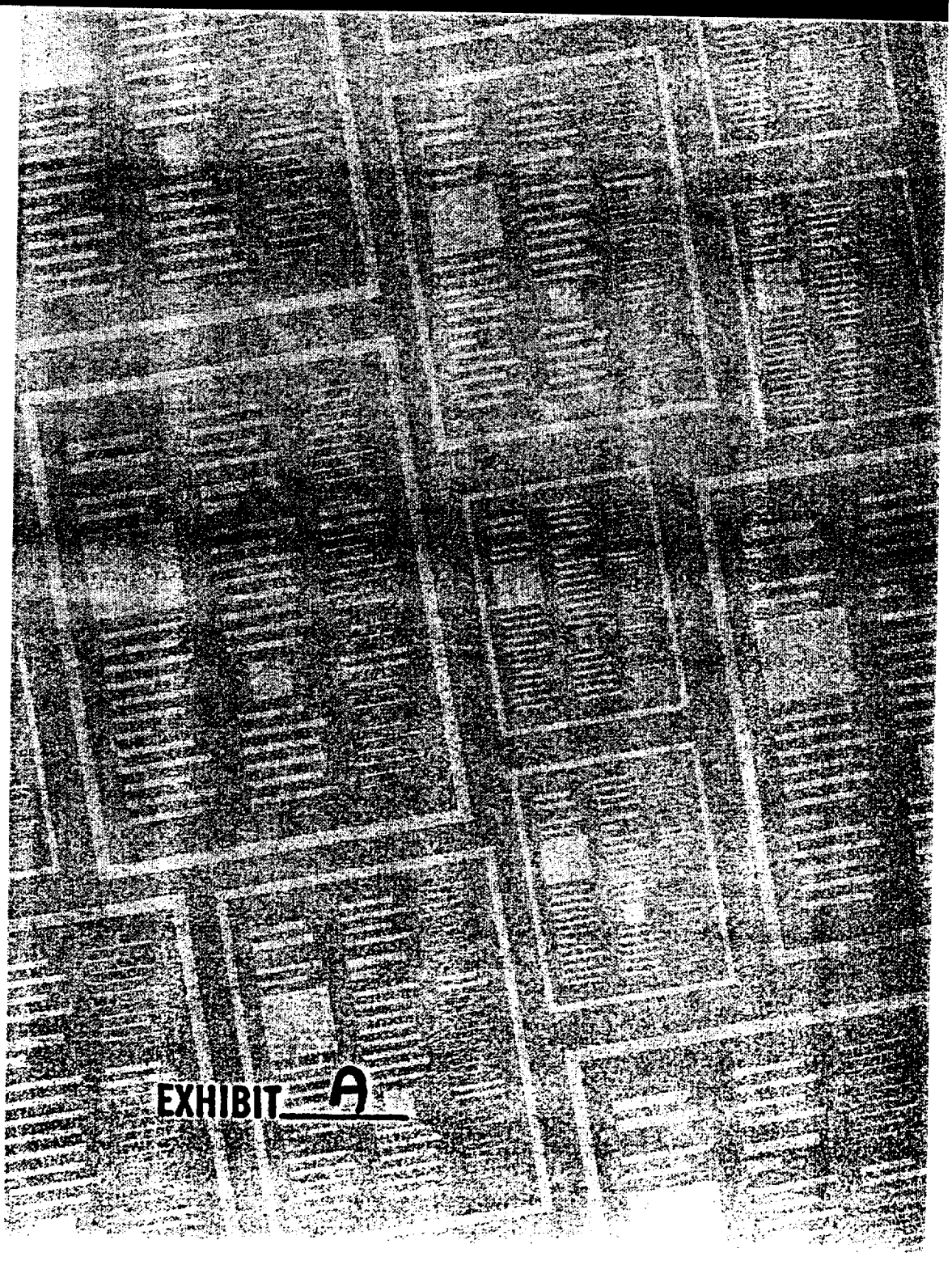


EXHIBIT A

3Com V.90 Technology

Contents

3Com V.90 Technology

V.90, a data transmission recommendation developed by Study Group 16 of the International Telecommunications Union (ITU), provides a specification for achieving line speeds of up to 56 Kbps. This paper explains V.90 in detail.

V.90 technology allows modems to receive data at up to 56 Kbps over the standard public switched telephone network (PSTN). V.90 overcomes the theoretical limitations imposed on standard analog modems by exploiting the digital server connections that most Internet and online service providers use at their end to connect to the PSTN.

Typically, the only analog portion of the phone network is the phone line that connects the remote site to the telephone company's central office (CO). Over the past two decades, local telephone companies have been replacing portions of their original analog networks with digital circuits. But the slowest portion of the network to change has been the connection from the home to the CO. That connection will likely remain analog for some years to come.

A software upgrade converts a service provider's 3Com Total Control™ remote access concentrator, SuperStack® II Remote Access System 1500 with Universal Connect™ technology, NETServer I-modems, or U.S. Robotics® MP I-modems to V.90 operation. 3Com calls the modems that have a direct digital connection to the PSTN V.90 *digital modems*. Likewise, converting a U.S. Robotics Courier™ V.Everything® analog modem to a V.90 *analog modem* is as simple as downloading new software.

V.34 Encoding in More Detail

The PSTN was designed for voice communications (Figure 1). By artificially limiting the sound spectrum to just those frequencies relevant to human speech, network engineers found they could reduce the bandwidth needed per call, increasing the number of potential simultaneous calls. While this works well for voice, it imposes limits on data communications.

V.34 modems are optimized for the situation where both ends connect by analog lines to the PSTN. Even though most of the network is digital, V.34 modems treat it as if it were entirely analog. V.34 modems are incredibly robust, but they cannot make the most of the bandwidth that becomes available when one end of the connection is completely digital. V.34 was built on the assumption that both ends of the connection suffer impairment due to quantization noise introduced by analog-to-digital converters (ADCs).

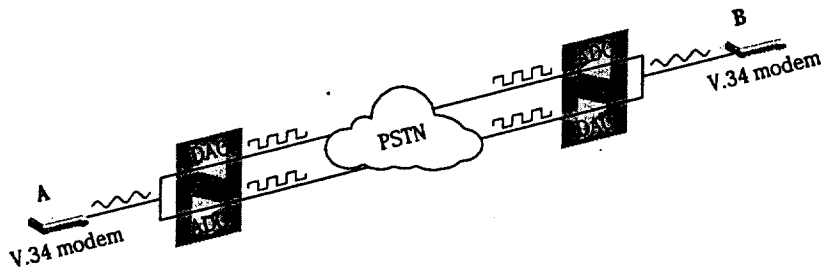


Figure 1. *Anatomy of a V.34 Connection*

Signal-to-Noise Ratio (SNR)

Signal-to-noise ratio is a measure of link performance arrived at by dividing signal power by noise power. The higher the ratio, the clearer the connection, and the more data can be passed across it. Even under the best conditions, when a signal undergoes analog-to-digital conversion, there is a 38 to 39 dB signal-to-noise ratio (the "noise floor"), which limits practical V.34 speeds to 33.6 Kbps.

Upstream and Downstream Channels: Asymmetric Operation

V.90 connections employ one bidirectional channel, upstream and downstream. The V.90 analog modem's downstream (receive) channel is capable of higher speeds because no information is lost in the digital-to-analog conversion. The V.90 analog modem's upstream (send) channel goes through an analog-to-digital conversion, which limits it to V.34 speeds.

Noise Introduced by Quantization of Analog Signals

Analog information must be transformed to binary digits in order to be sent over the PSTN. The incoming analog waveform is sampled 8,000 times per second, and each time its amplitude is recorded as a pulse code modulation (PCM) code. The sampling system uses 256 discrete 8-bit PCM codes.

Because analog waveforms are continuous and binary numbers are discrete, the digits that are sent across the PSTN and reconstructed at the other end can only approximate the original analog waveform. The difference between the original waveform and the reconstructed quantized waveform is called quantization noise, and it limits modem speed.

V.90 Encoding in More Detail

Quantization noise limits the V.34 communications channel to about 35 Kbps. But quantization noise affects only analog-to-digital conversion—not digital-to-analog. This is the key to V.90: if there are no analog-to-digital conversions between the V.90 digital modem and the PSTN, and if this digitally connected transmitter uses only the 255 discrete signal levels available on the digital portion of the phone network, then this exact digital information reaches the analog modem's receiver, and no information is lost in the conversion processes.

Here's how the process (Figure 2) works:

1. The server connects, in effect, digitally to the telephone company trunk.

2. The server signaling is such that the encoding process uses only the 256 PCM codes used in the digital portion of the phone network. In other words, there is no quantization noise associated with converting analog-type signals to discrete valued PCM codes.

3. These PCM codes are converted to corresponding discrete analog voltages and sent to the analog modem via an analog loop circuit, with no information loss.

4. The client receiver reconstructs the discrete network PCM codes from the analog signals it received, decoding what the transmitter sent.

Data is sent from the V.90 digital modem over the PSTN as binary numbers. But to meet the conditions of step 2 above, the V.90 digital modem transmits data (eight bits at a time) to the client's ADC at the same rate as the telephone network (8,000 Hz). This means the modem's symbol rate must equal the phone network's sample rate.

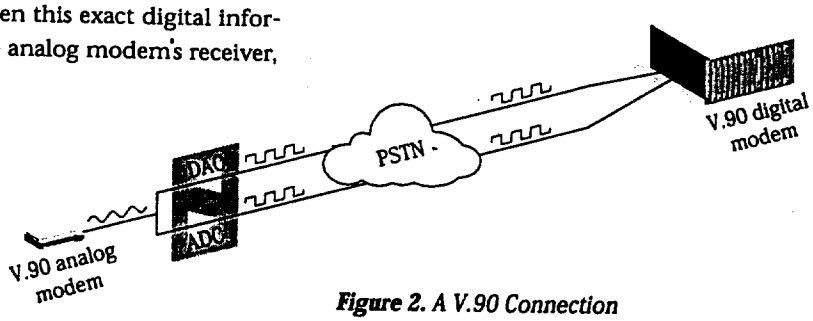
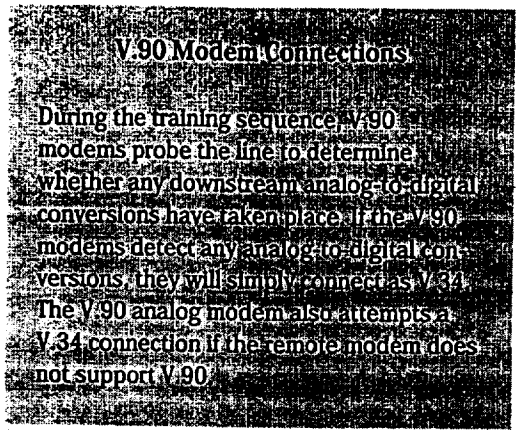


Figure 2. A V.90 Connection



The V.90 analog modem's task is to discriminate among the 256 potential voltages, to recover 8,000 PCM codes per second. If it could do this, then the download speed would be nearly 64 Kbps (8,000 x 8 bits per code). But it turns out that several problems slow things down slightly.

First, even though the network quantization noise floor problem is removed, a second, much lower noise floor is imposed by the network digital-to-analog converter (DAC) equipment and the local loop service to the client's premises. This noise arises from various nonlinear distortions and circuit crosstalk.

Second, network DACs are not linear converters, but follow a conversion rule (μ-law in North America and A-law in many other places). As a result, network PCM codes representing small voltages produce very small DAC output voltage steps, whereas codes representing large voltages produce large voltage steps.

These two problems make it impractical to use all 256 discrete codes, because the corresponding DAC output voltage levels near zero are just too closely spaced to accurately represent data on a noisy loop. (Note: Each network PCM code corresponds to a DAC voltage level.) Therefore, the V.90 encoder uses various subsets of the 256 codes that eliminate DAC output signals most susceptible to noise. For example, the most robust 128 levels are used for 56 Kbps, 92 levels to send 52 Kbps, and so on. Using fewer levels provides more robust operation, but at a lower data rate.

V.90 Requirements

V.90 requires the following three conditions for full 56 Kbps transmission:

1. **Digital at one end.** Today, most service providers have digital connections to the PSTN. One end of an V.90 connection must terminate at a digital circuit, meaning a "trunk-side" channelized T1, ISDN PRI, or ISDN BRI. "Line-side" T1 will not work because additional analog-to-digital and digital-to-analog conversions are added. In a trunk-side configuration, once the user's analog call is converted to digital and sent through the carrier network, the call stays digital until it reaches a digital modem through a T1, PRI, or BRI circuit.

2. **V.90 support at both ends.** V.90 must be supported on both ends of the connection, by the analog modem as well as by the remote access server or modem pool at the host end. Typically, the remote user will be using a 3Com Courier, U.S. Robotics, Megahertz®, or other brand V.90 modem dialing into a 3Com U.S. Robotics MP I-modem, NETServer I-modem, Courier I-modem, SuperStack II Remote Access System 1500, Total Control remote access concentrator, or other brand V.90 digital modem.

3. **One analog-to-digital conversion.** There can be only one analog-to-digital conversion in the phone network along the path of the call between the V.90 digital modem and the analog modem. If the line is a channelized T1, it must be "trunk-side" and not "line-side." With line-side service from the phone company, there is typically an additional analog-to-digital conversion.

3Com x2™ Technology vs. 3Com V.90 Technology

Until recently, proprietary implementations were the only options for 56 Kbps access. However, in February 1998 the ITU reached a determination for 56 Kbps technology, providing for one universally compatible solution—the V.90 standard. 3Com's V.90 solution will remain compatible with 3Com's proprietary transmission scheme for 56 Kbps access, x2™ technology.

As Table 1 illustrates, all 3Com x2 modems, both client and server, will continue to support x2 technology when they are upgraded to V.90. Users who do not upgrade to the new standard will be able to connect to digital modems with 3Com's x2 technology for high-speed downloads. Client x2 modems that are not upgraded to the standard will receive a V.34 connection when they call a digital modem that was originally K56flex, even if it has been upgraded to the standard.

The Difference Is in the Details

The data modes of x2 technology and V.90 are essentially the same. The technical differences between x2 technology and V.90 are primarily in two areas of the "handshake" or initialization sequences.

- **V.8 Signaling Protocol.** V.8 is an international standard that determines the capabilities of the modems on both ends of the call. The V.8 signaling protocol used in V.90 differs from the proprietary signaling method used in x2 technology.
- **Digital Impairment Learning (DIL).** Digital Impairment Learning is a mechanism employed in V.90 technology that allows each manufacturer to determine the digital impairments in its own way. This method allows for flexibility and future improvements without a change to the protocol.

Table 1. *Modem Compatibility Matrix*

	x2 Server	K56flex Server	3Com V.90 Server	Other V.90 Server	V.34 Server
x2 Client	56K	V.34	56K	V.34	V.34
K56flex Client	V.34	56K	V.34	?	V.34
3Com V.90 Client	56K	V.34	56K	56K	V.34
Other V.90 Client	V.34	?	56K	56K	V.34
V.34 Client	V.34	V.34	V.34	V.34	V.34

? Backward compatibility is up to individual manufacturers

V.90 Technology from 3Com

There are a number of important benefits to choosing 3Com's V.90 modem technology:

- **Digital connections today.** 3Com digital modems, such as those in the Total Control remote access concentrator, already process digital signals straight from digital lines, and can be upgraded to V.90 operation via a software upgrade.
- **Programmable platform.** 3Com has a long history of delivering software-based implementations based on digital signal processors (DSPs), and was the first to deliver 56 Kbps products to the market with U.S. Robotics x2 technology. 3Com has taken advantage of this lead to refine, enhance, and improve its 56 Kbps product line in order to deliver top performing products and easy upgrades for its customers.
- **Overcoming digital impairments/universal PAD detection.** 3Com has repeatedly developed technology that overcomes impairments on the telephone network. In previous protocols—V.34, for example—the industry faced analog impairments such as echo, line noise, and cross-talk. Common digital impairments include network signals (such as robbed bits), transcoding (A-law to μ-law conversion), and digital devices called packet assembler/disassemblers (PADs). If not properly compensated for in PCM modem algorithms, these digital impairments can change the digital bit stream enough to impact performance. The V.90 specification sets a framework and mechanism to allow for discovering and compensating for digital impairments, but it leaves the task of overcoming them to individual vendors.

3Com has designed and built true digital modems for years. Our engineers have spent the past year researching obscure impairments and variations and identifying solutions. 3Com has developed technology to overcome digital impairments and achieve maximum performance on the widest variety of transmission lines across the globe. V.90 modems from 3Com and its licensees will deliver the benefits of this research and development. ☐

Glossary

amplitude
A measure of the distance between the high and low points of a waveform.

analog-to-digital converter (ADC)
A device that samples incoming analog voltage waveforms, rendering them as sequences of binary digital numbers. Passing waveforms through an ADC introduces quantization noise.

Basic Rate Interface (BRI)
An ISDN line that provides up to two 64 Kbps B-channels and one 16 Kbps D-channel over an ordinary two-wire telephone line. B-channels carry circuit-oriented data or voice traffic while D-channels carry call-control signals.

call-control signaling
Operations associated with establishing and tearing down virtual circuits through a network; for example, dialing.

central office (CO)
The facility at which individual telephone lines in a limited geographic area are connected to the public telephone network.

Digital Impairment Learning (DIL)
A mechanism during the initial training sequence that allows for uploading and sending tones that allow the client analog modem to detect and learn about digital impairments in the path. This allows the analog modem to build a custom constellation that can avoid or compensate for the discovered impairments.

digital signal processor (DSP)
A processor that is optimized for performing the complex mathematical calculations inherent in processing digital signals. A discrete DSP can be reprogrammed; a DSP integrated in a chipset typically contains its own ROM and cannot be reprogrammed.

digital-to-analog converter (DAC)
A device that reconstructs analog voltage waveforms from an incoming sequence of binary digits; does not in itself introduce noise.

Integrated Services Digital Network (ISDN)
A public switched digital network that provides a wide variety of communications services and integrated access to the network

line-side T1
A T1 that undergoes at least one analog-to-digital conversion in the path between the V.90 digital modem and the PSTN.

Primary Rate Interface (PRI)
A four-wire ISDN line (or "trunk") with the same capacity as a T1, 1.544 Mbps. PRIs contain 23 64 Kbps B-channels and one 64 Kbps D-channel. The D-channel carries call-control signaling for all the B-channels.

public switched telephone network (PSTN)
The public networks that deliver telephone services worldwide.

pulse code modulation (PCM)
A technique for converting an analog signal with an infinite number of possible values into discrete binary digital words that have a finite number of values. The waveform is sampled, then the sample is quantized into PCM codes.

quantization
The process of representing a voltage with a discrete binary digital number. Approximating an infinite valued signal with a finite number system introduces an error called quantization error.

signal-to-noise ratio (SNR)
A measure of link performance arrived at by dividing signal power by noise power. Typically measured in decibels. The higher the ratio, the clearer the connection.

T1
A four-wire digital line (or "trunk") with the same capacity as a PRI line, 1.544 Mbps. T1s contain 24 DS-0s, each of which carries 56 Kbps (call-control signaling is carried within the DS-0).

trunk-side T1
A T1 line that has a direct digital connection to the phone network, and therefore undergoes no analog conversions in the path between the V.90 digital modem and the PSTN.

V.90 analog modem
A modem equipped with V.90 software and attached to a standard analog telephone line. In order to connect at V.90 speeds (32–56 Kbps), the device at the other end of the connection must be a V.90 digital modem that is attached to a trunk-side T1, BRI, or PRI line.

V.90 digital modem
A digital modem equipped with V.90 software and attached to a trunk-side T1, BRI, or PRI line. Analog modems must be equipped with V.90 software in order to connect at V.90 speeds (32–56 Kbps). Current 3Com products that can act as V.90 servers include the Total Control remote access concentrator, NETServer I-modem, MP I-modem, and Courier I-modem. The SuperStack II Remote Access System 1500 will support V.90 when it ships in July 1998.

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