May 21, 1997

Ascend

TECHNICAL BACKGROUNDER

The Second Generation IDSL Technology

VOICE/DATA OVER IDSL

Richard Sekar

ASCEND

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1. Introduction

Ascend introduced the MultiDSL™ family of products in December 1996 that included products for ISDN Digital Subscriber Line (IDSL), Single Pair HDSL (SDSL), Rate Adaptive Asymmetric Digital Subscriber Line-Carrierless Amplitude and Phase modulation (RADSL-CAP), and Discrete MultiTone (RADSL-DMT).

The MultiDSL product family includes both the Central Office Equipment (COE) and the Customer Premises Equipment (CPE) needed for implementing xDSL technologies immediately. The COE includes the MAX™ 4002, MAX 4004 and MAX TNT™ carrier-class WAN access switch with line cards for various DSL technologies. The CPE includes the DSLPipe-S (SDSL), DSLPipe-C (RADSL-CAP) and DSLPipe-D(RADSL-DMT) and Pipeline products for IDSL.

All of Ascend's solutions are cost-effective, immediately deployable and designed to provide service providers with a viable alternative to other access services. IDSL is the easiest to deploy of all the xDSL technologies since a majority of the local loops are "ISDN-ready" making it "IDSL-ready" as well.

IDSL was an Ascend innovation and with the first generation of IDSL technology, Ascend brought data only IDSL service at 128 Kbps to the market which has helped pave an evolutionary path to the high speed xDSL services.

Ascend has further enhanced their IDSL technology with a capability that permits integration of voice and data over the same IDSL circuit.

2. Market Drivers

High-speed data service for Internet and intranet at an affordable price is the key driving factor of IDSL. But for the telephone companies, offering data services over their existing voice network (PSTN) has only increased the network congestion on the PSTN. With the second generation of IDSL technology, telephone companies are able to send data services directly to the data network and alleviate the voice network congestion while routing voice calls to the voice network.

Regional Bell Operating Companies (RBOCs)

With the first generation of IDSL technology, telephone companies required a second pair of wires (local loop) between the telephone company's Central Office (CO) and the customer premises so they could offer data-only IDSL service.

Since local loop is a scare and expensive resource, telephone companies are looking to efficiently utilize the local loop. With the second generation IDSL technology from Ascend, telephone companies can accomplish that goal by integrating voice and data over a single pair of copper wire (local loop), thus eliminating the need for a second pair of wires.

Independent Telephone Companies

Independent telephone companies currently serve customers who are in remote locations. Typically, the local loop has either "U" loop repeaters and/or Digital Loop Carriers (DLCs) to handle the longer distance between the CO and the remote customer premises. Or a second line may be installed at great expense if the remote customers desire high-speed data service.

As a result, independent telephone companies are looking for ways to offer data and voice over a single pair of wire without changing the existing infrastructure with "U" loop repeaters and DLCs. Ascend's second generation IDSL technology delivers exactly what these independent telephone companies are looking for – voice and data at 128 Kbps over existing wiring.

Competitive Access Providers

Competitive Access Providers (CAPs) want to leverage the Telecommunications Act of 1996 to enter the local regions and expand into voice market for additional revenues. Penetrating into the voice market can be challenging; but, Ascend's second generation IDSL technology is designed to make it easier to enter the voice market.

CAPs can enter this market using IDSL-based 128 Kbps data services; as an added value, they can offer voice service by integrating voice and data over the same single pair of wire that was originally used for data only. This allows CAPs to offer voice service to their data service customers.

3. Second Generation IDSL: Technology Overview

The second generation of IDSL technology integrates voice and data over a single pair of wires. The data rate can be as high as 128 Kbps for up to 18,000 feet without "U" loop repeaters or DLCs. For voice, it can be up to two voice channels. Since IDSL is transparent to "U" loop repeaters and DLCs, distances of more than 18,000 feet may also be achieved.

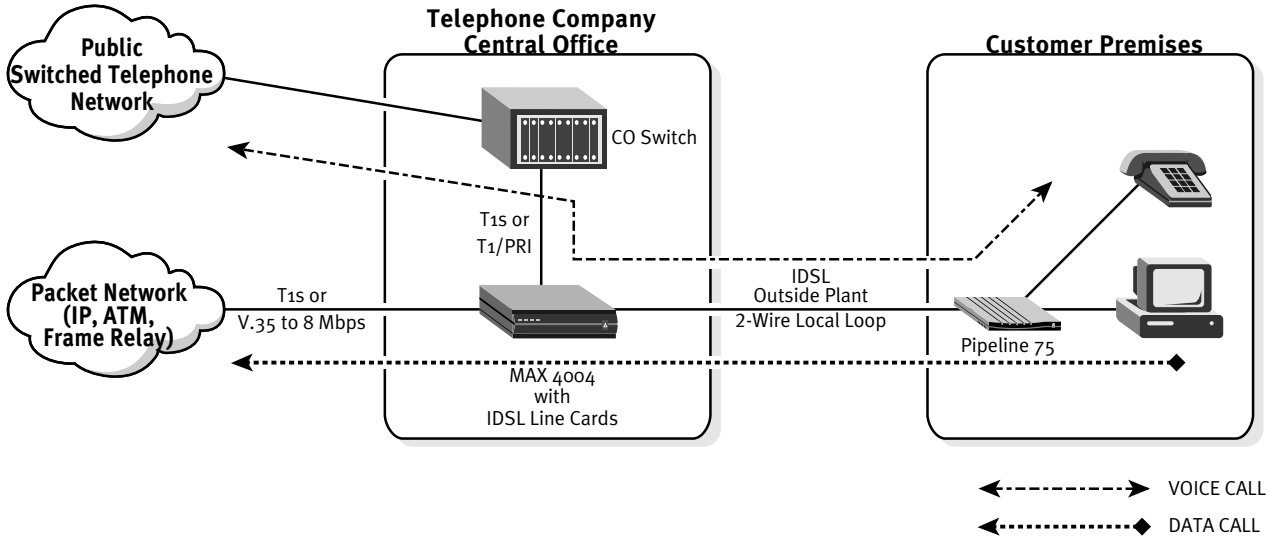

Figure 1 – Ascend's solution integrates voice and data over a single line.

Data Calls

IDSL utilizes 2B1Q line coding and therefore is compatible with any ISDN TA or ISDN router from any vendor (including Ascend's Pipeline products) for data over an IDSL connection.

The IDSL line cards for the MAX products permit configurable settings of either 64 Kbps or 128 Kbps. The protocols may be based on PPP, MP or Frame Relay. MP may be used to obtain 128 Kbps data rate while using any ISDN TA from any vendor. The TA needs to be configured with the switch type for the AT&T Point-to-Point and with the appropriate dialing number. Since most of the TAs do not initiate a connection until a dialing number is configured, Ascend's IDSL permits configuration of an arbitrary number on the ISDN TA (CPE), and the MAX will simply discard that number upon receipt.

With Ascend's Pipeline 50/75/130 as the CPE, however, the same IDSL may be configured for 128 Kbps Frame Relay using a single pair of wires.

Outgoing Voice Calls

If customers want to support voice/fax along with data over the IDSL line (single pair of wires), a Pipeline 25-*Px* Pipeline 25-*Fx* or a Pipeline 75 with POTS ports must be used as the CPE, allowing connection of an analog phone and/or a FAX machine. By configuring the Pipeline units for a switch type of IDSL, the Pipeline will permit integration of voice and data over a single pair of wire using IDSL service.

When the phone goes off-hook, the user receives a dial tone from the Pipeline and enters the trunk group number followed by the phone number (similar to an ISDN Centrex service). The Pipeline then forwards the number over the IDSL line to the MAX unit at the central office. The MAX receives the number, recognizes the first digit as the trunk group number, strips off the first digit and routes the call to the appropriate T1 or T1/PRI line to the Central Office voice switch or to a voice PBX.

Incoming Voice Calls

When the MAX receives an incoming voice call from the CO voice switch, it matches the called number with the number configured in the “ANS#1” or “ANS#2” field of the IDSL port and routes the call on the appropriate IDSL line. The Pipeline receives the call and provides the ring voltage to the analog phone that may be connected to the POTS port.

The ANS# field in the IDSL port configuration facilitates assigning of unique phone numbers to end users by the telephone company.

4. Central Office Equipment (COE)

The central office equipment for IDSL consists of a MAX 4000, MAX 4002 or MAX 4004 with IDSL cards running software release 5.0Ai8 or better. To support voice and data over IDSL connection, only a software upgrade is required for existing MAX 400x-based IDSL customers.

As always, the on-board HDLC controller supports up to four IDSL cards on the MAX 400x while an additional HDLC controller card is required to support the fifth IDSL card on a MAX 400x unit. ISDN signaling software is also required to support IDSL on a MAX 400x products.

The IDSL card for MAX 400x is an eight (8) port card with a maximum of up to 40 IDSL ports per MAX 400x.

The IDSL card for a MAX TNT is a 32-port card that is 2-slot wide. Up to seven IDSL cards may installed per MAX TNT shelf to realize up to 224 IDSL ports. The MAX HDLC controllers are built into every IDSL card that is on a MAX TNT. No additional HDLC controller cards are required on the MAX TNT to support IDSL cards. Of course, ISDN signaling software is required to support IDSL cards on a MAX TNT. Voice support for IDSL card on a MAX TNT is planned for the end of 1997.

5. Customer Premises Equipment (CPE)

The following CPE equipment is required for implementing IDSL:

For IDSL circuits for Data only – Any ISDN TA from any vendor including Ascend's Pipeline products

For IDSL circuits for Data and Voice/FAX – Must be Ascend's Pipeline 25-*Px*, Pipeline 25-*Fx* or Pipeline 75

6. IDSL Benefits

The key benefits of IDSL include:

- Voice and data support over a single pair of wire but does not require expensive CO switch upgrade
- Up to 18,000 feet transmission distance
- Transparency to "U" loop repeaters and Digital Loop Carriers (DLCs) ensures distance beyond 18,000 feet
- Compatibility with any ISDN TA from any vendor for IDSL circuits with data only service
- Ability to enter the DSL market with IDSL today with an easy upgrade path to support other DSL technologies such as SDSL (single-pair HDSL) and RADSL
- 64 Kbps or 128 Kbps Frame Relay service using IDSL over a single pair of wire saves the scarce and expensive resource – copper pair (traditional 56 Kbps and 128 Kbps Frame Relay services require 2 pairs of wires)
- Protection of customers' investment in their existing ISDN CPE

7. Pricing and Availability

The new Voice/Data over IDSL capability will be available:

For the MAX 400x – Free of charge. Only software upgrade required (software release 5.0Ai8 or better)

For the MAX TNT – Planned for 1997

8. Summary

With continuous innovation, Ascend remains the leader in the DSL market place and is the only vendor in the industry to offer a fully integrated true carrier-class WAN access switch, ready to deliver multiple services. In addition to offering various DSL services such as IDSL, SDSL, RADSL-CAP and RADSL-DMT, the same MAX or MAX TNT platform can be used for other traditional services such as analog, ISDN, T1 and Frame Relay. And Ascend offers the customer premises equipment needed for high-speed access to a central office.

Worldwide and North American Headquarters
One Ascend Plaza
1701 Harbor Bay Parkway
Alameda, CA 94502, United States
Tel: 510.769.6001
Fax: 510.747.2300
E-mail: info@ascend.com
Toll Free: 800.621.9578
Fax Server: 415.688.4343
Web Site: http://www.ascend.com

European Headquarters
Rosemount House
Rosemount Avenue
West Byfleet
Surrey KT14 6NP, United Kingdom
Tel: +44 (0) 1932.350.115
Fax: +44 (0) 1932.350.199

Japan Headquarters
Level 19 Shinjuku Daiichi-Seimei Bldg.
2-7-1 Nishi-Shinjuku
Shinjuku-ku, Tokyo 163-07, Japan
Tel: +81.3.5325.7397
Fax: +81.3.5325.7399
Web Site: http://www.ascend.co.jp

Asia-Pacific Headquarters
Suite 1419, Central Building
1 Pedder Street
Central, Hong Kong
Tel: +852.2844.7600
Fax: +852.2810.0298

Latin, South America and the Caribbean Headquarters
One Ascend Plaza
1701 Harbor Bay Parkway
Alameda, CA 94502, United States
Tel: 510.769.6001
Fax: 510.747.2669

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05-23