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DALNET BOARD OF DIRECTORS

Meeting, Tuesday, June 2, 1998
9:30am - 11:30 am

Oakland County Library
in the
Oakland County Service Center
1200 North Telegraph Road

2nd Floor Conference Room

AGENDA

1. Approval of Minutes of May 13, 1998 (action)
2. Scope of Work (action)
3. By-Laws Revision (distributed at previous meeting)
4. Help Desk
5. Other Business

Map enclosed, parking in yellow highlighted area

A handwritten signature in black ink, appearing to be "M. A." or similar, located in the lower right quadrant of the page.

4001 W. McNichols Road
P.O. Box 19900
Detroit, Michigan 48219-0900
313-993-1000

DALNET BOARD MINUTES

DOC # 1

Tuesday June 2, 1998
Oakland Count Law Library

Present:

Maurice Wheeler
Jerry Bosler
Michele Klein
Patricia Senn Breivik
James A Flaherty
Margaret E Auer
Phyllis Jose
Karen Tubolino

DPL
MCC
DMC
WSU
WCC
UDM
OL
VA

Excused:

Julia Davis
Nancy Bulgarelli

Walsh
Beaumont

Staff:

Louise Bugg
Robert Harris

The meeting was called to order by M. Auer, Chair at 9:40AM.

1. Minutes of the May 13, 1998 Board meeting were approved
2. The Board reviewed the Scope of Work draft document with Ameritech Advanced Data Services. M. Auer also submitted a memo outlining four issues which needed further negotiation.

Issues 1, 2, and 4 were resolved as follows:

1. page 9, first bullet under AADS Design Engineer and Sales Engineer. Add "AADS will provide consulting services to route or transport applicable traffic to the frame relay network." This will help determine any incompatibility between the institution and AADS.
2. The no-recurring cost for an upgrade to DALNET libraries would be the difference between the initial price of the router and the new router.
4. Changes were made to Appendix B "56K Pricing with Head-end" to correct inaccuracies and to add Detroit Public Schools Library.

Issue 3 is not yet resolved:

3. No one has been given access to Ameritech SNMP network management system. There is software available to monitor our own frame relay. Two issues needing further investigation: find out what other networks use to handle functional problems at the Help Desk; and what impact would 'view only access' have on the level of assistance available through our help desk.

ACTION: P. Breivik moved, seconded by P. Jose, that the Board support the Scope of Work document pending successful resolution of four issues:

1. Ameritech SNMP network access as outlined in 3 above.
2. Add Header to next to last page of the document on upgrade costs

3. Include network diagram in the document

4. Monitoring network performance - requesting monthly reports on capacity line utilization.

APPROVED

3. By-laws revision.

The Board discussed the proposed changes to Articles I through V, with Article III on hold. Revisions will be distributed to the Board and discussion on the remaining Articles will be taken up at the next scheduled Board meeting.

4. Other business:

Mt Clemens Hospital library has requested membership in DALNET.

ACTION: P. Breivik moved, seconded by J. Flaherty, that Mt Clemens Hospital be a new member of DALNET and be folded into the last group of hospitals to come up on Horizon system.

APPROVED

The next meeting of the Board is scheduled on June 16 after the luncheon for Gloria Ellis' retirement at 220 Merrill.

Meeting adjourned at 11:35AM.

Karen M Tubolino
Secretary



University Libraries

TO: DALNET Board of Directors
FROM: Margaret E. Auer, *MS* Chairperson
DATE: May 26, 1998

Attached is the draft Rider E, "Scope of Work," which was still to be negotiated when the Board approved the WSU (as fiscal agent for DALNET)/Ameritech Contract. Although this is the fifth draft of the document, there are still a few points to be cleared up. They are:

- page 9, first bullet under AADS Design Engineer and Sales Engineer. There is an additional sentence under consideration: "AADS will provide consulting services to route or transport applicable traffic to the frame relay network."
- For upgrades, what does the non-recurring charge include? Under what circumstances would DALNET libraries have an additional NRC for an upgrade?
- The SNMP network management reporting to the Help Desk is being discussed at AADS.
- Appendix B "56K Pricing with Head-end" list is libraries is inaccurate; changes are noted in felt tip and those libraries which were to be excluded have been lined out.

The Scope of Work is currently being reviewed by legal counsel at WSU.

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SCOPE OF WORK - DRAFT DOCUMENT - Version 5

The purpose of this document is to describe responsibilities of Ameritech Library Services (AmLibS), Ameritech Advanced Data Services (AADS), and the Detroit Area Library Network (DALNET) as well as the services to be provided by each participant.

Vendor: Ameritech Advanced Data Services
Customer: Ameritech Library Services and DALNET member libraries
Project Leader: Angela Collareno (AADS)

Project Participants:

<u>Title:</u>	<u>Name:</u>	<u>Phone:</u>	<u>Pager:</u>	<u>Fax:</u>
AADS Project Leader:	Angela Collareno	313-234-3239		
AADS Ops Manager:	TBD			
AADS Vendor Manager:	Judy Klein	312-857-7884		
AADS Sales Engineer:	Jim Grant	313-234-3836	313.840.7225	313.234.3869
AADS Design Engineer:	TBD			
AADS Facility Manager:	TBD			
AADS Account Team:	Milan Manojilovich/Jim Ewing			
AMLIBS Project Lead:	Harry Masik			
AMLIBS Account Manager:	Bill Easton			
AMLIBS Horizon Team Lead:	Randall Jones			
Primary Customer:	Ameritech Library Services as an agent for the DALNET member libraries			

The products and services to be provided by Ameritech Advanced Data Services are explained throughout this document. Responsibilities of all participants are also defined. Please see the Table of Contents and Glossary of terms for additional explanations.

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RESPONSIBILITIES OF PARTICIPANTS

Ameritech Library Services, through Ameritech Advanced Data Services, will provide DALNET and its institutions with 56K up to DS3 Frame Relay Service (FRS). The service is scalable such as ATM access with Ameritech Managed Router Service (Bundled Service) with a FRS CSU/DSU (Frame Relay Service, Channel Service Unit/ Data Service Unit) for the specified location(s). The scope of this project is to provide Ameritech AADS service and installation to DALNET management and contracting libraries at the desired contract location(s).

This project is undertaken on behalf of the member institutions of DALNET. Eligible individual member institutions of DALNET who participate in the Frame Relay program will choose from among the options outlined in this document. Individual institutions may accept different levels of services. A list of DALNET participating libraries is attached.

Also attached to this document is the pricing for available services. AADS will directly bill the individual member institutions of DALNET. Those individual institutions are responsible for paying for equipment and services directly to AADS.

All DALNET member institutions will receive the benefits and services outlined in this document. However, for new members joining DALNET after execution of the contract, the prices in this document are guaranteed only for the first 24 months. Prices beyond that date will be negotiated at then current applicable rates but will be calculated at the 60 month price.

Joint Responsibilities of Project Participants

- DALNET and AADS must define community string names, IP addresses, password protection, etc. to determine the feasibility of SNMP view only access. AADS can provide network reports to prevent a negative impact on the DALNET support office Help Desk.
- The AADS consulting and installing interval is a minimum of six (6) weeks at each location provided adequate service connectivity exists into the building and equipment is available through the hardware vendor. If special construction is required, this interval may be longer.
- Each party, AmLibs, AADS, and DALNET, shall appoint a Project Leader and provide name, address, and contact numbers to the other party. A Project Leader shall be defined as the primary representative of each party who has full responsibility for coordinating the activities of his or her respective party.
- The AADS project manager will oversee the complete scope of this project and the installation of service. Schedules shall be determined by the AADS Project Leader and

driven by the Amlibs and DALNET schedule and the regular installation intervals. The AADS Project Leader will update AMLIBS and DALNET with actual schedule information.

Ameritech Advanced Data Services Responsibilities

AADS will:

- provide the appropriate WAN addressing information as it is installed at each individual institution and an 800 number for trouble reporting upon service acceptance by the DALNET Project Leader.
- provide each location and DALNET with service information and documentation for trouble reporting.
- Twenty-four hour a day access to all wiring closets (where appropriate) and equipment rooms during the period of installation is preferred. If access is not provided, installation/service may be delayed.
- maintain the DSU/CSU for the duration of the service contract.
- provide the Amlibs and DALNET Project Leaders with a network diagram of the proposed service.
- provide DALNET with service for the specified locations in the contract. The service dates will be defined by AADS Project Leader, the Amlibs Project Leader, and the DALNET Project Leader. The first installations will begin no earlier than seven weeks from contract execution.

DALNET Responsibilities

DALNET is responsible for:

- providing the service extension, inside wiring, beyond the network demarcation. The network demarcation is the point of interface between the AADS owned router and the LAN interface at the DALNET institution.
- access to the network demarcation 24 hours a day, 7 days a week for the duration of the service. If this access is not provided, service may be delayed.
- providing an on-site project manager/contact for the duration of the installation interval who will designate the service interface requirements and provide service acceptance. The

DALNET Project Leader is also the single point of contact with the authority to approve and process.

- **providing LAN protocol(s) addresses at each DALNET Institution.**
- **paying one-time activation charges and recurring charges at monthly intervals for the Service. Billing shall commence on the Date of Service Availability for each circuit.**
- **providing reasonable access to Customer premises for installation work.**
- **designating both ends of the PVCs (Permanent Virtual Circuits) which need to communicate with one another, these PVCs will then be provisioned through the network.**
- **any and all electrical work which might have to be done to accommodate the new AADS equipment as well as providing the proper environmental conditions as required by that equipment manufacturer. Please see the "Power Requirements" section below for a description of electrical needs.**

Environmental/Installation Requirements:

DALNET should provide a secure area, preferably a locked communications closet or controlled access location. The preferred location within this room or closet would be a communications rack, suitable shelf, or table surface, insuring the equipment is above floor level. The location should also be free from flooding, reasonably vibration free and provided with suitable HVAC (Heating/Ventilating/Air Conditioning) for equipment and personnel.

DALNET shall provide:

- the proper environment, electrical and telecommunication connections for the Services as specified by AADS.
- adequate loading and unloading facilities.
- parking for AADS's project team members during the period of initial installation, where feasible.
- installation site which must be:
 - well ventilated, reasonably free from airborne particles;
 - spacing between other equipment/walls providing access to front & back of equipment;
 - temperature must be 32° to 122° F (0° to 50° C), 5-95% non- condensing relative humidity

AADS will not install any network equipment in space AADS considers unacceptable.

Power Requirements for each installation:

90-132 VAC

60 Hz 3 Hz, 0.1 amp: 15 amps at 115 VAC

AC receptacle within 4-5 feet of ultimate equipment placement

3-prong grounded receptacle, preferably on separate Branch Circuit

These power requirements must be available wherever AADS is to install its equipment. This may be in the library or at another location in the institution.

OTHER AADS RESPONSIBILITIES:

AADS Staff:

AADS Project Leader:

- Provide equipment ordering information to the AADS Vendor Manager via this project plan for the CISCO router and coordinating equipment.

- Provide to the Network Administration Manager via this project plan all necessary customer network documentation for maintenance of the equipment under contract.
- Provide circuit ID's, circuit order numbers, circuit completion dates, ship dates, and equipment order numbers to the Operations Manager.
- Provide project status to the DALNET Project Leader during implementation.

AADS Vendor Manager:

- Order the CISCO router and coordinating equipment and software required at the customer site and ship to the AADS Operations Manager per the information provided in this project plan.
- Notify the Project Leader of the equipment order numbers and promise ship dates when received from the vendor.
- Track deliveries of hardware from third party vendors and escalate any missed shipping dates to insure that installations are not delayed by missing equipment.

AADS Operations Manager:

- Receive and inventory equipment. Refer any missing items to the Project Leader.
- Configure the router and CSU/DSU.
- Contact DALNET Project Leader or on-site location manager/contact to arrange for access to the location.
- Install the router at the customer location and work with the AADS Network Pre-service Provisioning Group to verify functionality and monitoring.
- Provide router installation status to the DALNET Project Leader.
- Provide on site technical support to DALNET and DALNET member institutions as required during network turn up.
- Take over responsibility of all maintenance of the network and contracted equipment once the production cut over is complete and the network is stabilized.

AADS Network Administration Manager:

- Update SNMP platform with WAN IP addresses for managed router service.

- Verify the completeness of all ISC (intersystem communications) documentation for the DALNET network and inform the DALNET Project Leader of any discrepancies.

AADS Design Engineer and Sales Engineer:

- Included with Managed Router Service are consulting services (Sales Engineer and Design Engineer) for the proposed network. This includes up to and not beyond the point of demarcation.
- The consulting service continues for the life of the contract.
- Sales and Design Engineering provides technical guidance to DALNET and DALNET member institutions to ensure the frame relay network meets the requirements and business objectives. Sales and Design Engineering recommends solutions using technologies already installed at DALNET member sites and identifies solutions where newer technologies may be applicable for effectiveness and efficiencies. A Sales Engineer along with the Design Engineer supports the entire sales team for the account. This includes design and consulting as it relates to the contracted network.

OTHER DALNET RESPONSIBILITIES:

- Complete a service order form for each site.
- Arrange for location access when contacted by Network installers and AADS Operations Manager.
- Provide for space and power requirements for the router at the site.
- Provision and maintenance of all customer owned equipment beyond the router interface.
- Provision or circumvention of firewall(s) at any DALNET institution.
- Verify functionality of the router and refer any problems to the AADS Project Leader for resolution.
- Charges for Time and Material for work performed by AADS outside of the contract scope. (See "Appendix B - AADS Maintenance Charges" for included and excluded services.)
- Provide the following information to the Integrated Service Center at 1-800-972-3441:
 1. Customer name
 2. Circuit ID #
 3. Location of the problem
 4. Street address for problem site and access instructions
 5. Local Contact Information i.e. Name - Phone Number - Pager Number

6. Description of problem

ACCEPTANCE CRITERIA:

DALNET's verification of network functionality and acceptance within five (5) working days of each site's Service Availability notification.

SERVICE UPGRADES AND SERVICE LOCATION CHANGES

There is no penalty for upgrading AADS services, yet it will result in different pricing for each requesting institution.

The initial location(s) to receive the Service (excluding fiber based services) may be moved from one site to another within the LATA provided that no interruption in Service occurs. Non-recurring charges and new recurring charges that would apply for the new location will be negotiated at the time of the move.

CURRENT CONTRACTS WITH DALNET MEMBERS

Any DALNET member migrating from an existing contract with AADS, will not incur any penalties on services. The change of equipment will only be an incremental charge.

EQUIPMENT AND SERVICES TO BE PROVIDED BY AMERITECH ADVANCED DATA SERVICES

AADS Frame Relay

Ameritech Frame Relay Service is a low to medium speed, packet data service. It is a connection-oriented data service that relays variable length frames (packets) across Permanent Virtual Connections (PVCs). PVCs are end-to-end, bi-directional logical channels from one Frame Relay port to another port. Multiple PVCs can be established over a single physical access circuit and bandwidth on the network is only allocated when required and not on a dedicated basis. DALNET shall designate both ends of the PVCs which need to communicate with one another, and these PVCs are then provisioned through the network.

Ameritech Frame Relay is comprised of a public interface, a User Network Interface (UNI). The UNI provides the local DALNET connection to the Ameritech Frame network.

Ameritech Frame Relay UNI effectively supports LAN to LAN traffic between remote sites. It is a perfect solution for Customer which wants any-to-any communications through the design of a meshed or partially meshed network.

Should one of the primary Horizon servers be unavailable, network traffic can be automatically rerouted to the remaining server. The proposed network has two head-end locations. Multiple PVCs will be configured to transport traffic. In the case of a failure, the traffic would re-route to the other site.

Access Speeds

Frame Relay UNI is available at DS0-56/64 Kbps, 128 Kbps*, 256 Kbps*, 384Kbps*, 384FT1, DS1 - 1.544 Mbps and 45 Mbps*.

* These speeds are available on a limited basis where facilities and conditions permit.

Basic Service

The CSU/DSU (Channel Service Unit/Data Service Unit) is equipment required to interface the Local Area Network to the Permanent Virtual Circuit.

Options

DALNET member institutions will choose from these four (4) optional levels of service:

- Frame Relay DS0 - 56/64 Kbps
CSU/DSU included

- **Frame Relay 128 Kbps, 256 Kbps, and 384 Kbps (these three speeds are available on a limited basis where facilities and conditions permit)
CSU/DSU included**
- **Frame Relay DS1 - 1.544 Mbps
CSU/DSU included**
- **Frame Relay DS3 - 45 Mbps (available on a limited basis where facilities and conditions permit)
CSU/DSU included**

DLCI Mapping/Addressing

DLCI stands for Data Link Connection Identifier. The DLCI specifies the logical link, or virtual circuit, between endpoints. In other words, the network uses the DLCI of a frame submitted to the network by a user to determine which endpoint receives the frame. The UNI is the User Network Interface.

Maximum number of DLCIs per UNI:

56 Kbps	30 DLCIs per UNI
384 Kbps	100 DLCIs per UNI
1.544 Mbps	250 DLCIs per UNI
45 Mbps	250 DLCIs per UNI

PVC (Permanent Virtual Circuit) Management

PVC management will be provided via the Local Management Interface (LMI). Over the LMI, DALNET shall be provided with notification of the addition, deletion and presence of a PVC, as well as notification of the availability or unavailability of a configured PVC.

Ongoing Maintenance

AADS provides the following ongoing maintenance:

- 7x24 monitoring of the network**
- 24 hour problem resolution help desk**

Interface Specification and Technical References of Frame Relay

AADS network equipment components conform to the following standards:

ANSI T1-618
ANSI T1-617 Annex D
ITU-T Q-922
ITU-T Q-933 Annex A
ITU-T 1.122
Frame Relay Consortium Specifications with Extensions, Document #001-208996
Bellcore Technical Reference TR-TSV-000773 regarding Alarm Reporting and Performance
T1.602
T1.606
T1.607
Frame Relay Form FRF.1-1991

Routing, Addressing and Security

In all cases, AADS will spend reasonable effort to jointly develop, with DALNET, an Internet Addressing, routing, and security plan. To a reasonable extent and within the capabilities of AADS routers, AADS will implement custom configuration to assist DALNET with routing and security needs. The network design, router security, and addressing up to the demarc point (LAN interface) is included in AMRS.

AMERITECH ADVANCED DATA SERVICES

Ameritech Advanced Data Services is a separate unregulated subsidiary of Ameritech. This information about AADS services is provided to DALNET and the DALNET member institutions as an overview of current capabilities and a survey of the potential AADS provides to DALNET members for future enhancements.

Ameritech network services include: Asynchronous Transfer Mode, Enhanced Frame Relay, ISDN, LAN Interconnect, Fiber Distributed Digital Interface, SONET, Leased Lines and Video.

Ameritech Frame Relay

Frame Relay is a high performance, connection-oriented data service which allows for the transfer of variable length frames across Wide Area Networks. It combines the bandwidth efficiency of packet switching, with end-to-end protocol transparency. Frame Relay transports user information from one point to the next via a predetermined Permanent Virtual Circuit (PVC). End-users can prioritize their data across the Frame Relay network by assigning a Committed Information Rate (CIR) to individual PVCs. Frame Relay Service is designed to allow additional bandwidth-on-demand through temporary data bursting beyond the CIR. Frame Relay permits the end-user to define multiple logical connections among multiple end-users using a single access line into the Frame Relay network.

Ameritech Frame Relay allows connectivity through well defined standard specifications for service and support. Frame Relay is ideal for connecting bursty data traffic (data which is sent in "bursts" rather than in steady streams) between remote offices, ensuring seamless communication. Integration of Ameritech Frame Relay is easy and risk-free because it can utilize current hardware and network architecture. End-users can achieve reduced costs and improved connectivity performance with minimal installation and support issues. Ameritech Frame Relay allows end-users to cost-effectively interconnect remote sites to promote meshed communication by statistically sharing bandwidth. Bandwidth can be easily managed through enhanced network management without physical hardware upgrades.

FEATURES	BENEFITS
Statistically multiplexed technology	The statistically multiplexed nature of the frame relay technology allows multiple DWSD locations to share resources and reduce costs while maintaining the advantages of a private network.
Multiple connections over a single multiple access line	The ability of frame relay to provision logical connections over a single physical access line may reduce the number of DSU/CSU and router ports necessary.

Dynamic Bandwidth	Allows temporary bursting of bandwidth above the Committed Information Rate subscribed to by DWSD. Additional bandwidth can be allocated without physical hardware upgrades.
Enhanced Security	Private access lines and specific permanent virtual connections enhance network security and user data privacy.
Standardized Protocol	Provides for interworking between the hardware and software of a multitude of vendors. Protects against the risk of obsolescence. Ameritech Frame Relay adheres to ANSI and ITU-T (for Telecommunication Standardization Sector of the International Telecommunications Union) standards.
Migration Path	The ability of the frame relay protocol to interwork with other technologies protect against technology obsolescence.
Simple Network Management	Frame relay can be managed by existing SNMP. Protocol for Network Management

FRAME RELAY APPLICATIONS

Frame relay is an appropriate solution for these types of networking applications:

- Replacement for meshed or hub-and-spoke private line WAN topologies
- LAN to LAN interworking for four or more sites
- Networking of branch offices to host locations
- Transport for SNA and other legacy protocols
- Remote computing
- Distributed engineering
- Transaction processing (Financial and Retail industries)
- Electronic Mail
- Disaster Recovery
- Data Vaulting
- Bursty data applications (i.e. continuous electronic mail combined with less frequent file transfer)

MOVING FORWARD:

Evolution towards ATM (Asynchronous Transfer Mode) - The clean and smooth evolution from Frame Relay to ATM is one of its strategic benefits which cannot be ignored. The networking industry has converged on ATM as the networking technology of the nineties and beyond. Its benefits are recognized by equipment manufacturers, leading edge users, standard bodies and academic researchers. ATM is expected to give users a single network that can carry their video, voice and data traffic. Companies that begin using Frame Relay services and other high speed data services today will be well positioned to take advantage of ATM services as soon as they are available (will be ahead of others in the learning curve of switched networks).

Ameritech's FRS users can migrate to ATM services as soon as they are available, without any penalties (if desired). Since these services are provided from a common infrastructure, this migration should be seamless and non-disruptive.

Consolidation of Multiple Networks - Utilizing a switched data service, users are able to consolidate multiple networks and multiple circuits into one. Instead of having multiple under utilized 56Kbps, T1 or T3 circuits from a given site to all the other sites it communicates with, all sites can have one circuit (of the appropriate speed) and transmit data to all the rest through the Frame Relay network.

Equipment Savings - Along with circuit consolidation comes the consolidation of the equipment required to terminate these circuits. This includes a reduction in serial interfaces in routers and CSU/DSUs, and in large networks, multiple routers can be collapsed at a hub site. Along with the savings in capital associated with these, there is also a savings associated with the maintenance of this equipment. In some cases, implementation of FRS can free up existing routers for use at other remote sites (can grow the network).

At subscription time users pre-identify all the communications points with which they will communicate over their wide area network. By establishing logical Permanent Virtual Circuits (PVCs) between these communication points during installation, users at any node on the network, with a single physical circuit, can send and receive data to/from any other node on the network. This underlying infrastructure will be needed to truly support client/server and distributed applications.

Flexibility and Seamless Growth - As the institution grows, additional sites can be added to the network and have access to all the other sites without affecting any of the sites that were pre-existing in the network. FRS scale very well; a network can grow non-disruptively.

Disaster Recovery - Frame Relay's inherent architecture provides cost effective disaster recovery. If a major networking hub fails or a cable failure at a hub site (i.e. data center), all other sites can still communicate, even small remote offices. In a point-to-point private line network, this is possible only if multiple circuits to different locations exist (with multiple CSU/DSUs and router ports).

Investment Protection - The networking industry is changing very quickly. Most networking technologies and equipment have a life of three years. Usually, after three years, leading edge users begin to look for the next advancement in technology. Consequently, the industry is entering an era where many companies are reluctant to invest in capital and would prefer to lease and/or subscribe to services that can offer similar functionality. This is one of the reasons why so many companies are looking at switched services provided by the various carriers. It saves them from having to purchase their own switching and/or routing equipment to accomplish similar results.

Simplification of WAN Management

As previously mentioned, with Frame Relay services users can collapse multiple circuits and multiple networks into one. This brings about a simplification of the wide area network and the management and administration associated with it. It could be as simple as a small access router (one LAN and one WAN port) at all the remote sites, and a larger router (perhaps with T3 HSSI and one or more LAN ports) at the major sites. Additionally, with SNMP based Network Management, companies can manage their switched data services in the same manner and with the same equipment that they manage their router network.

Ameritech's solution is robust enough for this requirement while providing the migration path to other technologies and services to keep DWSD on the leading edge of internetworking.

Frame Relay Specifications

Ameritech Frame Relay Service allows connectivity through well defined standard specifications for service and support. Frame Relay is ideal for connecting bursty data traffic between remote offices, ensuring seamless communication. Integration of Ameritech Frame Relay Service into many advanced networking environments is easy and risk-free. Frame Relay Service uses current hardware and network architecture, users can achieve reduced costs and improved connectivity performance with minimal installation and support issues.

Frame Relay is a high-performance, connection-oriented data service which allows for the transfer of variable length frames across large geographic areas. It combines the bandwidth efficiency of packet switching with end-to-end protocol transparency. Frame Relay transports user information from one point to the next via a predetermined Permanent Virtual Circuit (PVC). Ameritech Frame Relay Service has all the advantages of a private network through allocated PVCs without the expense of private lines. Frame Relay allows network administrators to cost-effectively interconnect all remote sites to promote meshed communication between offices by statistically sharing bandwidth.

Frame Relay permits the end-users to define multiple logical connections among multiple end-users using a single access line. This reduces complexity of network design, as well as hardware and access line costs. Ameritech Frame Relay Service is designed to allow additional bandwidth on demand through temporary data bursting beyond subscription rate. Additional permanent bandwidth can be allocated easily through enhanced network management without physical hardware upgrades.

FEATURES	BENEFITS
Reduced internetworking costs	Virtual private network allows shared resources among users to reduce costs while maintaining the advantages of a private network through PVCs (permanent virtual circuits). Additionally, equipment costs may be less, due to the reduced number of router port connections required.
Enhanced Security	Private access lines and individual virtual circuits enhance network security and user data privacy.
Standardized Protocol	Easy internetworking of hardware and software due to standardized procedures ensures easy, risk-free introduction into advanced networking environments. Meets all ANSI and ITU-T standards.
Low risk investment	Can use existing DSU/CSU to terminate access line, which allows an easy upgraded path to the Frame Relay service without investment in new equipment. Ameritech will lease the equipment to users, eliminating the risk of hardware obsolescence.
Simple Network Management Protocol for Customer Network Management	Data traffic and Frame Relay network can be managed by existing SNMP.
24 X 7 Network Monitoring	Reliable, end-to-end communications.
One-Stop-Shop	Ameritech can fulfill all connectivity needs from network design to installation to hardware and system verification to management of CPE, minimizing risk and support requirements for the user.

Basic Service

Frame Relay is available access speeds of DS-0 (56/64 Kbps), and DS-1 (1.544 Mbps), with Committed Information Rates (CIR) available at 9.6K, 16K, 32K, 64K and multiples of 64K up to the link rate.

Standards Supported

- ANSI T1-618
- ANSI T1-617 Annex D

CCITT Q-922

CCITT Q-933 Annex A

CCITT 1.122

T1.602

T1.606

T1.607

Frame Relay Consortium Specifications with Extensions, Document #001-208996

Bellcore Technical Reference TR-TSV-00073 regarding Alarm

Reporting and Performance

Frame Relay Forum FRF.1-1991

Performance Criteria

Ameritech's network reliability objectives:

- 99.9% service availability
- Mean time between failures is 3500 hours (less than 2.5 service outages per year)
- Mean time to restore is less than 3.5 hours

Ameritech's objectives for error and/or misdelivered frames:

- The errored frame ratio should be less than 5×10^{-13}
- The misdelivered frame ratio should be less than 5×10^{-8}
- The frame not delivered ratio should be less than 1×10^{-4}
- The duplicated frame ratio should be less than 5×10^{-8}

Applications

- LAN to LAN internetworking of at least four sites for hierarchical or meshed communications.
- Host to IBM* internetworking
- Branch offices
- Remote computing
- Distributed engineering
- Financial communications and updates
- Electronic mail
- Disaster recovery
- Vaulting

*Most IBM equipment has native Frame Relay support available.

Migration Path

Ameritech Frame Relay Service is the perfect transition from a private network into a cost-effective public network. It integrates seamlessly into current network design and may be able to utilize existing hardware. It is easy to migrate current network designs from a hierarchical network to a meshed network for higher performance connectivity and improved network speed.

Frame Relay is a packet-based service which can be migrated easily to high bandwidth or new broadband services, such as Asynchronous Transfer Mode (ATM).

Congestion Control

When a node starts to see congestion, it will invoke congestion avoidance procedures. The node will send FECN (forward explicit congestion notification) and BECN (backward explicit congestion notification) to reduce the flow of traffic through the node. The Ameritech Frame Relay network will not re-route traffic due to congestion.

If this procedure fails to correct the problem and the node becomes severely congested, the node will invoke congestion recovery procedures. The node will drop Discard Eligible frames until the Condition stabilizes. The Ameritech network is designed so that this state should only occur in the event of abnormal conditions.

In the event of a facility failure in our backbone network, the inter-switch traffic will re-route automatically to another member of the trunk group. All Ameritech Frame Relay switches within the same LATA are connected by multiple trunks.

Committed Information Rate (CIR)

Ameritech Frame Relay is available with the option of CIR (Committed Information Rate) or with zero CIR. The Frame Relay backbone is engineered to provide enough bandwidth to support the standard traffic rates and bursts of our customers. The network links are monitored and additional trunks added if utilization on the trunk group reaches 70%.

CIR is offered at 9.6Kbps, 16Kbps, 32Kbps, 64Kbps, and multiples of 64Kbps up to the link rate. CIR allows customers to prioritize the traffic to ensure critical traffic is transported effectively. Frames within the CIR level will be given first priority through the network, zero CIR frames are given second priority and marked discard eligible. If the switch becomes congested the frames marked discard eligible will be dropped as necessary. Offering both CIR solutions allows the customer to efficiently manage their network.

Buffering

Buffering is provided at both the ingress port and the egress port of the Ameritech Frame Relay switches. Under normal operating conditions these buffers are shared among several ports. If the buffer pool experiences an overload, congestion avoidance procedures are invoked. If the

avoidance procedures fail to eliminate the overload, the pool is split equally between all members to isolate other users from the problem. Congestion recovery procedures are implemented on the port causing the congestion starting with the most PVC. When conditions return to normal the pool is restored.

Buffering is also provided on trunk interfaces to smooth the flow of traffic between switches.

FEATURES	BENEFITS
AADS	AADS can provide a customer with one stop shopping for networking including: hardware leasing, installation and management:
AADS Professional Services	Allows the customer to partner on the following activities and concentrate on their core Services business: network design, maintenance, management, project management, cable system design, interoperability testing, and verification.
24 X 7 monitoring	Ensures reliable communications
NetPROphet	Provides a customer with prepackaged solutions such as Managed Router Service and Managed SNA to meet their specific networking needs.
Maintenance Plans	Allows the customer to partner on CPE maintenance and concentrate on their core business.
Ameritech Network PerformanceReports	Provides customer with a comprehensive suite of reports including: network utilization, error occurrence, packet discard and network congestion.
ROAM	Remote Office Access Manager Provides analog (POTS) or digital (ISDN) dial up (ROAM) access. ROAM is a remote communications solution designed to support the computing needs of the Telecommuter or remote office user.
Frame/ATM Service Inter-working	Allows a customer to deploy a hybrid Frame Relay/ATM network.

Ameritech Managed Router Service

AADS provides Ameritech Managed Router Service. Ameritech Managed Router Service (AMRS) offers a comprehensive fast-packet network solution which includes network design, hardware, router (or FRAD) software configuration, real-time monitoring and maintenance for an ultimate Lan to Lan solution. As the single source for maintenance, management and monitoring of the customer router as well as the Frame Relay, CBDS or ATM network, AADS assumes full responsibility for network operations.

AADS also works with customers to assure easy migration from private line to any fast packet service or from frame relay to ATM and eliminates the customers' risk of equipment obsolescence. Most importantly, Ameritech Managed Router Service is offered for a fixed

monthly price which minimizes the capital investment risk and staff required to build and maintain a wide-area network.

Ameritech Managed Router Service is offered with Ameritech fast-packet services: Frame Relay, Connectionless Broadband Data Service (CBDS) and Asynchronous Transfer Mode (ATM).

The service is comprised of:

- A network of routers and/or Frame Relay Access Devices, (FRAD)
- AADS provided access circuits and software defined paths linking all elements of the network
- AADS designed router network including addressing, routing protocol, filtering and traffic prioritization
- Installation Guarantee - Ameritech guarantees on-time delivery of Ameritech Frame Relay, Ameritech CBDS and Ameritech ATM or AADS will refund a prorated portion of the installation charges
- Ongoing Router Software Management, including changes in addresses, protocols, filtering and traffic prioritization which usually can be completed within 3 business days. Software upgrades are provided for bug fixes. Several LAN protocols are supported including IP, Novell IPX, Appletalk, and Banyan Vines IP.
- Comprehensive Network Management -- After installation, AADS utilizes advanced network management tools to continuously monitor the backbone network and the router (SNMP manageable) and coordinates maintenance and repair. The Operations Center is alerted to potentially detrimental conditions in the network and often resolves them before customer service is affected. Ameritech provides around-the-clock telephone support for hardware, software and configuration problems. In cases of faulty equipment, Ameritech will provide same-day replacement parts and dispatch a technician to perform on-site maintenance with a four hour response time.

FEATURES	BENEFITS
One Source & Single Point of Contact	Realize on-time installation resulting in better use of IS staff. On-going activity is handled through one contact
Professional Services & Network Integration	Ameritech keeps current on emerging technologies to provide a state-of-the-art, standards compliant network - enabling customers to focus on core business objectives
On-Going Software Configuration	Simplifies daily operations for the network manager
Monthly Pricing & One	Receive one bill for the network service, customer equipment and

Bill	network management & maintenance. No capital investment is required to install and maintain a broadband network
Installation Guarantee	Ameritech will provide the customer with a guaranteed installation date and provide a prorated refund of the installation charge if the date is missed by Ameritech
Ongoing Software Configuration	Router configuration changes - including addressing, protocol changes, software upgrades, filtering/prioritization features - are implemented within 3 business days of receiving all required information from the customer (unless reengineering, design review or acceptance testing is required)
Standard Protocol Support	Basic protocols supported include: IP, IPX, Appletalk, DECnet, Vines IP, and OSI, XNS and source route bridging
24 x 7 Router/FRAD Monitoring	The Network Operations Center (NOC) provides 7 X 24 inband SNMP monitoring of Routers and FRADs
Problem Resolution & On-Site Service	The NOC and field technicians will work together to solve router and network problems identified by the NOC/customer and ensure timely customer notification. When necessary, on-site service coverage is provided 24 hours per day, 7 days per week, including holidays with guaranteed 4 hour response time. Same business day replacement parts is provided if trouble is received before 3:00 pm est
Customer Network Management	As an additional feature, customers may receive standard SNMP traps and objects that contain performance information about their network from the Ameritech backbone network - as implemented by vendors, industry forums, and Bellcore - - where available (not yet available with ATM). Customers must provide a MIB browser & Management Workstation -(Sun NetManager, HP Openview or Netview)
Ameritech Network Performance Reports	Frame Relay performance data will be provided regarding circuit (UNI) utilization, errored frames, and interface errors. Raw data is analyzed to provide meaningful data to the network manager. Reports will be available by electronic file transfer or a paper report will be delivered from the account team. PVC Utilization reports are available as an additional item.
Future Product Enhancements	As technology changes, Ameritech will offer enhanced services to continually optimize the operation and management of the customers fastpacket network

Appendix A - GLOSSARY

AADS	Ameritech Advanced Data Services
AmLibS	Ameritech Library Services
AMRS	Ameritech Managed Router Service
ATM	Asynchronous Transfer Mode. A method for the dynamic allocation of bandwidth using a fixed-size packet (called a cell).
CIR	Committed Information Rate.
CPE	Customer Premises Equipment. Any equipment - such as telephones, computers, printers, video equipment or other items - that a user can connect to a network.
CSU/DSU	Channel Service Unit/Data Service Unit (hardware). The CSU is used to terminate a digital circuit. The DSU terminates the data circuit and converts the users's data stream into a format for transmission.
DALNET	Detroit Area Library Network
DLCI	Data Link Connection Identifier. This is a channel number which is attached to data frames to tell the network how to route the data.
DWSD	DALNET - Wayne State - Detroit
FRS	Frame Relay Service. Frame relay is the result of wide area networking requirements for speed, LAN-WAN and LAN-LAN internetworking, "bursty" data communications, multiplicity of protocols and protocol transparency.
IP	Internet Protocol.
ISDN	Integrated Services Digital Network. This is a set of communications standards allowing a single wire or optical fiber to carry voice, digital network services and video. ISDN is intended to eventually replace the plain old telephone system (POTS).
LATA	Local Area Transport Area. A region served by a local exchange carrier that consists of one or more area codes.
LMI	Local Management Interface - Router Service
PVC	Permanent Virtual Circuit
SNMP	Simple Network Management Protocol. The Internet standard protocol, developed to manage nodes on an IP network, it can be used to manage and monitor all sorts of equipment including computers, routers, wiring hubs, toasters and jukeboxes.
UNI	User Network Interface
WAN	Wide Area Network. A network extending over distances greater than one kilometer.

Appendix B - AADS Maintenance Charges

All Rates Subject to Change

Services not included in Ameritech Managed Router Service and/or beyond the point of demarcation will be performed as resources permit.

Description	Normal Business Day	Other Hours
Software Configuration Changes		
Remote - inband or dialup Maximum 10 PVCs/service order 1 protocol/router/service order	\$50/service order	\$75/service order
Software Configuration Changes (minimum four (4) hours)		
On-Site Changes (in region)	\$225/hour	\$337.50/hour
On-Site changes (out of region)	\$337.50/hour	\$337.50/hour
Facility Demarcation Extension Charges from Ameritech network will be passed-through		
Local On-Call Phone Support	\$65/hour (minimum 2)	\$97.50/hour (minimum 2)
Professional Services		
In Region	\$225/hour	\$337.50/hour
*Out of Region	\$225/hour (4 hour minimum)	\$337.50/hour (4 hour minimum)
* Out of region will incur travel costs.		

Out of Scope Maintenance, Hardware Installations and Initial Site Surveys:

In Region	\$150/hour (minimum 4 when callout required)	\$225/hour
Out of Region	\$225/hour	\$300/hour

Configuration and Cost Information for Proposed DALNET Network:

Router Configurations Priced for Ameritech Managed Router Service:

REMOTE SITES:

Cisco 1601 Ethernet/Serial Modular Router

SF160B - IP/IPX

Cisco IOS IP/IPX Feature Set

Cisco 1600 AC Power Supply World Wide

Power Cord 110V

Cisco 1600 4MB to 12MB Flash Factory Upgrade

2MB to 18MB DRAM Factory Upgrade for Cisco 1600 Series

V.35 Cable, DTE, Male 10 ft.

Cisco 1601: one Ethernet, one serial, and one optional WAN slot. The serial WAN port on the Cisco 1601 supports asynchronous serial connections up to 115.2 kbps and synchronous serial connections up to 2.048 Mbps.

HEAD-END SITES:

Cisco 4500_m Router A.C.

4-Serial Port NP Module

6 Port Ethernet Port 10 Base T Np Mod.

16MB upgrade Replaces 8mb total of 16

Cisco 4500/4700 IOS IP/IPX. Feature Set

V.35 Cable DTE Male 10'

Changes to these configurations or circuit speed will result in different pricing.

Protocols supported: IP and IPX

Type of LAN: Ethernet One port per 1601, 6 ports per 4500

This Scope of Work was prepared and written by Jim Grant Sales Engineer AADS. Any questions should be directed to Jim at 313.234.3836.

56K Pricing with Head-end

Location	Frame Relay Service Rate	Non-recurring Price	Monthly Price
WSU Library (Head-end) *	1.544M	\$2,200.00	\$1,515.00
Detroit Public Library Main (Head-end) *	1.544M	\$2,200.00	\$1,515.00
WB Medical Library	56K	\$1,600.00	\$356.00
WB Medical Library	56K	\$1,600.00	\$356.00
Bosford / Library & Media Ctr	56K	\$1,600.00	\$356.00
Children's Hospital	56K	\$1,600.00	\$356.00
Detroit Institute of Arts/Resh Lib	56K	\$1,600.00	\$356.00
DPL Bowen	56K	\$1,600.00	\$356.00
DPL Campbell	56K	\$1,600.00	\$356.00
DPL Chandler Park	56K	\$1,600.00	\$356.00
DPL Chaney	56K	\$1,600.00	\$356.00
DPL Chase	56K	\$1,600.00	\$356.00
DPL Conely	56K	\$1,600.00	\$356.00
DPL Douglass	56K	\$1,600.00	\$356.00
DPL Downtown	56K	\$1,600.00	\$356.00
DPL Duffield	56K	\$1,600.00	\$356.00
DPL Edison	56K	\$1,600.00	\$356.00
DPL Elmwood Park	56K	\$1,600.00	\$356.00
DPL Franklin	56K	\$1,600.00	\$356.00
DPL Gray	56K	\$1,600.00	\$356.00
DPL Hubbard	56K	\$1,600.00	\$356.00
DPL Jefferson	56K	\$1,600.00	\$356.00
DPL Knapp	56K	\$1,600.00	\$356.00
DPL Lincoln	56K	\$1,600.00	\$356.00
DPL Lothrop	56K	\$1,600.00	\$356.00
DPL Mark Twain	56K	\$1,600.00	\$356.00
DPL Monteith	56K	\$1,600.00	\$356.00
DPL Municipal Reference	56K	\$1,600.00	\$356.00
DPL Parkman	56K	\$1,600.00	\$356.00
DPL Redford	56K	\$1,600.00	\$356.00
DPL Richard	56K	\$1,600.00	\$356.00
DPL South Campus Library	56K	\$1,600.00	\$356.00
DPL Sherwood Forest	56K	\$1,600.00	\$356.00
DPL Wilder	56K	\$1,600.00	\$356.00
McGregor Pub. Lib. of High. Park	56K	\$1,600.00	\$356.00
Det. REc. Hosp. Med Lib.	56K	\$1,600.00	\$356.00
the Hospital Grace/Sinai	56K	\$1,600.00	\$356.00
Harper Hospital Hosp. Lib.	56K	\$1,600.00	\$356.00
Huron Valley Hospital - Hosp Lib	56K	\$1,600.00	\$356.00
Hutzel Hosp. Medical Library	56K	\$1,600.00	\$356.00
Macomb Comm. College Ctr. Campus Learning	56K	\$1,600.00	\$356.00
Macomb Comm. Center Campus Library	56K	\$1,600.00	\$356.00
Macomb Comm. South Campus Library	56K	\$1,600.00	\$356.00
OCC Auburn Hills Learning Resource Ctr.	56K	\$1,600.00	\$356.00
OCC Central Processing Dept.	56K	\$1,600.00	\$356.00
OCC Highland Lakes Learning Resource Cente	56K	\$1,600.00	\$356.00

56K Pricing with Head-end

OCC Orchard Ridge Learning Resource Center	56K	\$1,600.00	\$356.00
OCC Royal Oak Learning Resource Center	56K	\$1,600.00	\$356.00
OCC Southfield Learning Resource Center	56K	\$1,600.00	\$356.00
Oakland County Law Library	56K	\$1,600.00	\$356.00
Oakland County Library	56K	\$1,600.00	\$356.00
Oakland County Art Library	56K	\$1,600.00	\$356.00
Rehab. Inst. of MI Learning Resource Center	56K	\$1,600.00	\$356.00
UODM Library	56K	\$1,600.00	\$356.00
UODM Main Library, McNichols Campus Lib.	56K	\$1,600.00	\$356.00
UODM Library, Medical Center	56K	\$1,600.00	\$356.00
UODM Outer Drive Campus-Library	56K	\$1,600.00	\$356.00
Vets. Adm. Med. Ctr. Library Services	56K	\$1,600.00	\$356.00
Walsh College Troy Campus	56K	\$1,600.00	\$356.00
Walsh College, Main Campus	56K	\$1,600.00	\$356.00
WCCC Central Learning Resource Center	56K	\$1,600.00	\$390.00
WCCC Downriver Learning Resource Center	56K	\$1,600.00	\$356.00
WCCC Northwest Learning Resource Center	56K	\$1,600.00	\$356.00
WCCC Western Learning Resource Center	56K	\$1,600.00	\$356.00
WCCC Western Learning Resource Center	56K	\$1,600.00	\$356.00
WSU Shiffman Medical Library	56K	\$1,600.00	\$356.00
WSU Oakland Center	56K	\$1,600.00	\$356.00
WSU Pharmacy/Allied Health Learning Resource	56K	\$1,600.00	\$356.00
WSU Shiffman Kresge Library PURDY	56K	\$1,600.00	\$356.00
WSU Reuther Library	56K	\$1,600.00	\$356.00
WSU Science Engineering Lib.	56K	\$1,600.00	\$356.00
WSU Undergraduate Library	56K	\$1,600.00	\$356.00
WCC Downtown Learning	56K	\$1,600.00	\$390.00

\$118,000.00 \$28,374.00

Router Configuration

Description typical remote site

Cisco 1601 Ethernet/Serial Modular Router
 SF160B - IP/IPX
 Cisco IOS IP/IPX Feature Set
 Cisco 1600 AC Power Supply World Wide
 Power Cord 110V
 Cisco 1600 4MB to 12MB Flash Factory Upgrade
 18MB DRAM Factory Upgrade for Cisco 1600 Series
 V.35 Cable, DTE, Male 10 ft.

Description typical head-end site

Cisco 4500_m Router A.C.
 4-Serial Port NP Module
 6 Port Ethernet Port 10 Base T Np Mod.
 16MB upgrade Replaces 8mb total of 16
 Cisco 4500/4700 IOS IP/IPX. Feature Set
 V.35 Cable DTE Male 10'

56K Pricing with Head-end

This information contained in this proposal is valid for 60 days. This pricing is for a 60 month contract. This is an exclusive confidential proposal.

Pricing proposed herein is available to the recipient of this proposal and only to the extent products are provided as stated herein and Ameritech's standard terms and conditions. Proposal pricing here specific product/service mix, and locations design included in this proposal. Any changes or variations in Ameritech's standard terms and conditions and the products, services, locations and/or herein may result in different pricing.

Frame Relay Site	Term	Miles	Rate	NRC Price	Monthly Price
128 K site 1601	60	0	128K	\$ 1,600.00	\$ 549.00
256 K site 1601	60	0	256K	\$ 1,600.00	\$ 645.00
384 K site 1601	60	0	384K	\$ 1,600.00	\$ 727.00
T-1 (1.544M) 1601	60	0	T-1	\$ 2,200.00	\$ 830.00
128 K site 4500	60	0	128K	\$ 2,000.00	\$ 1,273.00
256 K site 4500	60	0	256K	\$ 2,000.00	\$ 1,365.00
384 K site 4500	60	0	384K	\$ 2,000.00	\$ 1,430.00
T-1 (1.544M) 4500	60	0	T-1	\$ 2,200.00	\$ 1,560.00
128 K site 1601	60	5	128K	\$ 1,600.00	\$ 715.00
256 K site 1601	60	5	256K	\$ 1,600.00	\$ 810.00
384 K site 1601	60	5	384K	\$ 1,600.00	\$ 895.00
T-1 (1.544M) 1601	60	5	T-1	\$ 2,200.00	\$ 1,060.00
128 K site 4500	60	5	128K	\$ 2,000.00	\$ 1,440.00
256 K site 4500	60	5	256K	\$ 2,000.00	\$ 1,530.00
384 K site 4500	60	5	384K	\$ 2,000.00	\$ 1,600.00
T-1 (1.544M) 4500	60	5	T-1	\$ 2,200.00	\$ 1,790.00
128 K site 1601	60	9	128K	\$ 1,600.00	\$ 765.00
256 K site 1601	60	9	256K	\$ 1,600.00	\$ 860.00
384 K site 1601	60	9	384K	\$ 1,600.00	\$ 945.00
T-1 (1.544M) 1601	60	9	T-1	\$ 2,200.00	\$ 1,135.00
128 K site 4500	60	9	128K	\$ 2,000.00	\$ 1,490.00
256 K site 4500	60	9	256K	\$ 2,000.00	\$ 1,580.00
384 K site 4500	60	9	384K	\$ 2,000.00	\$ 1,665.00
T-1 (1.544M) 4500	60	9	T-1	\$ 2,200.00	\$ 1,865.00
128 K site 1601	60	15	128K	\$ 1,600.00	\$ 840.00
256 K site 1601	60	15	256K	\$ 1,600.00	\$ 935.00
384 K site 1601	60	15	384K	\$ 1,600.00	\$ 1,018.00
T-1 (1.544M) 1601	60	15	T-1	\$ 2,200.00	\$ 1,250.00
128 K site 4500	60	15	128K	\$ 2,000.00	\$ 1,565.00
256 K site 4500	60	15	256K	\$ 2,000.00	\$ 1,655.00
384 K site 4500	60	15	384K	\$ 2,000.00	\$ 1,740.00
T-1 (1.544M) 4500	60	15	T-1	\$ 2,200.00	\$ 1,980.00
128 K site 1601	60	20	128K	\$ 1,600.00	\$ 913.00
256 K site 1601	60	20	256K	\$ 1,600.00	\$ 1,010.00
384 K site 1601	60	20	384K	\$ 1,600.00	\$ 1,090.00
T-1 (1.544M) 1601	60	20	T-1	\$ 2,200.00	\$ 1,365.00
128 K site 4500	60	20	128K	\$ 2,000.00	\$ 1,635.00
256 K site 4500	60	20	256K	\$ 2,000.00	\$ 1,730.00

384 K site 4500	60	20	384K	\$ 2,000.00	\$ 1,810.00
T-1 (1.544M) 4500	60	20	T-1	\$ 2,200.00	\$ 2,095.00
128 K site 1601	60	25	128K	\$ 1,600.00	\$ 962.00
256 K site 1601	60	25	256K	\$ 1,600.00	\$ 1,058.00
384 K site 1601	60	25	384K	\$ 1,600.00	\$ 1,140.00
T-1 (1.544M) 1601	60	25	T-1	\$ 2,200.00	\$ 1,440.00
128 K site 4500	60	25	128K	\$ 2,000.00	\$ 1,685.00
256 K site 4500	60	25	256K	\$ 2,000.00	\$ 1,780.00
384 K site 4500	60	25	384K	\$ 2,000.00	\$ 1,863.00
T-1 (1.544M) 4500	60	25	T-1	\$ 2,200.00	\$ 2,169.00
128 K site 1601	60	30	128K	\$ 1,600.00	\$ 1,011.00
256 K site 1601	60	30	256K	\$ 1,600.00	\$ 1,108.00
384 K site 1601	60	30	384K	\$ 1,600.00	\$ 1,190.00
T-1 (1.544M) 1601	60	30	T-1	\$ 2,200.00	\$ 1,518.00
128 K site 4500	60	30	128K	\$ 2,000.00	\$ 1,735.00
256 K site 4500	60	30	256K	\$ 2,000.00	\$ 1,830.00
384 K site 4500	60	30	384K	\$ 2,000.00	\$ 1,910.00
T-1 (1.544M) 4500	60	30	T-1	\$ 2,200.00	\$ 2,245.00
128 K site 1601	60	40	128K	\$ 1,600.00	\$ 1,148.00
256 K site 1601	60	40	256K	\$ 1,600.00	\$ 1,242.00
384 K site 1601	60	40	384K	\$ 1,600.00	\$ 1,325.00
T-1 (1.544M) 1601	60	40	T-1	\$ 2,200.00	\$ 1,725.00
128 K site 4500	60	40	128K	\$ 2,000.00	\$ 1,870.00
256 K site 4500	60	40	256K	\$ 2,000.00	\$ 1,965.00
384 K site 4500	60	40	384K	\$ 2,000.00	\$ 2,045.00
T-1 (1.544M) 4500	60	40	T-1	\$ 2,200.00	\$ 2,455.00

The aforementioned sites are for FRAME RELAY ONLY. Examples are specific to miles. Prices are subject to change based on the router model.

Router Configuration	
Description typical remote site	Qty.
Cisco 1601 Ethernet/Serial Modular Router	1
SF160B - IP/IPX	1
Cisco IOS IP/IPX Feature Set	1
Cisco 1600 AC Power Supply World Wide	1
Power Cord 110V	1

Cisco 1600 4MB to 12MB Flash Factory Upgrade	1
2MB to 18MB DRAM Factory Upgrade for Cisco 1600 Series	1
V.35 Cable, DTE, Male 10 ft.	1
Description typical head-end site	
Cisco 4500_m Router A.C.	1
4-Serial Port NP Module	1
6 Port Ethernet Port 10 Base T Np Mod.	1
16MB upgrade Replaces 8mb total of 16	1
Cisco 4500/4700 IOS IP/IPX. Feature Set	1
V.35 Cable DTE Male 10'	4

The following are CIR prices:

CIR rates per month:

768K	\$ 125.00
384k	\$ 56.00
256K	\$ 45.00
128K	\$ 25.00
64K	\$ 15.00
32K	\$ 9.00
19.2K	\$ 7.00
16K	\$ 6.00
9.6K	\$ 5.50