Management Briefing



High Speed Frame Relay

"Setting the Pace in Frame Relay"

CASCADE

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Introduction

As the Frame Relay market explodes, expert projections indicate that the current expansion will continue for several years at the same rapid pace. Inherent in this explosion are the increasingly complex technical requirements and the diverse applications that the future will present. Increased traffic volumes and widely diverse application requirements will demand robust networks that support the high performance, capacity, port density, and availability that are critical to applications and users. In many cases, applications will require very high bandwidth and possess low tolerance for network delay. Ever-changing business requirements will demand scaleable solutions. Customers will demand successful operation of high speed, high capacity Frame Relay networks.

Today, public carriers and Internet Service Providers (ISPs) face increasingly complex questions as they look ahead to meet the future business needs of their users - the most technically advanced and demanding users in the world.

The questions are diverse:

- In an industry that expands continually - both in the number of users and the number and complexity of applications - can we anticipate the inevitable diverse end user requirements that will emerge? Can we stay on the cutting edge of industry trends to ensure that our networks will keep pace with the developing business needs of our customers?
- Do technologies exist today that we can take advantage of now as we anticipate our customers' future needs and requirements?
- How can we plan for the potential applications and the new ways that Frame Relay networks will be used?
- How can we keep pace with the dynamic requirements of switched networks?
- How can we best provide for remote access?

Impact

The Frame Relay Forum recently updated the FRF.1 Implementation Agreement for Frame Relay UNI to include support for Frame Relay access rates of up to T3 (45 Mbps) or E3 (34 Mbps). In addition, public carriers and ISPs face evolving industry trends, cutting edge technology, and increasingly complex applications and business issues that combine to make it increasingly important to support high speed access links to Frame Relay networks at high densities per switch. As the number of T1 access ports proliferates within Frame Relay networks, customers will need higher bandwidth to keep up with the volume of traffic requiring access to network aggregation points such as data centers, corporate headquarters, and web sites.

One company is setting the pace as the Frame Relay market leader to solve complex networking problems and answer these questions. Cascade Communications Corp. has developed products that are based on a scaleable hardware and software architecture and are designed to keep pace with the rate of technological innovation. Cascade products offer high performance and solutions that move beyond the current technical and economic challenges to address the significant challenges looming on the horizon.

Cascade's Multiservice WAN switches are software and hardware architected to provide the reliability, availability, scalability, and the flexibility that are essential to support evolving network requirements. With High Speed Frame Relay, Cascade gives its customers the ability to build networks and provide services that keep pace with the fast changing and dynamic requirements of both public and private switched networks to meet the business needs of worldwide users.

Having anticipated the industry trend, Cascade is now well positioned to provide High Speed Frame Relay technology. This provides a major competitive advantage to, and will be a strong factor in the successful operating of, high-speed, high-capacity, Frame Relay networks for public carriers and ISPs.

Commitment to Standards

Recently, the Frame Relay Forum updated the FRF.1 Implementation Agreement for Frame Relay UNI to include support for Frame Relay access rates of up to T3 (45 Mbps) or E3 (34 Mbps). Cascade's continuing commitment to developing standards-based products has resulted in a family of multiservice WAN switches that support Frame Relay and now High Speed Frame Relay. Cascade is the *first* vendor to support the updated agreement.

First in Industry

Cascade is the first vendor to deliver standards-compliant High Speed Frame Relay interfaces that allow ISPs to bolster the speed and scalability of Internet services while retaining cost efficiency. And, to meet SNA network requirements, the use of a high speed link (without requiring the use of multiple physical ports) will provide high speed access to a data center or corporate headquarters site. With the introduction of support for High Speed Frame Relay, Cascade continues its tradition of leading the industry in first-to-market implementation of cutting edge technology.

The Technologies

Frame Relay
Frame Relay technology is a fast, economical, WAN transmission technology that is well suited to data applications including LAN internetworking, SNA transport, and remote access. The use of Frame Relay technology has grown rapidly, and, today, many businesses depend heavily on Frame Relay for wide area transport of their day-to-day business applications.

High Speed Frame Relay
As the Frame Relay market matured, companies began to migrate from private leased line networking environments to the use of switched networks for mission-critical and other business applications. Applications are increasingly complex, and, in many cases, require very high bandwidth and have low tolerance for network delay. The increased traffic volumes and widely diverse application requirements demand robust networks that can support the high performance, port density, and availability that are critical to those applications and users.

High Speed Frame Relay provides for access rates of up to T3 (45 Mbps) or E3 (34 Mbps) and provides complementary network scalability, resulting in total but flexible solutions. High Speed Frame Relay lets public carriers and ISPs keep pace with the fast changing and dynamic requirements of both public and private switched networks.

Cascade is the *first* vendor to support industry movement to higher speed access, providing high speed ports at increased densities per switch.

ATM
ATM technology uses a rapid cell-switching process to support a host of additional applications such as voice and video. Although ATM technology is becoming more readily available and deployed in more networks, its application as a backbone technology for scaling Frame Relay networks allows companies to obtain the best of both technology worlds - Frame Relay for efficiency and ATM for next generation power and scalability.

As the first switch equipment vendor to provide a standards-based platform for commercially available Frame Relay-to ATM Interworking Services, Cascade leads the industry with technical solutions for scaling large Frame Relay networks.

Cascade's High Speed Frame Relay Technology

Cascade's High Speed Frame Relay technology provides complementary network scalability, resulting in flexible and total solutions. Two components comprise the High Speed Frame Relay effort from Cascade:

- Increased high speed port density
- High speed access

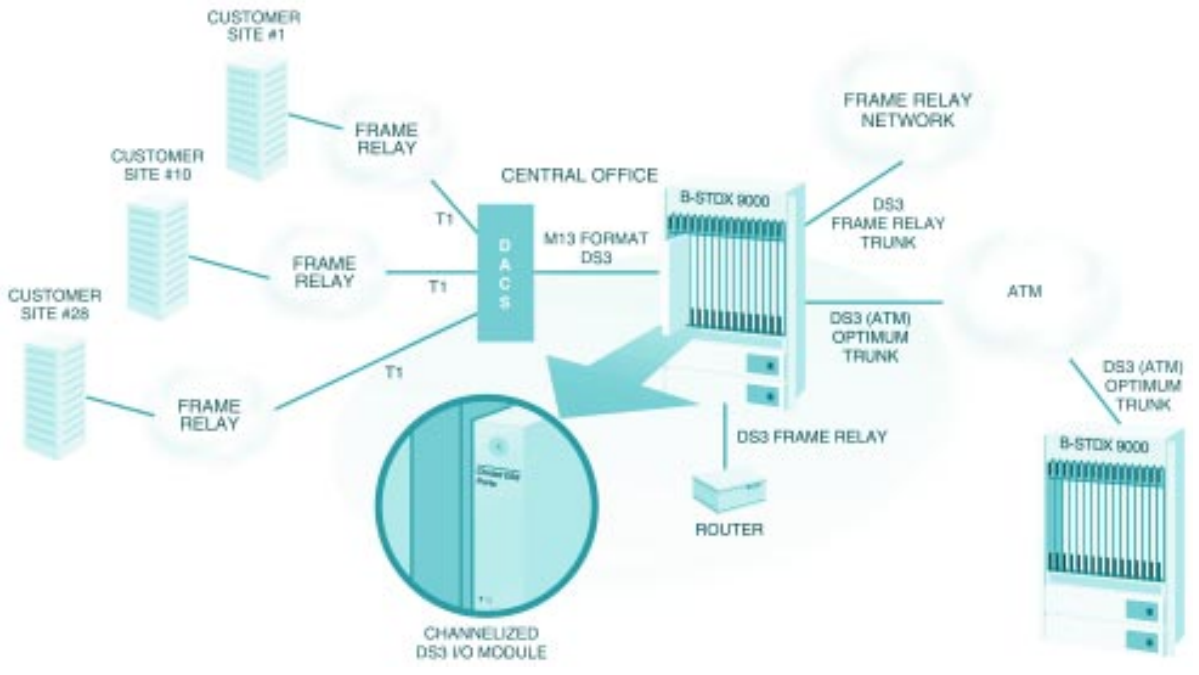
Increased High Speed Port Density

As industry trends indicate movement from 56 Kbps toward T1 Frame Relay access, an important component of Cascade's High Speed Frame Relay is increased T1 port density with an industry-leading 392 high-speed ports per switch. Estimates indicate that 50% of corporate Internet connections are now T1 connections. Although ISPs currently lead the equipment market demand for T1 ports, the entrance of local exchange carriers and IXCs to the Internet access business will further fuel the trend toward higher speed ports.

As Internet access becomes more prevalent and evolves to become a critical component of corporate communications, it will become increasingly important that public carriers and ISPs be able to support a large number of high-speed access links to their Frame Relay networks. Yesterday's relatively low-speed access rates will not be adequate. A critical need will emerge for public carriers and service providers to support high speed ports at high densities per switch.

Cascade introduces the Channelized DS3 I/O module for its B-STDX family of switches. The one port Channelized DS3 module supports up to 28 T1s on a single connection and effectively triples the maximum T1 port density per switch and simplifies operational complexity, while reducing the price per port. This module provides the highest density T1 solution at the lowest T1 price per port in the industry.

Figure 1: The Cascade Channelized DS3 I/O Module provides the industry's highest T1 port density



High Speed Access

Until recently, most Frame Relay access speeds were limited to T1/E1, or 1.54/1.92 Mbps. When the Frame Relay Forum updated the FRF.1 Implementation Agreement for Frame Relay UNI to include support for access at rates of up to T3 (45 Mbps) or E3 (34 Mbps), Cascade was ready to step forward to support the updated agreement. With products that deliver standards-compliant High Speed Frame Relay interfaces, Cascade's products allow ISPs to bolster the speed and scalability of Internet services while retaining cost efficiency.

Combining the Technologies

High Speed Frame Relay is especially important in two specific areas. The first is, obviously, to support Internet/Intranet access to high volume Internet web sites. Although the growth trend for T3/E3 Frame Relay is on the rise, the real increase is in the proliferation of T1 access ports within Frame Relay networks where data centers, corporate headquarters, and web sites must support higher bandwidth to keep up with the traffic requiring access. Bottlenecks can be avoided by provisioning high speed UNI access pipes between the server and the Frame Relay network. At the heart of the Internet, Cascade is the first to deliver the High Speed Frame Relay interfaces that allow ISPs to cost-effectively bolster the speed and scalability of Internet access.

The second area of import for high speed Frame Relay is in SNA networking environments in which many remote sites must connect to a single or a few data center sites. A high-speed access link provides the high-speed access that most SNA networks require, without using multiple physical ports.

Product Family Modules and Functionality

Channelized DS3 I/O Module

Cascade delivers High Speed (T1) Frame Relay port density with the Channelized DS3 I/O module. The Channelized DS3 interface supports up to 28 individual T1 connections per module, providing today's most cost-effective and scaleable solution for concentrating multiple circuits, saving space, and providing the ability to ease cable and consolidate network management into a central site. The Channelized DS3 I/O Module enables remote provisioning of central office DACs and multiplexer equipment, decreasing provisioning time and operational complexity. The module's design includes an integral M13 multiplexer, providing fractional T1 connectivity at variable data rates from 56 Kbps through 1.54 Mbps.

The Channelized DS3 I/O Module supports all Cascade Frame Relay functionality (UNI DCE, DTE, NNI, Multicast), and allows B-STDX switches to connect to a variety of different devices and networking environments. With its 16-slot modular architecture, Cascade's B-STDX switch is capable of an industry leading 392 DS1 ports per switch. This provides configuration flexibility and high T1 port density at a low price per port. In addition, the B-STDX supports the industry's highest number of simultaneous virtual circuits.

The Channelized DS3 I/O Module delivers comprehensive diagnostic and performance monitoring capabilities to the B-STDX platform. Each I/O module contains a RISC processor for high performance and flash memory for easy field installation of new capabilities.

Key Features

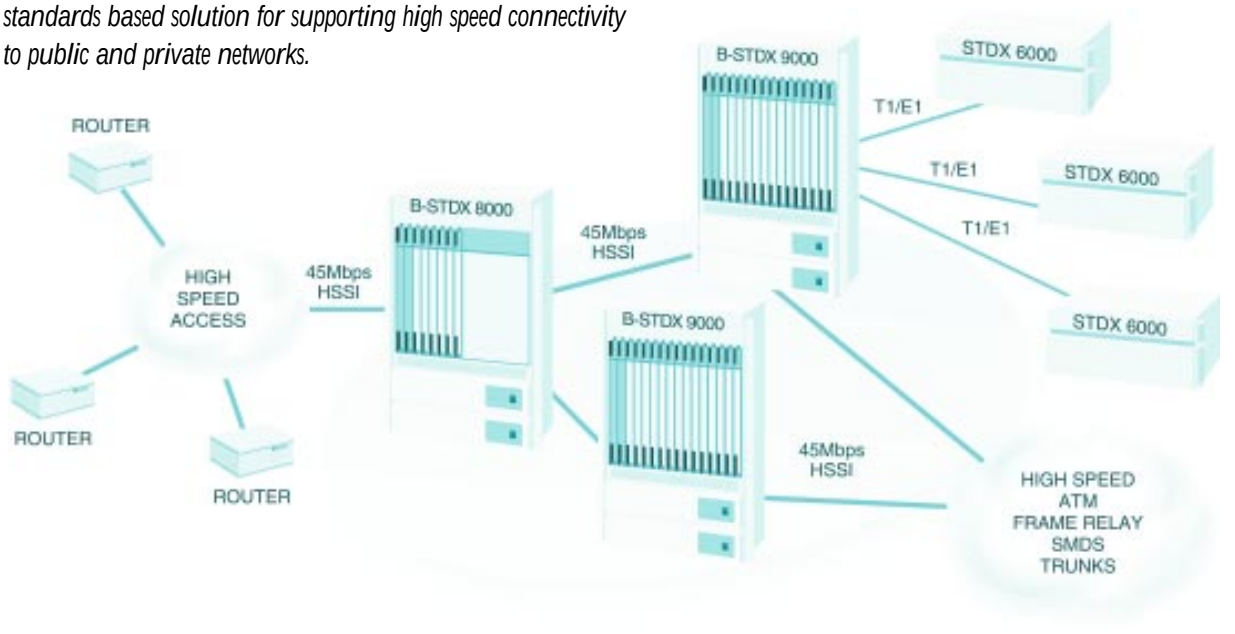
- Supports:
  - Maximum throughput - 45 Mbps/port/module
  - Channelized T3 Interface with up to 28 individual T1s for frame-based traffic
  - M13 and C-Bit parity formats for translation of T3 to and from 28 T1 serial links
  - Fractional T1
  - 938 Module Maximum Originating Permanent Virtual Circuits
  - 4000/module maximum trunk Permanent Virtual Circuits
  - External, looped time or internal clock input
  - Full T1 and T3 line and payload loopbacks, as well as Bit Error Rate Test (BERT) Patterns on any selected DS1 link
- Provides:
  - Highest T1 Port Density with ability to support up to 392 T1s in a fully loaded B-STDX 9000
  - Comprehensive link performance monitoring and statistics
  - High availability (with optional redundant configuration)
  - Allows port to be user or trunk interface for flexibility
  - Minimizes upgrade and network downtime with hot swap and live insertion capability

HSSI I/O Module

The two-port High-Speed Serial Interface (HSSI) I/O Module is an option for the B-STDX 8000/9000 Multiservice WAN switches, providing switched networking connections at data rates of up to 45 Mbps. The module's two physical ports are each configurable at speeds that increment from 1.544 Mpbs (T1) to 45 Mbps (T3, supporting the new Frame Relay Forum UNI IA - FRF 1.1). Each of the two physical ports can be individually configured as DCE or DTE to provide any Frame Relay logical port functions.

The HSSI I/O Module enables B-STDX Switches to connect CPE devices to the network at LAN speeds. It can also provide a high-speed trunk between Cascade switches, or it can provide a feeder link into a backbone Central Office class switch.

Figure 2: The flexibility of Cascade's HSSI I/O Module provides a cost-effective, standards based solution for supporting high speed connectivity to public and private networks.



Key Features

- Allows flexibility with DTE, DCE, and NNI Frame Relay interfaces
- Adheres to all Frame Relay specifications
- Minimizes upgrade and network downtime with hot swap and live insertion capabilities of all cards
- Supports SNMP management
- Supports any combination of Frame Relay DLCIs with an aggregate total of 1000 originating virtual circuits
- Supports maximum throughput
  – 20 Mbps per port (64 byte frames)
  – 40 Mbps per module (256 byte frames)
- Supports maximum originating Permanent Virtual Circuits (PVCs)
  – 500 per port
  – 938 per module
- Supports 4000 (maximum) trunk PVCs

Finding the Solution

Rapidly changing technologies, applications, and network growth will continue to drive change in the Frame Relay market. Cascade anticipated the industry trends and is ready with clear, cost-effective answers to the challenges that are associated with the change. Cascade is well positioned to step forward and provide the cutting edge technology, and specifically High Speed Frame Relay technology, to its public carrier and ISP customers.

Cascade's solution is not just chartware. Fully distributed routing and network management ensure that the solution will work in real networks. Cascade's High Speed Frame Relay solution provides ISPs with competitive advantages to meet explosive market demands by facilitating network administration, collapsing costs, improving customer service, and simplifying operations - all while retaining cost efficiency. Cascade's solution positions ISPs to address increased number of Internet users and the growing deployment of Corporate Intranets.

Conclusion

Cascade has a history of working closely with customers to anticipate and prepare for new industry trends, being driven by industry standards, being first to market new technologies, and being the first vendor to offer Frame Relay-to-ATM Interworking. Now, Cascade is the first vendor to offer High Speed Frame Relay. Cascade is committed to implementing features and functionality that allow its customers to be successful in the fast-paced switched networking market.

Cascade has proven its commitment to the success of its customers. With its reputation as an industry leader in price, performance, and flexible products, Cascade allows its customers to meet many diverse challenges, This, in turn, increases the customer's addressable market size and business success and provides their own customers with critical competitive advantages.

High Speed Frame Relay is the next logical step in scaling large networks to previously unimagined sizes, speeds, and capacities. Cascade provides the technical solutions to effectively scale large installed networks with complementary technology that results in flexible and total solutions for companies that are seeking the best of all technological worlds.

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