Understanding Frame Relay

Introduction

Throughout the 1980's, LAN technology and its implementation grew at a phenomenal rate. By the 1990's, the ability to inter-network LANs via the wide area was limited to relatively slow speed and inefficient mechanisms. The need to inter-network LANs at higher speeds using more effective communication methods led to the development of frame relay. Today, frame relay is extremely well established as a data networking protocol being supported by most service providers and equipment vendors. Frame relay's high performance and flexible frame size are ideal for the bursty nature of most LAN traffic and is today's preferred method for wide area LAN internetworking.

Who should attend the course?

This course is aimed at individuals who wish to develop a solid understanding of all aspects of frame relay technology.

Course Agenda

The following is an outline of the sections included in the course:

1. Introduction to Frame Relay
2. User-to-Network and Network-to-Network Interfaces
3. High Speed Frame Relay and ATM to Frame Relay Interworking
4. Handling real-world and time sensitive traffic
5. Voice and Video over Frame Relay
6. Defining and Measuring Service Levels
7. Synergies of Frame Relay, IP and ATM - New Developments
8. Further Aspect of Frame Relay

Course Length

Two days.

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Course Section Descriptions

1 Introduction to Frame Relay

This section deals with the origins of Frame Relay, its purpose and application. The role of the Frame Relay Forum and Implementation Agreements is explained. We also discover how Frame Relay transfers data, how it differs from X.25 and how network congestion is handled.

- Background to Frame Relay
- Frame Relay Standards and the role of the Frame Relay Forum
    - Overview of Implementation Agreements
- Frame Relay and X.25
- C and U Plane concepts
- PVCs and SVCs and their use
- The Frame Relay Frame structure
    - Multiplexing and the Link Layer Address structure
    - Congestion Indicators (FECN and BECN)
    - Discard Eligibility (DE)
- Basic switching functions
- Traffic contracts and parameters
    - Committed Information Rate (CIR), Committed Burst size (Bc), Excess Burst Size (Be) and measurement time interval.
- Congestion Control and Management

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2 User-to-Network and Network-to-Network Interfaces

The majority of Frame Relay service offerings are based on PVCs. In this section we investigate how the user-to-network interface is managed for PVCs. Carriers in the USA and Europe are now beginning to deploy SVCs. We then extend the discussion to see how SVCs might be useful and how they are supported.

- Physical Interfaces
    - From X.21 to SDH/SONET
- PVC management procedures
    - Management messages
    - Adding and Deleting PVCs
    - Limitations of polling procedures and possible solutions
    - Alternative event driven PVC management procedures
- Switched Virtual Circuits (SVCs)
    - Numbering scheme
    - Call Control signalling – Call set-up and tear-down
    - Supporting PVCs using SVCs

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3 High Speed Frame Relay and ATM to Frame Relay Interworking

The ability of ATM to operate at very high speeds and to carry a wide range of traffic types has given it an important role as a trunk or backbone technology. Many of today's Frame Relay services are supported by an ATM network. We will see how this is achieved. Furthermore, as end users require higher speeds there may be a choice between high speed Frame Relay and a migration to ATM service interworking. The benefits of each approach are explained.

- How fast can Frame Relay go?
- Multilink Frame Relay (combining several virtual connections)
- When does High Speed Frame Relay make sense?
- Clarifying the role of Frame-based ATM solutions
    - The Frame-based User to Network Interface (FUNI)
    - The Frame-based Network to Network Interface (FB-NNI)
- When does interworking make sense?
- Using ATM as a backbone technology carrying Frame Relay traffic
    - Frame Relay to ATM Network Interworking
- Complete service interworking between Frame Relay and ATM
    - Service interworking using PVCs
    - Service interworking using SVCs

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4 Handling real-world and time sensitive traffic

Although Frame Relay was originally aimed at carrying data traffic, it is quite capable of carrying time sensitive traffic including voice and video. Various enhancements have improved the way that time critical traffic can be handled by Frame Relay. They are explained. Frame Relay is also used extensively to carry a wide range of legacy protocols – we shall see how this is achieved.

- Transporting multiple user protocols and Multiprotocol Encapsulation
- Using Service Classes and Prioritisation to achieve QOS
- ITU-T Service Classes
    - Prioritisation by the network
    - Prioritisation by the CPE
- The use of Fragmentation procedures
    - End-to end fragmentation
    - Fragmentation across the UNI/NNI
- Frame Relay and SNA traffic
- Interactive Traffic
- Frame Relay over satellite links

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5 Voice and Video over Frame Relay

There are definite trends towards carrying voice traffic over packet networks. In this section we will examine how Frame Relay can be used to carry voice traffic. We will also consider how Frame Relay can be used to carry video traffic e.g. for videoconferencing.

- Voice over Frame Relay (VoFR)
    - Service description
    - Encoding voice and the issue of voice quality
    - Primary Payloads and Signaled Payloads
    - Multiplexing voice and data
    - Frame Formats
    - Frame Relay Forum conformance classes for Voice transfer
    - Fax relay
- Video over Frame Relay
    - Example based on currently available CPE

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6 Defining and measuring service levels

Service Level Agreements (SLAs) are an important element in the procurement and operation of Frame Relay networks. In this part, we examine how service levels are defined and how these definitions provide a common basis for measurements and SLAs.

- Service Level Definitions (SLD)
    - What are SLDs?
    - The reference model and measurement reference points
    - Measurement Parameters
- Frame Relay Operations Administration and Maintenance (OAM)
    - Defining an OAM protocol

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7 Synergies Frame Relay, IP and ATM - new developments

Connectionless services using IP are striving to achieve a measure of Quality of Service. The different approaches are explained. Other developments seek to integrate the world of IP with underlying layer 2 technologies such as Frame Relay and ATM. These developments and their implications are discussed.

- Approaches to QOS
    - RSVP
    - Diffserv
    - The role of SVCs: Frame Transfer Priorities
        - Using ATM's PNNI routing
    - Multiprotocol Label Switching (MPLS)
- Frame Relay and MPLS
- Multiprotocol over ATM (MPOA)
    - Using the MPOA architecture with Frame Relay

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8 Further aspects of Frame Relay

This section introduces and explains features that provide added value to Frame Relay solutions.

- Frame Relay Multicast
- Data Compression over Frame Relay
- Frame Relay Encryption

End of Training Outline

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We offer a range of standard training courses as well as providing a customisation service where we will specifically tailor a course to a particular client's needs.

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