WAN Technologies

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Abstract: This report final project addresses technologies WAN (Wide Area Network) focusing on protocols Point-to-Point Protocol (PPP) and Frame Relay, with its mode of operation, configuration, and troubleshooting common problems. Are also presented scenarios demonstration of these protocols conducted with Cisco routers and network simulator Packet Tracer 5.2 Cisco Systems.

I. INTRODUCTION

The development of communications in data networks has led to the development of several factors that serve as preconditions for its better functioning, such as:

- Types of communication
- Network topologies
- Geographical coverage
- Models of reference: OSI and TCP/IP

The protocols allow communication from one host to another via the network. A protocol is a formal description of a set of rules and conventions that govern the way of communication between devices on a network.

WANs operate at the three lower layers of the OSI reference model. The routers determine the fate of the data from the headers of the network layer and transfer the packets to the data link layer and performs the tunnel through the WAN protocols.

II. POINT-TO-POINT PROTOCOL (PPP)

The point-to-Point Protocol (PPP) is a non-proprietary protocol, this means that can be applied to network equipment from different manufacturers.

The PPP can encapsulate various protocols of the network layer, with methods of authentication, compression, dynamic addressing, multilink and callback.

Its main function is to transmit packets from the network layer of the OSI model, also known as layer 3, using point-to-point links from thedata link layer.

The PPP protocol consists of four main components:

- HDLC - Method of tunnel through serial connections.
- LCP (Link Control Protocol) - subprotocol used to connect point-to-point.
- NCP (Network Control Protocol) - subprotocol used to configure the protocols of the network layer.
- EIA/TIA-323-C - An international standard physical layer for serial communication

A PPP session is established in four phases:

Stage 1: Establishment of connection and networking configuration.

Stage 2 (optional): Determination of the quality of the connection and authentication.

Stage 3: Negotiation of the configuration of the protocols of the network layer

Stage 4: Termination of connection

Link Control Protocol (LCP):
The Link Control Protocol (LCP) is located in the base of data link layer and has the function of the establishment, configuration, maintenance and termination of point-to-point links.

The LCP protocol provides the following configuration options:

- Authentication: The routers exchange any authentication messages
- Compression: Reduces the size of the data in the frame that is sent to the destination, thereby increasing the throughput of PPP connections
- Error detection: The PPP uses the resources Magic and Quality Number to ensure a secure connection.
- Multilink: Split traffic across multiple WAN interfaces and links through the fragmentation of packets.

Network Control Protocol (NCP):

The PPP was designed to allow simultaneous use of multiple layer protocols within a single network connection.

The NCP is the protocol responsible for establishing and setting the protocols of the network layer in the same connection

III FRAME RELAY

Frame Relay is the method of packaging high performance and is defined in the physical and data link layers of the OSI model. It was originally conceived and developed to be used in ISDN interfaces and currently supports a wide variety of interfaces

Frame Relay provides a communications interface between DTE and DCE devices. DTE devices represent the terminal equipment used by the client side, such as computers, routers and bridges.The DCE devices are usually equipments used by service providers.

Frame Relay is more efficient than most WAN protocols that it takes an infrastructure less error prone.

It provides a connection-oriented communication data link layer through the establishment of virtual circuits (PVC - Permanent Virtual Circuit). These circuits are logical connections created between two DTE devices across a network of type Packet-Switched and identified by a number DLCI (Data Link Connection Identifier).

PVC provides the full path to the destination before starting any data transmission

A ideia básica do Frame Relay é possibilitar a comunicação de utilizadores entre dois dispositivos DTE, através de dispositivos DCE.

Data Link Connection Identifiers (DLCI)

Virtual circuits created by the Frame Relay are identified by DLCI. The Frame Relay service provider assigns DLCI numbers that are used by Frame Relay to distinguish between different virtual circuits on a given network. If there are many virtual circuits to finish in the same multipoint Frame Relay interface, many DLCIs will be associated with this interface.

Local Management Interface (LMI)

The LMI is a set of features added to the Frame Relay protocol that allow Frame Relay devices to communicate more easily.

The LMI is a signaling standard that provides information and is also responsible for managing

and maintenance of the status of Frame Relay connections between a device
DTE, in the case, a router and Frame Relay switch (DCE).

Subinterfaces:

It is possible to create multiple virtual circuits on a single serial interface, and to address each one as if it were different interface. One advantage of creating sub interfaces is to assign different characteristics of the network layer to the subinterface and virtual circuit.

There are two types of subinterfaces:

· Point-to-point: Used when only one virtual circuit connects one router to another. Each interface point-to-point requires its own subnet.

· Multipoint: Used when a router is the center of a star of virtual circuits

Virtual Circuits (VC):

Instead of using only private line point-to-point Frame Relay allows the use of virtual circuits (VC). A virtual circuit defines a logical path between two DTE devices Frame Relay, and there is no direct physical path between two points, but rather a virtual path.

Virtual circuits share the access connections and Frame Relay network.

IV TROUBLESHOOTING

The troubleshooting related to WAN protocols: PPP and Frame Relay.
The problems that flow directly related to these two protocols are located in the lower three layers of the OSI reference model: the physical, data link and network layers.

For each of these two protocols, the problems in these three layers, suffer a different approach to their resolution, according to their characteristics and configuration of them.

Another type of resolution of common problems in both protocols on the serial interfaces

The problems related to WAN protocols are located in the three lower layers of the OSI model and the method of identifying and solving these problems differ according to the protocol to be analyzed. The method of identification, and troubleshooting WAN protocols is to detect which of the layers of the OSI model there is the problem to its resolution.

V CONCLUSION

This project was done to study the Wide Area Network protocols (WAN) Point-to-Point Protocol (PPP) and Frame Relay through a first approach to communication technologies and in-depth study of these encapsulation protocols.
The evolution of technology follows the same WAN speed of evolution of technology in general can be said that "tomorrow will be one step ahead."

However, as with everything, this speed has its disadvantages. A major drawback that has occurred has been the non-practical use of the total development of technologies. But surely the future also this "sub use" technology available that can and should be studied will be exceeded.

After finishing a degree in computer engineering i intend to act professionally in this area, so I decided to undertake a final project related to computer networks.