

Internet Protocols for VOIP

By
Jerry Scott
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Modem Connections and Protocols

- Most modern modems are V.34 or V.90
- Modems connect via a serial interface
 - The V.24 specification defines the pinouts or interface circuits
 - RS-232/EIA 232 have been widely set and agree with the V.24 recommendations
 - The DTE, DTR, RTS, and CTS circuits are on when the modem is powered up properly

The Modem LAPM Protocol

- Modems use either LAPM or LAPB
 - Link Access Procedure for Modems, Balanced
- LAPM
 - Uses HDLC operations to carry out its activities
 - Performs the L2-handshake, after L1 completes
 - Insures proper sequencing of the traffic
- If frames are out of order, LAPM
 - Notifies sending modem in order to correct the problem
 - By resending the problem frames

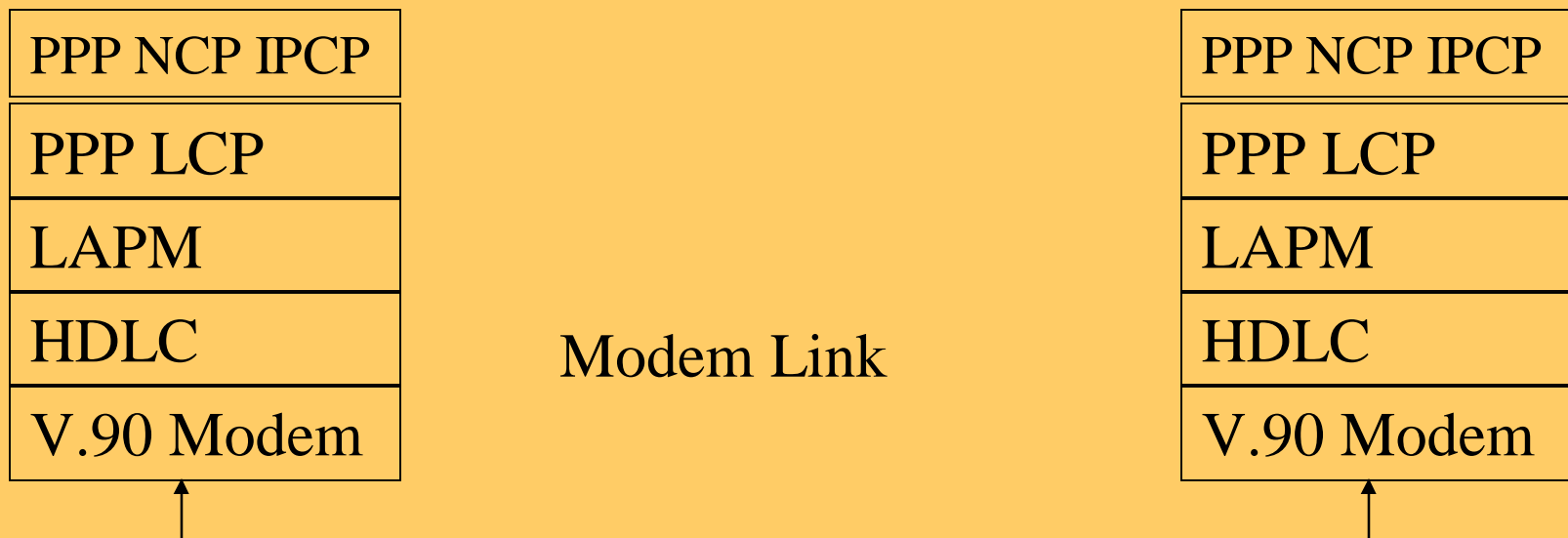
Point to Point Protocol -- PPP

- PPP is a L2 protocol
 - Relies on HDLC for basic L2 framing, error checking and bit-stuffing operations
 - May also rest on top of LAPM or LAPB
 - If error correction and retransmission operations are to be used
- PPP solves the interoperability problem
 - Came after earlier efforts like SLIP

Point to Point Protocol – Continued

- PPP consists of two separate layers
 - Link Control Protocol -- LCP
 - Responsible for configuring the link and negotiation of the link options
 - Network Control Protocol – NCP
 - Used to negotiate specific options needed for the L3 protocol
 - Different NCP's for different L3 protocols
 - VOIP will use IPCP

Protocols Used in Modem Connections



IP Transport Protocols – TCP and UDP

- IP has two transport protocols
 - TCP – connection-oriented, handles the sequencing and reliability for data transmission
 - UDP – connection-less, has no reliability, which must reside in a higher layer protocol or the application itself
- Because TCP handles retransmission, TCP is very seldom used for real-time data transport
- UDP is normally used to carry real-time data, such as VOIP

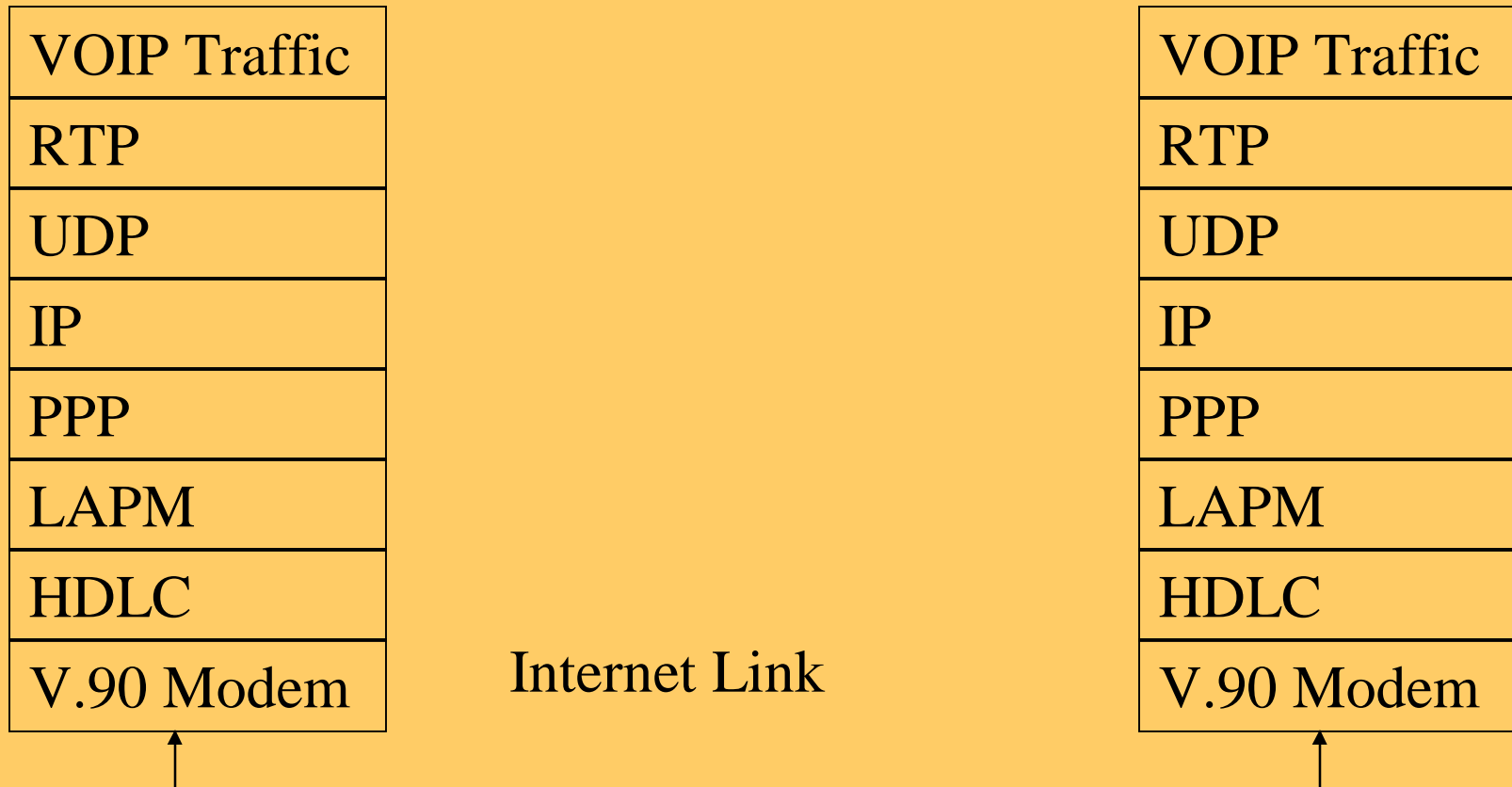
Real Time Protocol -- RTP

- The RTP protocol
 - Was designed to carry real-time data,
 - Voice and Video, ie, VOIP
 - Normally runs over UDP using well-known port 5004
 - Contains a time-stamp and a synchronization number in its header
 - To make certain the traffic is in the proper sequential order
 - To handle missing or lost traffic
 - To synchronize the traffic flow
- RTP does not define the contents of the application data field, that is up to the application

The Real Time Control Protocol

- VOIP traffic is sent using RTP because we do not resend lost VOIP packets
 - TCP would always send any lost packets
- RTCP procedures allow the source and receiver to keep informed about
 - The Quality of Services they are providing
 - The Quality of Services they are receiving

Putting the Pieces Together



Putting the Pieces Together

Sender V.90

Receiver V.90

Voice
RTP
UDP
IP
PPP
LAPM
HDLC
V.90 Modem

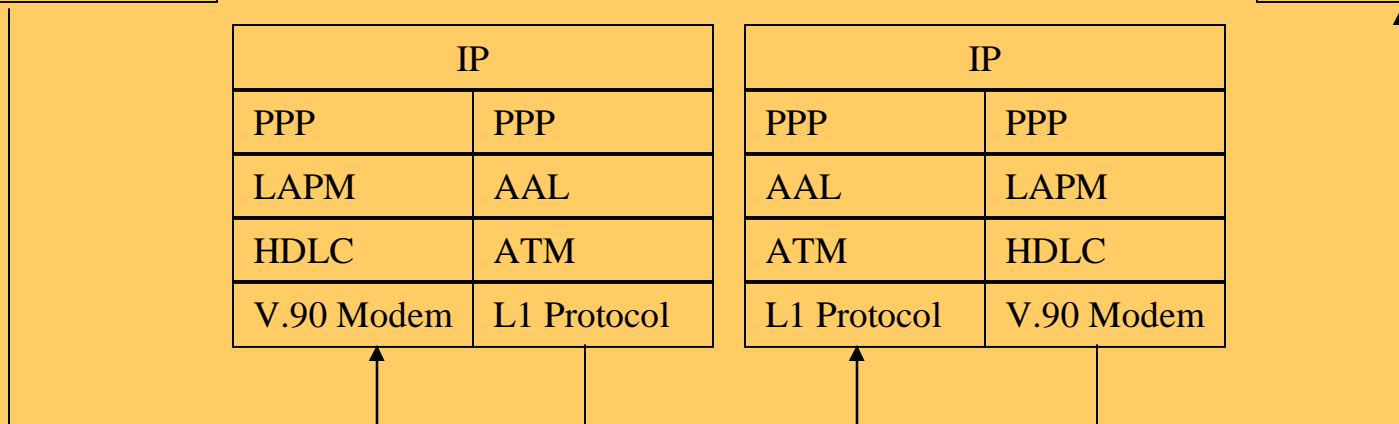
Voice
RTP
UDP
IP
PPP
LAPM
HDLC
V.90 Modem

Router 1
V.90 to ATM

Router 2
ATM to V.90

IP	
PPP	PPP
LAPM	AAL
HDLC	ATM
V.90 Modem	L1 Protocol

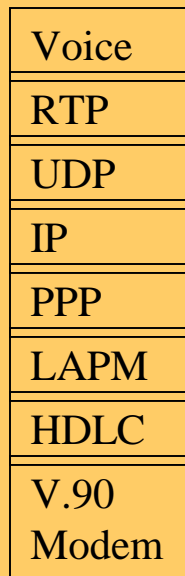
IP	
PPP	PPP
AAL	LAPM
ATM	HDLC
L1 Protocol	V.90 Modem



Putting the Pieces Together

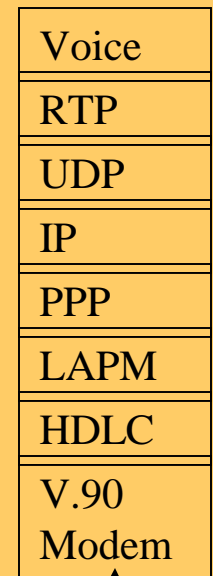
Sender V.90

Receiver V.90



Router 1
V.90-ATM

Router 2
ATM to V.90



Use ATM Network
Reduces Processing

