PPP

The point-to-point protocol

PPP versus SLIP

- PPP
  - Where is PPP used
  - What is the task of LCP
  - What is the task of NCP
- SLIP
  - Serial Line IP
  - Predecessor of PPP
  - We don't even think of it today

Introduction (1)

- Goal of PPP
  - Convey datagrams over a serial link
  - Both synchronous or asynchronous serial links are supported
  - Both bit or byte oriented transmissions are supported
- Basically, PPP consists of
  - One Link Control Protocol (LCP)
  - Several Network Control Protocols (NCPs)

Introduction (2)

- HDLC is basis for encapsulation
  - Only framing and error detection necessary
  - Only simple unnumbered information frames (UI)
- PPP supports full-duplex links only (!)
- PPP Frame = Datagram + 2-8 bytes extra header
  - Extra header consists of HDLC header and PPP header
- Byte Stuffing: Data dependent overhead!

LCP

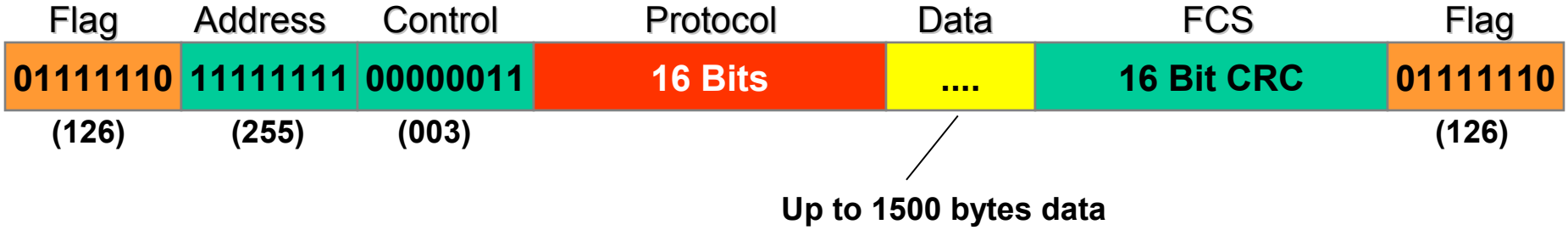
- Link Control Protocol (LCP)
  - Setup, configure, test and terminate PPP connection
  - Supports various environments
- LCP negotiates
  - Encapsulation format options
  - Maximal packet sizes
  - Identification and authentification of peers (!)
  - Determination of proper link functionality

NCPs

- Network Control Protocols (NCPs)
  - Helper to establish various network protocols
  - IP uses "IPCP"
- Typical tasks
  - Assignment and management of IP addresses
  - Compression and authentication

Data Link Layer: HDLC

- Address 11111111 means "all stations"
  - PPP does not assign individual station addresses
- Only the control field 00000011 is used
  - Unnumbered Information (UI) command
- Protocol field identifies datagram
  - Already part of PPP, not HDLC (!)



Protocol Field

0xxx – 3xxx	L3 protocol type
4xxx – 7xxx	L3 protocol type without associated NCPs
8xxx – bxxx	Associated NCPs for protocols in range 0xxx – 3xxx
cxxx – fxxx	LCP, PAP, CHAP, ...

0021	IP
002b	Novell IPX
002d	Van Jacobson Compressed TCP/IP
002f	Van Jacobson Uncompressed TCP/IP

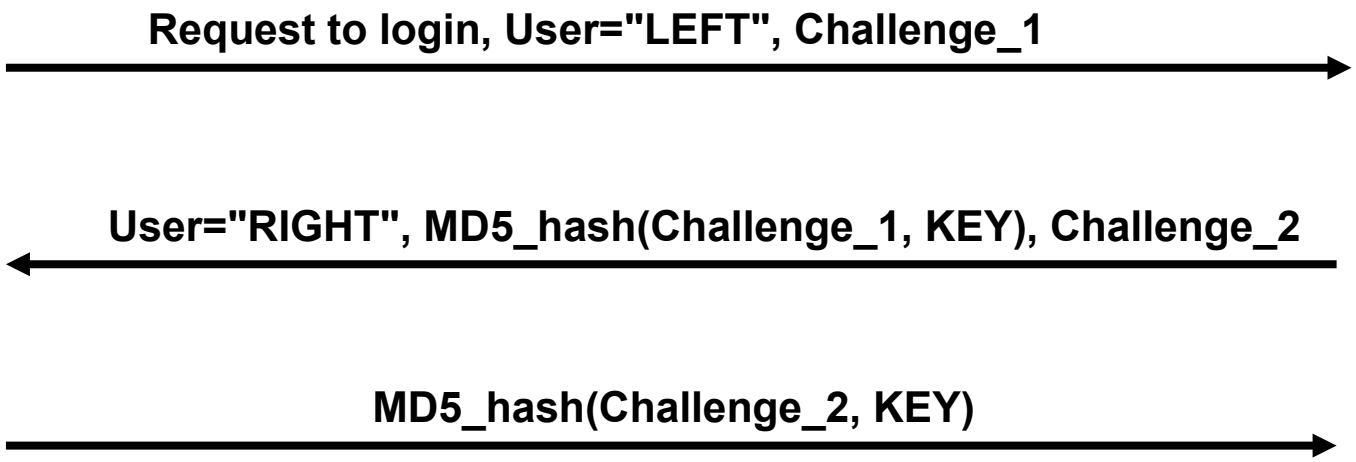
8021	IP-NCP (IPCP)
802b	IPX-NCP (IPXCP)

Important Examples

c021	Link Control Protocol (LCP)
c023	Password Auth. Protocol (PAP)
c025	Link Quality Report
c223	Challenge Handshake Auth. Protocol (CHAP)

CHAP – The Challenge Handshake Authentication Protocol

- Supports 1-way and 2-way authentication
- Periodically verifies the identity of the remote node using a three-way handshake
- Relies on MD5 hash (regarded as weak today)
  - Offline dictionary attacks possible!
- Still widely used



PPP today

- Is still a usual choice when carrying IP packets over high-speed serial lines
- Several flavors for different media
  - PPPOE (over Ethernet)
  - PPPOA (over ATM)
  - PPTP (Tunnel PPP through a IP network)
  - POS – Packet over SONET/SDH
- See RFC 1661, 1662