

Data Communications

Point-to-Point Protocol (PPP)

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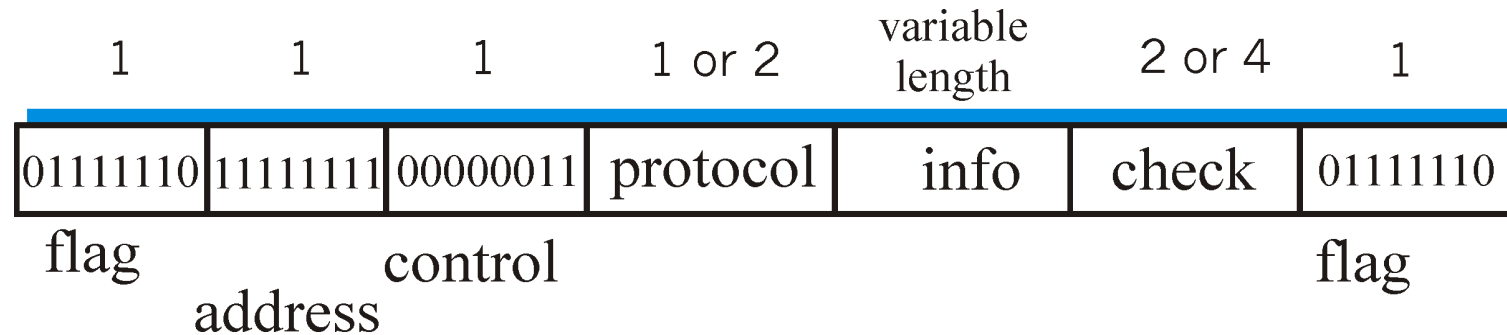
- Point to point, wired data link is easier to manage than broadcast link:
 - No Media Access Control
 - No Collision
 - No addressing
- Several Data Link Protocols: PPP, HDLC...
- PPP (Point to Point Protocol) is very popular: used in dial up connection between residential Host and ISP; on SONET/SDH connections, etc
- PPP is extremely simple (the simplest in the Data Link protocol family) and very streamlined

PPP Requirements

- framing: encapsulation of packets
- bit transparency: must carry any bit pattern in the data field
- error detection (no correction)
- supports multiple network layer protocols
- connection oriented
- Network Layer Address negotiation: Hosts/nodes across the link must learn/configure each other's network address

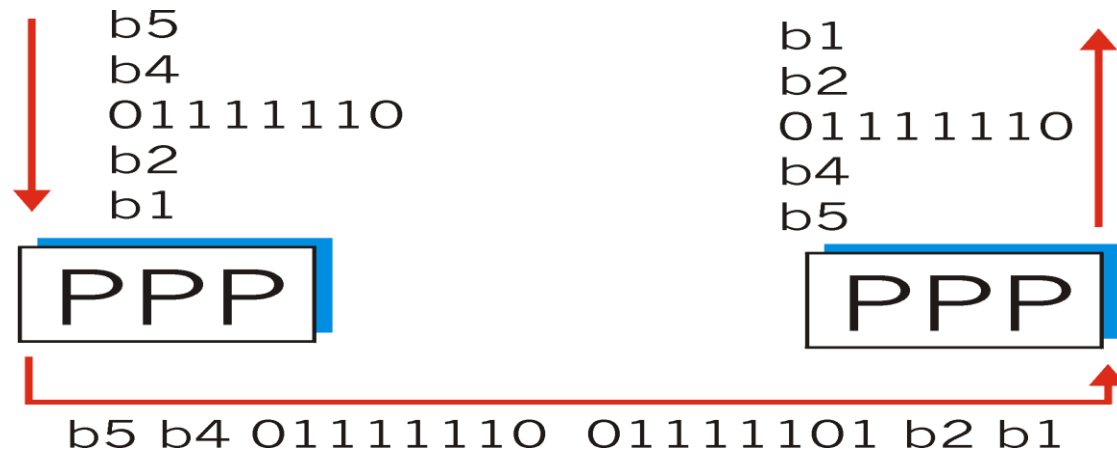
PPP Data Frame

- Flag: delimiter (framing)
- Address: does nothing (only one option)
- Control: does nothing; in the future possible multiple control fields
- Protocol: upper layer to which frame must be delivered (eg, PPP-LCP, IP, IP-CP, etc)



Byte Stuffing

- For “data transparency”, the data field must be allowed to include the pattern `<01111110>` ; ie, this must not be interpreted as a flag
- to alert the receiver, the transmitter “stuffs” an extra `<01111101>` byte after each `<01111110>` data byte
- the receiver discards each `01111101` after `01111110`, and continues data reception



1. Link Establishment & Configuration Negotiation

- Link establishment occurs at the data link layer with each PPP device sending LCP packets.
- The Link Control Protocol packets contain a configuration field for options such as...
 - MTU
 - compression
 - link authentication
- LCP must establish the link before any network layer protocols can be exchanged
- This phase is completed when a configuration acknowledgement has been sent and received.

2. Link-Quality Determination

- PPP provides optional testing to determine whether the link is good enough to bring up network layer protocols.
- In addition, if authentication is required it occurs during this phase:
 - PAP (Password Authentication Protocol)
 - CHAP (Challenge Handshake Authentication Protocol)
- Authentication occurs before the network layer configuration phase begins.