Virtual Private Networks

FEUP
MPR

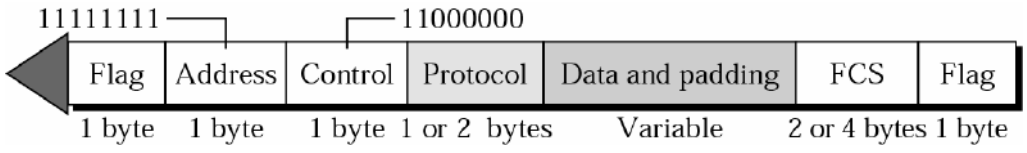
Type of VPNs

- Secure VPNs
  - » Built by customers
  - » Constructed using encryption
  - » PPP, PPTP, L2TP, IPSec
- Trusted VPNs
  - » Built by ISP, which provides and maintains the circuits integrity
  - » Layer 2 frames over MPLS, VLANs

PPP – Point-to-Point Protocol

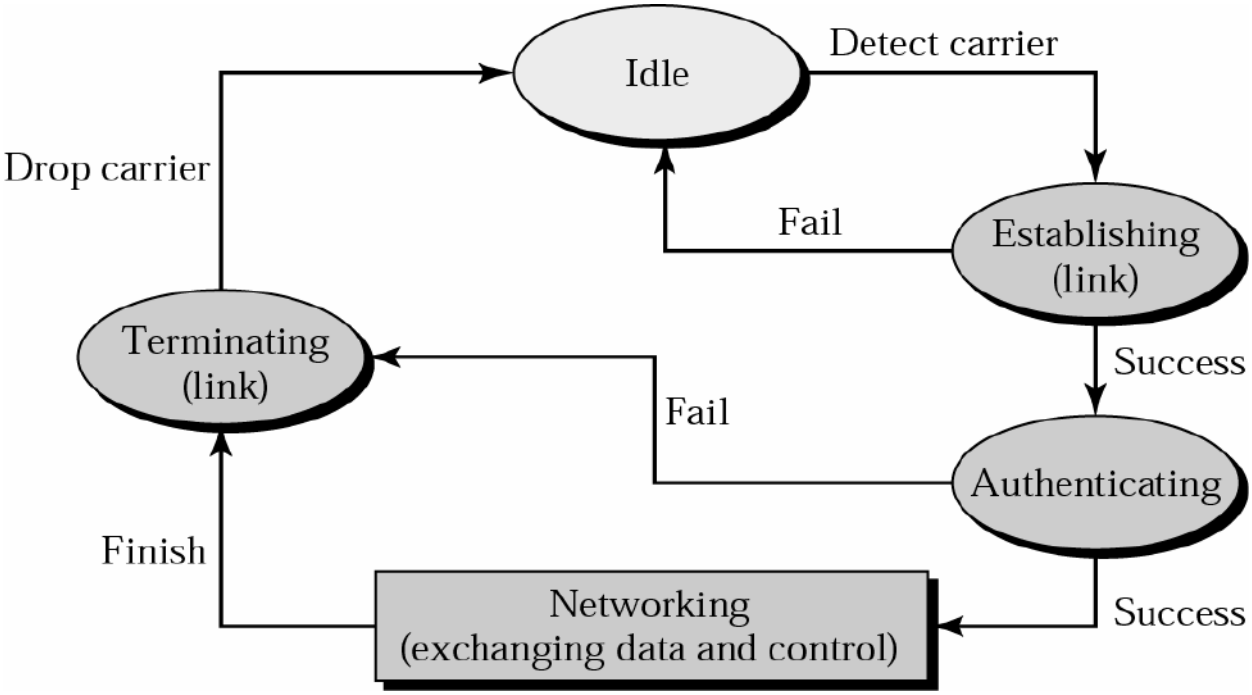
Point-to-Point Protocol

- PPP - The Point-to-Point Protocol
  RFC 1661, RFC 2153
- Method for transporting datagrams over point-to-point links
- 3 main components
  - » method for encapsulating multi-protocol datagrams
  - » LCP - Link Control Protocol
    establishing, configuring, testing the data-link connection
  - » Family of NCP - Network Control Protocols
    establishing, configuring different network-layer protocols

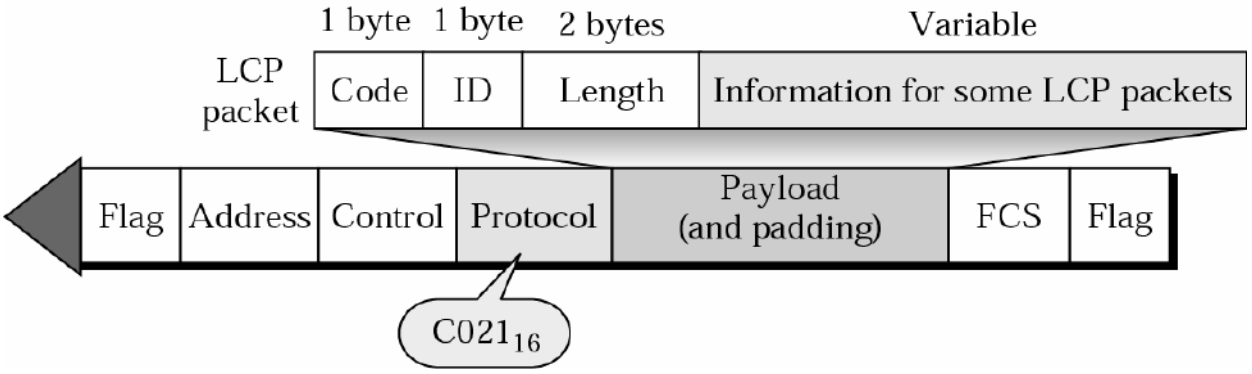


Flag: start/end of frame (01111110); **Address:** broadcast address; **Protocol:** protocol encapsulated

Transition States



LCP Packet in a Frame



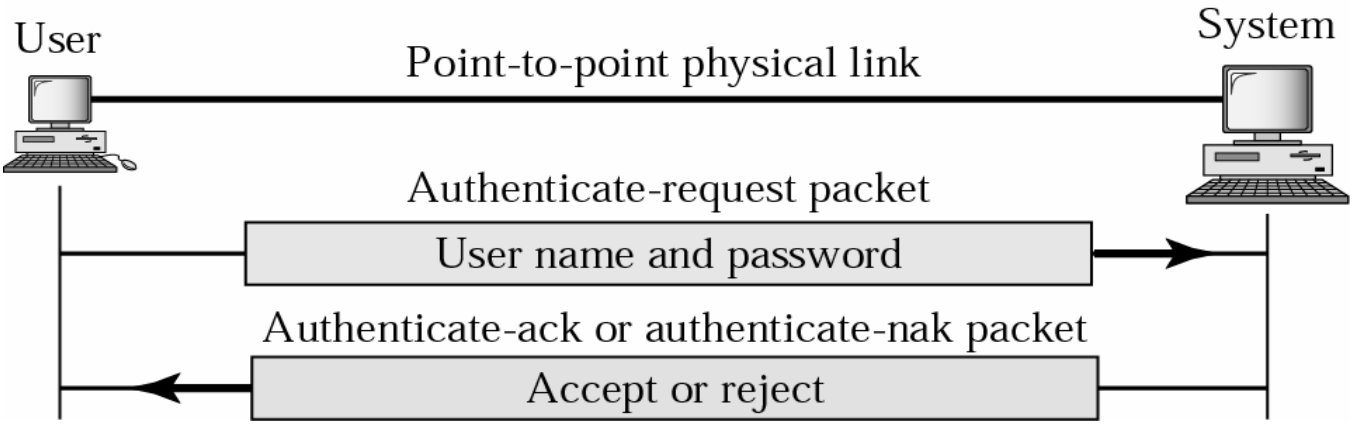
LCP Packet and Codes

Code 0x	Packet Type	Description
01	Configure-request	Contains the list of proposed options and their values
02	Configure-ack	Accepts all options proposed
03	Configure-nak	Announces that some options are not acceptable
04	Configure-reject	Announces that some options are not recognized
05	Terminate-request	Requests to shut down the line
06	Terminate-ack	Accepts the shut down request
07	Code-reject	Announces an unknown code
08	Protocol-reject	Announces an unknown protocol
09	Echo-request	A type of hello message to check if the other end is alive
0A	Echo-reply	The response to the echo-request message
0B	Discard-request	A request to discard the packet

Some Options and Their Values

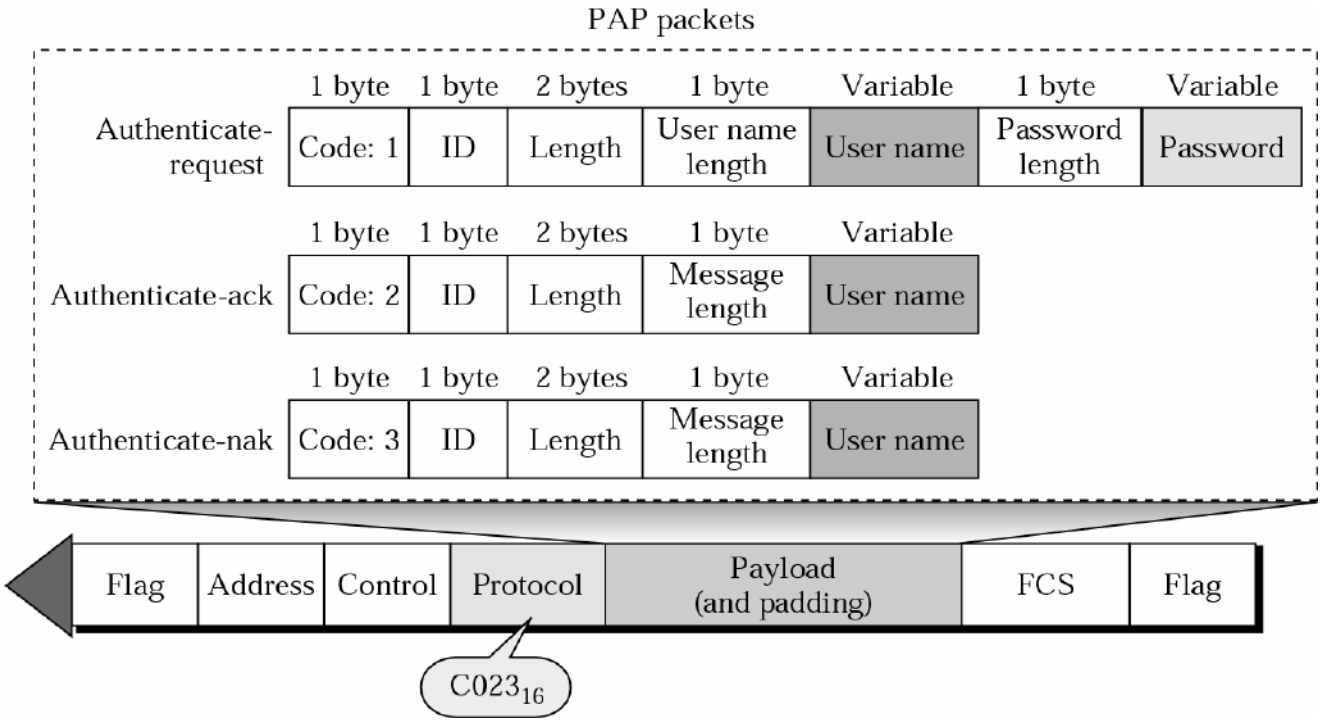
Option	Example Values
Maximum receive unit	**1500**
Authentication protocol	**None, PAP, CHAP**

PAP – Password Authentication Protocol



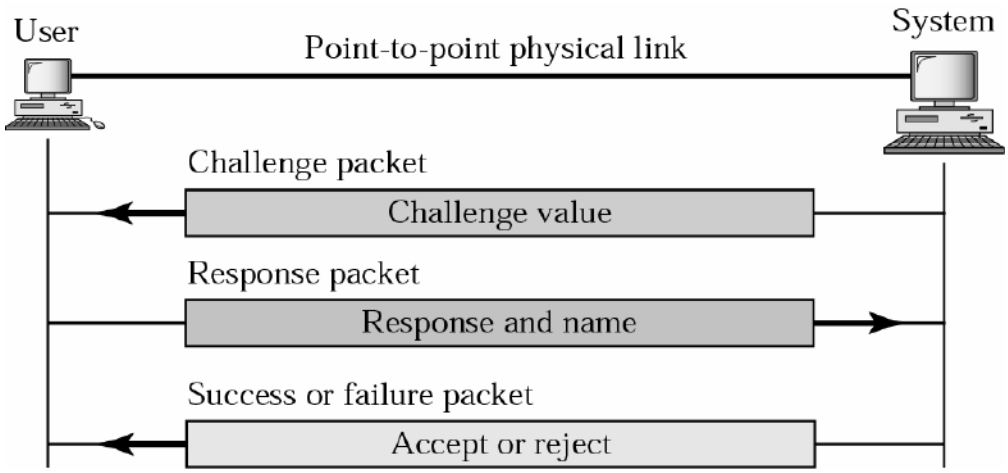
Poor Security: Usernames and Passwords sent in the clear

PAP Packets

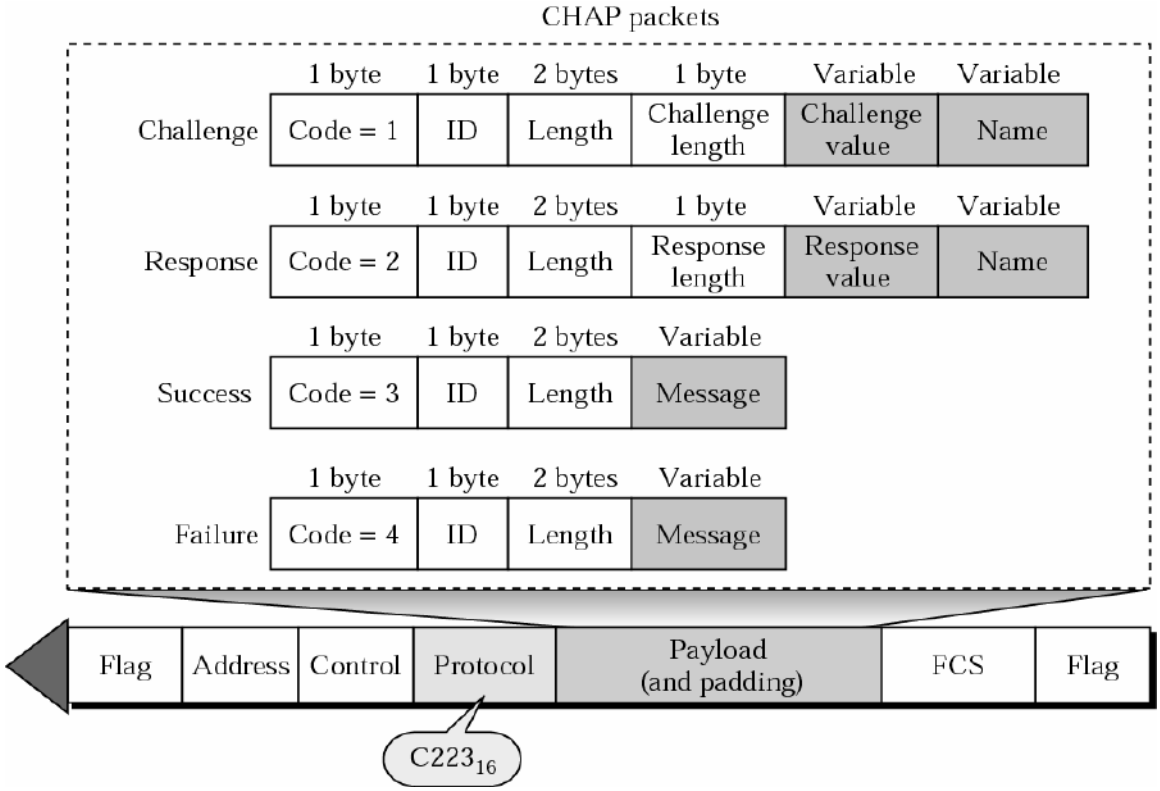


Challenge Handshake Authentication Protocol (CHAP)

- System computes hash of challenge message plus secret
  MD5
- If equals the response message, authentication is successful

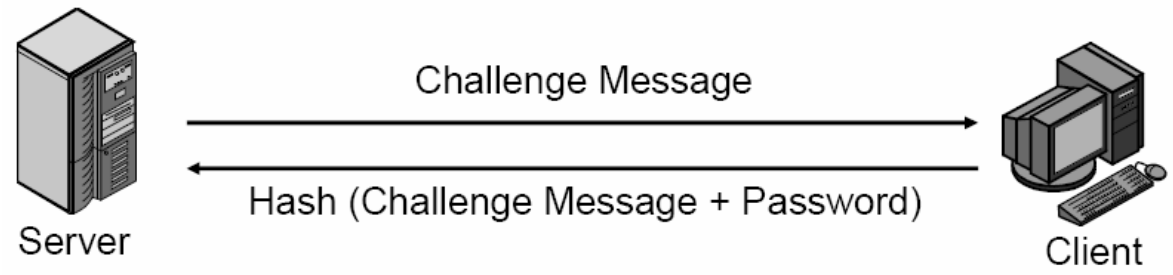


CHAP Packets

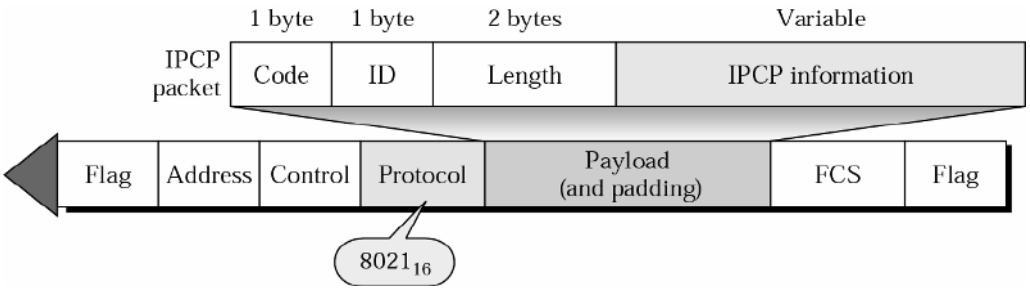


MS-CHAP Authentication

- CHAP but with password as the secret
- Widely used allows password authentication

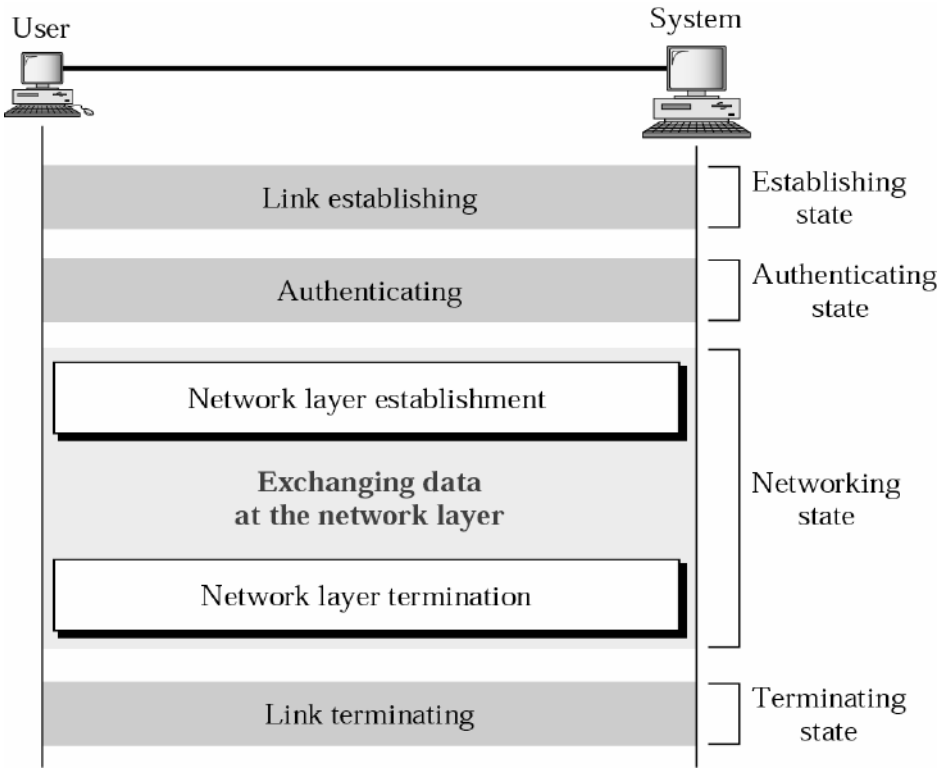


IPCP Packet encapsulated in PPP Frame



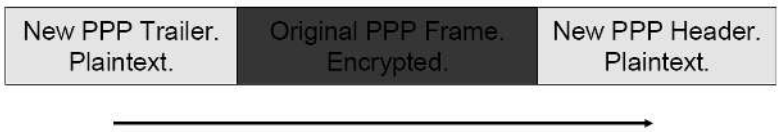
Code	IPCP Packet
01	Configure-request
02	Configure-ack
03	Configure-nak
04	Configure-reject
05	Terminate-request
06	Terminate-ack
07	Code-reject

Example



PPP Encryption

- IETF specifies DES and 3DES for PPP encryption
- Original PPP frame encrypted and placed in a new PPP frame with plaintext headers



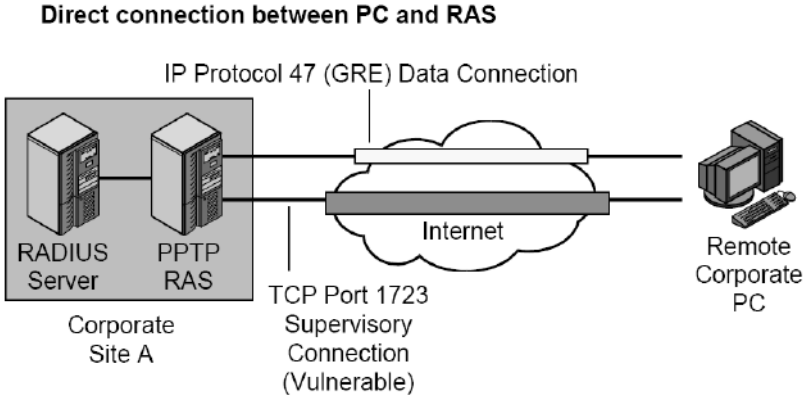
- Microsoft uses Microsoft Point-to-Point Encryption (MPPE)

PPTP – Point-to-Point Tunnelling Protocol

PPTP - Point-to-Point Tunneling Protocol

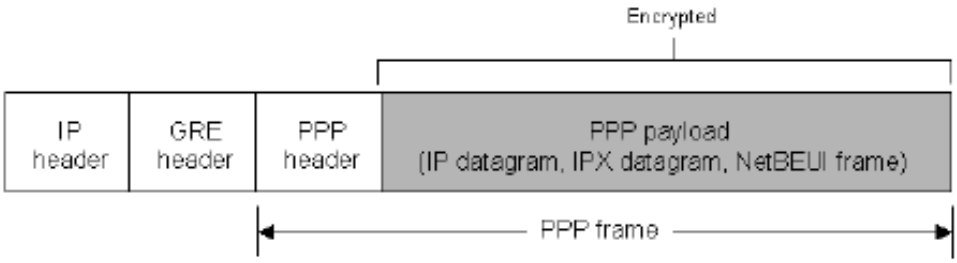
- Point-to-Point Tunneling Protocol (PPTP) [RFC 2637]
  - » Mainly implemented and used by Microsoft
  - » Extension of PPP
  - » Tunneling of PPP datagrams over IP networks

- Use of 2 connections
  - » Control connection
  - » Tunnel connection



PPTP

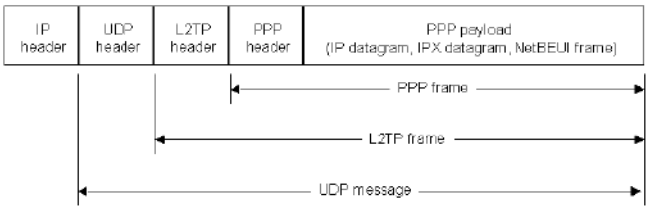
- Tunneling places de PPP frame in an IP packet
  - Encryption and authentication possible, as in PPP
  - GRE, Generic Routing Encapsulation for traffic tunneling
    RFC 1701, RFC 2784



L2TP – Layer 2 Tunnelling Protocol

L2TP

- Layer 2 Tunneling Protocol
  - RFC 2661
- No control channel



- User
  - Makes dial-up/PPP to local acess concentrator
    - Local phone calls
  - Access concentrator redirects PPP frames to ISP via internet
    - PPP/L2TP/UDP/IP frame from Access Concentrator to ISP
    - Multiplexing of individual PPP sessions
- Can be combined with IPSec