Data Link Layer (4)
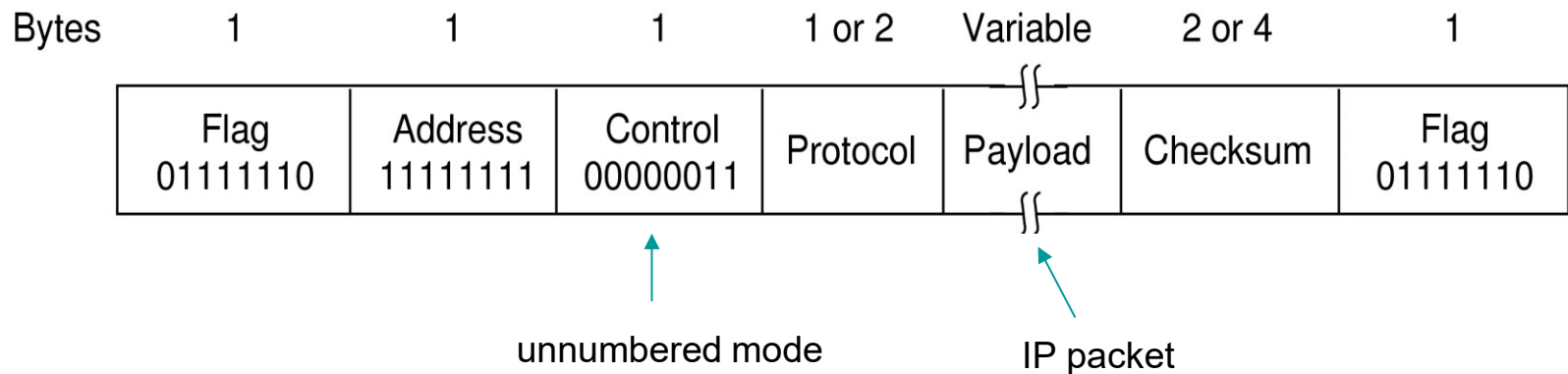
COMP90007 Internet Technologies

Lecturer: Ling Luo

Semester 2, 2024

Examples of Data Link Protocols

- Point-to-Point Protocol (PPP)
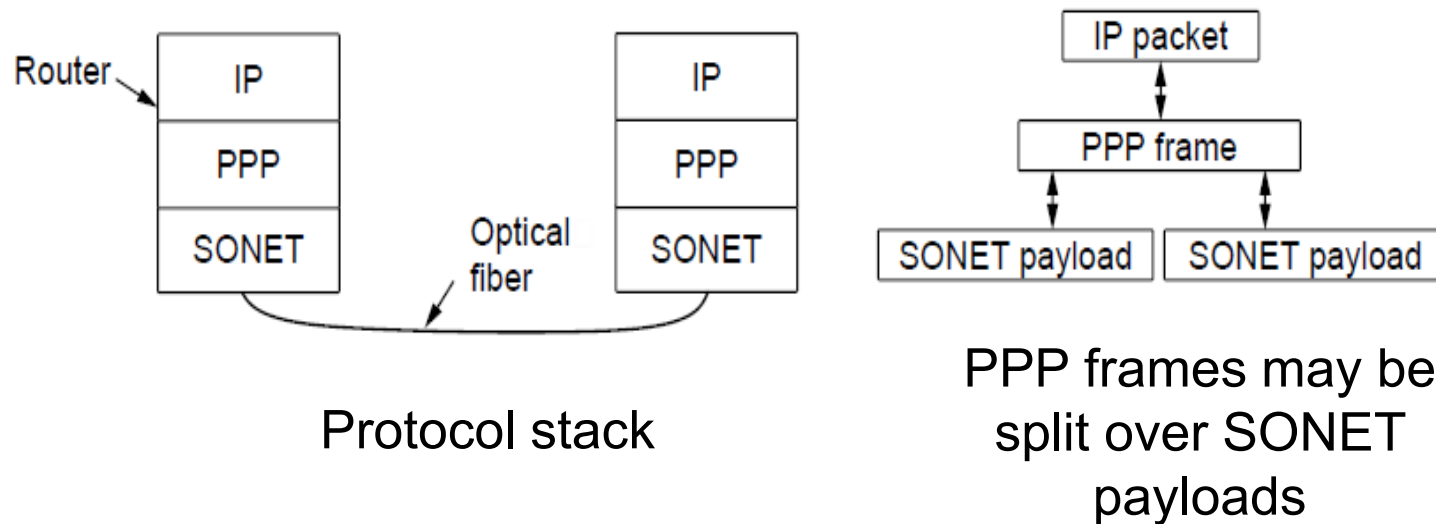- Packet over SONET
- PPP over ADSL

Point-to-Point Protocol

- **PPP is a standard protocol for delivering packets across links**
    - Framing uses a flag 01111110 and byte stuffing
    - Default is unnumbered mode: connectionless unacknowledged service
    - Errors are detected with a checksum
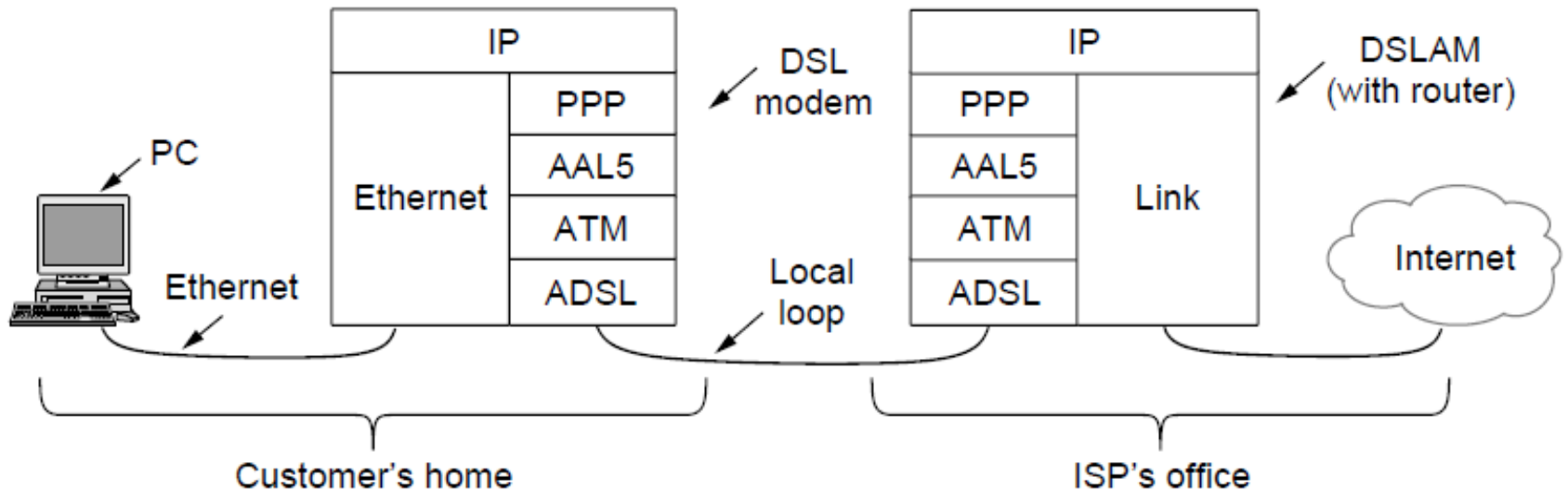
Bytes	1	1	1	1 or 2	Variable	2 or 4	1
	Flag 01111110	Address 11111111	Control 00000011	Protocol	Payload	Checksum	Flag 01111110

unnumbered mode

IP packet

Packet over SONET

- Packet over SONET: carry IP packets over SONET optical fibre links
- Uses PPP (Point-to-Point Protocol) for framing

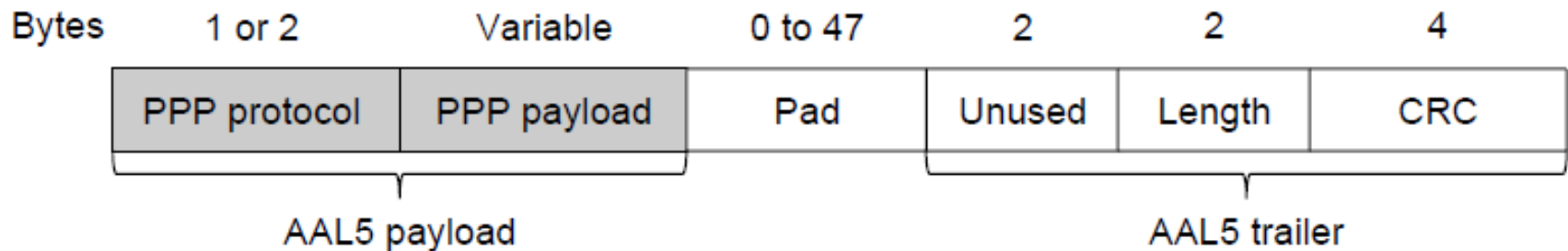Protocol stack

PPP frames may be split over SONET payloads

ADSL

- Widely used for broadband Internet over telephone lines
  - ADSL runs from modem (customer) to DSLAM (ISP)
  - IP packets are sent over PPP and AAL5, ATM

ADSL

- **PPP data is sent in ATM cells over ADSL**
- **ATM uses short, fixed-size cells (53 bytes); each cell has a virtual circuit identifier**
  - i. PPP frame is converted to an AAL5 frame (PPPoA)
  - ii. AAL5 frame is converted to ATM cells

Bytes	1 or 2	Variable	0 to 47	2	2	4
	PPP protocol	PPP payload	Pad	Unused	Length	CRC

AAL5 payload ⟶ (PPP protocol, PPP payload)

AAL5 trailer ⟶ (Unused, Length, CRC)

Structure of AAL5 frame

It will be divided into 48-byte pieces, each of which goes into one ATM cell with 5-byte header

Summary

- **Data Link Layer Services**
- **Framing**
  - Character count
  - Flag bytes with byte stuffing
  - Start and end flags with bit stuffing
- **Error Control**
  - Error detection: parity bit, Internet checksum, CRC
  - Error correction: Hamming code
- **Flow Control**
  - Stop and Wait
  - Go-Back-N
  - Selective Repeat