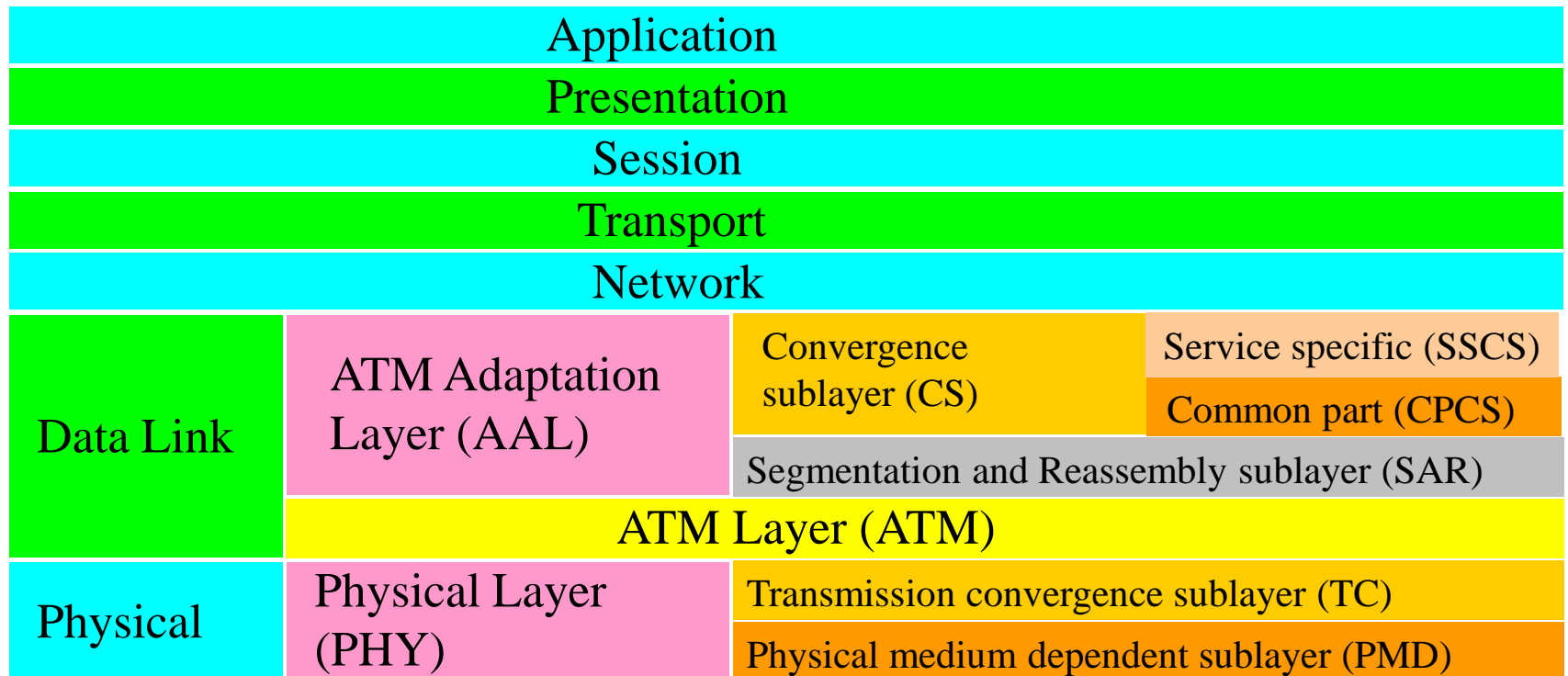# PART IV: Internetworking of ATM, LANs, and the Internet

Multiprotocol Encapsulation Over ATM
Adaptation Layer 5
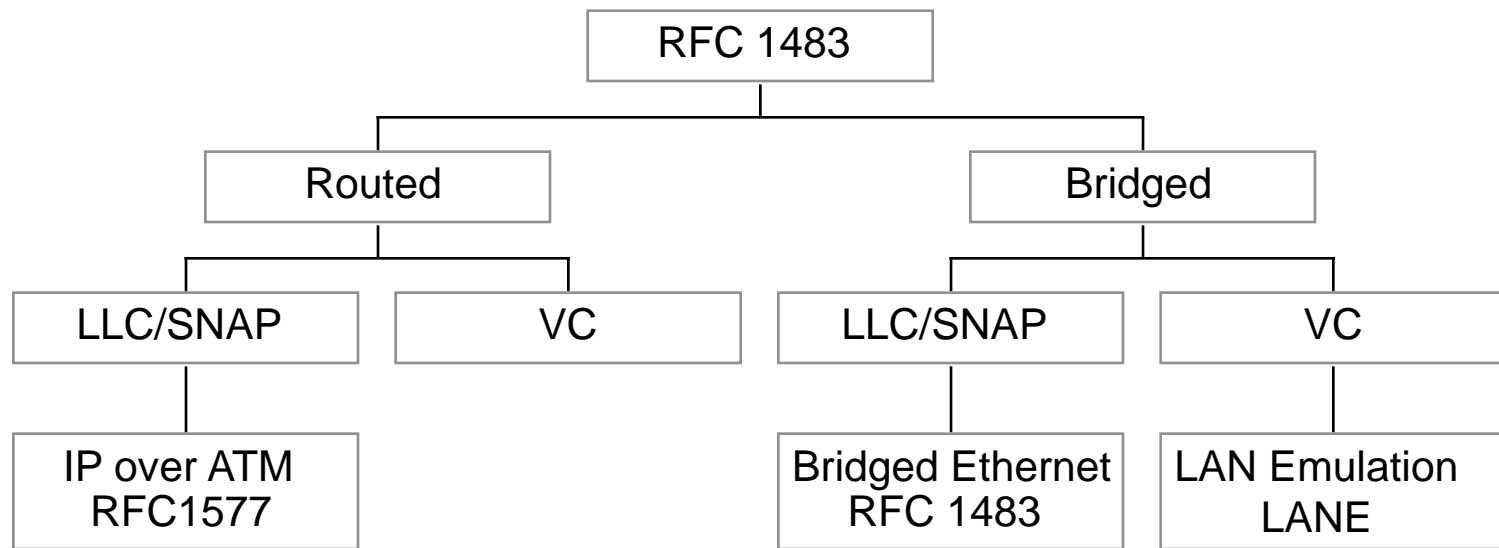*RFC 1483*

Transporting LAN Packets over ATM

- Purpose: transport routed or bridged packets over an ATM cloud.

- Uses AAL-5 with an empty SSCS; the AAL-5 SDU is the packet to be transported, which is fed directly through the CPCS of AAL-5.

- Two methods:
  - Logical Link Control (LLC) Encapsulation: a single VC is used for all protocols, and the LLC field differentiates the protocols.
  - Virtual Circuit (VC) Encapsulation: uses one VC per protocol.

- Supports both bridged and routed PDUs.

How ATM Fits In

Application
Presentation
Session
Transport
Network

Data Link	ATM Adaptation Layer (AAL)	Convergence sublayer (CS)	Service specific (SSCS)
			Common part (CPCS)
		Segmentation and Reassembly sublayer (SAR)	
	ATM Layer (ATM)		
Physical	Physical Layer (PHY)	Transmission convergence sublayer (TC)	
		Physical medium dependent sublayer (PMD)	

Road map

Protocol encapsulation

```
                        ┌─────────────────┐
                        │    RFC 1483     │
                        └─────────────────┘
                 ┌───────────────┴───────────────┐
         ┌───────────────┐               ┌───────────────┐
         │    Routed     │               │    Bridged    │
         └───────────────┘               └───────────────┘
          ┌──────┴──────┐                 ┌──────┴──────┐
  ┌───────────────┐ ┌──────────┐  ┌───────────────┐ ┌──────────┐
  │   LLC/SNAP    │ │    VC    │  │   LLC/SNAP    │ │    VC    │
  └───────────────┘ └──────────┘  └───────────────┘ └──────────┘
          │                               │                │
  ┌───────────────┐               ┌──────────────────┐ ┌──────────────┐
  │  IP over ATM  │               │ Bridged Ethernet │ │ LAN Emulation│
  │   RFC1577     │               │    RFC 1483      │ │    LANE      │
  └───────────────┘               └──────────────────┘ └──────────────┘
```

AAL 5 CPCS-PDU Fields

- The AAL 5 CPCS-PDU fields are used in the standard way.

- The CPCS-UU field is not used by the protocol encapsulation and can be set to any value.

- The CPI field is not used and should be set to zero.

- The maximum PDU size is 65535 bytes (2^{16} - 1).

LLC Encapsulation

- A single virtual circuit is used for all protocols
- The payload field should contain enough information to identify the protocol being carried.
- Different types of encapsulation:
  - Encapsulation for routed protocols
  - Encapsulation for bridged protocols

LLC Encapsulation for Routed Protocols
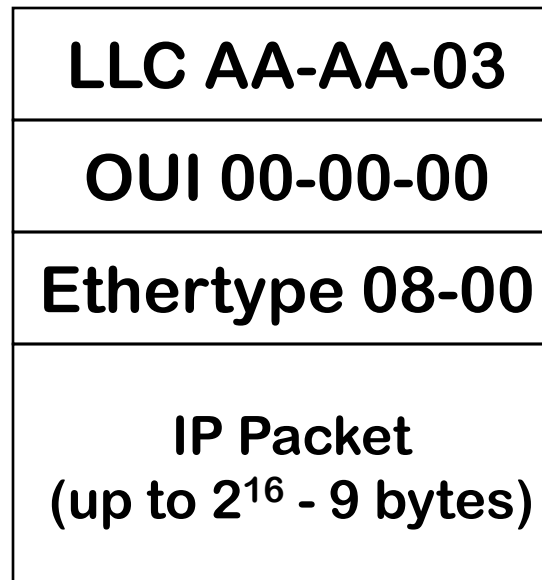
- Uses a standard LLC header with Ctrl=3:

DSAP	SSAP	Ctrl

- LLC value of AA-AA-03 indicates the presence of a SNAP header:

OUI	PID
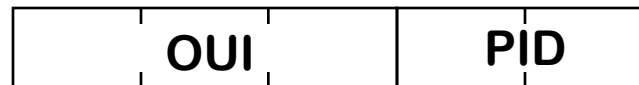
- If the OUI is 00-00-00, then the PID indicates an Ethertype

Example: IP Packet

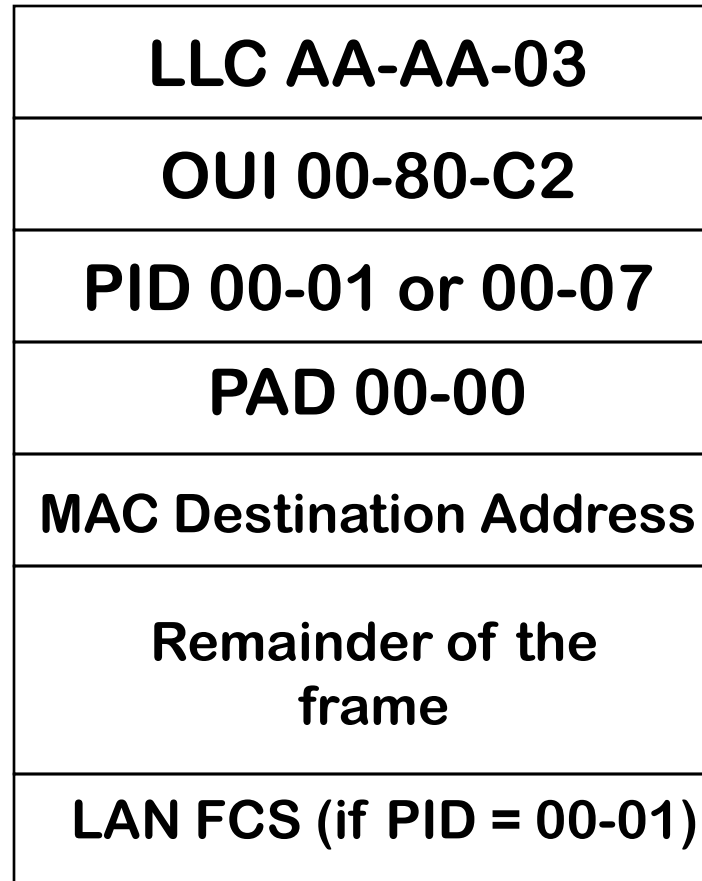| |
|---|
| **LLC AA-AA-03** |
| **OUI 00-00-00** |
| **Ethertype 08-00** |
| **IP Packet**
(up to 2^{16} - 9 bytes) |

LLC Encapsulation for Bridged Protocols

- Bridged PDUs are encapsulated by identifying the type of bridged media in the SNAP header.

- They use the SNAP LLC (AA-AA-03) with the 802.1 organization OUI code of 00-80-C2.

- The PID field indicates:
  - Type of media: Ethernet, Token Ring, FDDI, etc. (see table in RFC 1483).
  - Whether or not the original FCS is preserved in the PDU.

Example: Ethernet Frame

LLC AA-AA-03
OUI 00-80-C2
PID 00-01 or 00-07
PAD 00-00
MAC Destination Address
Remainder of the frame
LAN FCS (if PID = 00-01)

VC-Based Multiplexing

- Each protocol is carried over a different VC.
- The VC implicitly identifies the protocol; there is no need to include explicit identification.
- Routed protocols:
  - The carried PDU goes directly as the AAL 5 payload.
- Bridged protocols:
  - The carried PDU is padded with two bytes (to align the user data on a 32-bit boundary) and is carried directly as the AAL5 payload.
  - The LAN FCS may or may not be included (depending on VC, negotiated at setup).