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## Supplement Ethernet Frames

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### Recall: Ethernet II Frame



- **6-byte Destination MAC**
- **6-byte Source MAC**
- **2-byte Ethertype (e.g. 0x0800 means IPv4)**
  - greater than 1500
  - see RFC1700
- **variable length Data (0-1500 bytes)**
  - padded with zeros to achieve minimum frame size of 46 bytes (as necessary)
- **4-byte FCS**

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## Recall: 802.3 / 802.2 LLC

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- 6-byte Destination MAC
- 6-byte Source MAC
- 2-byte length (2 to 1500 – value excludes padding)
- 802.2 Logical Link Control Frame:
  - 1 byte Destination Service Access Point
  - 1 byte Source Service Access Point
  - variable length Control & Data (0-1498 bytes)
- zero-padded to minimum of 46 bytes as needed
- 4-byte FCS

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## SubNet Access Protocol (SNAP) Frame

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- Because the original LLC frame only allowed one byte for SAP values, it was anticipated that there would be a need to extend the number of *access point* values. The 802.2 LLC frame was therefore enhanced by:
- SubNet Access Protocol (SNAP) Frame
  - DSAP = 0xAA
  - SSAP = 0xAA
  - Control = 0x03
  - 3-byte Vendor OUI (same as that used in MAC addresses)
  - 2-byte *Type* (also called *Protocol ID*)
  - variable length data (0 to 1492 bytes)

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## Summary of Frame Formats


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**Ethernet II (DIX)**

6	6	2		4
Dest MAC	Src MAC	E-Type	Payload (to 1500 bytes)	FCS

**802.3 / 802.2 LLC**

		1	1		
Dest MAC	Src MAC	Len	DSAP	SSAP	Payload (to 1498 bytes)
					FCS

value is from 0 to 1500 (excludes any padding)


**802.3 / 802.2 SNAP**

			1	3	2				
Dest MAC	Src MAC	Len	0xAA	0xAA	03	OUI	Type	Payload (to 1492)	FCS

Cisco-proprietary protocols are often encapsulated in “SNAP” frames, with OUI = 0x00000c (registered to Cisco) - see next slide.

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## Cisco Protocols Using SNAP Frames


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- Cisco’s proprietary trunking protocol ISL (Inter-Switch Link) uses a form of SNAP framing.
- Below are some other Cisco protocols that target on-link neighbours (sent to a multicast address) using a SNAP frame with OUI 0x00000c followed by a 2-byte Type (Protocol ID):
  - CDP: PID=0x2000 (Cisco Discovery Protocol)
  - VTP: PID=0x2003 (VLAN Trunking Protocol)
  - DTP: PID=0x2004 (Dynamic Trunking Protocol)
  - PAgP: PID=0x0104 (Port Aggregation Protocol)
  - RLQ-REQ: PID=0x0108 (Root Link Query Request)
  - RLQ-ACK: PID=0x0109 (Root Link Query Acknowledge)
  - PVST+: PID=0x010b (Per VLAN STP and RSTP)
  - UDLD: PID=0x0111 (Uni-Directional Link Detection)

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