

# Local Area Networks

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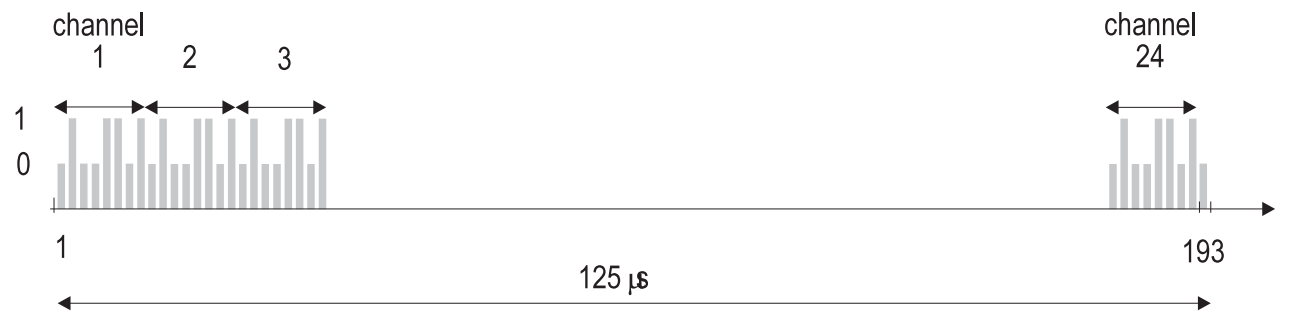
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# PCM - Pulse Coded Multiplex

## T1 Bell



24 channels (56 kbps data, 8kbps signalling)  
1.544 Mbps (including synchronization)

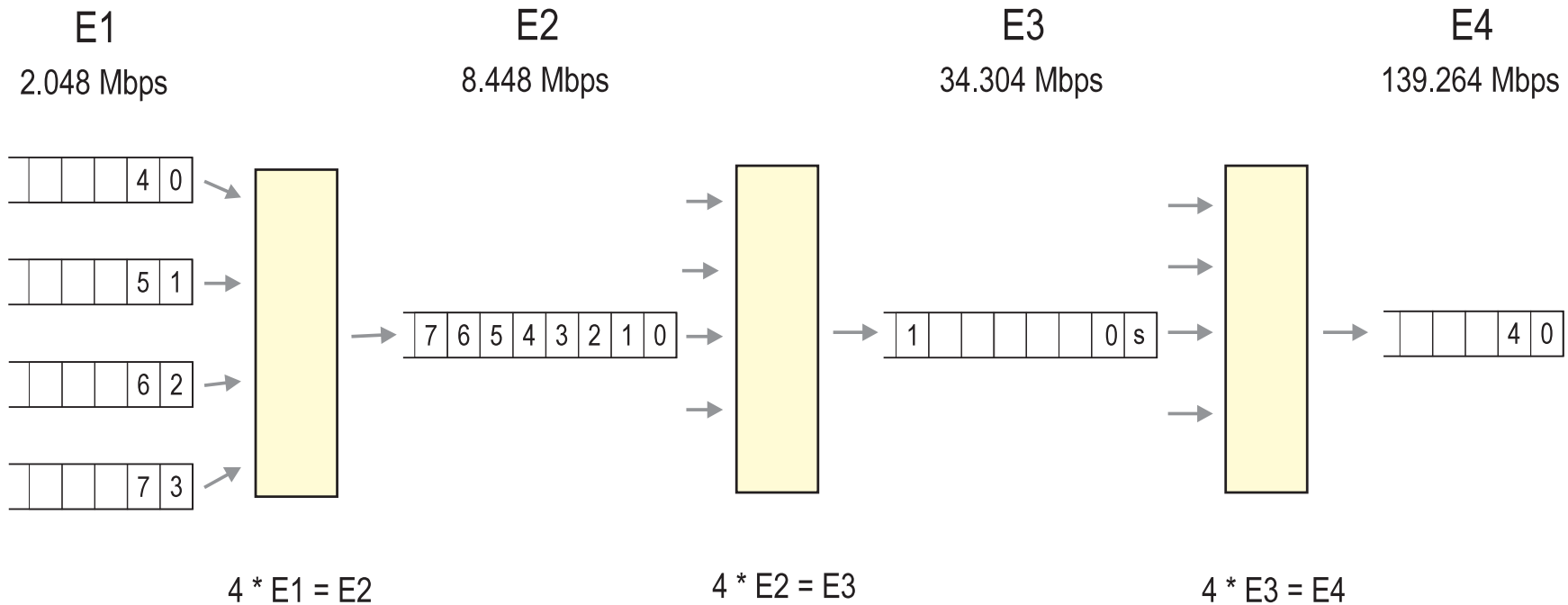
## E1 CCITT

30 channels data (64 kbps)  
2 channels signalling + control (64 kbps)  
2.048 Mbps (including synchronization)

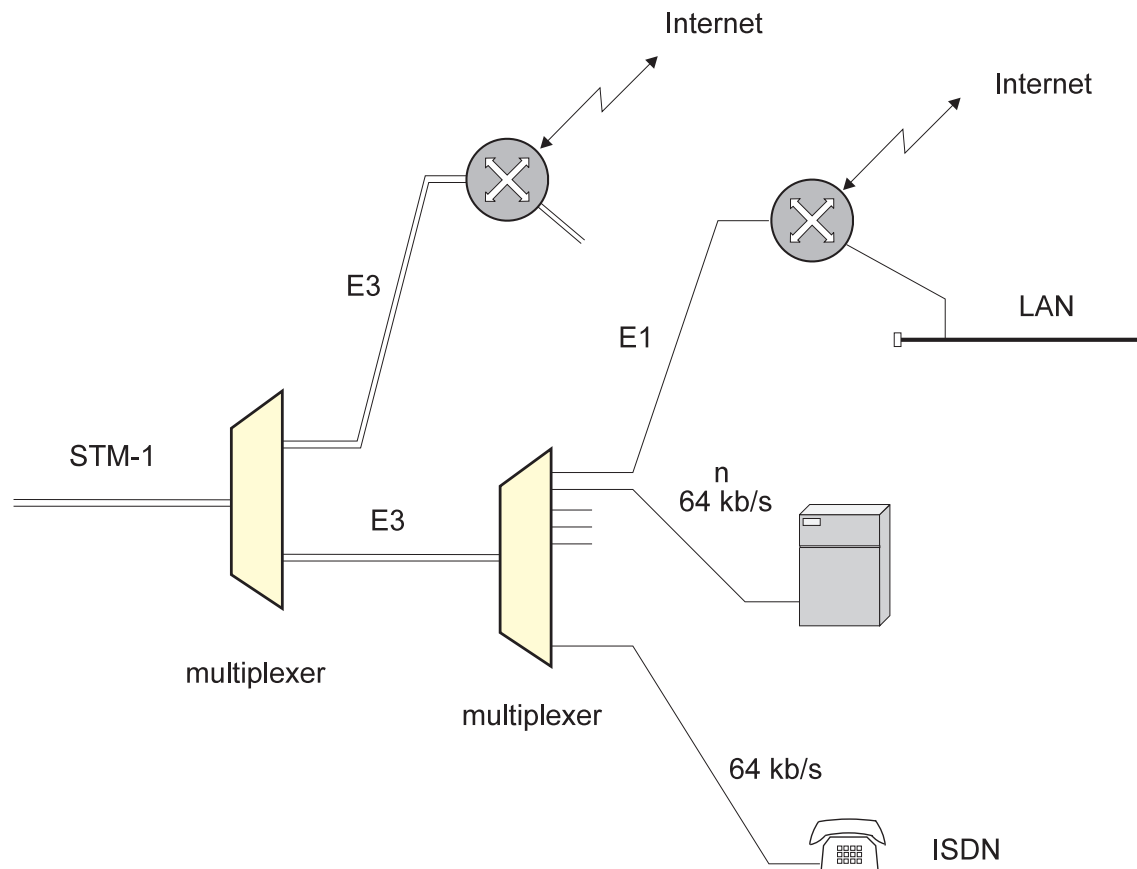


# PCM - Multiplexing

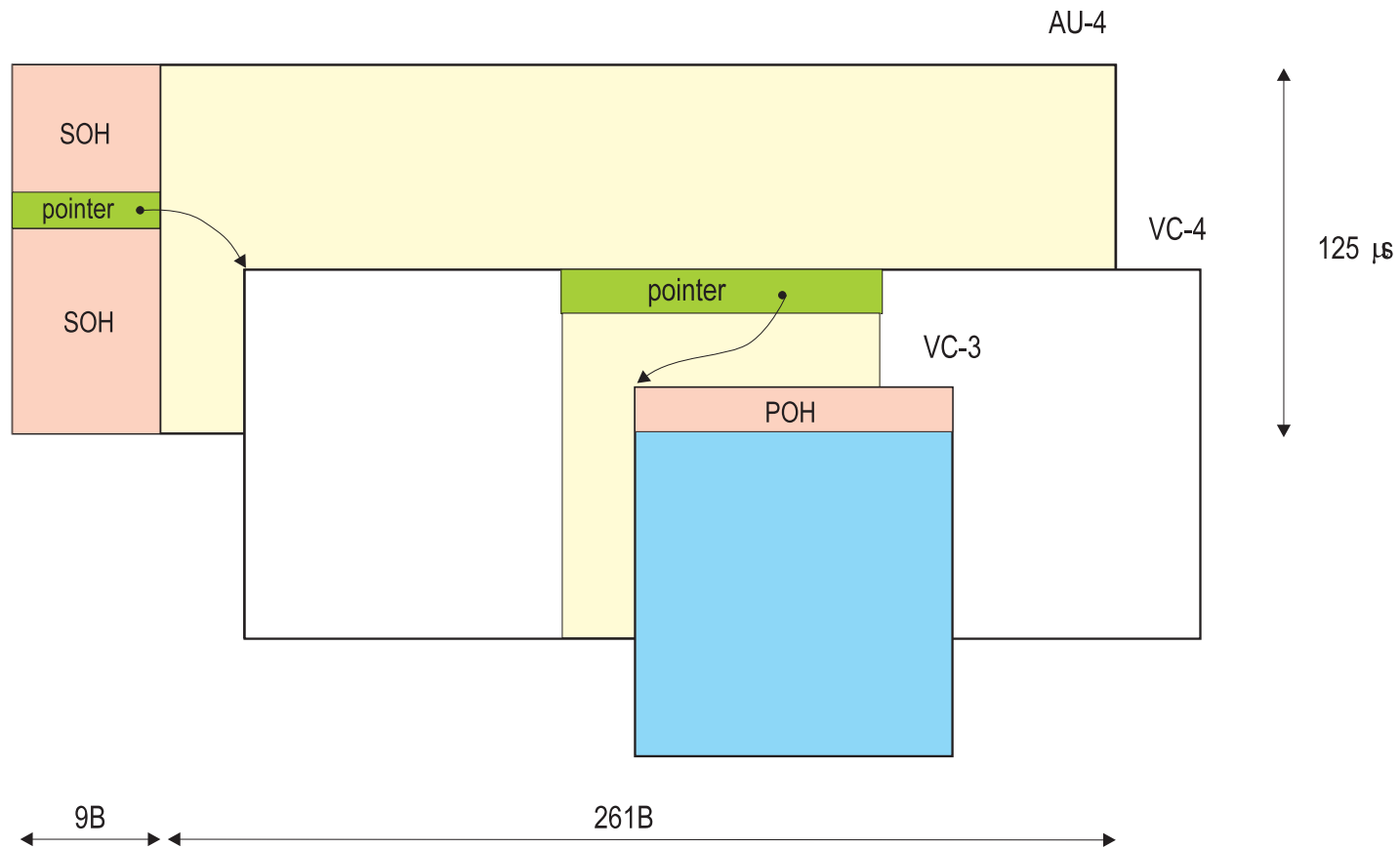
## CCITT



# PDH - Multiplexor network



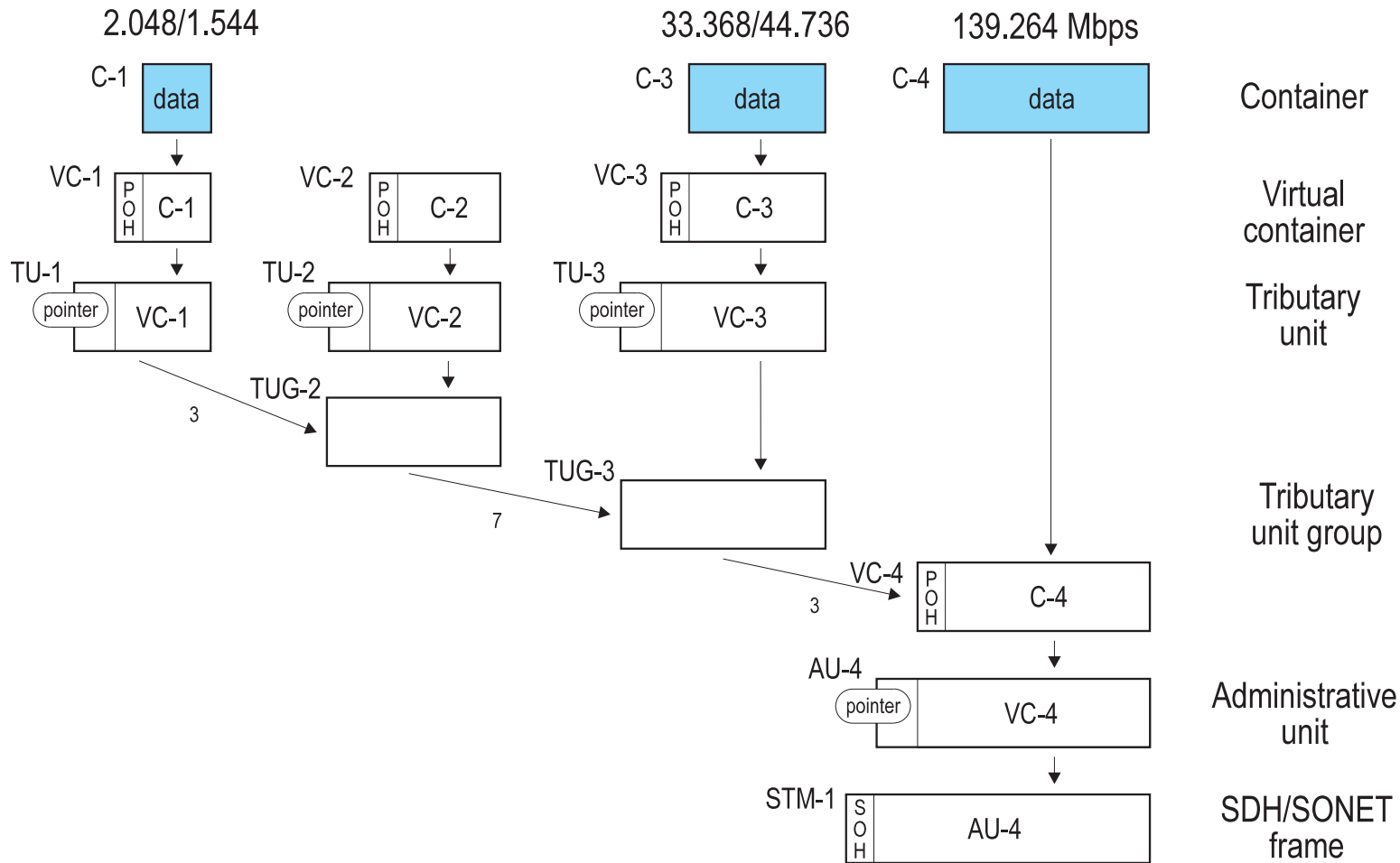
# SDH - Synchronous Digital Hierarchy



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SDH	SONET		Digital Rate [Mbps]		
	electrical	optical	gross	payload	user
STM-1	STS-1	OC-1	51.84	50.112	49.536
	STS-3	OC-3	155.52	150.336	148.608
	STS-9	OC-9	466.56	451.008	445.824
STM-4	STS-12	OC-12	622.08	601.344	594.432
	STS-18	OC-18	933.12	902.016	891.648
	STS-24	OC-24	1244.16	1202.688	1188.864
	STS-36	OC-36	1866.24	1804.032	1783.296
STM-16	STS-48	OC-48	2488.32	2405.376	2377.728



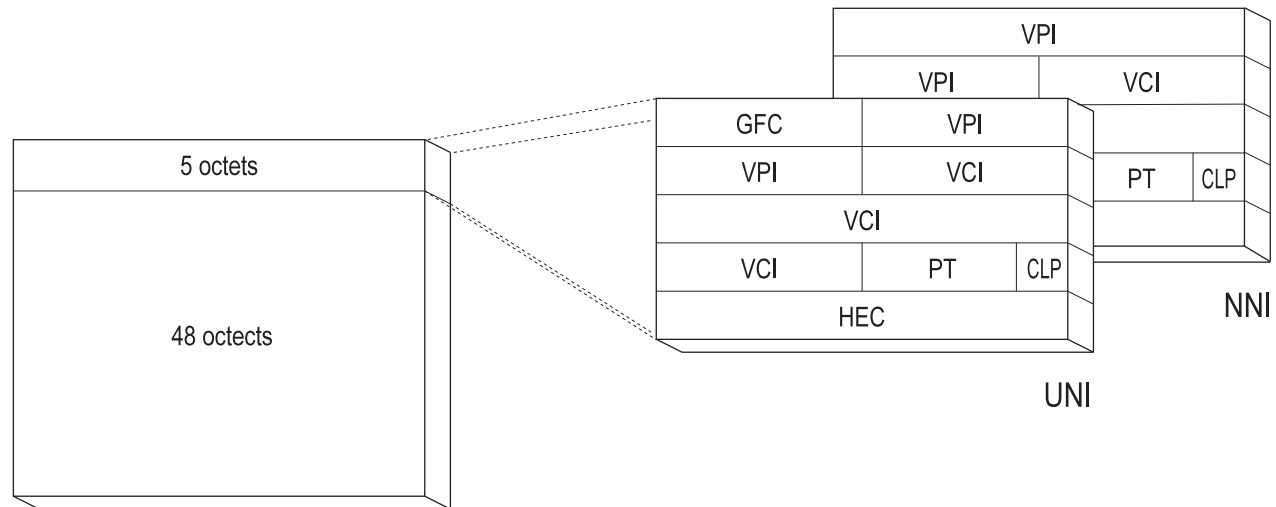


# ATM - Asynchronous Transfer Mode

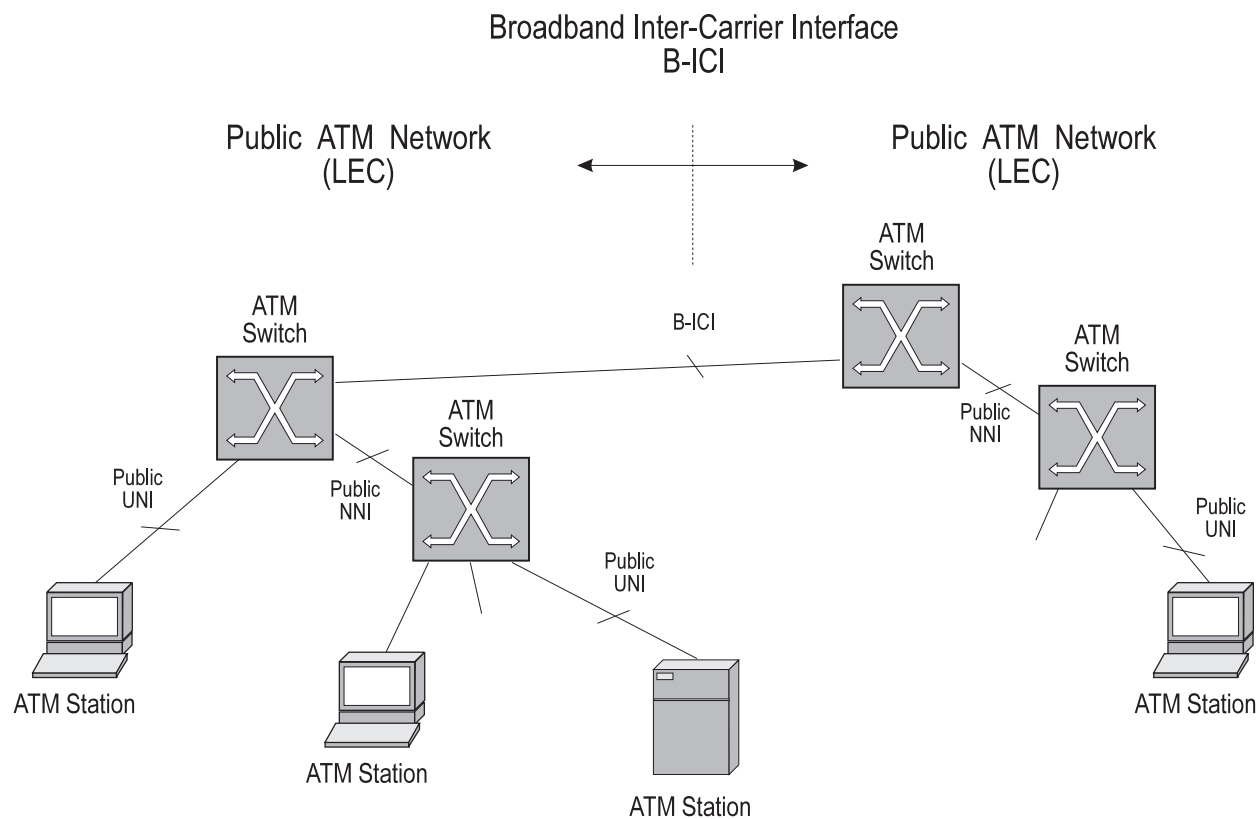




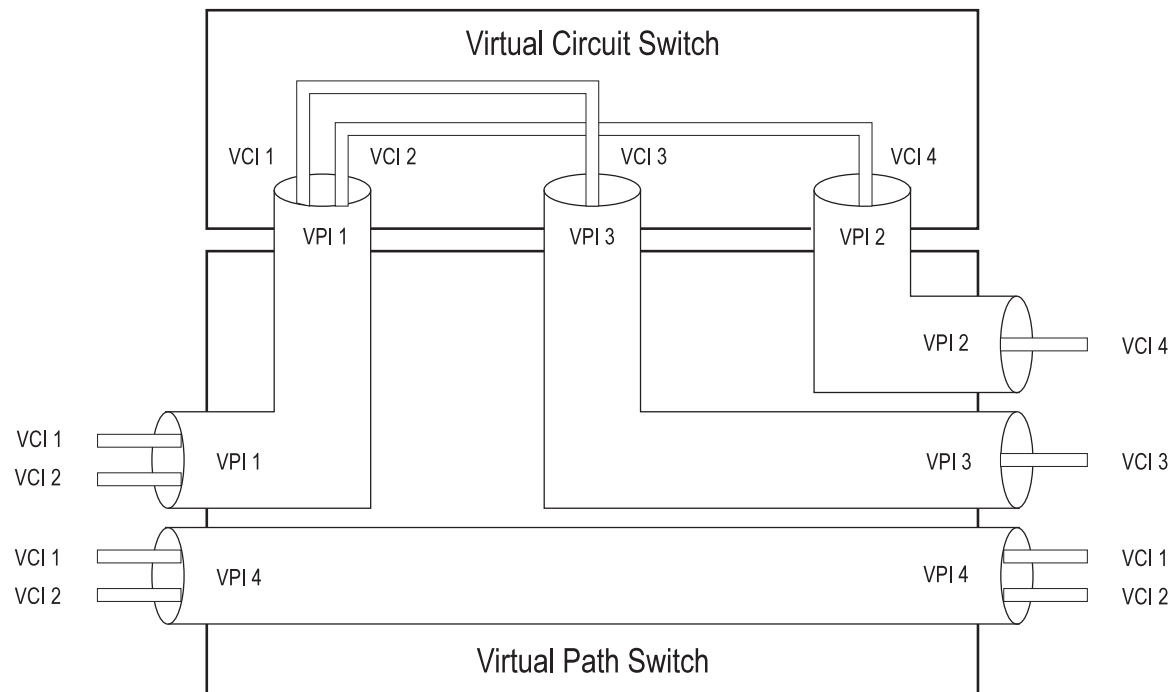
# ATM - Cell



# ATM - Network Topology

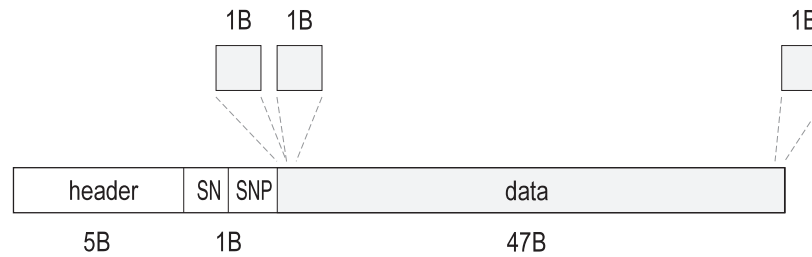


# Virtual Path / Channel

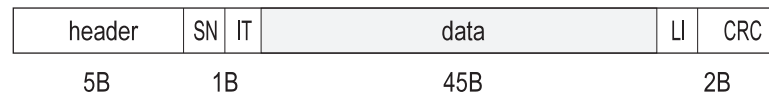


# Adaptation Layers - AAL1, AAL2

AAL1 (CBR)

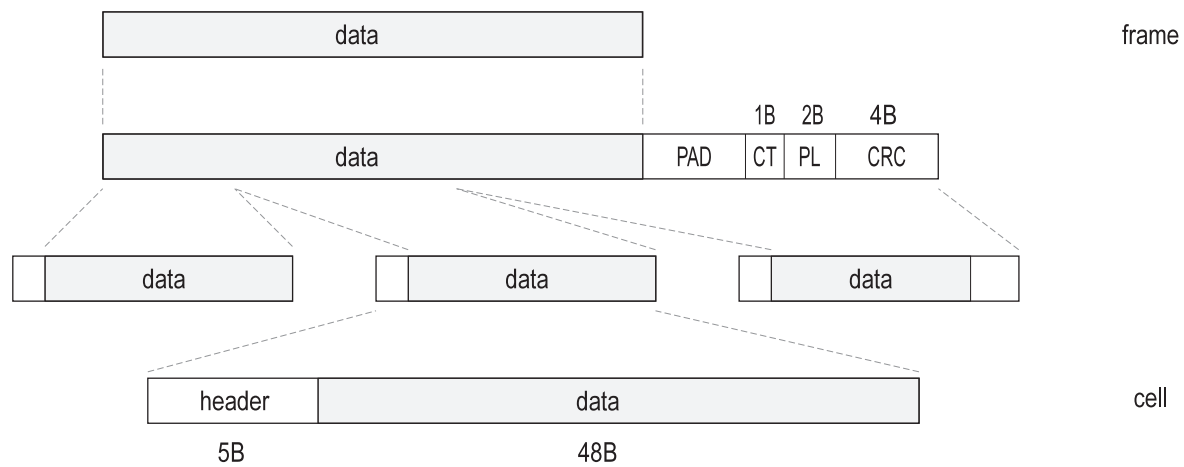


AAL2 (VBR)



# Adaptation Layer - AAL5

AAL5 (UBR, ABR)



# Service Classes

CBR - Constant Bit Rate

T1 circuit transfer

VBR - Variable Bit Rate

RT-VBR - video conferencing

NRT-VBR - multimedia e-mail

ABR - Available Bit Rate

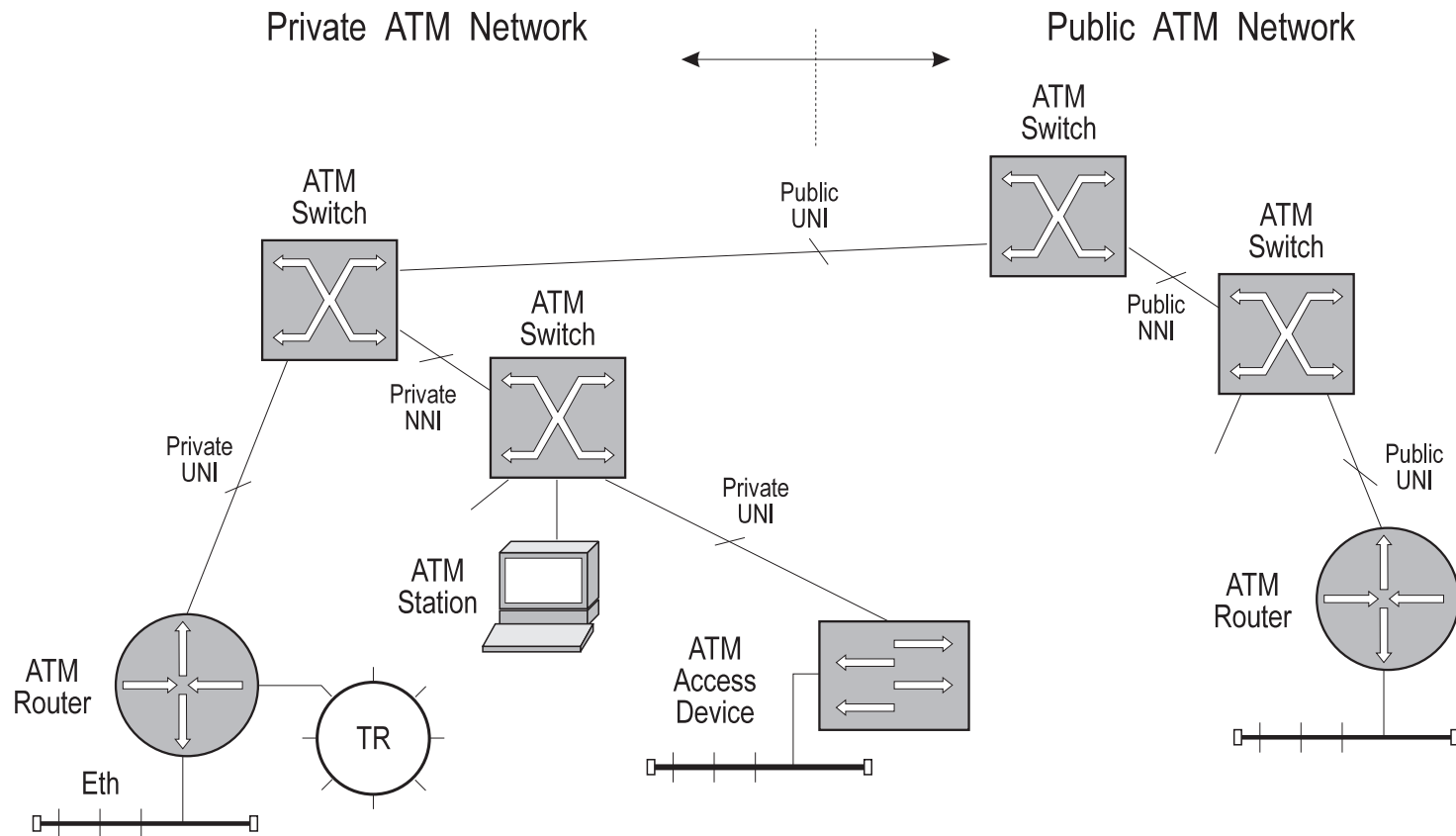
WWW access

UBR - Unspecified Bit Rate

file transfer

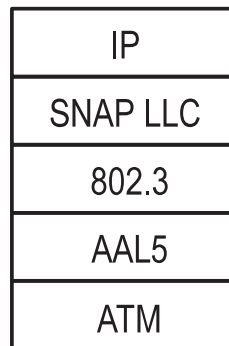


# LANE - ATM Framework



# LANE - IP Traffic

## Packet Encapsulation



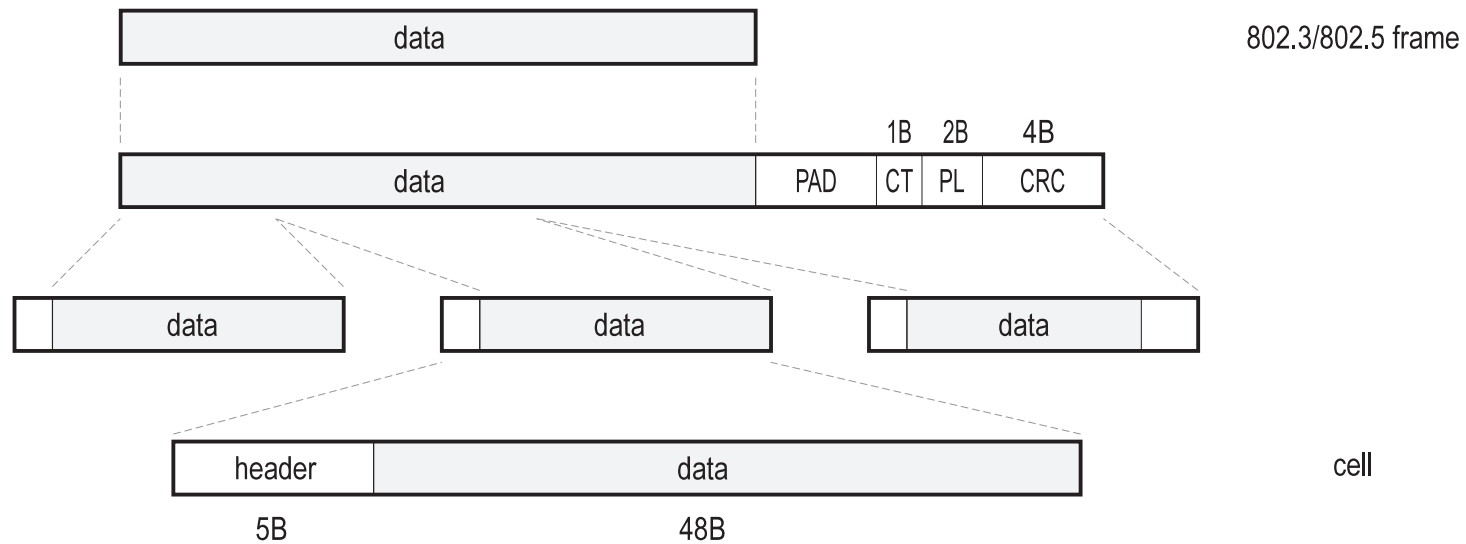
## Address Resolution

- ARP broadcasting by BUS (Broadcast / Unknown Server)

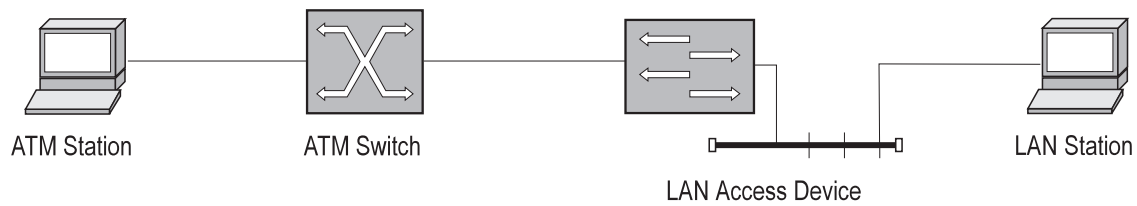
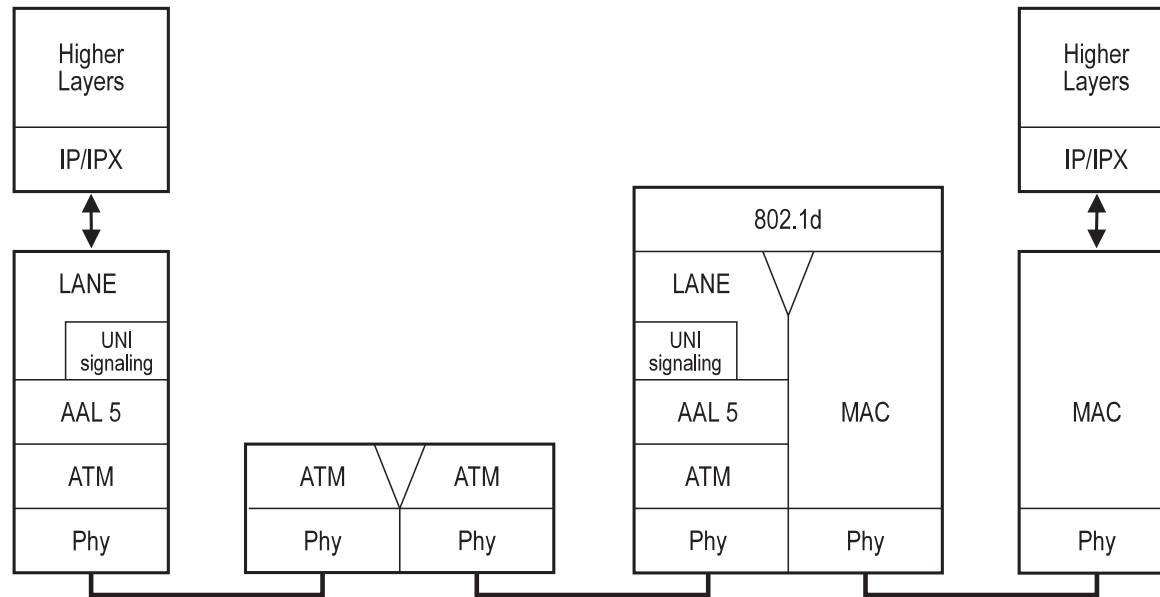




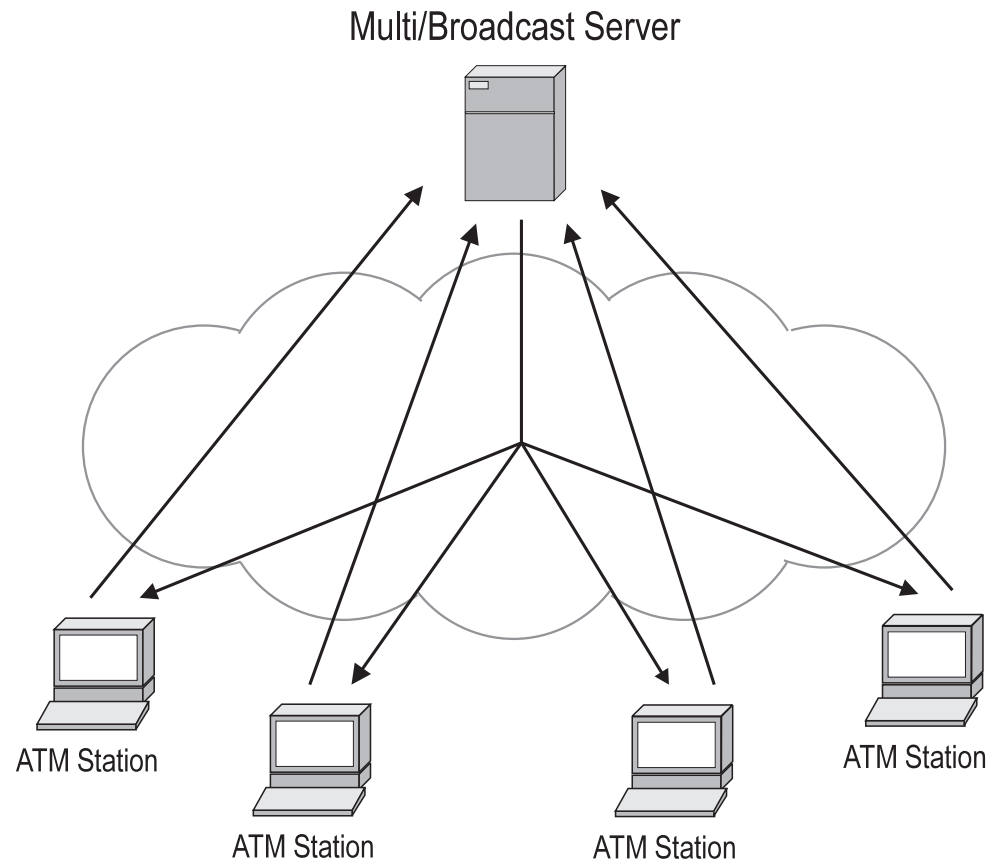
# LANE - 802.3/802.5 Encapsulation



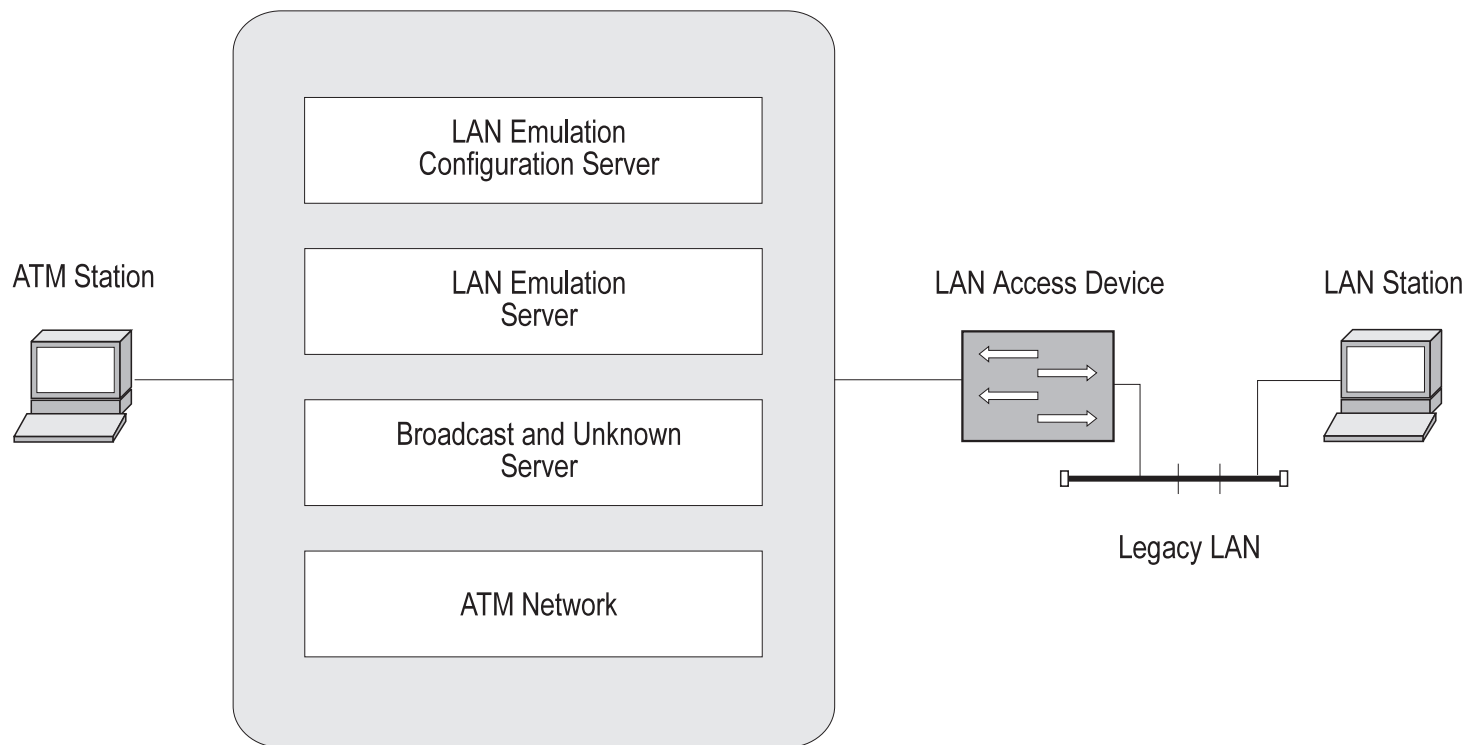
# LANE - Protocol Layers



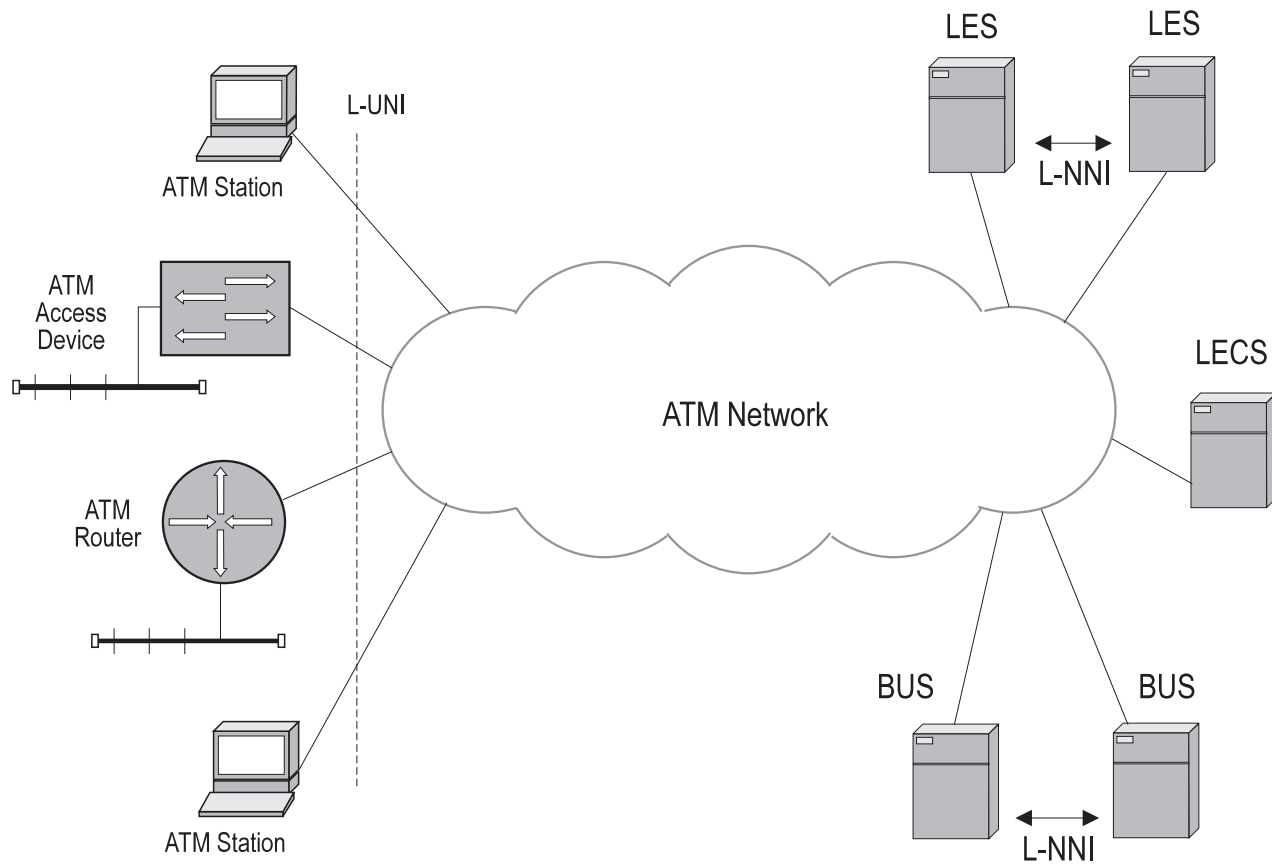
# LANE - Broad/Multicasting



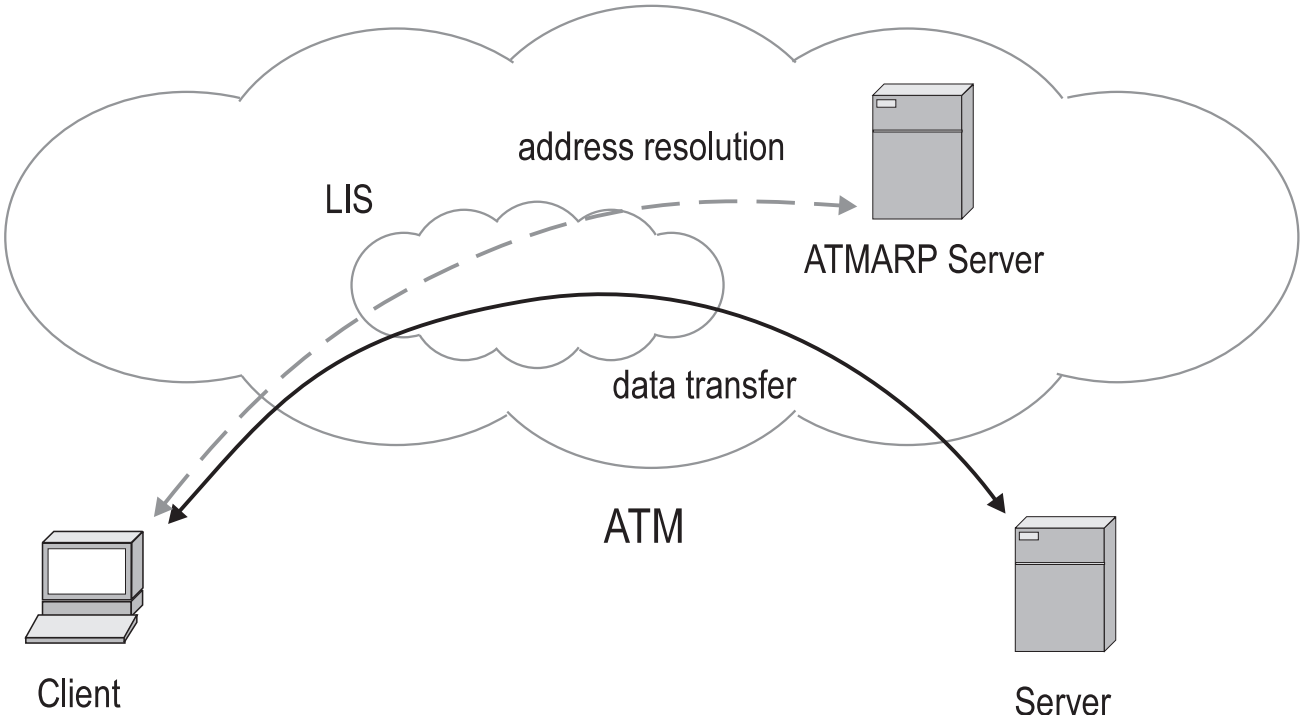
# LANE - Servers



# LANE - L-UNI Architecture



# CLIP - Clasic IP over ATM



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## IP Packet Encapsulation

RFC 1483

## Address Resolution

RFC 1577

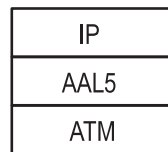
## Multicast (MARS)

RFC 2149



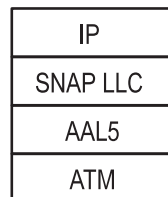
# CLIP - Packet Encapsulation

## VC Multiplexing



no VC sharing  
over L3 protocols  
(IP, IPX, AppleTalk)

## SNAP LLC Encapsulation

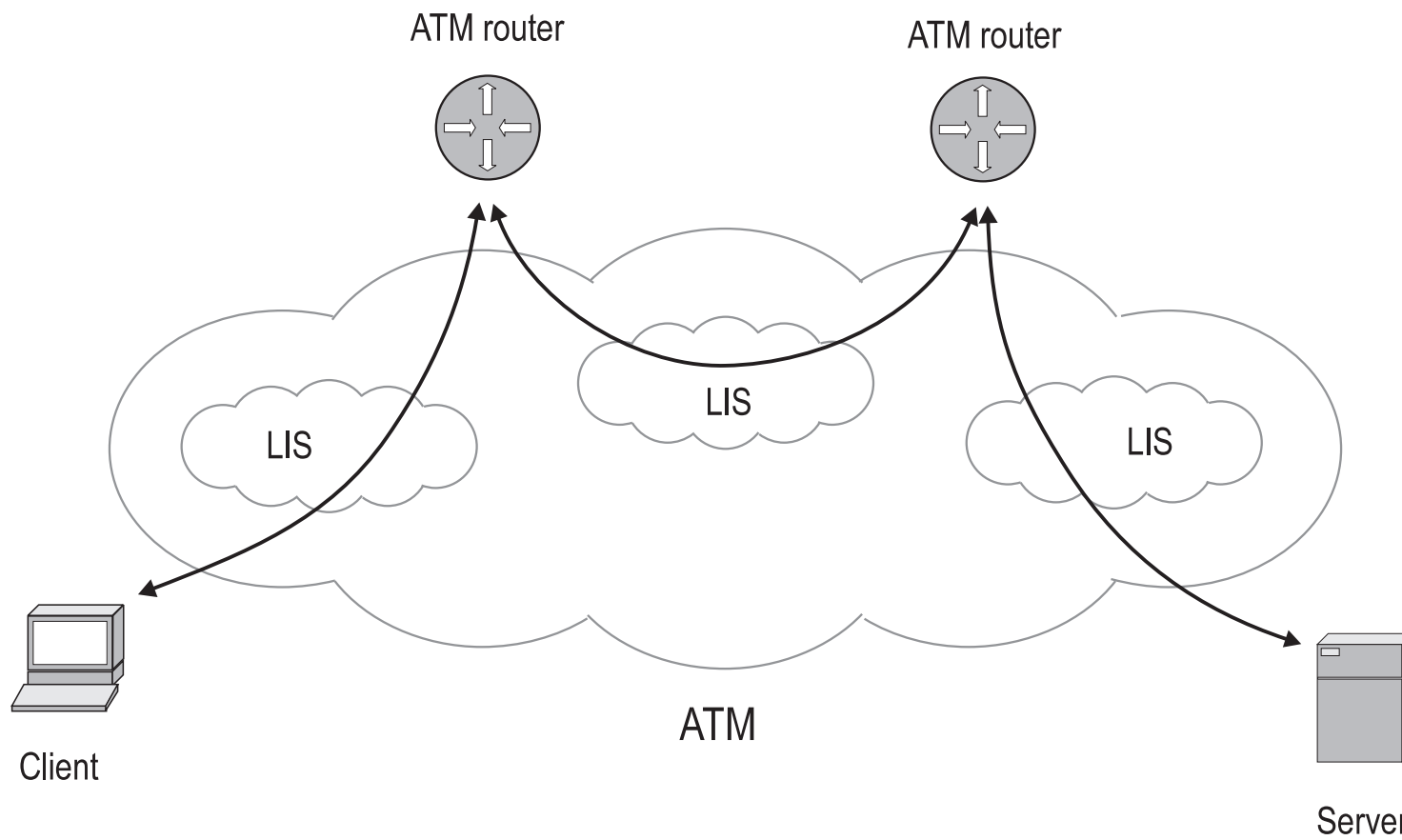


VC sharing  
over L3 protocols  
( IP - 0x0800  
IPX - 0x8137  
AppleTalk - 0x809B )

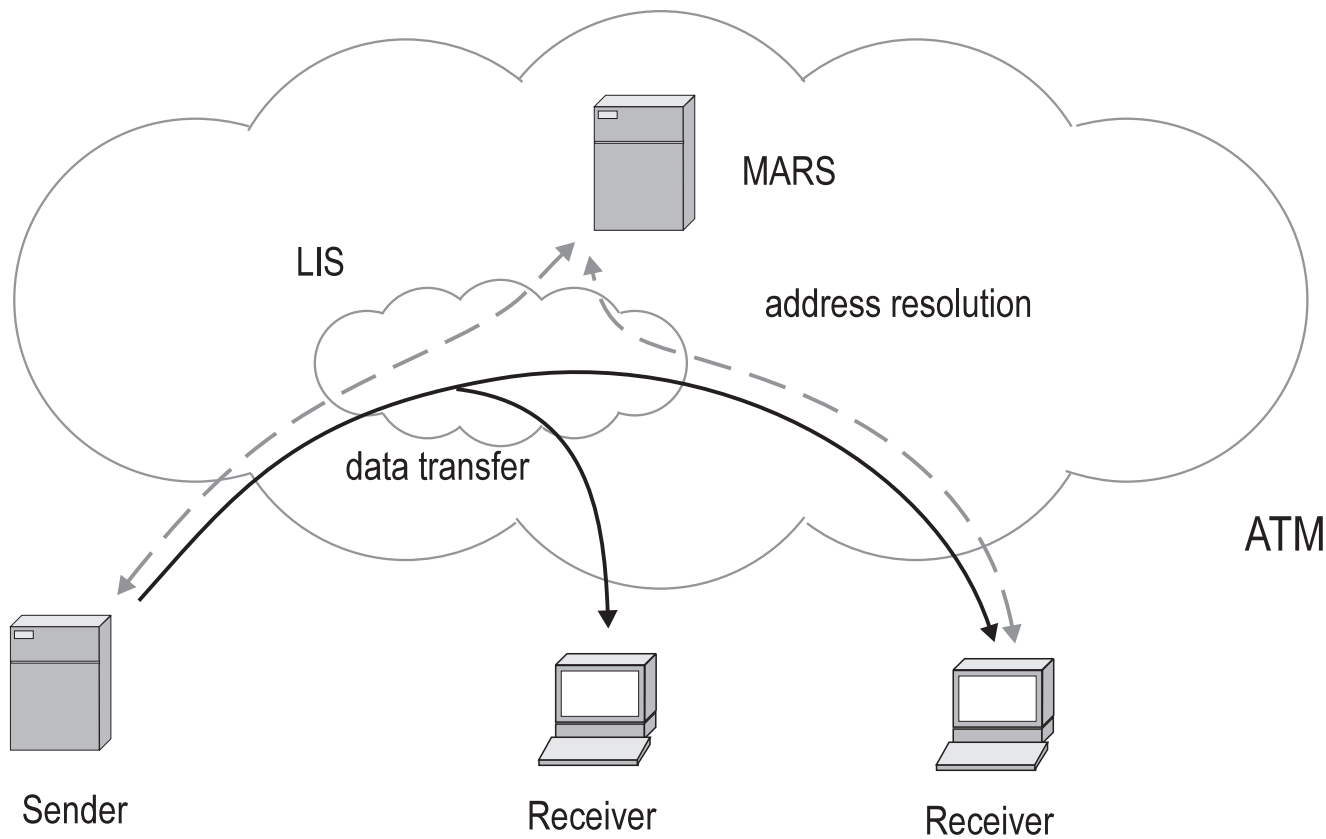




# CLIP - Routing



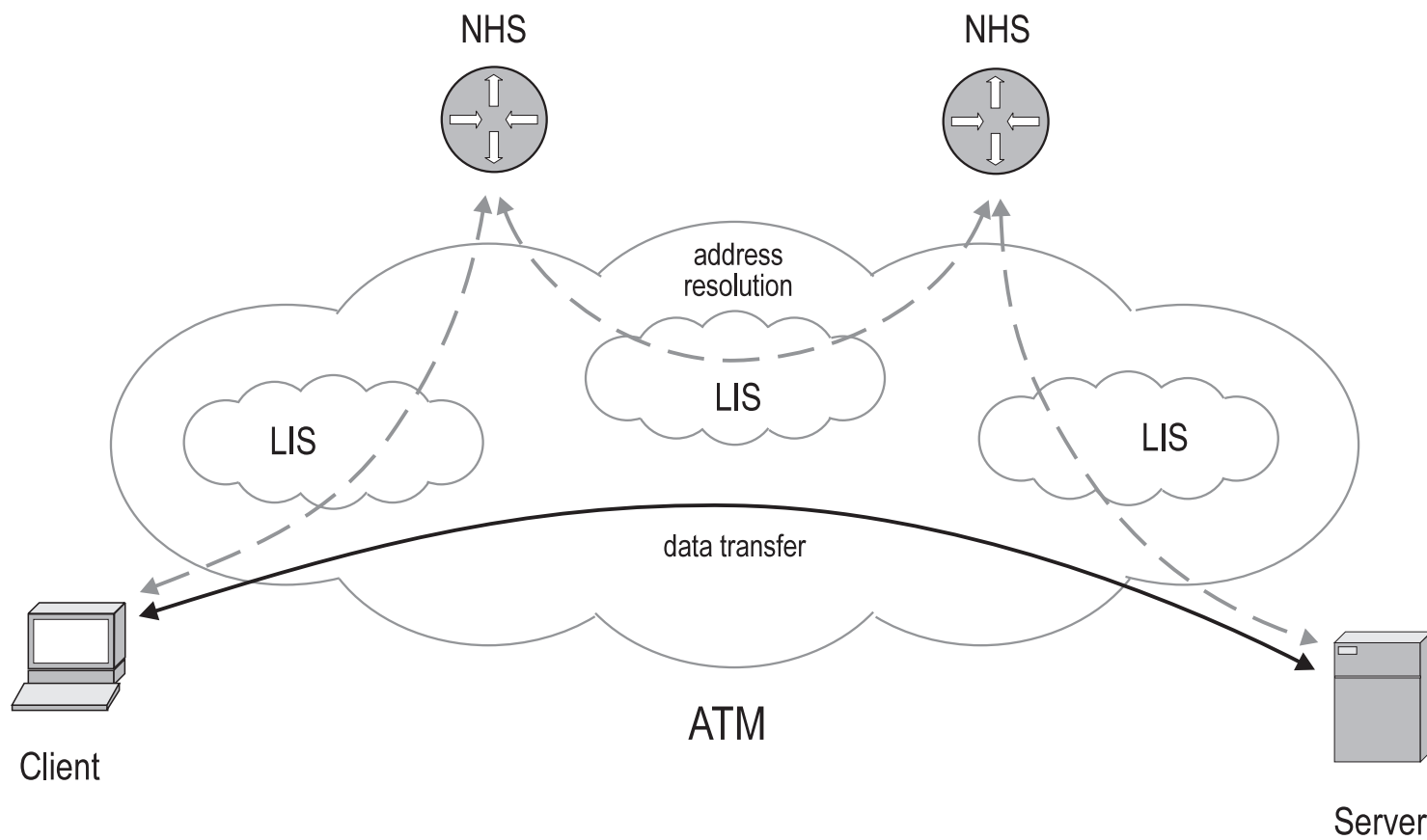
# MARS - Multicast Address Resolution



IGMP interoperability



# NHRP - Next Host Resolution

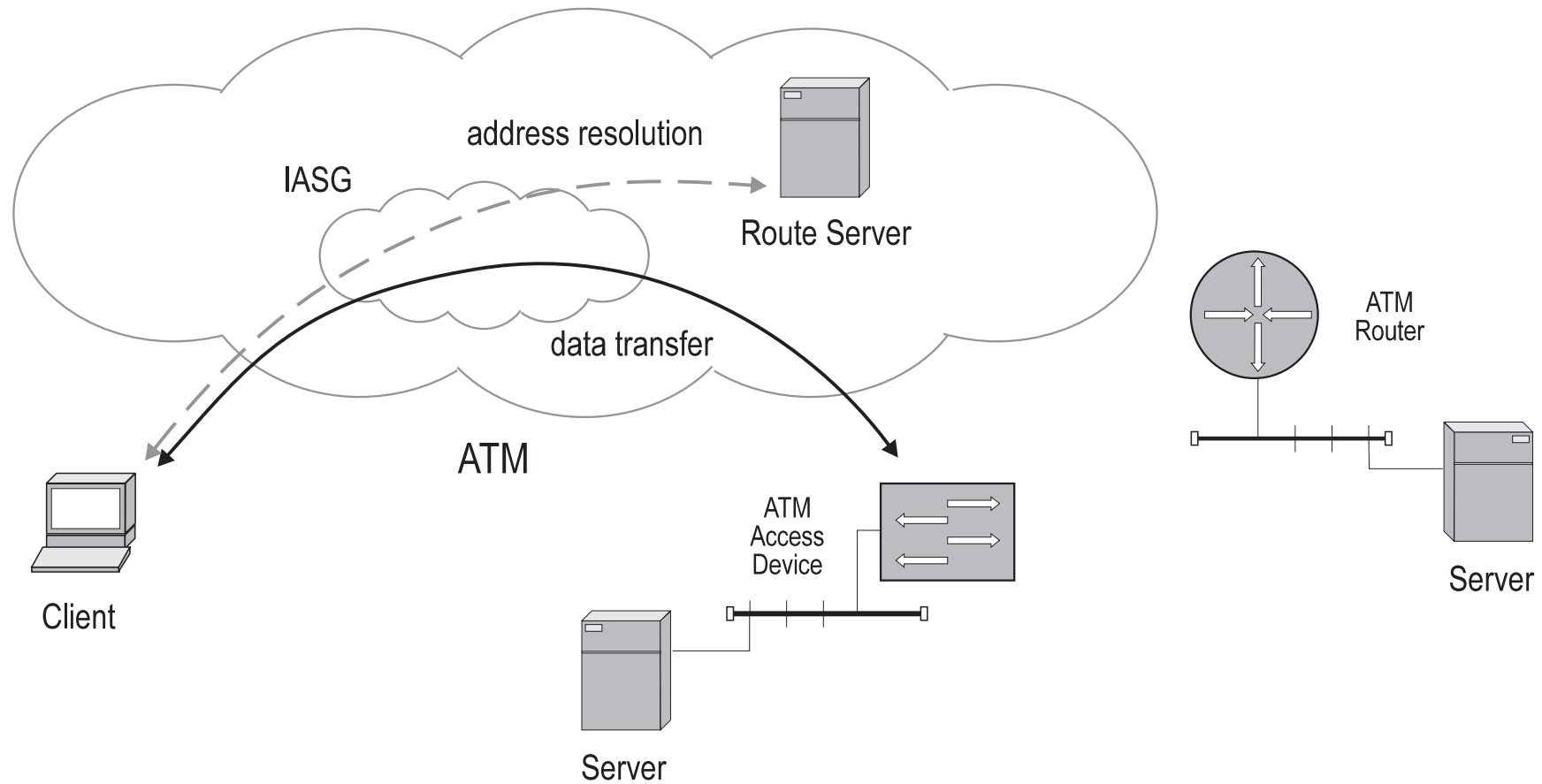


# MPOA - Multi-Protocol over ATM

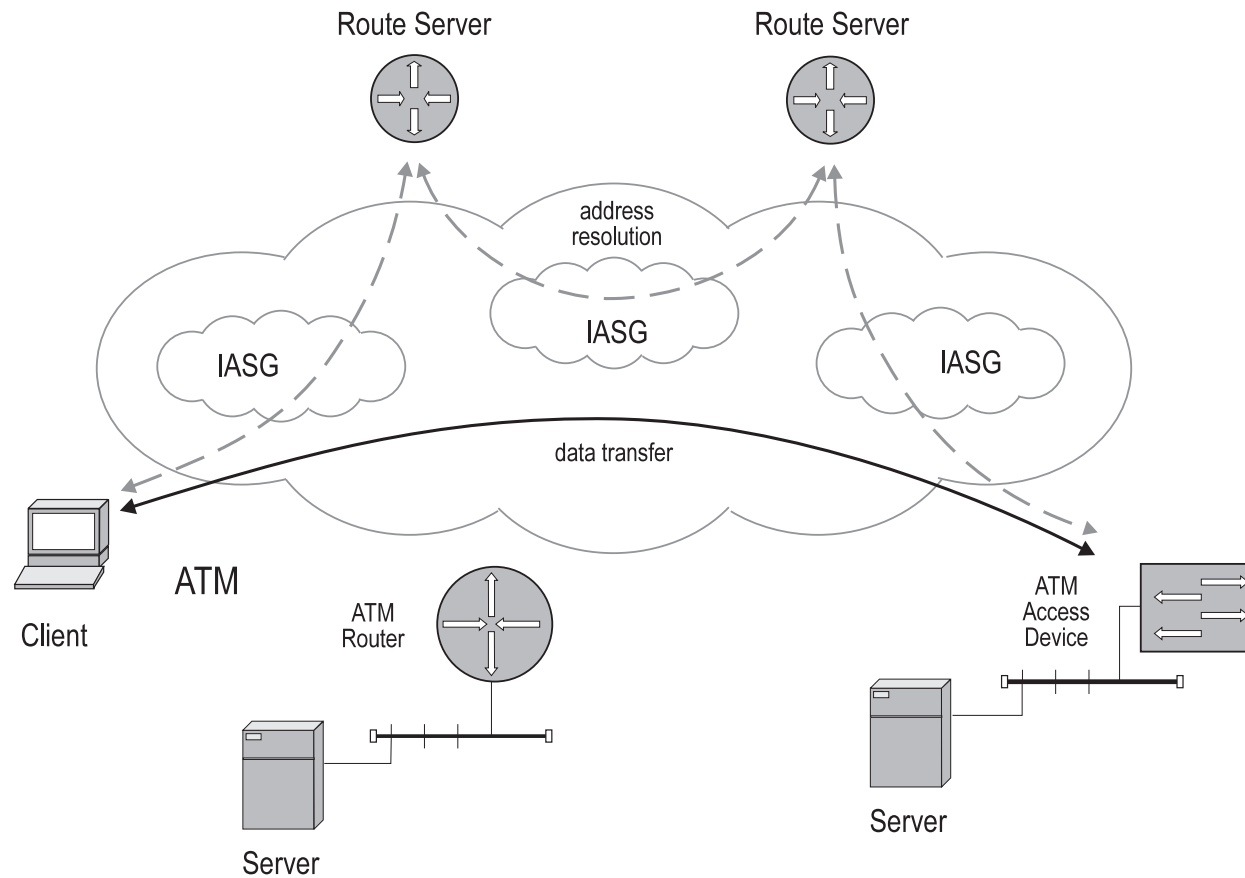
- LANE - L2 clients
- NHRP - L3 clients
  - IP - LANE - ATM
  - IP - NHRP - ATM



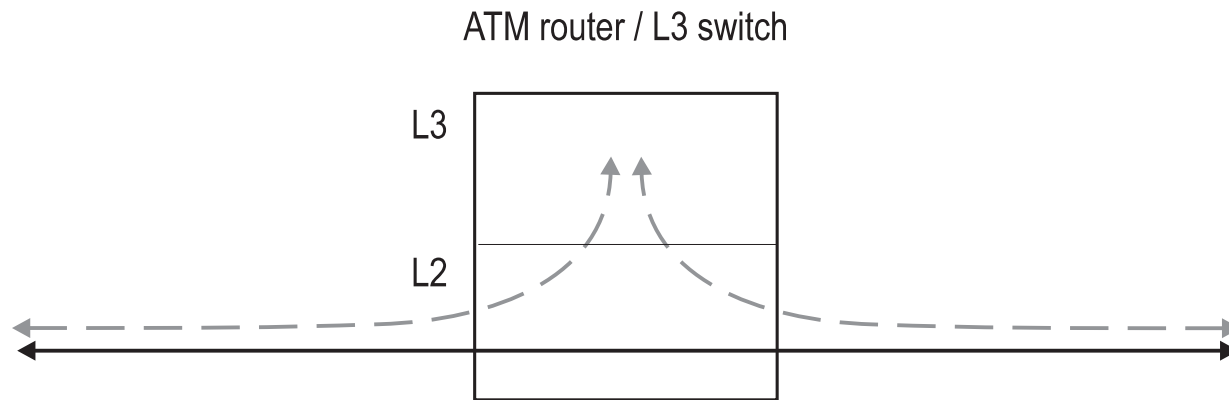
# MPOA - Multi-Protocol over ATM



# MPOA - Multi-Protocol over ATM



# IP Switching



Ipsilon IP Switching

Cisco Tag Switching

IBM Aggregate Route Based IP Switching

Toshiba Cell Switching

MPLS Multi-Protocol Label Switching

