

ATM Networks

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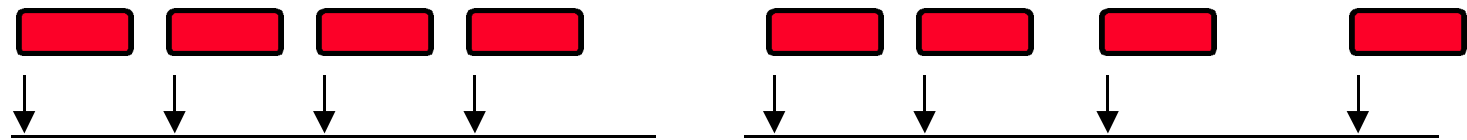
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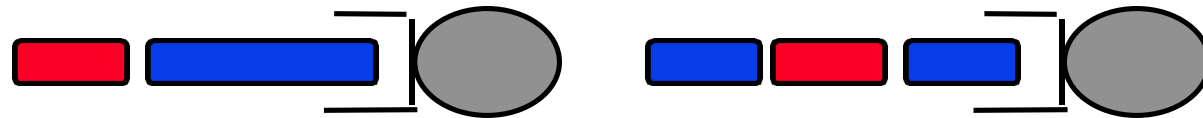
- q ATM: Overview
- q ATM Protocol Layers
- q Network Interfaces
- q Adaptation Layers
- q Physical Layers

ATM: Overview

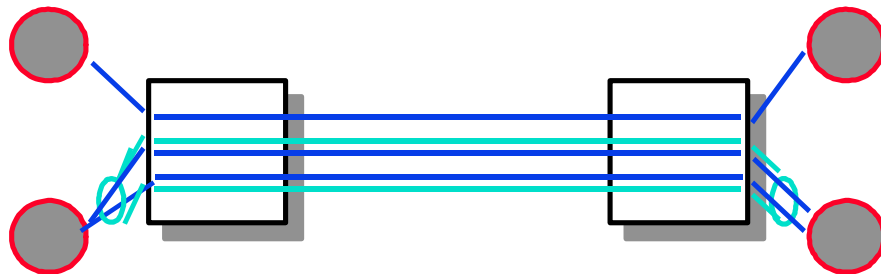
- q STM = Synchronous Transfer Mode,
ATM = Asynchronous Transfer Mode



- q ATM = Short fixed size 53-byte cells

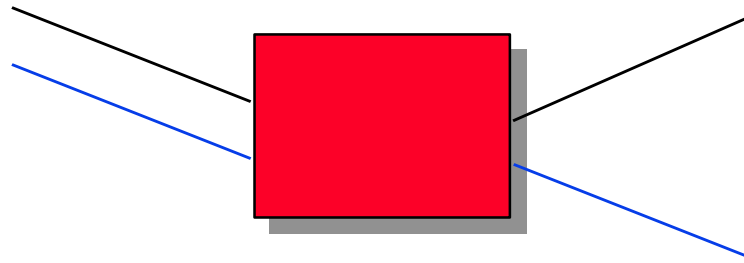


- q Connection oriented \Rightarrow Virtual Channels (VC)



q Labels vs addresses

⇒ Better scalability in number of nodes



o Switches vs routers

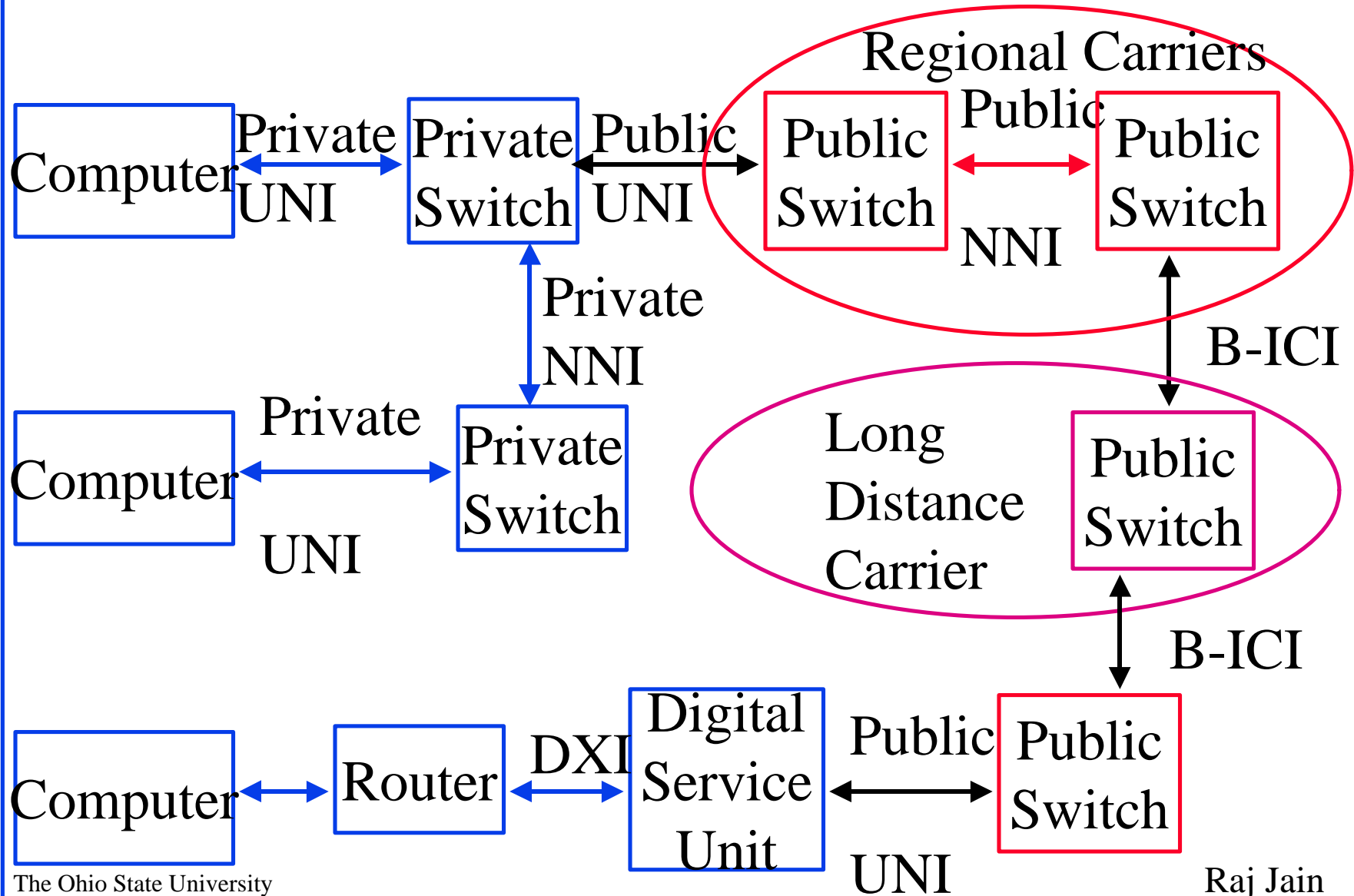
⇒ Faster due to fixed size, short address, simplicity

o Seamless ⇒ Same technology for LAN, WAN,

o Data, voice, video integration

o Everyone else is doing it

ATM Interfaces



ATM Network Interfaces

- q User to Network Interface (UNI):
Public UNI, Private UNI
- q Network to Node Interface (NNI):
 - q Private NNI (P-NNI)
 - q Public NNI = Inter-Switching System Interface (ISSI)
 - LATA ISSI (Regional Bell Operating Co)
 - q Inter-LATA ISSI (Inter-exchange Carriers)
 - ⇒ Broadband Inter-Carrier Interface (B-ICI)
- q Data Exchange Interface (DXI)
Between routers and ATM Digital Service Units (DSU)

Protocol Layers

End System

ATM
Adaptation
Layer

ATM
Layer

Physical
Layer

Switch

ATM
Layer

Physical
Layer

End System

ATM
Adaptation
Layer

ATM
Layer

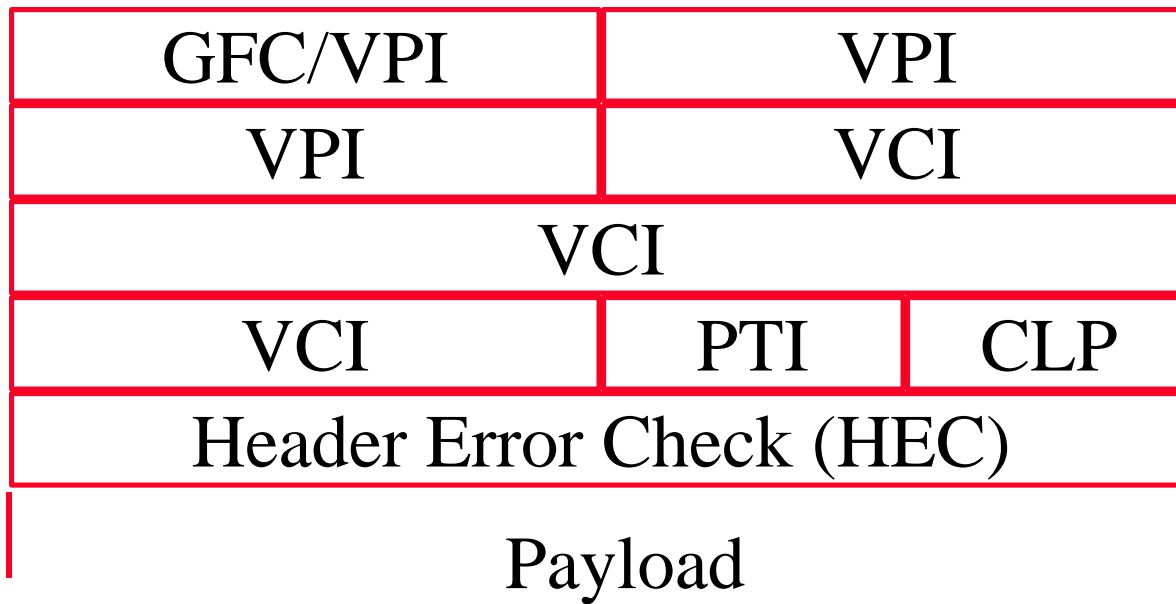
Physical
Layer

Protocol Layers

- q The ATM Adaptation Layer
 - q How to break application messages to cells
- q The ATM Layer
 - q Transmission/Switching/Reception
 - q Congestion Control/Buffer management
 - q Cell header generation/removal at source/destination
 - q Cell address translation
 - q Sequential delivery

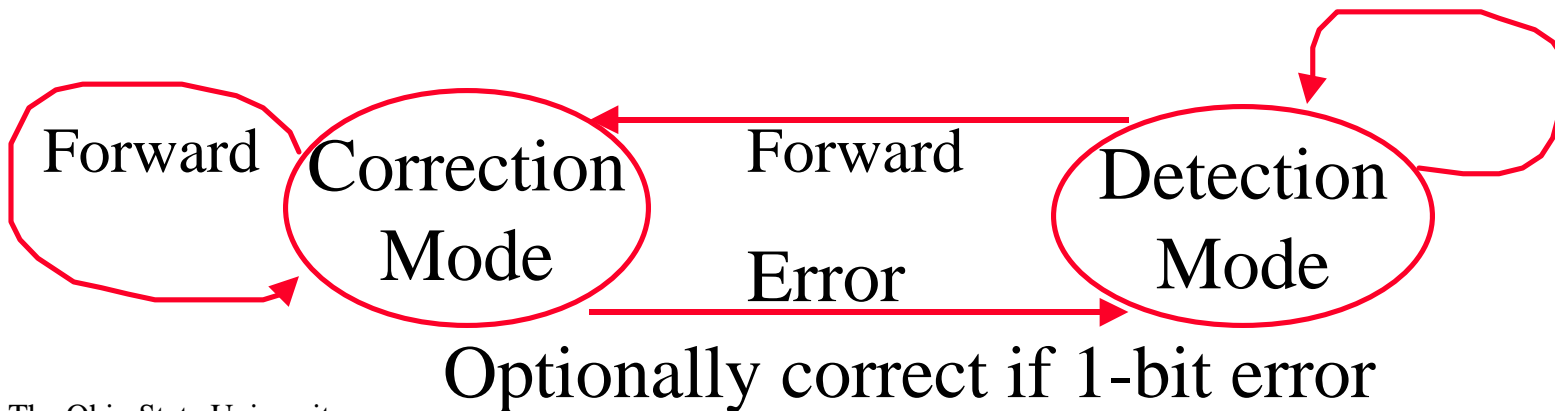
Cell Header Format

- q GFC = Generic Flow Control
 - q (Was used in UNI but not in NNI)
- q VPI/VCI = 0/0 \Rightarrow Idle cell; 0/n \Rightarrow Signaling
- q HEC: $1 + x + x^2 + x^8$



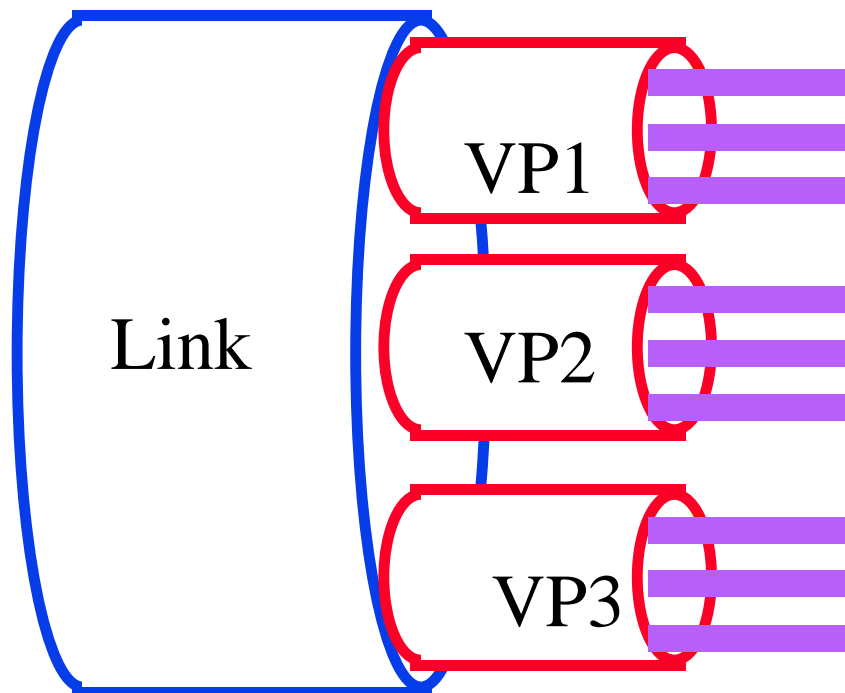
Header Error Check

- q HEC protects header only
- q Optional Correction mode: Correct one bit errors if no
- q Discard cells with bad HEC
- q Used for cell delineation in SONET
- q Recalculated on each hop

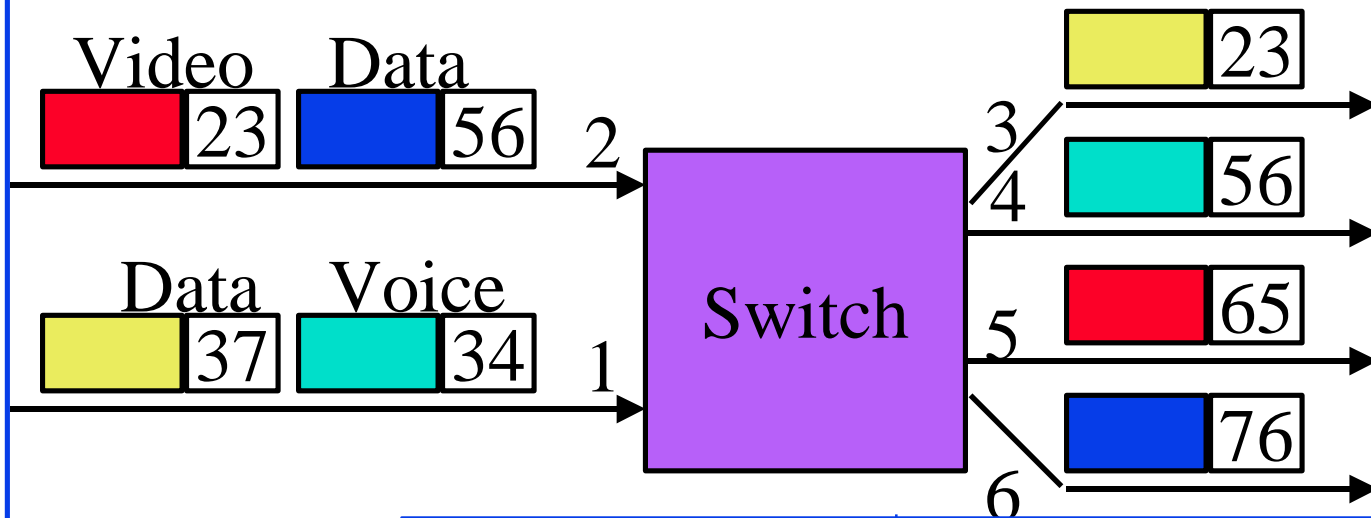


Connection Identifiers

- q Each cell contains a 24/28-bit connection identifier
First 8/12 bits: Virtual Path,
Last 16 bits: Virtual Circuit
- q VP service allows new VC's w/o orders to carriers



VP/VC Assignment/Use



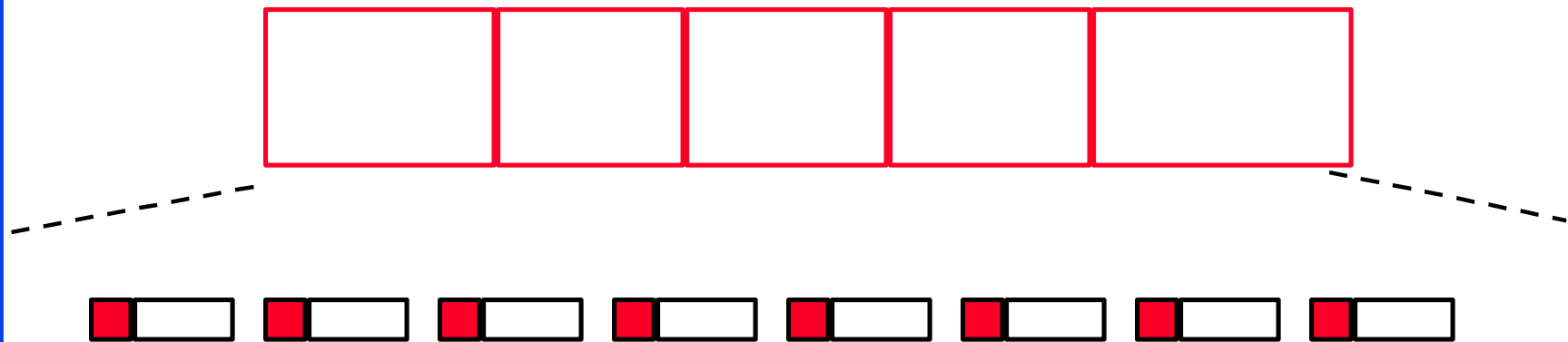
In		Out	
Port	VPI/VCI	Port	VPI/VCI
1	0/37	3	1/23
1	0/34	4	0/56
2	0/23	5	0/65
2	0/56	6	4/76

Original Classes of Traffic

	Class A	Class B	Class C	Class D
Time Sync	Yes	Yes	No	No
Bit Rate	Constant	Variable	Variable	Variable
Connection -Oriented	Yes	Yes	Yes	No
Examples	Circuit Emulation	Comp. Video	Frame Relay	SMDS
AAL	AAL1	AAL2	AAL3	AAL4

AAL 5

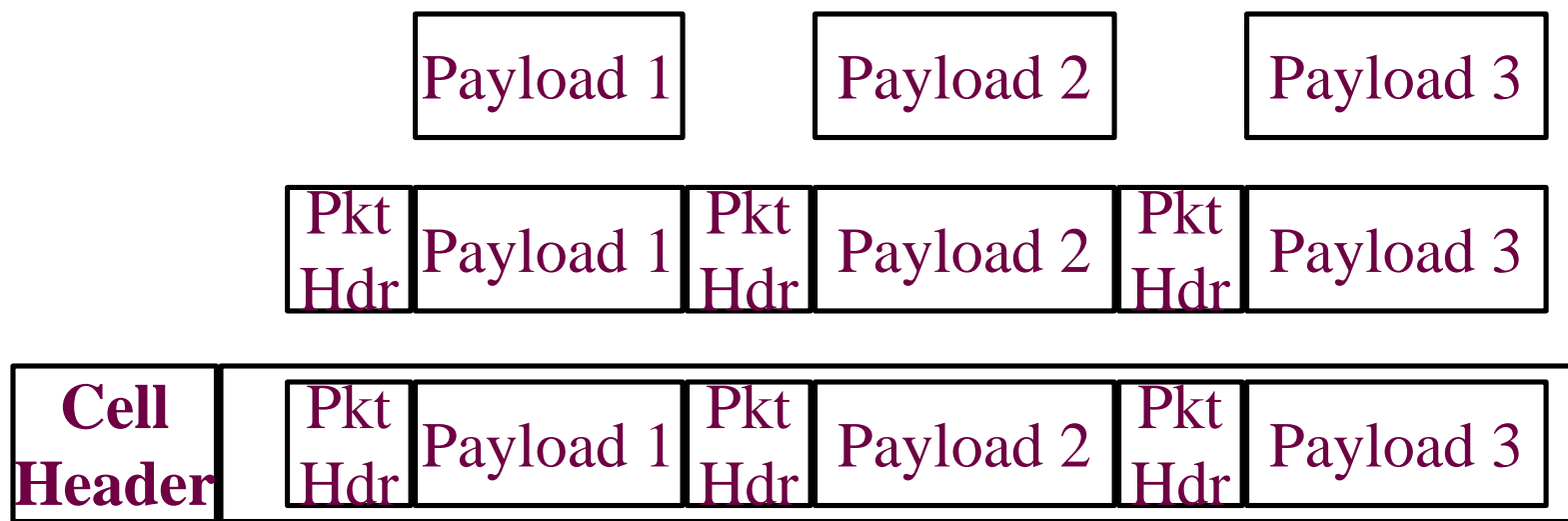
- ❑ Designed for data traffic
- ❑ Less overhead bits than AAL 3/4
Simple and Efficient AAL (SEAL)
- ❑ No per cell length field, No per cell CRC



PTI bit indicates last cell

AAL2

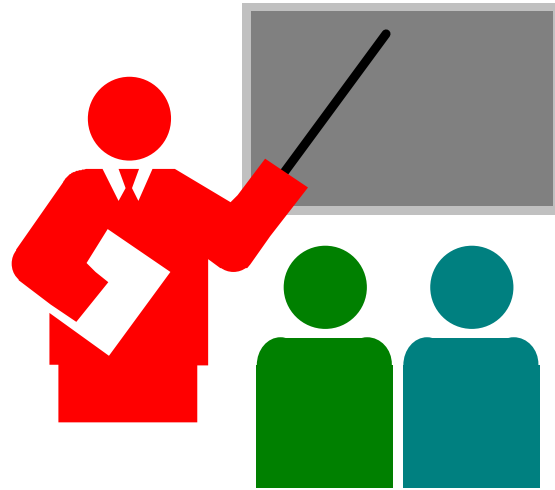
- ❑ Ideal for low bit rate voice
- ❑ Variable/constant rate voice
- ❑ Multiple users per VC
- ❑ Compression and Silence suppression
- ❑ Idle channel suppression



Physical Media Dependent Layers

- ❑ Multimode Fiber: 100 Mbps using 4b/5b, 155 Mbps SONET STS-3c, 155 Mbps 8b/10b
- ❑ Single-mode Fiber: 155 Mbps STS-3c, 622 Mbps
- ❑ Shielded Twisted Pair (STP): 155 Mbps 8b/10b
- ❑ Coax: 45 Mbps, DS3, 155 Mbps
- ❑ Unshielded Twisted Pair (UTP)
 - ❑ UTP-3 (phone wire) at 25.6 Mbps, 51.84 Mbps
 - ❑ UTP-5 (Data grade UTP) at 155 Mbps
- ❑ DS1, DS3, STS-3c, STM-1, E1, E3, J2, $n \times T1$

Summary



- ❑ ATM Overview: History, Why and What
- ❑ Protocol Layers: AAL, ATM, Physical layers, Cell
- ❑ Interfaces: PNNI, NNI, B-ICI, DXI

ATM : Key References

- ❑ See http://www.cis.ohio-state.edu/~jain/atm_refs.htm
- ❑ G. Sackett and C. Y. Metz, “ATM and Multiprotocol Networking,” McGraw-Hill, 1997
- ❑ S. Siu and R. Jain, "A brief overview of ATM: Protocol Layers, LAN Emulation and Traffic Management" Computer Communications Review (ACM SIGCOMM), April 1995. Available at <http://www.cis.ohio-state.edu/~jain/>
- ❑ ATM Forum specs are available at <ftp://ftp.atmforum.com/pub/approved-specs/>