ATM: Asynchronous Transfer Mode Protocol

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The Asynchronous Transfer Mode (ATM) composes a protocol suite which establishes a mechanism to carry all traffic on a stream of fixed 53-byte packets (cells). A fixed-size packet can ensure that the switching and multiplexing function could be carried out quickly and easily. ATM is a connection-oriented technology, i.e.; two systems on the network should inform all intermediate switches about their service requirements and traffic parameters in order to establish communication.

The ATM reference model, which has two forms - one for the user-to-network interface (UNI) and the other for the network-to-node interface (NNI), is divided into three layers: the ATM adaptation layer (AAL), the ATM layer, and the physical layer. The AAL interfaces the higher layer protocols to the ATM Layer, which relays ATM cells both from the upper layers to the ATM Layer and vice versa. When relaying information received from the higher layers, the AAL segments the data into ATM cells. When relaying information received from the ATM Layer, the AAL must reassemble the payloads into a format the higher layers can understand. This is called Segmentation and Reassembly (SAR). Different AALs are defined in supporting different types of traffic or service expected to be used on ATM networks.

The ATM layer is responsible for relaying cells from the AAL to the physical layer for transmission and from the physical layer to the AAL for use at the end systems, it determines where the incoming cells should be forwarded to, resets the corresponding connection identifiers and forwards the cells to the next link, as well as buffers cells, and handles various traffic management functions such as cell loss priority marking, congestion indication, and generic flow control access. It also monitors the transmission rate and conformance to the service contract (traffic policing).
The physical layer of ATM defines the bit timing and other characteristics for encoding and decoding the data into suitable electrical/optical waveforms for transmission and reception on the specific physical media used. In addition, it also provides frame adaptation function, which includes cell delineation, header error check (HEC) generation and processing, performance monitoring, and payload rate matching of the different transport formats used at this layer. SONET , DS3, Fiber, twisted-pair are few media often used at the physical layer.

Protocol Structure - ATM: Asynchronous Transfer Mode Protocol

ATM Cell Format:

<table>
<tr><td rowspan="5">H
E
A
D
E
R</td><td>GFC or VPI</td><td colspan="2">VPI</td></tr>
<tr><td>VPI</td><td colspan="2">VCI</td></tr>
<tr><td colspan="3">VCI</td></tr>
<tr><td>VCI</td><td>PT (3 Bit)</td><td>CLP</td></tr>
<tr><td colspan="3">HEC</td></tr>
<tr><td>IE</td><td colspan="3">Cell Payload (48 Bytes)</td></tr>
</table>

- Header — (5 Bytes) Generic flow control, VPI/VCI, and other control header.
- IE — (48 Bytes) Cell Payload.

Physical Layer Specification – Private UNI:

Frame Format	Bit Rate/Line Rate	Media
Cell Stream	25.6 Mbps/ 32 Mbaud	UTP-3
STS-1	51.84 Mbps	UTP-3
FDDI	100 Mbps/ 125 Mbaud	Multimode Fiber
STS-3c, STM-1	155.52 Mbps	UTP-5
STS-3c, STM-1	155.52 Mbps	Single-Mode Fiber, Multimode Fiber, Coax pair
Cell Stream	155.52 Mbps/ 194.4Mbaud	Multimode Fiber, STP
STS-3c, STM-1	155.52 Mbps	UTP-3
STS-12, STM-4	622.08 Mbps	SMF, MMF

Physical Layer Specification – Public UNI:

Frame Format	Bit Rate/Line Rate	Media
DS1	1.544 Mbps	Twisted pair
DS3	44.736 Mbps	Coax pair
STS-3c, STM-1	155.520 Mbps	Single-mode Fiber
E1	2.048 Mbps	Twisted pair, Coax pair
E3	34.368 Mbps	Coax pair
J2	6.312 Mbps	Coax pair
N × T1	N × 1.544 Mbps	Twisted pair

The ATM protocol reference model is based on standards developed by the ITU.
http://www.atmforum.com/standards/approved.html : ATM Forum approved specifications