A.4 ATM LAN Emulation as the LLP

The ATM Forum specifies the emulation of IEEE 802 LANs using ATM networks (AF-LANE-0021.000, January, 1995; AF-LANE-0084.000, July 1997). This method is used for the configuration and operation of emulated LANs over which ST packets can be transmitted. Additionally, LAN Emulation (LANE) provides for virtual LANs that may span networks other than ATM using bridge technology. These other networks are referred to as "legacy LANs" in the specification and include Ethernet and Token Ring. It is feasible that this bridging method could be extended to other networks, HIPPI-6400-PH in particular. While the definitive specifications are in the LANE documents, parts of LANE are included here as an aid to the reader.

Two types of LANs are emulated: Ethernet and Token Ring. For Ethernet, both the original "DIX" (Digital/Intel/Xerox) Ethernet standard, and the IEEE 802.3 LAN standard are emulated. For Token Ring, both the 4 Mbit/s 802.5 and the 16 Mbit/s 802/5 standards are emulated. ST implementations do not need to support all of these LAN types to be compliant. For each of these four network types, the encapsulation as well as the minimum and maximum frame sizes are respected to enable bridging to real LANs of the same type.

For emulated LANs that are deployed on homogeneous ATM networks, a frame size as defined in RFC 1626 ("Default IP MTU for use over ATM AAL5") is specified using the 802.3 LAN encapsulation. The configuration, management, and control of emulated LANs are described in the ATM LANE specifications.

The CCI information that needs to be passed from ST to the LAN emulation layer includes the EtherType = x'8181', the destination address, and optionally the source address. How the addresses are obtained is outside the scope of this document. It should be noted, however, that LAN emulation provides a broadcast service upon which upper level address resolution can be based. Furthermore, the resolution of MAC addresses to ATM addresses is handled transparently by the LAN emulation layer.

ST defines Control Channels and Data Channels. ATM Virtual Connections (VC's) are used to implement these channels. An implementation of ST over ATM should provision these VC's to respect their respective usage: low latency message transmission and reception for the Control Channel, high bandwidth for the Data Channel. The ATM Forum LAN Emulation Standard, Version 2 provides for multiple VC's per LAN Emulation Client (LEC). However, the upper level protocol implementation (ST in this case) must be aware of this facility in order to request and use it.

The ST protocol enables high performance implementations where the sending/receiving network interface adapters can directly transfer data to/from the network from/to application buffers with a minimum of processor intervention. Any implementation of ST over ATM should preserve this property. More specifically, network interface adapters should:

– directly perform the high frequency operations of the ST protocol (e.g. Slot accounting);

– alternate the transmission of control and data transfers so as to reduce the latency of control messages;

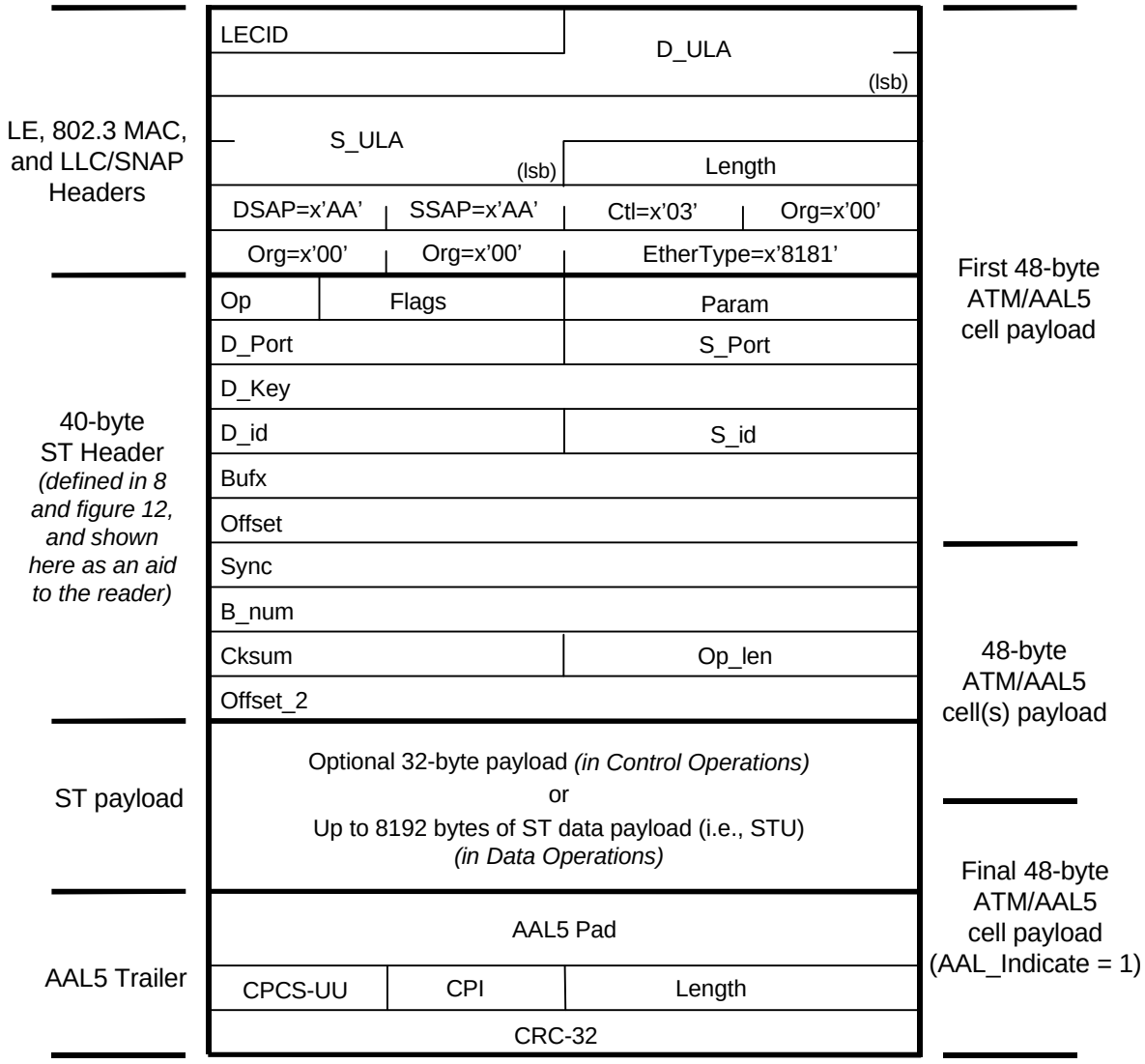
– when the ATM network interface adapter is used for ST traffic as well as other protocols, discriminate between ST traffic and other traffic. In general, the manner in which data is moved to/from memory from/to the network by the adapter will depend on the protocol encapsulated by the frames. The ATM VC number may be used if VC's are dedicated to particular protocols. Otherwise, the frame contents need be examined.

Acronyms specific to ATM and ATM LANE are specified in the ATM LANE specifications. Those used in this annex are repeated here as an aid to the reader.

ATM	Asynchronous Transfer Mode
CPCS-UU	Common Part, Convergence Sublayer - User-to-User Indication
CPI	Common Part Indicator
CRC-32	32-bit Cyclic Redundancy Check
DIX	Digital / Intel / Xerox
LECID	LAN Emulation Client Identifier
LANE	LAN Emulation

A.4.1 Mapping to the IEEE 802.3 LAN standard

Figure A.5 shows the mapping for carrying ST over ATM for IEEE 802.3 networks. The 16-bit Length parameter in the 802.3 MAC Header includes the LLC/SNAP Header, the ST Header, and any ST payload. This Length parameter shall be passed to the ULP, and used by the ULP to determine the size of the payload. The maximum frame size for IEEE 802.3 encapsulation, specified in RFC 1626, is 9234 bytes. Since ST specifies maximum STU size as a power of 2, this results in a maximum STU of 8192 bytes.



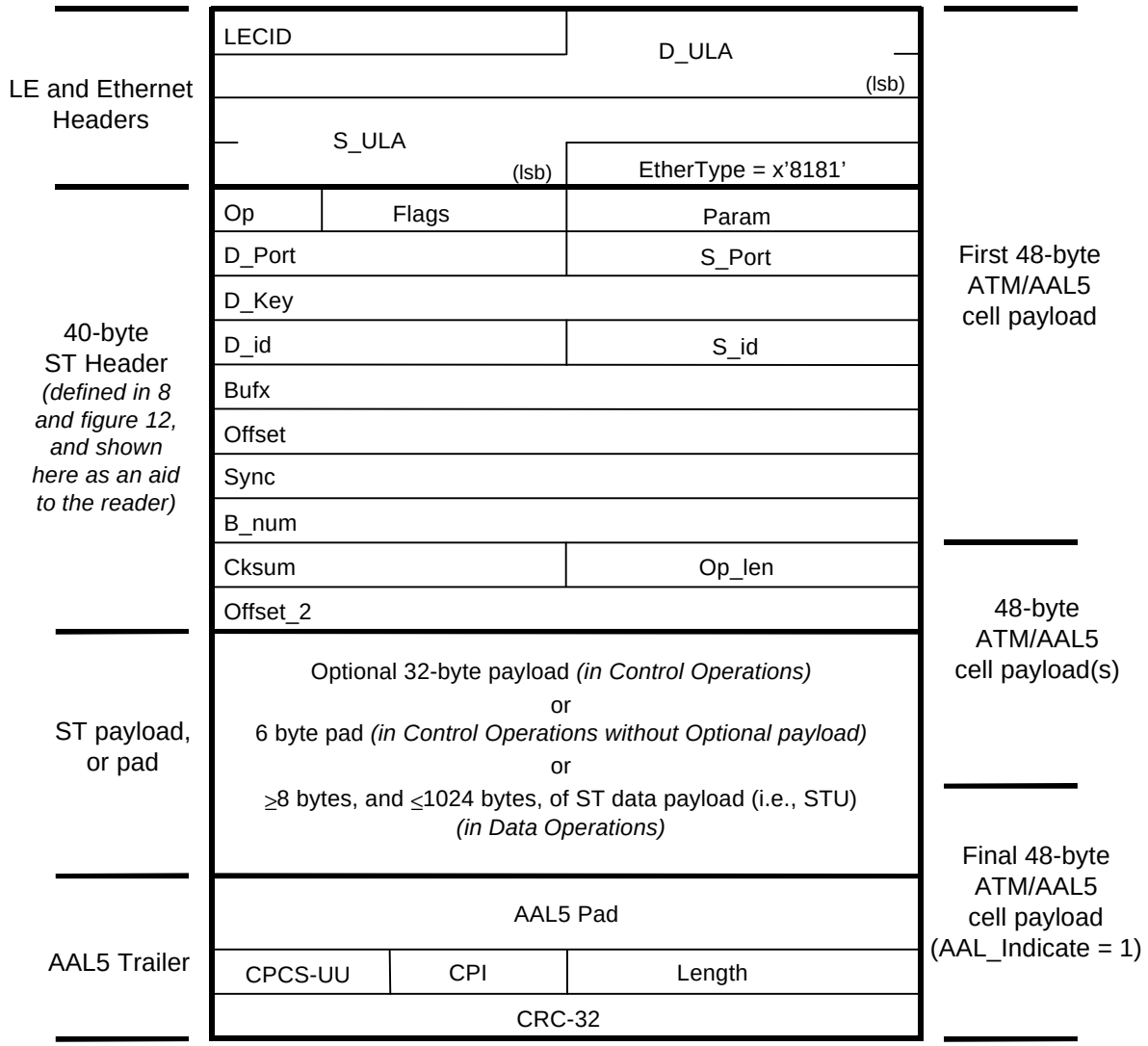
NOTE – Shown as 32-bit words

Figure A.4 – An ST operation carried in an ATM LANE IEEE 802.3 network emulation frame

A.4.2 Mapping to the DIX Ethernet standard

Figure A.5 shows the mapping for carrying ST over ATM for original "DIX" (Digital/Intel/Xerox) Ethernet standard networks.

The minimum Ethernet data frame size is 46 bytes, six bytes more than the 40 byte ST header. Hence, ST Control Operations shall pad the Ethernet frame with at least 6 bytes. This is independent of the padding applied by the ATM AAL5 layer, which serves to complete an integral number of cells and is appended/stripped by the ATM AAL5 layer. The ST payload in Data operations shall be ≥ 8 bytes, and ≤ 1024 bytes.

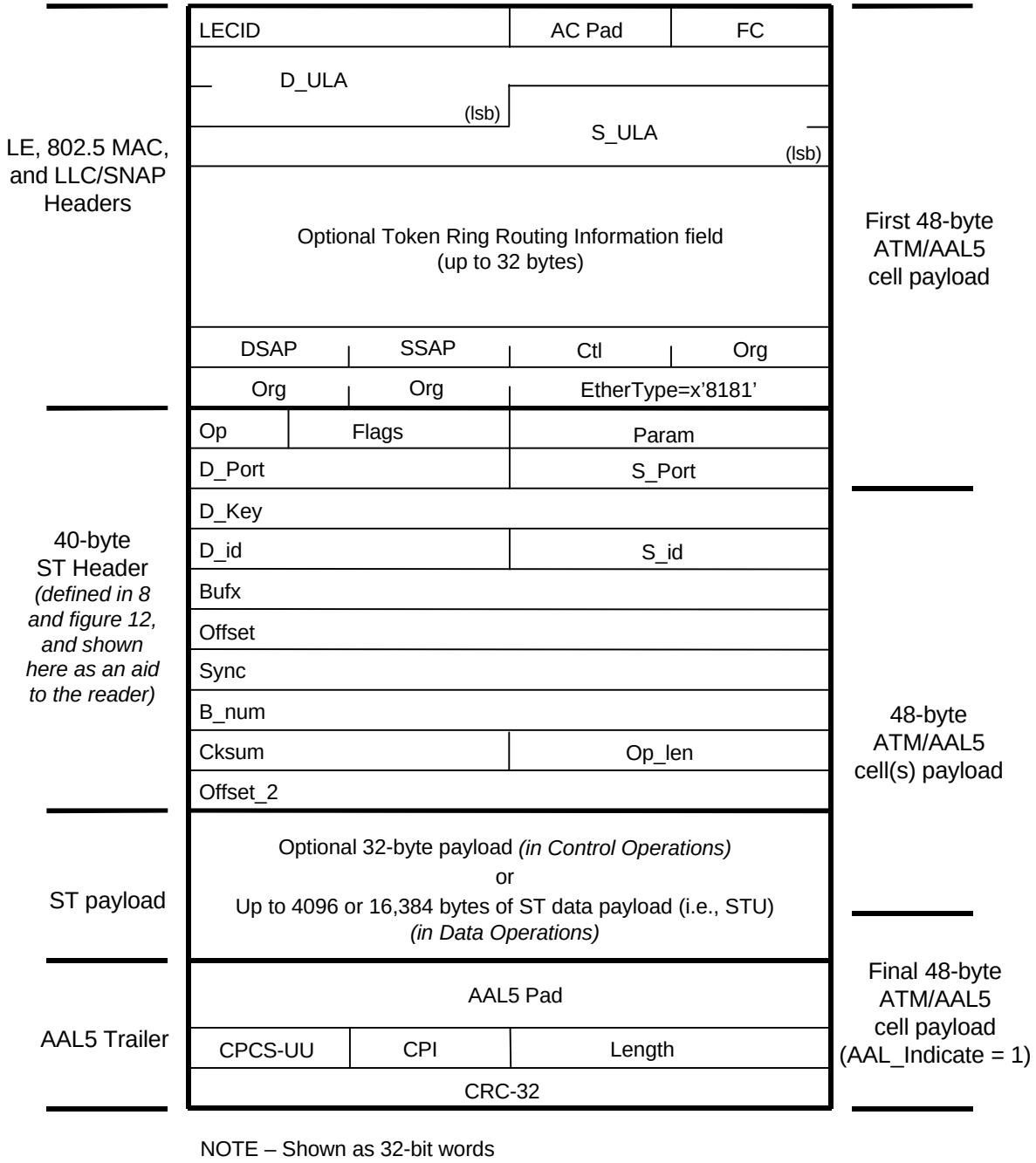


NOTE – Shown as 32-bit words

Figure A.5 – An ST operation carried in an ATM LANE DIX Ethernet emulation frame

A.4.3 Mapping to Token Ring networks

Figure A.6 shows the mapping for carrying ST over ATM for IEEE 802.5 (4 Mbit/s) and 802/5 (16 Mbit/s) Token Ring networks. The AC Pad is not used and shall be ignored. The FC field is set according to AF-LANE-0021 and IEEE 802.5-1992, and shall specify an LLC frame. The optional Token Ring Routing Information Field (16 to 46) bytes may be present. The LLC/SNAP values shall be determined by the LLC Layer. The maximum ST data payload for a 4 Mbit/s 802.5 Token Ring is 4096 bytes; for a 16 Mbit/s 802/5 Token Ring it is 16,384 bytes.



NOTE – Shown as 32-bit words

Figure A.6 – An ST operation carried in an ATM LANE IEEE 802.5 emulated frames