The ATM Forum

Technical Committee

# LAN Emulation Client Management Specification

## Version 1.0

af-lane-0038.000

September 1995

The information in this publication is believed to be accurate as of its publication date. Such information is subject to change without notice and The ATM Forum is not responsible for any errors. The ATM Forum does not assume any responsibility to update or correct any information in this publication. Notwithstanding anything to the contrary, neither The ATM Forum nor the publisher make any representation or warranty, expressed or implied, concerning the completeness, accuracy, or applicability of any information contained in this publication. No liability of any kind shall be assumed by The ATM Forum or the publisher as a result of reliance upon any information contained in this publication.

The receipt or any use of this document or its contents does not in any way create by implication or otherwise:

- Any express or implied license or right to or under any ATM Forum member company's patent, copyright, trademark or trade secret rights which are or may be associated with the ideas, techniques, concepts or expressions contained herein; nor
- Any warranty or representation that any ATM Forum member companies will announce any product(s) and/or service(s) related thereto, or if such announcements are made, that such announced product(s) and/or service(s) embody any or all of the ideas, technologies, or concepts contained herein; nor
- Any form of relationship between any ATM Forum member companies and the recipient or user of this document.

Implementation or use of specific ATM standards or recommendations and ATM Forum specifications will be voluntary, and no company shall agree or be obliged to implement them by virtue of participation in The ATM Forum.

The ATM Forum is a non-profit international organization accelerating industry cooperation on ATM technology. The ATM Forum does not, expressly or otherwise, endorse or promote any specific products or services.

NOTE: The user's attention is called to the possibility that implementation of the ATM interoperability specification contained herein may require use of an invention covered by patent rights held by ATM Forum Member companies or others. By publication of this ATM interoperability specification, no position is taken by The ATM Forum with respect to validity of any patent claims or of any patent rights related thereto or the ability to obtain the license to use such rights. ATM Forum Member companies agree to grant licenses under the relevant patents they own on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license. For additional information contact:

The ATM Forum
Worldwide Headquarters
2570 West El Camino Real, Suite 304
Mountain View, CA 94040-1313
Tel: +1.415.949.6700
Fax: +1.415.949.6705

# Contents

# 1. Introduction

One of the most promising networking technologies is ATM. ATM offers high performance, the ability to carry many types of services (data, voice, video), and the ability to carry traffic over both the LAN and the WAN.

*LAN Emulation* provides a means of running existing applications and protocols over ATM. The LAN Emulation specification defines four types of components:

- LAN Emulation Clients - which use emulated LANs to send and receive data.
- LAN Emulation Servers - which perform control coordination functions, and assist clients in doing address resolution.
- Broadcast and Unknown Servers - which emulate the multicast functions of a shared-media LAN.
- LAN Emulation Configuration Servers - which provide auto-configuration services.

*Network management* is concerned with the ability to remotely monitor and control networks and networked devices.

This document defines network management for LAN Emulation Clients.

## 1.1 Terminology

The following acronyms and terminology are used throughout this document.

| | |
|---|---|
| AAL | ATM Adaptation Layer |
| ATM | Asynchronous Transfer Mode |
| BUS | Broadcast and Unknown Server |
| ELAN | Emulated Local Area Network |
| LAN | Local Area Network |
| LE | LAN Emulation |
| LE_ARP | LAN Emulation Address Resolution Protocol |
| LEC | LAN Emulation Client |
| LECID | LAN Emulation Client Identifier |
| LECS | LAN Emulation Configuration Server |
| LES | LAN Emulation Server |
| LUNI | LAN Emulation User-Network Interface |
| MAC | Medium Access Control |
| RD | Route Descriptor |
| RFC | Request For Comment (Document Series) |

| | |
|---|---|
| UNI | User-Network Interface |
| VCC | Virtual Channel Connection |
| VCI | Virtual Channel Identifier |
| VPI | Virtual Path Identifier |

## 1.2 References

The ATM Forum, *LAN Emulation Over ATM Specification, Version 1.0*.

- *RFC 1213*, McCloghrie and Rose, *Management Information Base for Network Management of TCP/IP-based internets: MIB-II.*
- *RFC 1493*, Decker, Langille, Rijsinghani, and McCloghrie, *Definitions of Managed Objects for Bridges.*
- *RFC 1573*, McCloghrie and Kastenholtz, *Evolution of the Interfaces Group of MIB-II.*
- *RFC 1695*, Ahmed and Tesink, *Definitions of Managed Objects for ATM Management.*

# 2. Management Functions

Network management can be divided into the areas of configuration, performance, fault, security, and accounting management.

## 2.1 Configuration Management

Configuration management is concerned with setting up network elements for normal operation, finding out their current operational parameters, and keeping track of inventories and network topologies.

This network management specification addresses several common tasks, including

Identifying all of the LAN Emulation Clients currently set up at a managed device.

- Creating and destroying LAN Emulation Clients, for hosts which support this. (This is like adding network interface cards to a machine, or removing them from a machine.)
- Forcing LAN Emulation Clients to join or leave emulated LANs. (This is like attaching a machine to a traditional LAN, or detaching it from a traditional LAN. Making a client leave an emulated LAN does not destroy the client, but simply returns it to an Initial State, where its configuration can be examined and altered.)
- Examining and changing Initial State Parameters.
- Identifying Configuration, Control, and Multicast VCCs.

It does not address identification of Data Direct VCCs, configuration of LAN Emulation PVCs, or identification of the ATM addresses at each end of a VCC. These are expected to be handled via extensions to other MIBs.

Other areas which affect LEC management are at least partially outside of the scope of the LUNI. They include configuration of LAN Emulation Configuration Servers, fault management at the LAN Emulation Server, and full auto-discovery of emulated LAN topology.

## 2.2 Performance Management

Performance management is concerned with the quality of service that a system delivers to its users, and the efficiency with which it delivers that service.

### *2.2.1 Observing the behavior of an ATM emulated LAN*

One important component of performance management is the ability to observe the behavior of a network. Several factors make ATM emulated LANs harder to observe than traditional ones.

- Traffic is spread out over many virtual circuits, instead of being concentrated in one physical network segment.

- These virtual circuits may be set up and torn down frequently, presenting a moving target to would-be observers.
- The performance of each virtual circuit may be affected by factors outside the control of the ATM emulated LAN hosts. In particular, these include which switches are congested, and what actions those switches take in response to congestion (cell loss, flow control, etc.).
- In addition to data traffic, there may be a fair amount of LAN Emulation control traffic. It is desirable to monitor this control traffic separately.
- It is an explicit non-goal for ATM Forum LAN Emulation to support promiscuous listeners (hosts who want to listen to all unicast traffic). Thus, managers can't simply attach protocol analyzers to an emulated LAN to find out what is happening.

Given this, the only ways for a network management station to monitor the amount of traffic going to a specific host are

1. To enlist the help of LAN Emulation Clients (LECs) in collecting this information.
2. To collect and aggregate performance statistics about individual virtual circuits.
3. To collect performance statistics at the ATM port level, using the AToM MIB.
4. To eavesdrop on communication between two LAN Emulation hosts. A major disadvantage of this is that the network manager must decide which paths to monitor in advance.

This specification requires LAN Emulation Clients to carry out basic traffic measurements, and to make them available through SNMP MIBs, as described in the following text.

### *2.2.2 Levels of performance management*

There are several potential levels of performance management, including

- Performance management of the MAC layer, where we view an emulated LAN as providing a connectionless packet delivery service.
- Performance management of LUNI traffic, especially LE_ARPs.
- Performance management of individual virtual circuits within an emulated LAN.
- Performance management of the ATM switch network over which an emulated LAN runs.

This specification focuses on the first two levels. While performance management of the switch network is important, it is beyond the proper scope of the LUNI. Furthermore, we recognize the philosophy that

> "The SNMP explicitly minimizes the number and complexity of management functions realized by the management agent itself." - RFC 1157
>
> "This memo strongly recommends that connection-oriented sub-layers not have a conceptual row in the ifTable for each virtual circuit. This avoids the proliferation of conceptual rows, especially those which have considerable redundant information." - RFC 1573

In particular, this specification does **not** require clients to implement elaborate protocol analysis functionality, or to maintain separate traffic counters for each virtual circuit. Vendors may, of course, choose to implement such features in addition to those specified herein.

## 2.3 Fault Management

Fault management is concerned with the prevention, detection, and correction of problems in an emulated LAN that are caused by the failure of network elements.

At the LAN Emulation Client level,

- The MIB-II object 'ifOperStatus' indicates whether the emulated interface is up or down.
- The RFC 1573 object 'ifLinkUpDownTrapEnable' provides an optional way to enable and disable 'linkUp'/'linkDown' traps. (Because this object's MIN-ACCESS is 'read-only', and its default value is 'disabled', an implementation is not required to implement these traps for the LAN Emulation Client layer.)
- The LEC MIB object 'lecInterfaceState' provides additional information on the state of the LAN Emulation Client.
- The LEC MIB objects 'lecLastFailureRespCode' and 'lecLastFailureState' provide information on the last Configure failure or Join failure.

At the virtual circuit level, operational status, administrative status, and AAL5 error statistics are available for Configuration, Control, and Multicast VCCs, via the LEC MIB Server VCC table and the AToM MIB.

## 2.4 Security Management

Security management is outside the scope of the initial LAN Emulation specification.

## 2.5 Accounting Management

Accounting management is outside the scope of the initial LAN Emulation specification.

# 3. Management Framework

This chapter defines the network management framework for LAN Emulation Clients.

## 3.1 SNMP

LAN Emulation Client management is defined using SNMP MIBs. SNMP is an Internet-standard network management framework whose basic concepts are as follows:

> "A network management system contains: several (potentially many) nodes, each with a processing entity, termed an agent, which has access to management instrumentation; at least one management station; and, a management protocol, used to convey management information between the agents and management stations. Operations of the protocol are carried out under an administrative framework which defines both authentication and authorization policies.
>
> Network management stations execute management applications which monitor and control network elements. Network elements are devices such as hosts, routers, terminal servers, etc., which are monitored and controlled through access to their management information.
>
> Management information is viewed as a collection of managed objects, residing in a virtual information store, termed the Management Information Base (MIB). Collections of related objects are defined in MIB modules. These modules are written using a subset of OSI's Abstract Syntax Notation One (ASN.1)." - RFC 1442 (SMI for SNMPv2)

Currently, there are two versions of the SNMP framework. This specification uses SNMPv2 as the basis for defining a LAN Emulation Client MIB, and refers to other MIBs whose published definitions use SNMPv2 conventions. However, this specification does not mandate the use of SNMPv2, as opposed to SNMPv1. RFC 1452 describes how SNMPv1 and SNMPv2 coexist, and *The Simple Times* reports that automatic translations can be obtained by mailing SNMPv2 MIBs to `mib-v2tov1@dbc.mtview.ca.us`.

## 3.2 RFCs

RFC ("Request for Comment") documents are a standard way of proposing new protocols and MIBs in the Internet community. Some of the most relevant RFCs, for our purposes, are

- RFC 1213, which defines MIB-II, the core set of managed objects for the Internet suite of protocols.
- RFCs 1441 through 1452, which define SNMPv2. These RFCs total more than 400 pages. *The Simple Times* volume 2, number 3 contains a useful road map.
- RFC 1573, which defines the evolution of the Interfaces group of MIB-II.

## 3.3 Requirements for LAN Emulation Hosts

All LAN Emulation Clients SHOULD be network-manageable, either via the SNMP network management protocol or via some other network management protocol.

### 3.3.1 Requirements for SNMP

SNMP agents that support LAN Emulation Clients MUST implement:

- STD 17, RFC 1213 - *MIB II*.
- RFC 1695 - *Definitions of Managed Objects for ATM Management*, according to the conformance statements defined in that RFC. This RFC is better known as the AToM MIB.
- The LAN Emulation Client MIB defined in this specification.

These are in addition to any other MIB objects that a particular host may be required to support. For instance, an ATM-to-Ethernet bridge should also support the Bridge MIB.

Optionally, an agent may support

- RFC 1573 - *Evolution of the Interfaces Group of MIB-II*.

In this event, the specifications in RFC 1573 supersede those in MIB-II (for example, an agent which implements RFC 1573 does not need to support 'ifInNUcastPkts' or 'ifOutNUcastPkts').

### 3.3.2 Requirements for Other Network Management Protocols

Although the use of SNMP is recommended, it is not strictly required. LAN Emulation Client management for other protocols SHOULD be based on the MIBs listed above - especially MIB-II, RFC 1573 and the LAN Emulation Client MIB.

### 3.3.3 Conclusion

We now define these requirements in more detail, starting with MIB-II and RFC 1573.

# 4. MIB-II and RFC 1573 Support

All SNMP agents which support LAN Emulation Clients must implement MIB-II, and are also encouraged to implement RFC 1573. This chapter explains why, and defines interpretations of MIB-II / RFC 1573 as they apply to LAN Emulation Clients.

## 4.1 Emulated Network Interfaces and the Interfaces table

The goal of LAN Emulation is to present the illusion that one or more ATM ports can be treated as one or more 802.* LAN ports[1]. Real LAN ports have entries in the MIB-II Interfaces table and the RFC 1573 Interface Extensions table. To preserve a consistent management framework, it is highly desirable for each emulated port to have entries in these tables as well.

Each SNMP agent that supports LAN Emulation Clients must support such entries. Thus, the host in Figure 1 would have at least three ifTable entries - one for the physical ATM port, and two for the emulated network interfaces corresponding to its LAN Emulation Clients.

To identify an interface as belonging to an emulated LAN, it must be tagged with one of these ifType constants:

- 'aflane8023(59)', for an emulated LAN that supports the IEEE 802.3 and Ethernet data frame formats.
- 'aflane8025(60)', for an emulated LAN that supports the IEEE 802.5 / Token Ring data frame format.

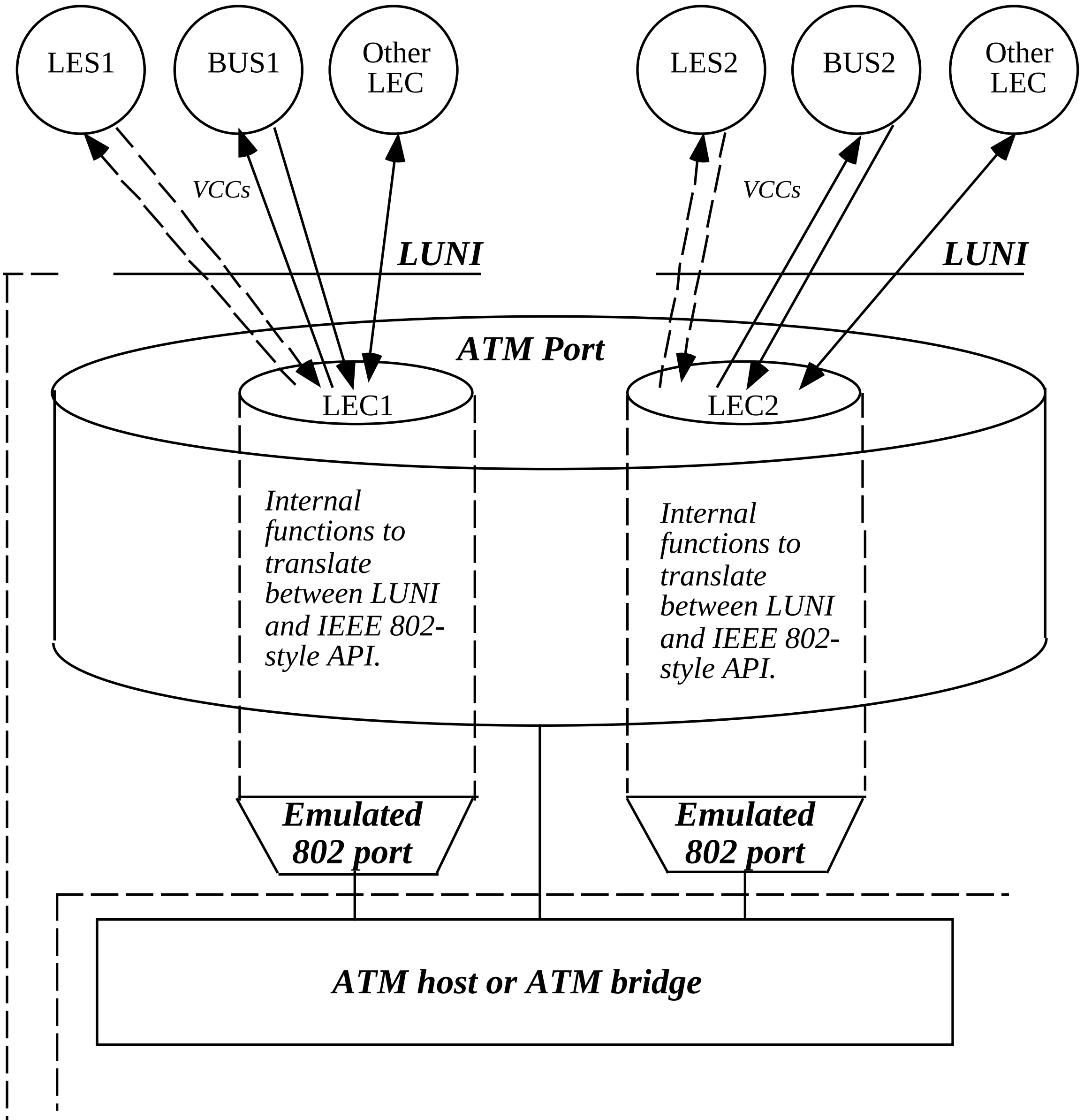
These constants let a network management application know that additional information about the interface is available via the LAN Emulation Client MIB.

Unlike most kinds of interfaces, LAN Emulation Client interfaces can be created and destroyed by network management. So that agents can control ifIndex allocation, most tables in the LEC MIB use a separate lecIndex. For convenience,

- *lecMappingIndex* converts an ifIndex to a lecIndex.
- *lecIfIndex* converts the other way.

[1] The mapping may be, but is not required to be, one-to-one. A single ATM port may support several active LAN Emulation Clients, and a single LAN Emulation Client may employ several ATM ports.

**Figure 1 - Emulated Network Interfaces at a LAN Emulation Client Host**


LES1
BUS1
Other LEC
LES2
BUS2
Other LEC
VCCs
VCCs
LUNI
LUNI
ATM Port
LEC1
LEC2
Internal functions to translate between LUNI and IEEE 802-style API.
Internal functions to translate between LUNI and IEEE 802-style API.
Emulated 802 port
Emulated 802 port
ATM host or ATM bridge

*The packet and octet counters defined in the MIB-II Interfaces group and RFC 1573 shall be measured separately for each LAN Emulation Client.*

*Packet counters for unicast, multicast, and broadcast traffic are measured at the virtual 802.* LAN interface between a LAN Emulation Client and higher protocol (sub-)layers. Unwanted multicast traffic does not count towards 'ifInMulticastPkts' if it is filtered within the LEC implementation.*

*Octet counters are measured at the LUNI, and summarize traffic for all VCCs. They include LAN Emulation overhead, while excluding ATM and AAL5 overhead.*

## 4.2 Interpretations of Interface tables for ATM emulated LANs

RFC 1573 "defines a portion of the Management Information Base (MIB) for use with the network management protocols in the Internet community." Specifically, this includes an updated version of the MIB-II 'ifTable' and an extension table called the 'ifXTable'.

The following tables specify interpretations for 'ifTable' and 'ifXTable' objects, as they apply to emulated LANs. Text copied verbatim from RFC 1573 is printed in the `Courier` font, to distinguish it from this document's additions and changes.

**Note**

Although 'ifSpeed' and 'ifHighSpeed' are defined to be 0, decisions as to which of RFC 1573's 64-bit octet and/or packet counters must be implemented must be based on the maximum AAL SDU bandwidth that a host theoretically offers to its LAN Emulation Clients. This is an extra requirement that the LAN Emulation Client MIB imposes above and beyond the conformance statement in RFC 1573, to ensure that LAN Emulation Clients implement the spirit as well as the letter of that MIB.

For instance, a host whose LAN Emulation Clients have access to a single 155 Mb/S SONET interface would be required to implement 64-bit octet counters and 32-bit packet counters, as specified in the compliance statement for 'ifHCPacketGroup'.

| **Object** | **Use for the emulated network interface layer** |
|---|---|
| ifIndex | Same interpretation as RFC 1573. A unique value, greater than zero, for each interface. Note that the LAN Emulation Client MIB's 'LeConnectionInterface' textual convention depends upon the assurance that no Interfaces table entry has an 'ifIndex' of zero. |
| ifDescr | Same interpretation as RFC 1573. A textual string containing information about the interface. This string should include the name of the manufacturer, the product name, and the version of the interface hardware/software. |
| ifType | If the 'lecActualLanType' for the corresponding LAN Emulation Client is 'unspecified' or 'aflane8023', the IANA ifType constant 'aflane8023(59)'.<br>If the 'lecActualLanType' is 'aflane8025', the IANA ifType constant 'aflane8025(60)'. |
| ifMtu | This read-only value is a function of the 'lecActualLanType' and 'lecActualMaxDataFrameSize' objects in the LAN Emulation Client MIB. For the purposes of calculating this value, an unspecified maximum frame size is taken to mean the smallest standard size.<br>For a client whose 'lecActualLanType' is 'unspecified' or 'aflane8023', 'ifMtu' is equal to the maximum AAL5 SDU size minus 'X' octets. The value of 'X' is up to the implementation, and may be either 16 (Ethernet encapsulation) or 24 (LLC/SNAP encapsulation).<br>For a client whose 'lecActualLanType' is 'aflane8025', 'ifMtu' is equal to the maximum AAL5 SDU size minus 54 octets. |
| ifSpeed, ifHighSpeed | Set to 0. Note, however, that decisions as to whether to implement 64-bit octet and/or packet counters must be made on the basis of the maximum AAL5 SDU bandwidth that is theoretically available to any of the managed device's LAN Emulation Clients. |
| ifPhysAddress | For an active LAN Emulation client, (one of) the MAC address(es) registered for this emulated network interface, stored using the MacAddress convention defined in RFC 1443. For an inactive client which has at least one MAC address, one of those addresses. For an inactive client with no MAC addresses, the empty string.<br>The LUNI lets clients register MAC addresses dynamically. Thus, the value of this object may change over time. However, a client should only change the value of 'ifPhysAddress' at the time that it joins an emulated LAN or deregisters the current 'ifPhysAddress'.<br>Note that the ATM addresses of the LAN Emulation Client and LAN Emulation Server are located in the LEC MIB. |

| **Object** | **Use for the emulated network interface layer** |
|---|---|
| ifAdminStatus | Provides manual control over Joins and terminations.<br>To make an inactive client join an emulated LAN, set its 'ifAdminStatus' to 'up'. The MIB-II 'ifOperStatus' and LAN Emulation Client MIB 'lecInterfaceState' will reflect the progress and success of the attempt. Once 'ifAdminStatus' has been set to 'up', it will stay 'up' until the manager changes it, or until the managed system changes it as specified in RFC 1573. It will not go 'down' simply because a Join attempt fails or because the client becomes disconnected from an emulated LAN. This makes it easy to distinguish operational problems from intentional termination, ensuring that 'ifAdminStatus' reflects the desired state of the interface.<br>To make a client leave an emulated LAN, set its 'ifAdminStatus' to 'down'. This will cause 'ifOperStatus' to change to 'down', and 'lecInterfaceState' to change to 'initialState'.<br>The 'testing' value is not currently supported for LE Clients. |
| ifOperStatus | The current operational state of the interface. In particular, the state of the MAC interface between the LAN Emulation Client and higher (sub-)layers, as opposed to the health of the client.<br>'ifOperStatus' is defined to be 'up' when, and only when, the 'lecInterfaceState' of the LAN Emulation Client is 'operational'. It may take on the values 'down' or 'unknown' at other times. The values 'testing' and 'dormant' are not used. |
| ifLastChange | Same interpretation as RFC 1573. The value of sysUpTime at the time the interface entered its current operational state. If the current state was entered prior to the last re-initialization of the local network management subsystem, then this object contains a zero value. |
| ifInOctets, ifOutOctets, and their 64-bit HC counterparts | The total number of PDU octets (received, transmitted) on all of the VCCs associated with this emulated network interface. This includes octets from circuits which have been torn down since this client joined the emulated LAN.<br>Note that these counters are not measured at the emulated network interface between the LEC and higher (sub-)layers. Instead they are measured at the interface between the LEC and the AAL layer. Thus, all received multicast packets and LAN Emulation control packets count towards 'ifInOctets', even if the LEC implementation filters out unwanted multicast packets before they reach higher (sub-)layers. |

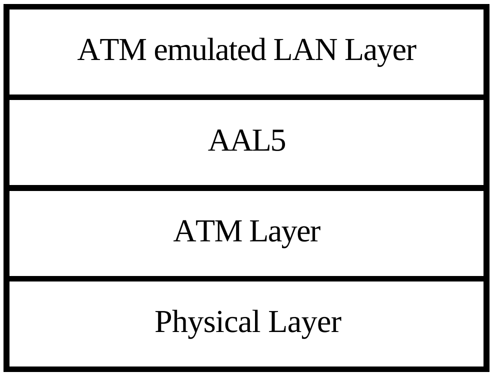
| Object | Use for the emulated network interface layer |
|---|---|
| (continued) | These counts exclude ATM cell layer overhead and AAL overhead. They include LAN Emulation overhead, which is currently just a LEC-ID. |
| Packet counters in general | Traffic counters: Total number of qualifying packets received or transmitted across the emulated network interface between this LAN Emulation Client and higher (sub-)layers. Error counters: Total number of errored PDUs, including control and data PDUs. All counters include packets from VCCs torn down since this client joined the emulated LAN.<br>Specific interpretations for each counter follow. |
| ifInUcastPkts,<br>ifHCInUcastPkts | The number of data packets delivered by this LAN Emulation Client to a higher (sub-)layer, which were not addressed to a multicast or broadcast LAN Destination. |
| ifInNUcastPkts | Required in MIB-II; deprecated in RFC 1573.<br>The sum of 'ifInMulticastPkts' and 'ifInBroadcastPkts'. |
| ifInDiscards | The number of inbound LAN Emulation PDU packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol or to the control entity in the LAN Emulation Client. One possible reason for discarding such a packet could be to free up buffer space. This count also includes packets discarded for echo-suppression reasons - which may limit its utility for detecting data-loss problems. |
| ifInErrors | The number of inbound LAN Emulation PDU packets that contained errors preventing them from being deliverable to a higher-layer protocol or to the control entity in the LAN Emulation Client. |
| ifInUnknownProtos | The number of LAN Emulation PDU packets this client received via the LUNI which were discarded because of an unknown or unsupported LAN Emulation Control, IEEE 802.3, Ethernet, or IEEE 802.5 protocol. |
| ifOutUcastPkts,<br>ifHCOutUcastPkts | The total number of data packets that higher-level protocols asked this LAN Emulation Client to transmit, and which were not addressed to a multicast or broadcast LAN Destination, including those that were discarded or not sent. |
| ifOutNUcastPkts | Required in MIB-II; deprecated in RFC 1573.<br>The sum of 'ifOutMulticastPkts' and 'ifOutBroadcastPkts'. |

| Object | Use for the emulated network interface layer |
|---|---|
| ifOutDiscards | The number of outbound LAN Emulation PDU packets which were chosen to be discarded even though no errors had been detected to prevent their being transmitted. One possible reason for discarding such a packet could be to free up buffer space. This count includes all types of LAN Emulation PDUs: Ethernet, 802.3, 802.5, and Control. |
| ifOutErrors | The number of outbound LAN Emulation PDU packets that could not be transmitted because of errors. This count includes all types of LAN Emulation PDUs: Ethernet, 802.3, 802.5, and Control. |
| ifOutQLen | Deprecated in RFC 1573.<br>The number of data packets that higher-level protocols have requested this LAN Emulation Client to transmit, and which have not (yet) been discarded or transmitted across the LUNI. |
| ifSpecific | Deprecated in RFC 1573.<br>Set to OBJECT IDENTIFIER { 0 0 } if present. |
| ifName | Same interpretation as RFC 1573. |
| ifInMulticastPkts,<br>ifHCInMulticastPkts | The number of data packets, delivered by this sub-layer to a higher (sub-)layer, which were addressed to a multicast LAN Destination. This includes both Group and Functional MAC addresses.<br>The LUNI requires the BUS to forward all broadcast and multicast packets whose ages do not exceed the maximum hold time to all clients.<br>LAN Emulation Clients are permitted to filter unwanted, received, multicast frames, but are not required to do so. These counters are measured at the emulated packet interface between the LEC and higher (sub-)layers. Thus, unwanted multicast frames are included in the count if, and only if, the implementation delivers them to a higher (sub-)layer. |
| ifInBroadcastPkts,<br>ifHCInBroadcastPkts | The number of data packets delivered by this LAN Emulation Client to a higher (sub-)layer, which were addressed to the broadcast MAC address. |
| ifOutMulticastPkts,<br>ifHCOutMulticastPkts | The total number of data packets that higher-level protocols asked this LAN Emulation Client to transmit, and which were addressed to a multicast LAN Destination, including those that were discarded or not sent. This includes both Group and Functional MAC addresses. |

| Object | Use for the emulated network interface layer |
|---|---|
| ifOutBroadcastPkts,<br>ifHCOutBroadcastPkts | The total number of data packets that higher-level protocols asked this LAN Emulation Client to transmit, and which were addressed to the broadcast MAC address, including those that were discarded or not sent. |
| ifLinkUpDownTrapEnable | Default is disabled(2). |
| ifPromiscuousMode | Set to false(2). LE Clients do not support promiscuous mode in the sense that a network manager or user understands. |
| ifConnectorPresent | Set to false(2). |

## 4.3 AToM MIB support and the Interfaces Stack Table

Hosts which implement the LAN Emulation Client MIB may also implement RFC 1573. If a client uses AAL5 encapsulation, its Interfaces Stack looks like this:



Note that

- There may be both upwards and downwards multiplexing between the emulated LAN layer and the AAL5 layer. One client may use several ATM ports, and several clients may share an ATM port - perhaps at the same time.
- In a sense, each LAN Emulation Client row in the Interfaces table represents two interfaces: the emulated IEEE 802.* packet interface between the LEC and higher (sub-)layers, and the VCC-oriented interface between the LEC and the AAL5 (sub-)layer. The reason why there is one Interfaces table row per LEC is that the LEC-to-AAL5 interface does not have enough interesting MIB-II-style traffic measurements to justify a separate Interfaces table entry.

## 4.4 Maximum Data Frame Sizes

'lecActualMaxDataFrameSize' and 'ifMtu' both reflect a client's current maximum frame size. Since 'ifMtu' is the "size of the largest network datagram that can be sent", it depends on the packet format as well (excluding everything before the INFO field, and any LLC/SNAP fields). For convenience, here is a table summarizing the relationship. (Note that clients whose LAN Type is unspecified should use either the Ethernet column or the 802.3 column.)

| **lecActualMaxDataFrameSize** | **ifMtu (Ethernet)** | **ifMtu (802.3)** | **ifMtu (802.5)** | **AAL5 SDU max. octets** |
|---|---|---|---|---|
| unspecified | 1500 | 1492 | 1462 | *n/a* |
| max1516 | 1500 | 1492 | 1462 | 1516 |
| max4544 | 4528 | 4520 | 4490 | 4544 |
| max9234 | 9218 | 9210 | 9180 | 9234 |
| max18190 | 18174 | 18166 | 18136 | 18190 |

# 5. LAN Emulation Client Addresses

Because they live in both the IEEE 802.* and ATM worlds, LAN Emulation Clients have both MAC and ATM addresses. Furthermore, although MIB-II models interfaces as having a single 'ifPhysAddress', a LEC may have several addresses of each type.

This chapter addresses the question of how to store and configure these addresses.

## 5.1 MAC Addresses

Each LAN Emulation Client has

- Zero or more unicast MAC addresses which it has registered, or wishes to register.
- Zero or more multicast MAC addresses which it wishes to receive[2].

In keeping with the principle that Interfaces table entries should model the emulated IEEE 802.* packet interface between a LEC and higher protocol (sub-)layers, these addresses are stored and configured using objects defined in MIB-II and RFC 1573. For hosts which implement MIB-II and the LEC MIB,

- 'ifPhysAddress' contains one of a client's local unicast MAC addresses. It follows the RFC 1443 MacAddress convention.
- 'lecMacAddressTable' contains all of a client's registered local unicast MAC addresses and the ATM addresses associated with them. It is a read-only table.

For hosts which implement RFC 1573 and the LEC MIB,

- Implementation of the 'ifRcvAddressGroup' is mandatory. Interpretations of its objects can be found in the table at the end of this section.
- 'ifRcvAddressTable' holds all of a client's local unicast MAC addresses, all of the multicast MAC addresses the client wishes to receive[3], and the broadcast MAC address.
- Write and create access to 'ifRcvAddressTable' are optional. A host may allow such access but restrict it to a subset of rows - for instance, to allow configuration of multicast filters for a client whose MAC address is hardwired.
- Creating, enabling, disabling, or deleting unicast MAC address rows for an operational client will cause it to generate LE_[UN]REGISTER_REQUESTs as appropriate.
- Creating or enabling multicast MAC address rows will ensure that an operational client passes all received frames with those addresses to higher (sub-)layers. Clients MAY filter unwanted frames, but are not required to do so. Unwanted multicast frames count towards 'ifIn[HC]MulticastPkts' if and only if they are "delivered" to a higher (sub-)layer.

[2] Not counting the broadcast MAC address.

[3] This may not be true for all clients. For instance, a bridge LEC which wishes to receive all multicast traffic probably would not create an ifRcvAddressTable containing every possible multicast MAC address.

| **Object** | **Use for the emulated network interface layer** |
|---|---|
| ifRcvAddressAddress | One of the 48-bit MAC addresses associated with the corresponding LAN Emulation Client, stored using the MacAddress convention. Rows for unicast MAC addresses denote addresses that clients own or want to own (use as source MAC addresses). Rows for multicast and broadcast MAC addresses denote addresses higher (sub-)layers wish to receive.<br>'ifRcvAddressTable' must include rows for all of the unicast MAC addresses the client has successfully registered with the LES. This includes 'ifPhysAddress'. This table must also include one row for the broadcast MAC address (present by default). |
| ifRcvAddressStatus | **Unicast MAC Addresses**<br>For a client whose 'lecInterfaceState' is 'busConnect' or 'operational', 'ifRcvAddressStatus' is defined to be 'active' if a unicast address is registered, 'notInService' if it is unregistered and administratively disabled, or 'notReady' otherwise (LES rejected registration, information needed to activate row is missing, etc.).<br>For a client whose 'lecInterfaceState' is 'initialState', 'lecsConnect', or 'configure', 'ifRcvAddressStatus' is defined to be 'active' if the client is configured to register the unicast MAC address on its next Join, 'notInService' if an address is administratively disabled, or 'notReady' otherwise.<br>For a client whose 'lecInterfaceState' is either 'join' or 'initialRegistration', a unicast address which the client will attempt to register, but which the client has not yet attempted to register, shall have the status 'active'.<br>**Multicast MAC Addresses**<br>An 'ifRcvAddressStatus' of 'active' means that incoming packets addressed to the specified multicast address should be delivered to higher protocol (sub-)layers. LEC implementations may, but are not required to, filter out unwanted received multicast traffic based on the multicast MAC addresses in 'ifRcvAddressTable'.<br>Other status values mean that the row will be ignored because it has been disabled ('notInService'), or it has not been properly configured ('notReady'). The client is free to filter incoming packets for the specified multicast address, rather than delivering them to higher (sub-)layers.<br>**Broadcast MAC Addresses**<br>These addresses are treated in a similar fashion to multicast MAC addresses, with one major exception: a management station may not create or delete broadcast address rows. An implementation may permit management stations to set the status of a broadcast address row to 'notInService'. In this event, a client may discard incoming frames, but may not tear down the Multicast Forward VCC. |
| ifRcvAddressType | Same interpretation as RFC 1573. |

## 5.2 ATM Addresses

Each LAN Emulation Client has zero or more ATM addresses - one or more addresses if it is operational. These addresses may denote different ATM ports or the same port. Several LECs may share an ATM port, provided that they use different ATM addresses.

Because we have reserved each client's 'ifPhysAddress' and 'ifRcvAddressTable' to hold MAC addresses, we cannot use MIB-II and RFC 1573 to store a LEC's ATM addresses. Neither can we use the Interfaces stack to determine them - the many-to-many relationships between LECs, LEC ATM addresses, and ATM ports would make this technique unreliable even if the use of RFC 1573 was not optional.

Thus, we place the addresses in the LAN Emulation Client MIB.

- *lecPrimaryAtmAddress* identifies each client's primary ATM address.
- *lecAtmAddressTable* identifies all of each client's ATM addresses.

# 6. LAN Emulation Client MIB Description

Each network-manageable host which can act as a LAN Emulation Client SHOULD implement the LAN Emulation Client MIB.

## 6.1 Motivation

While Interfaces table entries for each LEC are useful, they do not cover all of the things which a network manager might need to know or do. The LEC MIB lets network managers

- Examine Initial State Parameters - including the LAN Name and LES ATM address for each operational client. Given that a LES is likely to know all its current clients, identifying the LES may make it easier for a network manager to locate other clients.
- Monitor statistics for LAN Emulation control traffic and SVC failures. This can provide an indication of whether a LEC is being swamped by LE_ARPs, or is failing to receive them.
- Examine LE_ARP caches.

The LEC MIB also provides the optional abilities to

- Create and destroy LAN Emulation Clients.
- Configure a client's Initial State Parameters.
- Create and destroy LE_ARP cache entries.

## 6.2 MIB Organization

The LAN Emulation Client MIB is organized into a number of groups, each corresponding to a table. They include

1. Client groups - *one row per client*

    a. Configuration group
    creation, deletion, and configuration

    b. Status group
    status and operational parameters

    c. Statistics group
    counters for LAN Emulation control traffic and SVCs

    d. Server Connections group
    identifies Control and Multicast VCCs

2. ATM Addresses group - *one row per (client, ATM address)*

3. Registered LAN Destination groups - *one row per (client, LAN Destination)*

   a. MAC Addresses group

   b. Route Descriptors group

4. LE_ARP cache groups - *one row per (client, LAN Destination)*

   a. MAC Address translations

   b. Route Descriptor translations

5. Index Mapping group - *one row per client, for translating ifIndex values to lecIndex values*

## 6.3 MIB Groups

This section briefly describes each group and object in the LEC MIB. For more detail, consult the MIB definition and the LAN Emulation specification.

### *6.3.1 Configuration Group*

This mandatory group contains settable configuration parameters, and consists of a table with one row for each LAN Emulation Client. Many objects correspond to Initial State Parameters in the LAN Emulation Specification, and are annotated with the appropriate *(Cxx)* label.

- *lecIndex* - Identifies the client.
- *lecRowStatus* - Used to create and destroy clients on hosts which support this.
- *lecOwner* - The entity that configured this entry and is therefore using the resources assigned to it.
- *lecConfigMode* - Controls whether this client uses the LECS to auto-configure.
- *lecConfigLanType (C2)* - The LAN Type this client will use the next time it enters the Initial state. This MIB object does not reflect LE_{CONFIGURE,JOIN}_RESPONSEs.
- *lecConfigMaxDataFrameSize (C3)* - The maximum data frame size this client will use the next time it enters the Initial state. This MIB object does not reflect LE_{CONFIGURE,JOIN}_RESPONSEs.
- *lecConfigLanName (C5)* - The ELAN name this client will use the next time it enters the Initial State. This MIB object does not reflect LE_{CONFIGURE,JOIN}_RESPONSEs.
- *lecConfigLesAtmAddress (C9)* - The LAN Emulation Server which this client will use the next time that you start the client in 'manual' configuration mode. This object is ignored if the client is using the LECS.
- *lecControlTimeout (C7)* - Time-out period used for timing out most request/response control frame interactions.
- *lecMaxUnknownFrameCount (C10)* - Used to limit flooding to the BUS.
- *lecMaxUnknownFrameTime (C11)* - Used to limit flooding to the BUS.

- *lecVccTimeoutPeriod (C12)* - The length of time after which an inactive Data Direct SVC should be closed.
- *lecMaxRetryCount (C13)* - Limits the number of LE_ARP_REQUESTs that can be issued for a given data frame.
- *lecAgingTime (C17)* - The maximum time that a LE Client will maintain an entry in its LE_ARP cache in the absence of a verification of that relationship.
- *lecForwardDelayTime (C18)* - The maximum time that a LE Client will maintain an entry in its LE_ARP cache for a non-local MAC address in the absence of a verification of that relationship, so long as the Topology Change flag is true. This value SHOULD BE less than the *lecAgingTime.*
- *lecExpectedArpResponseTime (C20)* - The maximum time that the LE Client expects a LE_ARP_REQUEST/LE_ARP_RESPONSE cycle to take. This value is used for retries and verifies.
- *lecFlushTimeout (C21)* - Time limit to wait to receive a LE_FLUSH_RESPONSE after the LE_FLUSH_REQUEST has been sent before taking recovery action.
- *lecPathSwitchingDelay (C22)* - The time since sending a frame to the BUS after which the LE Client may assume that the frame has been either discarded or delivered to the recipient.
- *lecLocalSegmentID (C23)* - For an IEEE 802.5 LAN Emulation Client which is a Source Routing bridge, the segment ID of the emulated LAN.
- *lecMulticastSendType (C24)* - The type of service (best-effort, variable-bit-rate, or constant-bit-rate) that the LE Client should request when establishing the Multicast Send VCC.
- *lecMulticastSendAvgRate (C25)* - The Forward and Backward Sustained Cell Rate that the LE Client should request when setting up the Multicast Send VCC, when requesting variable-bit-rate service.
- *lecMulticastSendPeakRate (C26)* - The Forward and Backward Peak Cell Rate that the LE Client should request when setting up the Multicast Send VCC, when requesting either variable-bit-rate or constant-bit-rate service.
- *lecConnectionCompleteTimer (C28)* - In Connection Establishment, the time period in which data or a READY_IND message is expected from a Calling Party.

### 6.3.2 Status Group

This mandatory group contains read-only status, identification, and operational parameters, and consists of a table with one row for each LAN Emulation Client. Many objects correspond to Initial State Parameters, and are annotated with the appropriate *(Cxx)* label.

- *lecIndex* - Identifies the client.
- *lecIfIndex* - Identifies the client's row in the MIB-II / RFC 1573 Interfaces table.
- *lecPrimaryAtmAddress (C1)* - The primary ATM address of this client.

- *lecID (C14)* - For an operational client, the LEC-ID assigned by the LAN Emulation Server. This ID must be in the range X'0001' through X'FEFF'. For a client which does not yet have a valid LEC-ID, the value 0.
- *lecInterfaceState* - Describes the operational state of each client in more detail than 'ifOperStatus'.
- *lecLastFailureRespCode* - Status code from the last failed Configure or Join response.
- *lecLastFailureState* - The state this client was in when it updated *lecLastFailureRespCode*.
- *lecProtocol* - The LAN Emulation protocol which this client supports.
- *lecVersion* - The LAN Emulation protocol version which this client supports.
- *lecTopologyChange (C19)* - Indicates whether the LE Client is using the Forward Delay Time to age non-local entries in its LE-ARP cache.
- *lecConfigServerAtmAddress* - The address of the LAN Emulation Configuration Server.
- *lecConfigSource* - Indicates whether this client used the LECS, and, if so, what method it used to establish the Configuration Direct VCC.
- *lecActualLanType (C2)* - The LAN Type this client is using now.
- *lecActualMaxDataFrameSize (C3)* - The maximum data frame size this client is using now.
- *lecActualLanName (C5)* - The ELAN name this client is using now.
- *lecActualLesAtmAddress (C9)* - The LAN Emulation Server address currently in use or most recently attempted.
- *lecProxyClient (C4)* - Indicates whether this client is a proxy client.

### 6.3.3 Statistics Group

This mandatory group consists of a table with one row for each LAN Emulation Client.

- *lecIndex* - Identifies the client.
- *lecArpRequestsOut, lecArpRequestsIn, lecArpRepliesOut, lecArpRepliesIn* - Counts of the LE_ARP requests and replies received and transmitted by this client.
- *lecControlFramesOut, lecControlFramesIn* - The total number of control frames sent and received by this client.
- *lecSvcFailures* - The number of SVCs which this client either tried and failed to establish, or rejected for protocol or security reasons.

### 6.3.4 Server Connections Group

This mandatory group consists of a table with one row for each LAN Emulation Client.

- *lecIndex* - Identifies the client.
- *lecConfigDirect{ Interface, Vpi, Vci }* - Identify the Configuration Direct VCC, if any.

- *lecControlDirect{ Interface, Vpi, Vci }* - Identify the Control Direct VCC, if any.
- *lecControlDistribute{ Interface, Vpi, Vci }* - Identify the Control Distribute VCC, if any.
- *lecMulticastSend{ Interface, Vpi, Vci }* - Identify the Multicast Send VCC, if any.
- *lecMulticastForward{ Interface, Vpi, Vci }* - Identify the Multicast Forward VCC, if any.

### 6.3.5 ATM Addresses Group

This mandatory group lists all of the ATM Addresses (Initial State Parameter C1) for this host's LAN Emulation Clients. It consists of a table indexed by LE Client and ATM address.

- *lecIndex* - Identifies the client.
- *lecAtmAddress* - Identifies one of its ATM addresses.
- *lecAtmAddressStatus* - Allows managers to create and delete table rows.

### 6.3.6 Registered MAC Addresses Group

This mandatory group lists all of the Local Unicast MAC Addresses (Initial State Parameter C6) registered for this host's LAN Emulation Clients. It consists of a table indexed by LE Client and MAC address.

- *lecIndex* - Identifies the client.
- *lecMacAddress* - The registered MAC address.
- *lecMacAddressAtmBinding* - The ATM address registered for this MAC address.

### 6.3.7 Registered Route Descriptors Group

This conditionally-mandatory group lists all of the Route Descriptors (Initial State Parameter C8) registered for this host's LAN Emulation clients. It consists of a table indexed by LE Client, IEEE 802.5 LAN ID, and bridge number.

- *lecIndex* - Identifies the client.
- *lecRouteDescrSegmentID* - The LAN ID portion of the IEEE 802.5 route descriptor.
- *lecRouteDescrBridgeNumber* - The Bridge Number portion of the route descriptor.
- *lecRouteDescrAtmBinding* - The ATM address registered for this route descriptor.

### 6.3.8 LE_ARP Cache Group - MAC Addresses

This mandatory group provides access to a LAN Emulation Client's MAC-to-ATM ARP cache (Initial State Parameter C16). It consists of a table indexed by LE Client and MAC address.

- *lecIndex* - Identifies the client.
- *leArpMacAddress* - The MAC address for which this cache entry provides a translation. This may be a unicast or broadcast MAC address, but not a multicast one.

- *leArpAtmAddress* - The ATM address to which it translates.
- *leArpIsRemoteAddress* - Indicates whether *leArpMACaddress* is local or remote.
- *leArpEntryType* - Indicates how this entry was created and whether it is aged.
- *leArpRowStatus* - Lets network managers create and destroy LE_ARP cache entries.

### 6.3.9 LE_ARP Cache Group - Route Descriptors

This conditionally-mandatory group provides access to an IEEE 802.5 LAN Emulation Client's Route Descriptor-to-ATM ARP cache (Initial State Parameter C16). It consists of a table indexed by LE Client, IEEE 802.5 LAN ID, and bridge number.

- *lecIndex* - Identifies the client.
- *leRDArpSegmentID* - The LAN ID portion of the IEEE 802.5 route descriptor.
- *leRDArpBridgeNumber* - The Bridge Number portion of the IEEE 802.5 route descriptor.
- *leRDArpAtmAddress* - The ATM address to which it translates.
- *leRDArpEntryType* - Indicates how this entry was created and whether it is aged.
- *leRDArpRowStatus* - Lets network managers create and destroy LE_ARP cache entries

### 6.3.10 Index Mapping Group

This mandatory group describes the ifIndex --> lecIndex translation. It consists of a table with one row for each LE Client.

- *ifIndex* - Identifies the client's entry in the MIB-II / RFC 1573 Interfaces table.
- *lecMappingIndex* - Identifies the corresponding *lecIndex* value.

## 6.4 Interaction with ifAdminStatus

Suppose that we have an inactive client whose lecIndex is 1, whose lecIfIndex is 10, and whose lecConfigMode is manual. Now suppose that we send its SNMP agent this request:

```
ifAdminStatus.10 = up;
lecConfigMode.1 = automatic;
```

Assuming that the request is accepted, two things might happen.

- The agent might set the client into automatic mode before enabling it, causing the client to auto-configure. This would be the most useful response.
- The agent might also start the client up in manual configuration mode, and then tell it to auto-configure next time, surprising the user in an unpleasant way.

**Recommendation**

When processing a SetRequest PDU which will change a client's parameters and enable the client, an agent SHOULD update the parameters before enabling the client.

(Theoretically, you could say that the client's desired state changes instantly at time T, but that the action of joining an emulated LAN is not triggered until time T + epsilon, when the new parameters are in effect.)

## 6.5 Limitations

If a proxy client has multiple ATM addresses, there is no way to determine which ATM address the client will use when responding to LE_ARP_REQUESTs for a given remote MAC address. This is a consequence of the fact that the MAC Address table includes only Local Unicast MAC Addresses.

The LEC MIB does not provide ways to

- Identify Data Direct VCCs.
- Get VCC topology information (local and far-end ATM addresses) that is not currently in the AToM MIB, or
- Configure PVCs for LAN Emulation use.

It is expected that some of these features will be incorporated into other ATM MIBs.

# 7. LAN Emulation Client MIB Text

```
--
--      MIB for configuration, performance, and fault management of ATM
--      LAN Emulation Clients.
--

        LAN-EMULATION-CLIENT-MIB DEFINITIONS ::= BEGIN


            IMPORTS

                MODULE-IDENTITY, OBJECT-TYPE,
                enterprises, Counter32, Integer32      FROM SNMPv2-SMI

                TEXTUAL-CONVENTION, MacAddress,
                RowStatus, TruthValue, DisplayString   FROM SNMPv2-TC

                MODULE-COMPLIANCE, OBJECT-GROUP        FROM SNMPv2-CONF

                ifIndex                                FROM RFC1213-MIB

                OwnerString                            FROM RFC1271-MIB;



            -- ------------------------------------------------------------ --
            --
            --  The following OBJECT IDENTIFIER definition should be moved to
            --  some other location, to conform with the statement in RFC 1442
            --  that the MODULE-IDENTITY section must appear immediately after
            --  any IMPORTs or EXPORTs statements.
            --
            --  However, some MIB utilities don't like MODULE-IDENTITY OIDs of
            --  the form { enterprises atmForum(353) ... 1 }.  Separate OBJECT
            --  IDENTIFIER definitions appear to be more widely accepted - so,
            --  in the interests of compatibility, it remains.
            --
            -- ------------------------------------------------------------ --


            -- The object identifier subtree for ATM Forum LAN Emulation MIBs
            atmfLanEmulation  OBJECT IDENTIFIER ::= {
                                        enterprises
                                           atmForum(353)
                                              atmForumNetworkManagement(5)
                                                 3
                              }


            leClientMIB MODULE-IDENTITY
                LAST-UPDATED "9505100000Z"
                ORGANIZATION "ATM Forum LAN Emulation Sub-Working Group"
                CONTACT-INFO
                      "
            The ATM Forum
            303 Vintage Park Drive
            Foster City, CA  94404
            United States of America
            Tel: 415-578-6860
            E-mail: info@atmforum.com"
    DESCRIPTION
        "This module defines a portion of the management
         information base (MIB) for managing ATM LAN Emulation
         Client nodes.  It is meant to be used in connection with
         the AToM MIB and MIB-II / RFC 1573 'ifTable' entries
         for each LEC / emulated 802.x network interface."
    ::= { atmfLanEmulation 1 }


leClientMIBObjects  OBJECT IDENTIFIER ::= { leClientMIB 1 }


-- This MIB module consists of the following groups:
--
--  (1) LAN Emulation Client groups
--      (a) Configuration group
--      (b) Status group
--      (c) Statistics group
--      (d) Server VCC group
--
--  (2) LEC ATM Addresses group
--
--  (3) Registered LAN Destination groups
--      (a) MAC addresses group
--      (b) Route Descriptors group
--
--  (4) LE_ARP cache groups
--      (a) MAC address cache group
--      (b) Route descriptor cache group
--
--  (5) ifIndex mapping group
--
-- Security management objects have been explicitly omitted from
-- this MIB as being outside the scope of the V1.0 LAN Emulation
-- specification.


AtmLaneAddress ::= TEXTUAL-CONVENTION
    STATUS     current
    DESCRIPTION
          "A twenty-octet binary string, containing a standard
           ATM Forum address -- or the zero-length string,
           indicating the absence of an address.

           For LAN Emulation purposes, the eight-octet address
           format is not used."
    SYNTAX     OCTET STRING ( SIZE( 0 | 20 ) )

VpiInteger ::= TEXTUAL-CONVENTION
    STATUS     current
    DESCRIPTION
          "An integer large enough to hold a VPI."
    SYNTAX     INTEGER ( 0..255 )

VciInteger ::= TEXTUAL-CONVENTION
    STATUS     current
    DESCRIPTION
          "An integer large enough to hold a VCI."
    SYNTAX     INTEGER ( 0..65535 )

LeConnectionInterface ::= TEXTUAL-CONVENTION
    STATUS     current
    DESCRIPTION
            "A combination flag and ifTable index, indicating
             whether a LAN Emulation circuit exists - and, if
             so, which interface is associated with it at the
             point where it connects to a LE Client.

             Objects of this type are always defined as part of
             a set that includes

                     fooInterface   LeConnectionInterface
                     fooVpi         VpiInteger
                     fooVci         VciInteger

             The interpretation of these objects is as follows.

             1.  If no connection exists, 'fooInterface' has a
                 value of 0.  Because Interfaces table entries
                 always have 'ifIndex' values larger than 0,
                 'fooInterface' reliably serves as a 'connection
                 exists' flag.

                 In this case, 'fooVpi' and 'fooVci' are
                 meaningless, and have the value 0.

             2.  If a PVC or SVC exists, 'fooInterface' is defined
                 to have the value of the MIB-II/RFC 1573 'ifIndex'
                 of the 'atm' interface associated with the VCC.
                 'fooVpi' and 'fooVci' will contain its VPI/VCI.
                 Therefore, ('fooInterface', 'fooVpi', 'fooVci')
                 give you an index into the AToM MIB which allows
                 you to examine and play with the circuit further.

              3. If a proprietary connection (such as an internal
                 data path between co-located components) exists,
                 this specification does not mandate how it should
                 be managed.  One option is to set 'fooInterface'
                 to the value of the MIB-II/RFC 1573 'ifIndex' for
                 the LAN Emulation Client.  This indicates that a
                 connection exists, but is not being managed in the
                 same fashion as an ATM VCC."
    SYNTAX   INTEGER ( 0..2147483647 )

LecState ::= TEXTUAL-CONVENTION
    STATUS     current
    DESCRIPTION
          "An official protocol state of a LAN Emulation Client."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.3.1"
    SYNTAX     INTEGER {
                         initialState(1),
                         lecsConnect(2),
                         configure(3),
                         join(4),
                         initialRegistration(5),
                         busConnect(6),
                         operational(7)
                        }

LecDataFrameFormat ::= TEXTUAL-CONVENTION
    STATUS     current
    DESCRIPTION
          "A 'LAN Type' value.

           C2  LAN Type.  The type of LAN that the LE Client is,
               or wishes to become, a member of.  This MUST be one
               of Ethernet/IEEE 802.3, IEEE 802.5, or Unspecified."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 5.1.1"
    SYNTAX      INTEGER {
                         unspecified(1),
                         aflane8023(2),
                         aflane8025(3)
                        }

LecDataFrameSize ::= TEXTUAL-CONVENTION
    STATUS     current
    DESCRIPTION
          "A 'Maximum Data Frame Size' value.

           C3  Maximum Data Frame Size.  The maximum AAL-5 SDU size
               of a data frame that the LE Client wishes to send on
               the Multicast Send VCC or to receive on the
               Multicast Send VCC or Multicast Forward VCC.  This
               parameter also specifies the maximum AAL-5 SDU on
               all of a LE Client's Data Direct VCCs.  This MUST be
               either 1516, 4544, 9234, or 18190 octets, or
               Unspecified."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 5.1.1"
    SYNTAX      INTEGER {
                         unspecified(1),
                         max1516(2),
                         max4544(3),
                         max9234(4),
                         max18190(5)
                        }

LeArpTableEntryType ::= TEXTUAL-CONVENTION
    STATUS     current
    DESCRIPTION
            "Indicates how a LE_ARP table entry was created and
             whether it is subject to aging.
```

```
                 other(1)
                     The LE_ARP entry does not fall into one of
                     the categories defined below.

                 learnedViaControl(2)
                     This LE_ARP entry was learned by using the
                     LE_ARP_REQUEST / LE_ARP_RESPONSE protocol,
                     or by otherwise observing relevant traffic
                     on Control VCCs.

                     Entries of this type are aged.

                 learnedViaData(3)
                     This LE_ARP entry was learned by observing
                     incoming traffic on Data VCCs.

                     Entries of this type are aged.

                 staticVolatile(4)
                     This LE_ARP entry was created by management.
                     It will not be aged.  On the other hand, it
                     will not survive a restart of the client.

                     If an agent permits LE_ARP entries of this
                     type to be created, it may require that the
                     LAN Emulation Client be in the 'operational'
                     state at the time.

                 staticNonVolatile(5)
                     This LE_ARP entry was created by management.
                     It will not be aged, and it will survive a
                     restart of the client.

             The values 'learnedViaData' and 'learnedViaControl'
             can be read, but may not be written."
    SYNTAX      INTEGER {
                         other(1),
                         learnedViaControl(2),
                         learnedViaData(3),
                         staticVolatile(4),
                         staticNonVolatile(5)
                        }


-- ------------------------------------------------------------- --

--
--  LAN Emulation Client configuration group
--

lecConfigTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF LecConfigEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "A table describing all of the LAN Emulation Clients
             implemented by this host.  Each LE Client has a row
             in the MIB-II/RFC 1573 Interfaces table (describing
             the emulated packet interface it presents to higher
             layers).  Each LE Client also has a row in this and
             other LEC MIB tables (describing its interface with
             other LAN Emulation components).

             This table contains configuration variables.  Three
             extension tables contain client status, performance
             statistics, and information about control/multicast
             VCCs.

             Unlike hardware ports, LE Clients can be created by
             management.  However, the RFC 1573 Interfaces table
             does not directly support row creation.  Therefore,
             creating or deleting a row in the lecConfigTable is
             defined to have the side effect of creating or
             deleting corresponding rows in

                 -  the MIB-II / RFC 1573 Interfaces table,
                 -  the 'lecMappingTable',
                 -  the 'lecStatusTable',
                 -  the 'lecServerVccTable',
                 -  the 'lecStatisticsTable', and
                 -  any other dependent tables

             New Interfaces table rows for LAN Emulation Clients
             always have 'ifAdminStatus' set to 'down'.


             A Note On Indexing:
             -------------------
             Most of the tables in this MIB are indexed in whole
             or in part by 'lecIndex' - not by 'ifIndex'.

             Why is there a separate index?

             Traditionally, ifIndex values are chosen by agents,
             and are permitted to change across restarts.  Using
             ifIndex to index lecConfigTable could complicate
             row creation and/or cause interoperability problems
             (if each agent had special restrictions on ifIndex).
             Having a separate index avoids these problems.      "
    ::= { leClientMIBObjects 1 }

lecConfigEntry OBJECT-TYPE
    SYNTAX       LecConfigEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "Each table entry contains configuration information
             for one LAN Emulation Client.

             Most of the objects are derived from Initial State
             Parameters in the LAN Emulation specification."
    INDEX   { lecIndex }
    ::= { lecConfigTable 1 }

LecConfigEntry ::=
    SEQUENCE {
        --
        --  Row indices, creation, and deletion.
        --
        lecIndex                    INTEGER,
        lecRowStatus                RowStatus,
        lecOwner                    OwnerString,

        --
        --  Key parameters for Configure / Join phase.  Note that
        --  these are not operational values - see lecStatusTable
        --  for those.
        --
        lecConfigMode               INTEGER,
        lecConfigLanType            LecDataFrameFormat,
        lecConfigMaxDataFrameSize   LecDataFrameSize,
        lecConfigLanName            DisplayString,
        lecConfigLesAtmAddress      AtmLaneAddress,

        --
        --  Other parameters.  These may be changed either by the
        --  network manager or by the LE Configuration Server.
        --
        lecControlTimeout           INTEGER,
        lecMaxUnknownFrameCount     INTEGER,
        lecMaxUnknownFrameTime      INTEGER,
        lecVccTimeoutPeriod         Integer32,
        lecMaxRetryCount            INTEGER,
        lecAgingTime                INTEGER,
        lecForwardDelayTime         INTEGER,
        lecExpectedArpResponseTime  INTEGER,
        lecFlushTimeOut             INTEGER,
        lecPathSwitchingDelay       INTEGER,
        lecLocalSegmentID           INTEGER,
        lecMulticastSendType        INTEGER,
        lecMulticastSendAvgRate     Integer32,
        lecMulticastSendPeakRate    Integer32,
        lecConnectionCompleteTimer  INTEGER

    }

lecIndex OBJECT-TYPE
    SYNTAX      INTEGER ( 1..2147483647 )
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A value which uniquely identifies this conceptual
             row in the lecConfigTable.

             If the conceptual row identified by this value of
             lecIndex is recreated following an agent restart,
             the same value of lecIndex must be used to identify
             the recreated row.  (However, the Interfaces table
             index associated with the client may change.)"
    ::= { lecConfigEntry 1 }

lecRowStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "This object lets network managers create and delete
             LAN Emulation Clients, on systems that support this
             optional capability.

             It does not control Joins and Terminations; they are
             controlled by 'ifAdminStatus'.  However, taking rows
             out of service will have the side effect of changing
             their 'ifAdminStatus' values to 'down', thus causing
             any active emulated LAN connections to be terminated.

             Within each conceptual lecConfigTable row, objects
             which are writable may be modified regardless of the
             value of lecRowStatus.  It is not necessary to set a
             row's status to 'notInService' first.

             When creating a LAN Emulation Client, it is up to the
             management station to determine a suitable 'lecIndex'.
             To facilitate interoperability, agents should not put
             any restrictions on the 'lecIndex' beyond the obvious
             ones that it be valid and unused.

             If you create a LAN Emulation Client via this object,
             it will initially have

                 'ifAdminStatus' = 'down'
                 'ifOperStatus' = 'down'
                 'lecInterfaceState' = 'initialState'            "
    ::= { lecConfigEntry 2 }

lecOwner OBJECT-TYPE
    SYNTAX      OwnerString( SIZE (0..127) )
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The entity that configured this entry and is therefore
             using the resources assigned to it."
    ::= { lecConfigEntry 3 }

lecConfigMode OBJECT-TYPE
    SYNTAX      INTEGER {
                         automatic(1),
                         manual(2)
                        }
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "Indicates whether this LAN Emulation Client should
             auto-configure the next time it is (re)started.

             In automatic(1) mode, a client uses a LAN Emulation
             Configuration Server to learn the ATM address of its
             LAN Emulation Server, and to obtain other parameters.

             lecConfig{ LanType, MaxDataFrameSize, LanName } are
             used in the Configure request.  lecConfigLesAtmAddress
```

```
                 is ignored.

                 In manual(2) mode, management tells the client the
                 ATM address of its LAN Emulation Server and the
                 values of other parameters.

                 lecConfig{ LanType, MaxDataFrameSize, LanName } are
                 used in the Join request.  lecConfigLesAtmAddress
                 tells the client which LES to call."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Sections 3.4.1.1 and 5.3"
        DEFVAL   { automatic }
        ::= { lecConfigEntry 4 }

    lecConfigLanType OBJECT-TYPE
        SYNTAX      LecDataFrameFormat
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C2  LAN Type.

                 The data frame format which this client will use the
                 next time it returns to the Initial State.

                 Auto-configuring clients use this parameter in their
                 Configure requests.  Manually-configured clients use
                 it in their Join requests.

                 This MIB object will not be overwritten with the new
                 value from a LE_{JOIN,CONFIGURE}_RESPONSE.  Instead,
                 lecActualLanType will be."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL   { unspecified }
        ::= { lecConfigEntry 5 }

    lecConfigMaxDataFrameSize OBJECT-TYPE
        SYNTAX      LecDataFrameSize
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C3  Maximum Data Frame Size.

                 The maximum data frame size which this client will
                 use the next time it returns to the Initial State.

                 Auto-configuring clients use this parameter in their
                 Configure requests.  Manually-configured clients use
                 it in their Join requests.

                 This MIB object will not be overwritten with the new
                 value from a LE_{JOIN,CONFIGURE}_RESPONSE.  Instead,
                 lecActualMaxDataFrameSize will be."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL   { unspecified }
        ::= { lecConfigEntry 6 }

    lecConfigLanName OBJECT-TYPE
        SYNTAX      DisplayString (SIZE( 0..32 ))
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C5  ELAN Name.

                 The ELAN Name this client will use the next time it
                 returns to the Initial State.

                 Auto-configuring clients use this parameter in their
                 Configure requests.  Manually-configured clients use
                 it in their Join requests.

                 This MIB object will not be overwritten with the new
                 value from a LE_{JOIN,CONFIGURE}_RESPONSE.  Instead,
                 lecActualLanName will be."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        ::= { lecConfigEntry 7 }

    lecConfigLesAtmAddress OBJECT-TYPE
        SYNTAX      AtmLaneAddress
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C9  LE Server ATM Address.

                 The LAN Emulation Server which this client will use
                 the next time it is started in manual configuration
                 mode.

                 When lecConfigMode is 'automatic', there is no need
                 to set this address, and no advantage to doing so.
                 The client will use the LECS to find a LES, putting
                 the auto-configured address in lecActualLesAtmAddress
                 while leaving lecConfigLesAtmAddress alone."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        ::= { lecConfigEntry 8 }

    lecControlTimeout OBJECT-TYPE
        SYNTAX      INTEGER ( 10..300 )
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C7  Control Time-out.  Time out period used for
                     timing out most request/response control frame
                     interactions, as specified elsewhere [in the
                     LAN Emulation specification].

                 This time value is expressed in seconds."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL   { 120 }
        ::= { lecConfigEntry 9 }

    lecMaxUnknownFrameCount OBJECT-TYPE
        SYNTAX      INTEGER ( 1..10 )
        UNITS       "frames"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C10 Maximum Unknown Frame Count.  See the description
                     of lecMaxUnknownFrameTime below."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL   { 1 }
        ::= { lecConfigEntry 10 }

    lecMaxUnknownFrameTime OBJECT-TYPE
        SYNTAX      INTEGER ( 1..60 )
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C11 Maximum Unknown Frame Time.  Within the period of
                     time defined by the Maximum Unknown Frame Time, a
                     LE Client will send no more than Maximum Unknown
                     Frame Count frames to the BUS for a given unicast
                     LAN Destination, and it must also initiate the
                     address resolution protocol to resolve that LAN
                     Destination.

                 This time value is expressed in seconds."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL   { 1 }
        ::= { lecConfigEntry 11 }

    lecVccTimeoutPeriod OBJECT-TYPE
        SYNTAX      Integer32
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C12 VCC Time-out Period.  A LE Client SHOULD release
                     any Data Direct VCC that it has not used to
                     transmit or receive any data frames for the
                     length of the VCC Time-out Period.  This parameter
                     is only meaningful for SVC Data Direct VCCs.

                 This time value is expressed in seconds.  The default
                 value is 20 minutes.  A value of 0 seconds means that
                 the timeout period is infinite.  Negative values will
                 be rejected by the agent."
        REFERENCE
```

```
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL   { 1200 }
        ::= { lecConfigEntry 12 }

    lecMaxRetryCount OBJECT-TYPE
        SYNTAX      INTEGER( 0..2 )
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C13 Maximum Retry Count.  A LE CLient MUST not retry
                     a LE_ARP_REQUEST for a given frame's LAN
                     destination more than Maximum Retry Count times,
                     after the first LE_ARP_REQUEST for that same
                     frame's LAN destination."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL   { 1 }
        ::= { lecConfigEntry 13 }

    lecAgingTime OBJECT-TYPE
        SYNTAX      INTEGER ( 10..300 )
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C17 Aging Time.  The maximum time that a LE Client
                     will maintain an entry in its LE_ARP cache in
                     the absence of a verification of that
                     relationship.

                 This time value is expressed in seconds."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL  { 300 }
        ::= { lecConfigEntry 14 }

    lecForwardDelayTime OBJECT-TYPE
        SYNTAX      INTEGER ( 4..30 )
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C18 Forward Delay Time.  The maximum time that a LE
                     Client will maintain an entry for a non-local MAC
                     address in its LE_ARP cache in the absence of a
                     verification of that relationship, as long as the
                     Topology Change flag C19 is true.

                 lecForwardDelayTime SHOULD BE less than lecAgingTime.
                 When it is not, lecAgingTime governs LE_ARP aging.

                 This time value is expressed in seconds."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL  { 15 }
        ::= { lecConfigEntry 15 }

    lecExpectedArpResponseTime OBJECT-TYPE
        SYNTAX      INTEGER ( 1..30 )
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C20 Expected LE_ARP Reponse Time.  The maximum time
                     that the LEC expects an LE_ARP_REQUEST/
                     LE_ARP_RESPONSE cycle to take.  Used for retries
                     and verifies.

                 This time value is expressed in seconds."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL   { 1 }
        ::= { lecConfigEntry 16 }

    lecFlushTimeOut OBJECT-TYPE
        SYNTAX      INTEGER ( 1..4 )
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C21 Flush Time-out.  Time limit to wait to receive a
                     LE_FLUSH_RESPONSE after the LE_FLUSH_REQUEST has
                     been sent before taking recovery action.

                 This time value is expressed in seconds."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL   { 4 }
        ::= { lecConfigEntry 17 }

    lecPathSwitchingDelay OBJECT-TYPE
        SYNTAX      INTEGER ( 1..8 )
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "C22 Path Switching Delay.  The time since sending a
                     frame to the BUS after which the LE Client may
                     assume that the frame has been either discarded
                     or delivered to the recipient.  May be used to
                     bypass the Flush protocol.

                 This time value is expressed in seconds."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification, V1.0,
                 Section 5.1.1"
        DEFVAL   { 6 }
        ::= { lecConfigEntry 18 }

    lecLocalSegmentID OBJECT-TYPE
```

```
    SYNTAX      INTEGER ( 0..4095 )
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "C23 Local Segment ID.  The segment ID of the emulated
                 LAN.  This is only required for IEEE 802.5 clients
                 that are Source Routing bridges."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecConfigEntry 19 }

lecMulticastSendType OBJECT-TYPE
    SYNTAX      INTEGER {
                         bestEffort(1),
                         variableBitRate(2),
                         constantBitRate(3)
                        }
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "C24 Multicast Send VCC Type.  Signalling parameter
                 that SHOULD be used by the LE Client when
                 establishing the Multicast Send VCC.

                 This is the method to be used by the LE Client
                 when specifying traffic parameters when it sets
                 up the Multicast Send VCC for this emulated LAN."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecConfigEntry 20 }

lecMulticastSendAvgRate OBJECT-TYPE
    SYNTAX      Integer32
    UNITS       "cells per second"
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "C25 Multicast Send VCC AvgRate.  Signalling parameter
                 that SHOULD be used by the LE Client when
                 establishing the Multicast Send VCC.

                 Forward and Backward Sustained Cell Rate to be
                 requested by LE Client when setting up Multicast
                 Send VCC, if using Variable bit rate codings."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecConfigEntry 21 }

lecMulticastSendPeakRate OBJECT-TYPE
    SYNTAX      Integer32
    UNITS       "cells per second"
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "C26 Multicast Send VCC PeakRate.  Signalling parameter
```

```
                 that SHOULD be used by the LE Client when
                 establishing the Multicast Send VCC.

                 Forward and Backward Peak Cell Rate to be
                 requested by LE Client when setting up the
                 Multicast Send VCC when using either Variable or
                 Constant bit rate codings."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecConfigEntry 22 }

lecConnectionCompleteTimer OBJECT-TYPE
    SYNTAX      INTEGER ( 1..10 )
    UNITS       "seconds"
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "C28 Connection Complete Timer.  Optional.  In
                 Connection Establishment this is the time period
                 in which data or a READY_IND message is expected
                 from a Calling Party.

             This time value is expressed in seconds."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    DEFVAL   { 4 }
    ::= { lecConfigEntry 23 }


-- ------------------------------------------------------------ --

--
--  LAN Emulation Client status group
--

lecStatusTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF LecStatusEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "A read-only table containing identification, status,
             and operational information about the LAN Emulation
             Clients this agent manages."
    ::= { leClientMIBObjects 2 }

lecStatusEntry OBJECT-TYPE
    SYNTAX       LecStatusEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "Each table entry contains information about one LAN
             Emulation Client."
    AUGMENTS  { lecConfigEntry }
    ::= { lecStatusTable 1 }

LecStatusEntry ::=
    SEQUENCE {

        --
        --  Client identification
        --
        lecIfIndex                  Integer32,
        lecPrimaryAtmAddress        AtmLaneAddress,
        lecID                       INTEGER,


        --
        --  Client status and protocol version
        --
        lecInterfaceState           LecState,
        lecLastFailureRespCode      INTEGER,
        lecLastFailureState         LecState,
        lecProtocol                 INTEGER,
        lecVersion                  INTEGER,
        lecTopologyChange           TruthValue,


        --
        --  Operational parameters and their source
        --
        lecConfigServerAtmAddress   AtmLaneAddress,
        lecConfigSource             INTEGER,
        lecActualLanType            LecDataFrameFormat,
        lecActualMaxDataFrameSize   LecDataFrameSize,
        lecActualLanName            DisplayString,
        lecActualLesAtmAddress      AtmLaneAddress,
        lecProxyClient              TruthValue

    }

lecIfIndex OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "This object identifies the logical interface number
             ('ifIndex') assigned to this client, and is used to
             identify corresponding rows in the Interfaces MIB.

             Note that re-initialization of the management agent
             may cause a client's 'lecIfIndex' to change."
    ::= { lecStatusEntry 1 }

lecPrimaryAtmAddress OBJECT-TYPE
    SYNTAX      AtmLaneAddress
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "C1  LE Client's ATM Addresses.

             The primary ATM address of this LAN Emulation Client.
             This address is used to establish the Control Direct
             and Multicast Send VCCs, and may also be used to set
             up Data Direct VCCs.
             A client may have additional ATM addresses for use
             with Data Direct VCCs.  These addresses are readable
             via the lecAtmAddressTable."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecStatusEntry 2 }

lecID OBJECT-TYPE
    SYNTAX      INTEGER( 0..65279 )
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "C14 LE Client Identifier.  Each LE Client requires a
                 LE Client Identifier (LECID) assigned by the LE
                 Server during the Join phase.  The LECID is placed
                 in control requests by the LE Client and MAY be
                 used for echo suppression on multicast data frames
                 sent by that LE Client.  This value MUST NOT
                 change without terminating the LE Client and
                 returning to the Initial state.  A valid LECID
                 MUST be in the range X'0001' through X'FEFF'.

             The value of this object is only meaningful for a LEC
             that is connected to a LES.  For a LEC which does not
             belong to an emulated LAN, the value of this object
             is defined to be 0."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecStatusEntry 3 }

lecInterfaceState OBJECT-TYPE
    SYNTAX      LecState
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The current state of the LAN Emulation Client.

             Note that 'ifOperStatus' is defined to be 'up' when,
             and only when, 'lecInterfaceState' is 'operational'."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 2.3.1"
    ::= { lecStatusEntry 4 }

lecLastFailureRespCode OBJECT-TYPE
    SYNTAX      INTEGER {
                         none(1),
                         timeout(2),
                         undefinedError(3),
                         versionNotSupported(4),
                         invalidRequestParameters(5),
                         duplicateLanDestination(6),
                         duplicateAtmAddress(7),
                         insufficientResources(8),
                         accessDenied(9),
                         invalidRequesterId(10),
                         invalidLanDestination(11),
                         invalidAtmAddress(12),
                         noConfiguration(13),
                         leConfigureError(14),
                         insufficientInformation(15)
                        }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "Status code from the last failed Configure response
             or Join response.  Failed responses are those for
             which the LE_CONFIGURE_RESPONSE / LE_JOIN_RESPONSE
             frame contains a non-zero code, or fails to arrive
             within a timeout period.

             If none of this client's requests have failed, this
             object has the value 'none'.

             If the failed response contained a STATUS code that
             is not defined in the LAN Emulation specification,
             this object has the value 'undefinedError'.

             The value 'timeout' is self-explanatory.

             Other failure codes correspond to those defined in
             the specification, although they may have different
             numeric values."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 4.2, Table 13"
    ::= { lecStatusEntry 5 }

lecLastFailureState OBJECT-TYPE
    SYNTAX      LecState
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The state this client was in when it updated the
             'lecLastFailureRespCode'.

             If 'lecLastFailureRespCode' is 'none', this object
             has the value initialState(1)."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 2.3.1"
    ::= { lecStatusEntry 6 }

lecProtocol OBJECT-TYPE
    SYNTAX      INTEGER ( 1..255 )
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The LAN Emulation protocol which this client supports,
             and specifies in its LE_JOIN_REQUESTs."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 4.2"
    ::= { lecStatusEntry 7 }

lecVersion OBJECT-TYPE
    SYNTAX      INTEGER ( 1..255 )
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The LAN Emulation protocol version which this client
             supports, and specifies in its LE_JOIN_REQUESTs."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 4.2"
    ::= { lecStatusEntry 8 }

lecTopologyChange OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "C19 Topology Change.  Boolean indication that the LE
                 Client is using the Forward Delay Time C18,
                 instead of the Aging Time C17, to age non-local
                 entries in its LE_ARP cache C16.

             For a client which is not connected to the LES, this
             object is defined to have the value 'false'."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecStatusEntry 9 }

lecConfigServerAtmAddress OBJECT-TYPE
    SYNTAX      AtmLaneAddress
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The ATM address of the LAN Emulation Configuration
             Server (if known) or the empty string (otherwise)."
    ::= { lecStatusEntry 10 }

lecConfigSource OBJECT-TYPE
    SYNTAX      INTEGER {
                         gotAddressViaIlmi(1),
                         usedWellKnownAddress(2),
                         usedLecsPvc(3),
                         didNotUseLecs(4)
                        }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "Indicates whether this LAN Emulation Client used the
             LAN Emulation Configuration Server, and, if so, what
             method it used to establish the Configuration Direct
             VCC."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.2"
    ::= { lecStatusEntry 11 }
```

```
lecActualLanType OBJECT-TYPE
    SYNTAX      LecDataFrameFormat
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "C2  LAN Type.

             The data frame format that this LAN Emulation Client
             is using right now.  This may come from

                 *  lecConfigLanType,
                 *  the LAN Emulation Configuration Server, or
                 *  the LAN Emulation Server

             This value is related to 'ifMtu' and 'ifType'.  See
             the LEC management specification for more details."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecStatusEntry 12 }

lecActualMaxDataFrameSize OBJECT-TYPE
    SYNTAX      LecDataFrameSize
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "C3  Maximum Data Frame Size.

             The maximum data frame size that this LAN Emulation
             client is using right now.  This may come from

                 *  lecConfigMaxDataFrameSize,
                 *  the LAN Emulation Configuration Server, or
                 *  the LAN Emulation Server                     "
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecStatusEntry 13 }

lecActualLanName OBJECT-TYPE
    SYNTAX      DisplayString (SIZE( 0..32 ))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "C5  ELAN Name.

             The identity of the emulated LAN which this client
             last joined, or wishes to join.  This may come from

                 *  lecConfigLanName,
                 *  the LAN Emulation Configuration Server, or
                 *  the LAN Emulation Server                     "
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecStatusEntry 14 }
```

```
lecActualLesAtmAddress OBJECT-TYPE
    SYNTAX      AtmLaneAddress
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "C9  LE Server ATM Address.

             The LAN Emulation Server address currently in use or
             most recently attempted.

             If no LAN Emulation Server attachment has been tried,
             this object's value is the zero-length string."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecStatusEntry 15 }

lecProxyClient OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "C4  Proxy.

             Indicates whether this client is acting as a proxy.

             Proxy clients are allowed to represent unregistered
             MAC addresses, and receive copies of LE_ARP_REQUEST
             frames for such addresses."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { lecStatusEntry 16 }


-- ------------------------------------------------------------- --

--
--  LAN Emulation Client - ifIndex Mapping Table
--

lecMappingTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF LecMappingEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "A table mapping the 'ifIndex' values of 'aflane8023'
             and 'aflane8025' interfaces to the 'lecIndex' values
             of the corresponding LAN Emulation Clients."
    ::= { leClientMIBObjects 3 }

lecMappingEntry OBJECT-TYPE
    SYNTAX       LecMappingEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "Each row describes one ifIndex --> lecIndex mapping."
    INDEX   { ifIndex }
    ::= { lecMappingTable 1 }

LecMappingEntry ::=
    SEQUENCE {
        lecMappingIndex             INTEGER
    }

lecMappingIndex OBJECT-TYPE
    SYNTAX      INTEGER ( 1..2147483647 )
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The 'lecIndex' of the client which implements the
             specified interface."
    ::= { lecMappingEntry 1 }

-- ------------------------------------------------------------ --

--
--  LAN Emulation Client - Statistics table
--

lecStatisticsTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF LecStatisticsEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "An extension table containing traffic statistics for
             all the LAN Emulation Clients this host implements."
    ::= { leClientMIBObjects 4 }

lecStatisticsEntry OBJECT-TYPE
    SYNTAX       LecStatisticsEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "Each row in this table contains traffic statistics
             for one LAN Emulation client."
    AUGMENTS  { lecConfigEntry }
    ::= { lecStatisticsTable 1 }

LecStatisticsEntry ::=
    SEQUENCE {
        lecArpRequestsOut           Counter32,
        lecArpRequestsIn            Counter32,
        lecArpRepliesOut            Counter32,
        lecArpRepliesIn             Counter32,
        lecControlFramesOut         Counter32,
        lecControlFramesIn          Counter32,
        lecSvcFailures              Counter32
    }

lecArpRequestsOut OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
```

```
            "The number of LE_ARP_REQUESTs sent over the LUNI by
             this LAN Emulation Client."
    ::= { lecStatisticsEntry 1 }

lecArpRequestsIn OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of LE_ARP_REQUESTs received over the LUNI
             by this LAN Emulation Client.

             Requests may arrive on the Control Direct VCC or on
             the Control Distribute VCC, depending upon how the
             LES is implemented and the chances it has had for
             learning.  This counter covers both VCCs."
    ::= { lecStatisticsEntry 2 }

lecArpRepliesOut OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of LE_ARP_RESPONSEs sent over the LUNI by
             this LAN Emulation Client."
    ::= { lecStatisticsEntry 3 }

lecArpRepliesIn OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of LE_ARP_RESPONSEs received over the LUNI
             by this LAN Emulation Client.  This count includes
             all such replies, whether solicited or not.

             Replies may arrive on the Control Direct VCC or on
             the Control Distribute VCC, depending upon how the
             LES is implemented.  This counter covers both VCCs."
    ::= { lecStatisticsEntry 4 }

lecControlFramesOut OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The total number of control packets sent by this
             LAN Emulation Client over the LUNI."
    ::= { lecStatisticsEntry 5 }

lecControlFramesIn OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The total number of control packets received by this
             LAN Emulation Client over the LUNI."
    ::= { lecStatisticsEntry 6 }
```

```
lecSvcFailures OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The total number of

                 *  outgoing LAN Emulation SVCs which this client
                    tried, but failed, to open;

                 *  incoming LAN Emulation SVCs which this client
                    tried, but failed to establish; and

                 *  incoming LAN Emulation SVCs which this client
                    rejected for protocol or security reasons.   "
    ::= { lecStatisticsEntry 7 }

-- ------------------------------------------------------------- --

--
--  LAN Emulation Client - Server VCC table
--

lecServerVccTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF LecServerVccEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "A table identifying the Control and Multicast VCCs
             for each LAN Emulation Client this host implements."
    ::= { leClientMIBObjects 5 }

lecServerVccEntry OBJECT-TYPE
    SYNTAX       LecServerVccEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "Each row in this table describes the Control VCCs
             and Multicast VCCs for one LAN Emulation client."
    AUGMENTS  { lecConfigEntry }
    ::= { lecServerVccTable 1 }

LecServerVccEntry ::=
    SEQUENCE {

--
--  Note that the 'lec*Interface' objects double as 'connection
--  exists' flags.
--
        lecConfigDirectInterface       LeConnectionInterface,
        lecConfigDirectVpi             VpiInteger,
        lecConfigDirectVci             VciInteger,

        lecControlDirectInterface      LeConnectionInterface,
        lecControlDirectVpi            VpiInteger,
        lecControlDirectVci            VciInteger,
        lecControlDistributeInterface  LeConnectionInterface,
        lecControlDistributeVpi        VpiInteger,
        lecControlDistributeVci        VciInteger,

        lecMulticastSendInterface      LeConnectionInterface,
        lecMulticastSendVpi            VpiInteger,
        lecMulticastSendVci            VciInteger,

        lecMulticastForwardInterface   LeConnectionInterface,
        lecMulticastForwardVpi         VpiInteger,
        lecMulticastForwardVci         VciInteger
    }

lecConfigDirectInterface OBJECT-TYPE
    SYNTAX      LeConnectionInterface
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The interface associated with the Configuration
             Direct VCC.  If no Configuration Direct VCC exists,
             this object has the value 0.  Otherwise, the objects

                 ( lecConfigDirectInterface,
                   lecConfigDirectVpi, lecConfigDirectVci )

             identify the circuit."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.1.1"
    ::= { lecServerVccEntry 1 }

lecConfigDirectVpi OBJECT-TYPE
    SYNTAX      VpiInteger
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "If the Configuration Direct VCC exists, this object
             contains the VPI which identifies that VCC at
             the point where it connects to this LE client.

             Otherwise, this object has the value 0."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.1.1"
    ::= { lecServerVccEntry 2 }

lecConfigDirectVci OBJECT-TYPE
    SYNTAX      VciInteger
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "If the Configuration Direct VCC exists, this object
             contains the VCI which identifies that VCC at
             the point where it connects to this LE client.

             Otherwise, this object has the value 0."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.1.1"
    ::= { lecServerVccEntry 3 }

lecControlDirectInterface OBJECT-TYPE
    SYNTAX      LeConnectionInterface
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The interface associated with the Control Direct VCC.
             If no Control Direct VCC exists, this object has the
             value 0.  Otherwise, the objects

                 ( lecControlDirectInterface,
                   lecControlDirectVpi, lecControlDirectVci )

             identify the circuit."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.1.2"
    ::= { lecServerVccEntry 4 }

lecControlDirectVpi OBJECT-TYPE
    SYNTAX      VpiInteger
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "If the Control Direct VCC exists, this object
             contains the VPI which identifies that VCC at
             the point where it connects to this LE client.

             Otherwise, this object has the value 0."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.1.2"
    ::= { lecServerVccEntry 5 }

lecControlDirectVci OBJECT-TYPE
    SYNTAX      VciInteger
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "If the Control Direct VCC exists, this object
             contains the VCI which identifies that VCC at
             the point where it connects to this LE client.

             Otherwise, this object has the value 0."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.1.2"
    ::= { lecServerVccEntry 6 }

lecControlDistributeInterface OBJECT-TYPE
    SYNTAX      LeConnectionInterface
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The interface associated with the Control Distribute
             VCC.  If no Control Distribute VCC has been set up to
             this client, this object has the value 0.  Otherwise,
             the objects

                 ( lecControlDistributeInterface,
                   lecControlDistributeVpi,
                   lecControlDistributeVci )

             identify the circuit."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.1.3"
    ::= { lecServerVccEntry 7 }

lecControlDistributeVpi OBJECT-TYPE
    SYNTAX      VpiInteger
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "If the Control Distribute VCC exists, this object
             contains the VPI which identifies that VCC at the
             point where it connects to this LE client.

             Otherwise, this object has the value 0."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.1.3"
    ::= { lecServerVccEntry 8 }

lecControlDistributeVci OBJECT-TYPE
    SYNTAX      VciInteger
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "If the Control Distribute VCC exists, this object
             contains the VCI which identifies that VCC at the
             point where it connects to this LE client.

             Otherwise, this object contains the value 0."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.1.3"
    ::= { lecServerVccEntry 9 }

lecMulticastSendInterface OBJECT-TYPE
    SYNTAX      LeConnectionInterface
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The interface associated with the Multicast Send
             VCC.  If no Multicast Send VCC exists, this object
             has the value 0.  Otherwise, the objects

                 ( lecMulticastSendInterface,
                   lecMulticastSendVpi, lecMulticastSendVci )

             identify the circuit."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.2.2"
    ::= { lecServerVccEntry 10 }

lecMulticastSendVpi OBJECT-TYPE
    SYNTAX      VpiInteger
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "If the Multicast Send VCC exists, this object
             contains the VPI which identifies that VCC at
             the point where it connects to this LE client.

             Otherwise, this object has the value 0."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.2.2"
    ::= { lecServerVccEntry 11 }

lecMulticastSendVci OBJECT-TYPE
    SYNTAX      VciInteger
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "If the Multicast Send VCC exists, this object
             contains the VCI which identifies that VCC at
             the point where it connects to this LE client.

             Otherwise, this object has the value 0."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.2.2"
    ::= { lecServerVccEntry 12 }

lecMulticastForwardInterface OBJECT-TYPE
    SYNTAX      LeConnectionInterface
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The interface associated with the Multicast Forward
             VCC.  If no Multicast Forward VCC has been set up to
             this client, this object has the value 0.  Otherwise,
             the objects

                 ( lecMulticastForwardInterface,
                   lecMulticastForwardVpi,
                   lecMulticastForwardVci )

             identify the circuit."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.2.3"
    ::= { lecServerVccEntry 13 }

lecMulticastForwardVpi OBJECT-TYPE
    SYNTAX      VpiInteger
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
```

```
            "If the Multicast Forward VCC exists, this object
             contains the VPI which identifies that VCC at the
             point where it connects to this LE client.

             Otherwise, this object has the value 0."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.2.3"
    ::= { lecServerVccEntry 14 }

lecMulticastForwardVci OBJECT-TYPE
    SYNTAX      VciInteger
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "If the Multicast Forward VCC exists, this object
             contains the VCI which identifies that VCC at the
             point where it connects to this LE client.

             Otherwise, this object has the value 0."
    REFERENCE
          "ATM Forum LAN Emulation Over ATM Specification, V1.0,
           Section 2.2.2.2.3"
    ::= { lecServerVccEntry 15 }

-- -------------------------------------------------------------- --

--
--  LAN Emulation Client - ATM Addresses table
--

lecAtmAddressTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF LecAtmAddressEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "A table listing all of the ATM addresses belonging
             to this host's LAN Emulation Clients."
    ::= { leClientMIBObjects 6 }

lecAtmAddressEntry OBJECT-TYPE
    SYNTAX       LecAtmAddressEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "Each row in this table describes one of a client's
             ATM addresses."
    INDEX   { lecIndex, lecAtmAddress }
    ::= { lecAtmAddressTable 1 }

LecAtmAddressEntry ::=
    SEQUENCE {
        lecAtmAddress               AtmLaneAddress,
        lecAtmAddressStatus         RowStatus
    }

lecAtmAddress OBJECT-TYPE
    SYNTAX      AtmLaneAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "The ATM address this row describes.  This could be
             either a primary address or a secondary address."
    ::= { lecAtmAddressEntry 1 }

lecAtmAddressStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "Used to create and delete rows in this table.

             A management station may not change the status of a
             primary ATM address to 'notInService' or 'destroy'
             unless the client's ifAdminStatus is 'down', and the
             client's lecInterfaceState is 'initialState'.

             Secondary ATM addresses may be destroyed at any time
             permitted by the agent."
    ::= { lecAtmAddressEntry 2 }


-- ------------------------------------------------------------ --

--
--  LAN Emulation Client Registered MAC Addresses group
--

lecMacAddressTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF LecMacAddressEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "This table contains entries for all of the registered
             MAC addresses belonging to this agent's LE clients.

             C6  Local Unicast MAC Address(es).  Each LE Client has
                 zero or more local unicast MAC addresses.  In an
                 operational LE Client, every address in this
                 variable MUST have been registered with the LE
                 Server.  Two LE CLients joined to the same
                 emulated LAN MUST NOT have the same local unicast
                 MAC address.  A LE Client's MAC addresses may
                 change during normal operations.  When answering
                 a LE_ARP_REQUEST for any address in this list, the
                 'Remote Address' bit in the FLAGS field of the
                 LE_ARP_RESPONSE MUST be clear."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { leClientMIBObjects 7 }

lecMacAddressEntry OBJECT-TYPE
    SYNTAX      LecMacAddressEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "Each table row describes a (MAC address, ATM address)
             pair registered for a particular client."
    INDEX   { lecIndex, lecMacAddress }
    ::= { lecMacAddressTable 1 }

LecMacAddressEntry ::=
    SEQUENCE {
        lecMacAddress              MacAddress,
        lecMacAddressAtmBinding    AtmLaneAddress
    }

lecMacAddress OBJECT-TYPE
    SYNTAX      MacAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A unicast MAC address which the LE client denoted by
             'lecIndex' has registered with its LE Server."
    ::= { lecMacAddressEntry 1 }

lecMacAddressAtmBinding OBJECT-TYPE
    SYNTAX      AtmLaneAddress
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The ATM address registered for 'lecMacAddress'."
    ::= { lecMacAddressEntry 2 }


-- ------------------------------------------------------------ --

--
--  LAN Emulation Client Registered Route Descriptors group
--

lecRouteDescrTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF LecRouteDescrEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "This table lists all of the Route Descriptors which
             are registered by this host's LAN Emulation Clients.

             C8  Route Descriptor(s).  Route Descriptors exist only
                 for source-routed IEEE 802.5 LE Clients that are
                 Source-Route Bridges.  All Route Descriptors in
                 any given emulated LAN MUST be unique.  A LE
                 Client MAY have zero or more Route Descriptors
                 and these Route Descriptors MAY change during
                 normal operation.  In an operational LE Client,
                 every Local Route Descriptor in C8 MUST have been
                 registered with the LE Server.  When answering a
                 LE_ARP_REQUEST for any address in this list, the
                 'Remote Address' bit in the FLAGS field of the
                 LE_ARP_RESPONSE MUST be clear."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification, V1.0,
             Section 5.1.1"
    ::= { leClientMIBObjects 8 }

lecRouteDescrEntry OBJECT-TYPE
    SYNTAX      LecRouteDescrEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "Each table row describes a (Route Descriptor, ATM
             address) pair registered for a particular client."
    INDEX   { lecIndex, lecRouteDescrSegmentID,
                        lecRouteDescrBridgeNumber }
    ::= { lecRouteDescrTable 1 }

LecRouteDescrEntry ::=
    SEQUENCE {
        lecRouteDescrSegmentID     INTEGER,
        lecRouteDescrBridgeNumber  INTEGER,
        lecRouteDescrAtmBinding    AtmLaneAddress
    }

lecRouteDescrSegmentID OBJECT-TYPE
    SYNTAX      INTEGER( 0..4095 )
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "The LAN ID portion of the IEEE 802.5 route descriptor
             associated with this conceptual row."
    ::= { lecRouteDescrEntry 1 }

lecRouteDescrBridgeNumber OBJECT-TYPE
    SYNTAX      INTEGER( 0..15 )
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "The Bridge Number portion of the IEEE 802.5 route
             descriptor associated with this conceptual row."
    ::= { lecRouteDescrEntry 2 }

lecRouteDescrAtmBinding OBJECT-TYPE
    SYNTAX      AtmLaneAddress
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The ATM address registered for the IEEE 802.5 route
             descriptor ('lecRouteDescrSegmentID',
             'lecRouteDescrBridgeNumber')."
    ::= { lecRouteDescrEntry 3 }

-- ------------------------------------------------------------ --

--
--  LAN Emulation Client ARP cache group - MAC addresses
--

leArpTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF LeArpEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "This table provides access to an ATM LAN Emulation
             Client's MAC-to-ATM ARP cache.  It contains entries
             for unicast addresses and for the broadcast address,
             but not for multicast MAC addresses.

             C16 LE_ARP Cache.  A table of entries, each of which
                 establishes a relationship between a LAN
                 Destination external to the LE Client and the
                 ATM address to which data frames for that LAN
                 Destination will be sent."
    REFERENCE
            "ATM Forum LAN Emulation Over ATM Specification,
             Section 5.1.1"
    ::= { leClientMIBObjects 9 }

leArpEntry OBJECT-TYPE
    SYNTAX      LeArpEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "An ATM LAN Emulation ARP cache entry containing
             information about the binding of one MAC address
             to one ATM address."
    INDEX   { lecIndex, leArpMacAddress }
    ::= { leArpTable 1 }

LeArpEntry ::=
    SEQUENCE {
        leArpMacAddress             MacAddress,
        leArpAtmAddress             AtmLaneAddress,
        leArpIsRemoteAddress        TruthValue,
        leArpEntryType              LeArpTableEntryType,
        leArpRowStatus              RowStatus
    }

leArpMacAddress OBJECT-TYPE
    SYNTAX      MacAddress
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "The MAC address for which this cache entry provides
             a translation.  Since ATM LAN Emulation uses an ARP
             protocol to locate the Broadcast and Unknown Server,
             the value of this object could be the broadcast MAC
             address.

             MAC addresses should be unique within any given ATM
             Emulated LAN.  However, there's no requirement that
             they be unique across disjoint emulated LANs."
    ::= { leArpEntry 1 }

leArpAtmAddress OBJECT-TYPE
    SYNTAX      AtmLaneAddress
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
```

```
                "The ATM address of the Broadcast & Unknown Server
                 or LAN Emulation Client whose MAC address is stored
                 in 'leArpMacAddress'.

                 This value may be determined through the use of the
                 LE_ARP procedure, through source address learning,
                 or through other mechanisms.

                 Some agents may provide write access to this object,
                 as part of their support for 'static' LE_ARP entries.
                 The effect of attempting to write an ATM address to
                 a 'learned' row is explicitly undefined.  Agents may
                 disallow the write, accept the write and change the
                 row's type, or even accept the write as-is."
        ::= { leArpEntry 2 }

    leArpIsRemoteAddress OBJECT-TYPE
        SYNTAX      TruthValue
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "Indicates whether this entry is for a local or remote
                 MAC address.

                 In this context, 'local' means 'a MAC address that is
                 local to the remote client', as opposed to 'one of my
                 addresses'.

                     true(1)
                         The address is believed to be remote - or its
                         local/remote status is unknown.

                         For an entry created via the LE_ARP mechanism,
                         this corresponds to the 'Remote address' flag
                         being set in the LE_ARP_RESPONSE.

                         During Topology Change periods, remote LE_ARP
                         entries generally age out faster than others.
                         Specifically, they are subject to the Forward
                         Delay Time as well as to the Aging Time.

                     false(2)
                         The address is believed to be local - that is
                         to say, registered with the LES by the client
                         whose ATM address is leArpAtmAddress.

                         For an entry created via the LE_ARP mechanism,
                         this corresponds to the 'Remote address' flag
                         being cleared in the LE_ARP_RESPONSE."
        ::= { leArpEntry 3 }

    leArpEntryType OBJECT-TYPE
        SYNTAX      LeArpTableEntryType
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "Indicates how this LE_ARP table entry was created and
                 whether it is aged."
        DEFVAL   { staticVolatile }
        ::= { leArpEntry 4 }

    leArpRowStatus OBJECT-TYPE
        SYNTAX      RowStatus
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "Lets users create and delete LE_ARP cache entries,
                 on systems that support this capability.

                 Normally clients will maintain their LE_ARP caches
                 automatically.  However, managers may occasionally
                 want to create 'static' LE_ARP cache entries.

                 Rules

                   1.  Before a new row can become 'active', values
                       must be supplied for the columnar objects
                       leArpAtmAddress and leArpEntryType.

                   2.  It is not necessary to set leArpRowStatus to
                       'notInService' in order to modify a writable
                       object in the same conceptual row.

                   3.  LE_ARP entries whose status is 'notReady' or
                       'notInService' will not be used to translate
                       LAN Destinations to ATM Addresses.  However,
                       clients may overwrite such entries with data
                       obtained from other sources.  For example, a
                       client which needed to transmit a data frame
                       to a given MAC address (or via a given Route
                       Descriptor) might find that its LE_ARP entry
                       for the LAN Destination is 'notInService' or
                       'notReady'.  The client might then act as if
                       the LAN Destination was unknown - generating
                       a LE_ARP_REQUEST, flooding the data frame to
                       the BUS, and creating a new, 'active' LE_ARP
                       cache entry based on the LE_ARP_RESPONSE."
        ::= { leArpEntry 5 }

    -- ------------------------------------------------------------- --

    --
    --  LAN Emulation Client ARP cache group - Route Descriptors
    --

    leRDArpTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF LeRDArpEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "This table provides access to an ATM LAN Emulation
                 Client's Route Descriptor-to-ATM ARP cache.

                 Implementation of this table is optional for hosts
                 that do not support emulated IEEE 802.5 Token Ring
                 LANs, and mandatory for hosts which do.
```

```
                 C16 LE_ARP Cache.  A table of entries, each of which
                     establishes a relationship between a LAN
                     Destination external to the LE Client and the
                     ATM address to which data frames for that LAN
                     Destination will be sent."
        REFERENCE
                "ATM Forum LAN Emulation Over ATM Specification,
                 Section 5.1.1"
        ::= { leClientMIBObjects 10 }

    leRDArpEntry OBJECT-TYPE
        SYNTAX      LeRDArpEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "An ATM LAN Emulation ARP cache entry containing
                 information about the binding of one IEEE 802.5
                 route descriptor to one ATM address."
        INDEX   { lecIndex, leRDArpSegmentID, leRDArpBridgeNumber }
        ::= { leRDArpTable 1 }

    LeRDArpEntry ::=
        SEQUENCE {
            leRDArpSegmentID              INTEGER,
            leRDArpBridgeNumber           INTEGER,
            leRDArpAtmAddress             AtmLaneAddress,
            leRDArpEntryType              LeArpTableEntryType,
            leRDArpRowStatus              RowStatus
        }

    leRDArpSegmentID OBJECT-TYPE
        SYNTAX      INTEGER ( 0..4095 )
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The LAN ID portion of the IEEE 802.5 route descriptor
                 associated with this ARP cache entry."
        ::= { leRDArpEntry 1 }

    leRDArpBridgeNumber OBJECT-TYPE
        SYNTAX      INTEGER ( 0..15 )
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The Bridge Number portion of the IEEE 802.5 route
                 descriptor associated with this ARP cache entry."
        ::= { leRDArpEntry 2 }

    leRDArpAtmAddress OBJECT-TYPE
        SYNTAX      AtmLaneAddress
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The ATM address of the LAN Emulation Client which is
                 associated with the route descriptor
                 ('leRDArpSegmentID', 'leRDArpBridgeNumber').
```

```
             This value may be determined through the use of the
             LE_ARP procedure, through source address learning,
             or through other mechanisms.

             Some agents may provide write access to this object,
             as part of their support for 'static' LE_ARP entries.
             The effect of attempting to write an ATM address to
             a 'learned' row is explicitly undefined.  Agents may
             disallow the write, accept the write and change the
             row's type, or even accept the write as-is."
    ::= { leRDArpEntry 3 }

leRDArpEntryType OBJECT-TYPE
    SYNTAX      LeArpTableEntryType
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "Indicates how this LE_ARP table entry was created and
             whether it is aged."
    DEFVAL   { staticVolatile }
    ::= { leRDArpEntry 4 }

leRDArpRowStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "Lets users create and delete LE_ARP cache entries,
             on systems that support this capability.

             Normally clients will maintain their LE_ARP caches
             automatically.  However, managers may occasionally
             want to create 'static' LE_ARP cache entries.

             Rules

               1.  Before a new row can become 'active', values
                   must be supplied for the columnar objects
                   leRDArpAtmAddress and leRDArpEntryType.

               2.  It is not necessary to set leRDArpRowStatus to
                   'notInService' in order to modify a writable
                   object in the same conceptual row.

               3.  LE_ARP entries whose status is 'notReady' or
                   'notInService' will not be used to translate
                   LAN Destinations to ATM Addresses.  However,
                   clients may overwrite such entries with data
                   obtained from other sources.  For example, a
                   client which needed to transmit a data frame
                   to a given MAC address (or via a given Route
                   Descriptor) might find that its LE_ARP entry
                   for the LAN Destination is 'notInService' or
                   'notReady'.  The client might then act as if
                   the LAN Destination was unknown - generating
                   a LE_ARP_REQUEST, flooding the data frame to
                   the BUS, and creating a new, 'active' LE_ARP
                   cache entry based on the LE_ARP_RESPONSE."
```

```
        ::= { leRDArpEntry 5 }


-- Conformance Information

leClientMIBConformance  OBJECT IDENTIFIER ::= { leClientMIB 2 }

leClientMIBGroups       OBJECT IDENTIFIER ::=
                                          { leClientMIBConformance 1 }
leClientMIBCompliances  OBJECT IDENTIFIER ::=
                                          { leClientMIBConformance 2 }

-- Compliance Statements

leClientMIBCompliance           MODULE-COMPLIANCE
        STATUS           current
        DESCRIPTION     "The compliance statement for SNMP entities
                         which support ATM LAN Emulation Clients.

        For a host to conform to this MIB, it must also implement

          - RFC 1213 - MIB II.

          - Interfaces table entries for each LE Client, as per the
            LAN Emulation Client management specification.

          - The AToM MIB (RFC 1695 - Definitions of Managed Objects
            for ATM Management), according to the conformance
            statements defined in that RFC.

        Optionally, a host may implement

          - RFC 1573 - Evolution of the Interfaces Group of MIB-II.

          - The 'ifRcvAddressGroup' from RFC 1573, which provides a
            way to represent and configure interfaces with multiple
            addresses.

        See the LAN Emulation Client management specification for
        interpretations of RFC 1573 / MIB-II as they apply to LAN
        Emulation Clients."


        MODULE -- this module
            MANDATORY-GROUPS   {leClientConfigGroup,
                                leClientStatusGroup,
                                leClientMappingGroup,
                                leClientStatisticsGroup,
                                leClientServerVccGroup,
                                leClientAtmAddressesGroup,
                                leClientMacAddressesGroup,
                                leClientArpGroup}

            GROUP               leClientRouteDescriptorsGroup
            DESCRIPTION         "This group is mandatory only for hosts
                                 that support emulated 802.5 LANs."

            GROUP               leClientRDArpGroup
```

```
DESCRIPTION         "This group is mandatory only for hosts
                     that support emulated 802.5 LANs."

OBJECT              lecRowStatus
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecOwner
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecConfigMode
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecConfigLanType
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required.

                     Implementations are not required to
                     support all legal values."

OBJECT              lecConfigMaxDataFrameSize
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required.

                     Implementations are not required to
                     support all legal values."

OBJECT              lecConfigLanName
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecConfigLesAtmAddress
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecControlTimeout
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecMaxUnknownFrameCount
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecMaxUnknownFrameTime
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecVccTimeoutPeriod
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecMaxRetryCount
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecAgingTime
```

```
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecForwardDelayTime
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecExpectedArpResponseTime
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecFlushTimeOut
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecPathSwitchingDelay
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecLocalSegmentID
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecMulticastSendType
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecMulticastSendAvgRate
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecMulticastSendPeakRate
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecConnectionCompleteTimer
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              lecAtmAddressStatus
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              leArpAtmAddress
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              leArpEntryType
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              leArpRowStatus
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."

OBJECT              leRDArpAtmAddress
MIN-ACCESS          read-only
DESCRIPTION         "Write access is not required."
```

```
    OBJECT              leRDArpEntryType
    MIN-ACCESS          read-only
    DESCRIPTION         "Write access is not required."

    OBJECT              leRDArpRowStatus
    MIN-ACCESS          read-only
    DESCRIPTION         "Write access is not required."

::= { leClientMIBCompliances 1 }

-- Units of Conformance


leClientConfigGroup    OBJECT-GROUP
        OBJECTS     { lecRowStatus, lecOwner,
                      lecConfigMode,
                      lecConfigLanType,
                      lecConfigMaxDataFrameSize,
                      lecConfigLanName,
                      lecConfigLesAtmAddress,
                      lecControlTimeout,
                      lecMaxUnknownFrameCount,
                      lecMaxUnknownFrameTime,
                      lecVccTimeoutPeriod,
                      lecMaxRetryCount,
                      lecAgingTime,
                      lecForwardDelayTime,
                      lecExpectedArpResponseTime,
                      lecFlushTimeOut,
                      lecPathSwitchingDelay,
                      lecLocalSegmentID,
                      lecMulticastSendType,
                      lecMulticastSendAvgRate,
                      lecMulticastSendPeakRate,
                      lecConnectionCompleteTimer }
        STATUS      current
        DESCRIPTION
            "A collection of objects used for creating and
             configuring LAN Emulation Clients."
        ::= { leClientMIBGroups 1 }

leClientStatusGroup    OBJECT-GROUP
        OBJECTS     { lecIfIndex,
                      lecPrimaryAtmAddress,
                      lecID,
                      lecInterfaceState,
                      lecLastFailureRespCode,
                      lecLastFailureState,
                      lecProtocol, lecVersion,
                      lecTopologyChange,
                      lecConfigServerAtmAddress,
                      lecConfigSource,
                      lecActualLanType,
                      lecActualMaxDataFrameSize,
                      lecActualLanName,
                      lecActualLesAtmAddress,
                      lecProxyClient }
        STATUS      current
        DESCRIPTION
            "A collection of objects describing the status
             and operational parameters of the managed LAN
             Emulation Clients."
        ::= { leClientMIBGroups 2 }

leClientMappingGroup    OBJECT-GROUP
        OBJECTS     { lecMappingIndex }
        STATUS      current
        DESCRIPTION
            "A collection of objects which map a LAN Emulation
             Client's 'ifIndex' to its 'lecIndex'."
        ::= { leClientMIBGroups 3 }

leClientStatisticsGroup    OBJECT-GROUP
        OBJECTS     { lecArpRequestsOut, lecArpRequestsIn,
                      lecArpRepliesOut , lecArpRepliesIn,
                      lecControlFramesOut,
                      lecControlFramesIn,
                      lecSvcFailures }
        STATUS      current
        DESCRIPTION
            "A collection of objects which act as an extension
             to the lecConfigTable.

             These objects provide statistics on LAN Emulation
             control traffic and SVC establishment."
        ::= { leClientMIBGroups 4 }

leClientServerVccGroup    OBJECT-GROUP
        OBJECTS     { lecConfigDirectInterface,
                      lecConfigDirectVpi,
                      lecConfigDirectVci,
                      lecControlDirectInterface,
                      lecControlDirectVpi,
                      lecControlDirectVci,
                      lecControlDistributeInterface,
                      lecControlDistributeVpi,
                      lecControlDistributeVci,
                      lecMulticastSendInterface,
                      lecMulticastSendVpi,
                      lecMulticastSendVci,
                      lecMulticastForwardInterface,
                      lecMulticastForwardVpi,
                      lecMulticastForwardVci }
        STATUS      current
        DESCRIPTION
            "A collection of objects which act as an extension
             to the lecConfigTable.

             These objects identify Configuration Direct,
             Control, and Multicast VCCs for each client,
             making it easier to locate their entries in the
             AToM MIB."
        ::= { leClientMIBGroups 5 }

leClientAtmAddressesGroup   OBJECT-GROUP
```

```
                OBJECTS     { lecAtmAddressStatus }
                STATUS      current
                DESCRIPTION
                    "A collection of objects which describe all of the
                     ATM addresses belonging to each client."
                ::= { leClientMIBGroups 6 }

        leClientMacAddressesGroup   OBJECT-GROUP
                OBJECTS     { lecMacAddressAtmBinding }
                STATUS      current
                DESCRIPTION
                    "A collection of objects which describe all of the
                     MAC addresses registered for each client."
                ::= { leClientMIBGroups 7 }

        leClientRouteDescriptorsGroup    OBJECT-GROUP
                OBJECTS     { lecRouteDescrAtmBinding }
                STATUS      current
                DESCRIPTION
                    "A collection of objects which describe all of the
                     Route Descriptors registered for each client."
                ::= { leClientMIBGroups 8 }

        leClientArpGroup    OBJECT-GROUP
                OBJECTS     { leArpAtmAddress,
                              leArpIsRemoteAddress,
                              leArpEntryType,
                              leArpRowStatus }
                STATUS      current
                DESCRIPTION
                    "A collection of objects which describe the MAC-
                     to-ATM address mappings that this LAN Emulation
                     Client has learned."
                ::= { leClientMIBGroups 9 }

        leClientRDArpGroup    OBJECT-GROUP
                OBJECTS     { leRDArpAtmAddress, leRDArpEntryType,
                              leRDArpRowStatus }
                STATUS      current
                DESCRIPTION
                    "A collection of objects which describe the IEEE
                     802.5 Route Descriptor-to-ATM address mappings
                     that this LAN Emulation Client has learned."
                ::= { leClientMIBGroups 10 }

END
```