

**The ATM Forum**  
**Technical Committee**

**Loop Emulation Service Using AAL2**  
**CP-IWF MIB Addendum**

**AF-VMOA-0175.000**

**October 2001**

© 2001 The ATM Forum. This specification/document may be reproduced and distributed in whole, but (except as provided in the next sentence) not in part, for internal and informational use only and not for commercial distribution. Notwithstanding the foregoing sentence, any protocol implementation conformance statements (PICS) or implementation conformance statements (ICS) contained in this specification/document may be separately reproduced and distributed provided that it is reproduced and distributed in whole, but not in part, for uses other than commercial distribution. All other rights reserved. Except as expressly stated in this notice, no part of this specification/document may be reproduced or transmitted in any form or by any means, or stored in any information storage and retrieval system, without the prior written permission of The ATM Forum.

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  
Presidio of San Francisco  
572B Rucker Street  
San Francisco, CA 94129-0920  
Phone: +1 415 561 6275  
Fax: +1 415 561 6120

## Preface

This specification uses three levels for indicating the degree of compliance necessary for specific functions, procedures, or coding. They are indicated by the use of key words as follows:

- **Requirements:** "Shall" indicates a required function, procedures or coding necessary for compliance. In some cases "shall" used in text indicates a conditional requirement, since the operation described is dependent on whether or not an objective or option is chosen.
- **Objective:** "Should" indicates an objective which is not required for compliance, but which is considered desirable.
- **Option:** "May" indicates an optional operation without implying a desirability of one operation over another. That is, it identifies an operation that is allowed while still maintaining compliance.

## Acknowledgments

The editor would like to thank particularly the following people for their input to this specification:

Malcolm Airst (VMOA Vice Chair)  
Mikko Alutoin  
Paul Carew  
Dal Chohan  
Don Choi (VMOA Chair)  
Joey Chou  
Tom Chu  
Wayne Daniel  
Paul Drew  
Eric Deichstetter  
Sagar Gordhan  
Jim Harford  
Gerhard Maegerl  
Wieland Roeser  
Claire Taniguchi  
Rolf Wendt  
Bill Whelan  
Shawn Ying

Editor: Martin Taylor  
mtaylor@coppercom.com

# Contents

<b>PREFACE</b> .....	<b>3</b>
<b>ACKNOWLEDGMENTS</b> .....	<b>3</b>
<b>CONTENTS</b> .....	<b>4</b>
<b>1 INTRODUCTION</b> .....	<b>5</b>
<b>2 REFERENCES</b> .....	<b>5</b>
2.1 <b>NORMATIVE</b> .....	5
<b>3 SCOPE</b> .....	<b>5</b>
3.1 <b>CONFIGURATION</b> .....	7
3.2 <b>PERFORMANCE</b> .....	8
3.3 <b>FAULT</b> .....	8
3.4 <b>SECURITY</b> .....	8
<b>4 MANAGEMENT MODEL</b> .....	<b>8</b>
<b>5 SNMP MIB STRUCTURE</b> .....	<b>10</b>
<b>6 RELATION TO OTHER MIBS</b> .....	<b>12</b>
6.1 <b>RELATION TO MIB-II</b> .....	12
6.1.1 <i>Relation to the System Group</i> .....	12
6.1.2 <i>Relation to the Interfaces MIB</i> .....	12
<b>7 PROTECTION AGAINST RESTART AVALANCHE</b> .....	<b>15</b>
<b>8 MIB DEFINITION</b> .....	<b>16</b>
<b>APPENDIX A: PROCEDURES FOR USAGE OF THE CP-IWF MIB</b> .....	<b>43</b>
A.1 <b>CP-IWF START-UP/RESTART</b> .....	43
A.1.1 <i>Basic Flow with Port Blocking</i> .....	43
A.1.2 <i>Alternative Flows</i> .....	46
A.2 <b>PHYSICAL PORT ASSIGNMENT TO CP-IWF USER PORT</b> .....	46
A.2.1 <i>Basic Flow</i> .....	46
A.2.2 <i>Alternative Flows</i> .....	47
A.3 <b>RELEASE OF A PHYSICAL PORT ASSIGNED TO A CP-IWF USER PORT</b> .....	48
A.3.1 <i>Basic Flow</i> .....	48
A.4 <b>LOOPBACK TESTING</b> .....	49
A.4.1 <i>Basic Flow</i> .....	49
A.4.2 <i>Alternative Flows</i> .....	50

## 1 Introduction

The Loop Emulation Service Using AAL2 (af-vmoa-0145.000) provides a specification for interoperability between a Customer Premises Inter-Working Function (CP-IWF) and a Central Office Inter-Working Function (CO-IWF), for the purpose of providing access to narrowband network services over a broadband access network.

The LES specification defines a method for supporting remote management operations over an Embedded Operations Channel (the LES EOC), using SNMP messages transmitted on the AAL2 VCC that exists between a CP-IWF and a CO-IWF. However, af-vmoa-0145.000 does not define the Management Information Base (MIB) for the CP-IWF that is necessary to achieve management interoperability. This specification defines the MIB for remote management of the CP-IWF, and also defines interactions with other standard MIBs (notably the Interfaces MIB defined in RFC2863) that are relevant to the remote management of the narrowband services delivered at the CP-IWF.

## 2 References

The following references contain provisions that, through reference in this text, constitute provisions of this specification. At the time of publication, the editions indicated were valid. All references are subject to revision, and parties to agreements based on this specification are encouraged to investigate the possibility of applying the most recent editions of the references indicated below.

### 2.1 Normative

1. ATM Forum af-vmoa-0145.000, "Voice and Multimedia Over ATM - Loop Emulation Service Using AAL2", July 2000.
2. IETF RFC 2863, "The Interfaces Group MIB", IETF, June 2000.
3. IETF RFC 1213, " Management Information Base for Network Management of TCP/IP-based internets: MIB-II", IETF, March 1991.
4. ATM Forum af-ilmi-0065.000, "Integrated Local Management Interface Specification 4.0", September 1996
5. ATM Forum af-nm-0165.000, "Addendum to the ILMi Auto-configuration Extension", July 2001

## 3 Scope

The scope of the CP-IWF MIB is to support the management of only the Loop Emulation Service within a LES device, as shown in Figure 1. It is important to note that this diagram makes no changes to the reference model described in Figure 1 of af-vmoa-0145.000 but merely serves as



### 3.1 Configuration

It is assumed that the CP-IWF slaves to the CO-IWF in that the CO-IWF can override the configuration in the CP-IWF if appropriate. It is also assumed that configuration management should accomplish all configuration tasks so that no user intervention is required to configure the Loop Emulation Service. The following functions shall be supported by the CP-IWF MIB in terms of configuration:

- The ability to check the capability of the CP-IWF to determine if there is compatibility with the service provided by the CO-IWF. This includes capability of the physical user port, CP-IWF user port, AAL SCS and AAL CPS layers.
- If necessary the ability to configure the AAL2 CPS and SCS layers associated with the VCC on the CP-IWF. LES uses both I.366.1 and I.366.2 (SSCS) and I.363.2 (CPS). In addition LES specifies CPS parameters of its own. The CP-IWF MIB shall provide the ability to configure all of these parameters over the LES EOC. In practice, however, the default values for most of these parameters should suffice for interoperability. Furthermore, CPS and SCS parameters of operation shall be configured at the ATM VCC level. Hence AAL2 connections transported over the VCC will inherit the appropriate parameters specified at the VCC level. Note that the AAL2 MIB defined by ILMI is used as a basis for the CP-IWF AAL2 MIB design to maintain consistency. In the presence of both LES EOC and ILMI, it is the responsibility of the CO-IWF to provision the AAL2 parameters of operation via the LES EOC and not ILMI. In the event that a LES device implements both ILMI auto-configuration and LES EOC, the values of the AAL2 parameters in the CP-IWF MIB shall take precedence over the values of AAL2 parameters in the ILMI auto-configuration MIB for the virtual circuit to which the LES EOC is related.
- The assignment/release of physical user ports to/from a CP-IWF user port respectively.
- The activation/de-activation of physical user ports. In order to provide telephony service to a given user port on a CP-IWF, the ability to maintain proper status of the port in the CP-IWF, CO-IWF, EMS and service node is paramount. The Interfaces MIB, specifically the ifTable, provides objects to control/maintain port status. The objects of interest are ifAdminStatus and ifOperStatus. These objects should be used to represent the status of the port and its ability to provide telephony service. The values that each of these objects may assume are defined by RFC2863. The object ifAdminStatus should normally be controlled exclusively via the LES EOC. The object ifOperStatus is entirely under the control of the CP-IWF. The CP-IWF should set the value of ifOperStatus to follow the status of ifAdminStatus when ifAdminStatus is changed, although internally detected events appropriate to providing telephony service take precedence. For example if the CP-IWF EMS changes the ifAdminStatus from DOWN to UP, the CP-IWF should attempt to set the ifOperStatus to UP unless an internally detected event prevents the user port from becoming active. In order to minimize the LES-EOC traffic at CP-IWF turn-up between CP-IWF EMS and CP-IWF, the following behavior is expected at CP-IWF:
  - When a new CP-IWF is first turned-up, all physical user ports should start with a default setting of ifAdminStatus in the UP state to minimize CO-IWF to CP-IWF management traffic.
  - In order to avoid flooding the network with link level traps, by default, the CP-IWF shall not enable “linkUp” and “linkDown” traps. The ‘ifLinkUpDownTrapEnable’ MIB object

(RFC 2863), for all user ports, shall assume the default value of disabled(2) when a new CP-IWF initializes. To persistently enable per user port link level traps, the CP-IWF EMS shall selectively set the corresponding 'ifLinkUpDownTrapEnable' object to the value enabled(1)

- In the absence of ELCP (and default values not being suitable) the ability to allocate/deallocate CIDs to POTS and ISDN bearer channels and ISDN D channels, within a CP-IWF user port.
- Configuration changes to physical user ports, the CP-IWF, AAL SCS and AAL CPS layers can be made regardless of the object's operational state. It is the responsibility of the administrator to ensure that changes are not made which might affect existing calls, for example changing the voice encoding profile for a CP-IWF while calls are in progress.

### **3.2 Performance**

Performance management uses counters to capture abnormal conditions, such as lost packets, buffer underrun, and a trap will be generated if a counter exceeds a given threshold in order to detect service degradation.

### **3.3 Fault**

Fault management shall be supported through the application of management states to physical user ports. In addition, fault management provides for fault isolation capabilities, including but not limited to, codec loopback and AAL2 loopback.

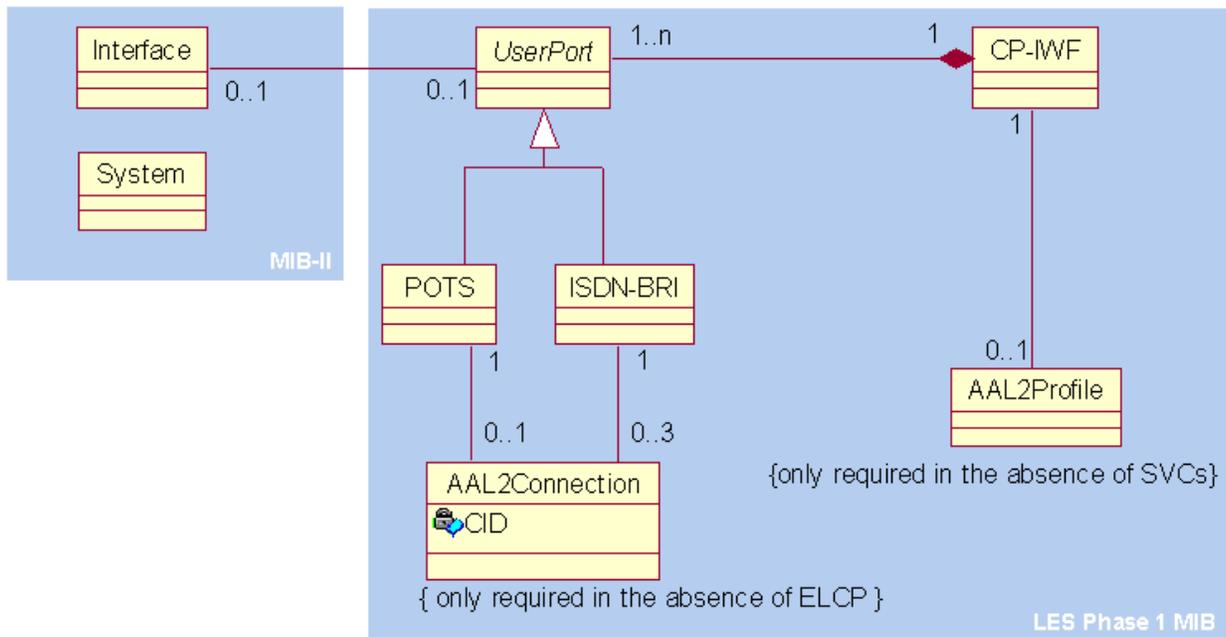
Notification of LES-affecting faults shall be provided from the CP-IWF to the CO-IWF over the LES EOC only when these fault notifications are not available through other mechanisms or when the propagation time for the notification of the fault to reach the CO-IWF through another mechanism would be unacceptably long for the LES provider.

### **3.4 Security**

The intended usage of the CP-IWF MIB is for the service provider to configure and manage the service delivered via the CP-IWF. In general, the LES device that implements the CP-IWF should not provide the user of the LES device with write access to objects within the CP-IWF MIB.

## **4 Management Model**

Prior to defining the MIB it is necessary to define a management model which provides a framework for both the static MIB structure and the dynamic behavior of the LES management function. The management model is described using the Unified Modeling Language (UML) syntax and is shown in Figure 2.



**Figure 2: LES Management Model**

Figure 2 captures the fundamental components of LES as described in Figure 1 that require to be managed. It also shows the relationship with MIB-II which defines the equipment level classes. The management model explicitly specifies the relationships between these classes and the cardinality of those relationships.

The model reads as follows:

A CP-IWF contains one or more UserPorts. Two types of user ports exist for LES and these include POTS and ISDN-BRI. Through inheritance the model allows for future extensions to include other types of UserPorts such as ISDN-PRI. The AAL2 connections that transport the POTS and ISDN-BRI bearer and D channels are modeled using AAL2Connections. Observe that AAL2Connections need only be modeled in the absence of ELCP, otherwise they shall be controlled via ELCP and shall not be managed. AAL2 CPS and SSCS parameters of operation to be used by AAL2 Connections of a single VCC are defined using the AAL2Profile. Observe that in the presence of SVCs AAL2 CPS and SSCS parameters of operation shall be negotiated through SVC signaling procedures. Hence when SVCs are used between CP-IWF and CO-IWF the AAL2Profile shall not be used to specify AAL2 parameters of operation for AAL2 connections.

## 5 SNMP MIB Structure

Based on the management model described in the previous section this section outlines the structure of the MIB for the management of LES. For clarity and grouping, each object defined in the management model (Figure 2) has been divided into two parts in the MIB, one that provides the configuration information and another that provides the statistics information. The resulting structure of the MIB is as follows and a graphical representation is shown in Figure 3.

Note that certain information concerning the physical ports that support CP-IWF user ports is held in the ifTable group of the Interfaces MIB, which is defined by RFC2863.

- **cpIwf**  
This branch incorporates the CP-IWF class's configuration attributes and provides information pertaining to the whole CP-IWF, e.g. the total number of CP-IWF user ports of each type contained in the CP-IWF.
- **cpIwfAal2Profile**  
This branch incorporates both the AAL2Profile and AAL2Connection classes' configuration attributes. Since the AAL2Connection class only contains a single attribute it was not necessary to have a separate table for it in the MIB structure. This branch contains configuration information pertaining to the AAL2 CPS and SSCS layers. The parameters available will be those specified in section 2 under configuration management.
- **cpIwfPotsPortTable** and **cpIwfIsdnBriPortTable**  
These tables incorporate the POTS and ISDN-BRI classes' configuration attributes and contain information on the configuration of the CP-IWF POTS and ISDN-BRI user ports. This is in addition to the information contained in the ifTable about the physical POTS and ISDN-BRI user ports to which the CP-IWF user ports peer with.
- **cpIwfAal2Stats**  
This branch incorporates the AAL2Profile class's statistics attributes and contains performance statistics applicable to the AAL2 at the VCC granularity, i.e. AAL connection level statistics are not captured individually but aggregated at the VCC level.
- **cpIwfPotsPortStatsTable** and **cpIwfIsdnBriPortStatsTable**  
These tables incorporate the POTS and ISDN-BRI classes' statistics attributes and contain performance statistics pertinent to CP-IWF POTS and ISDN-BRI user ports respectively. This is in addition to the information contained in the ifTable about the physical POTS and ISDN-BRI user ports to which the CP-IWF user ports peer with.

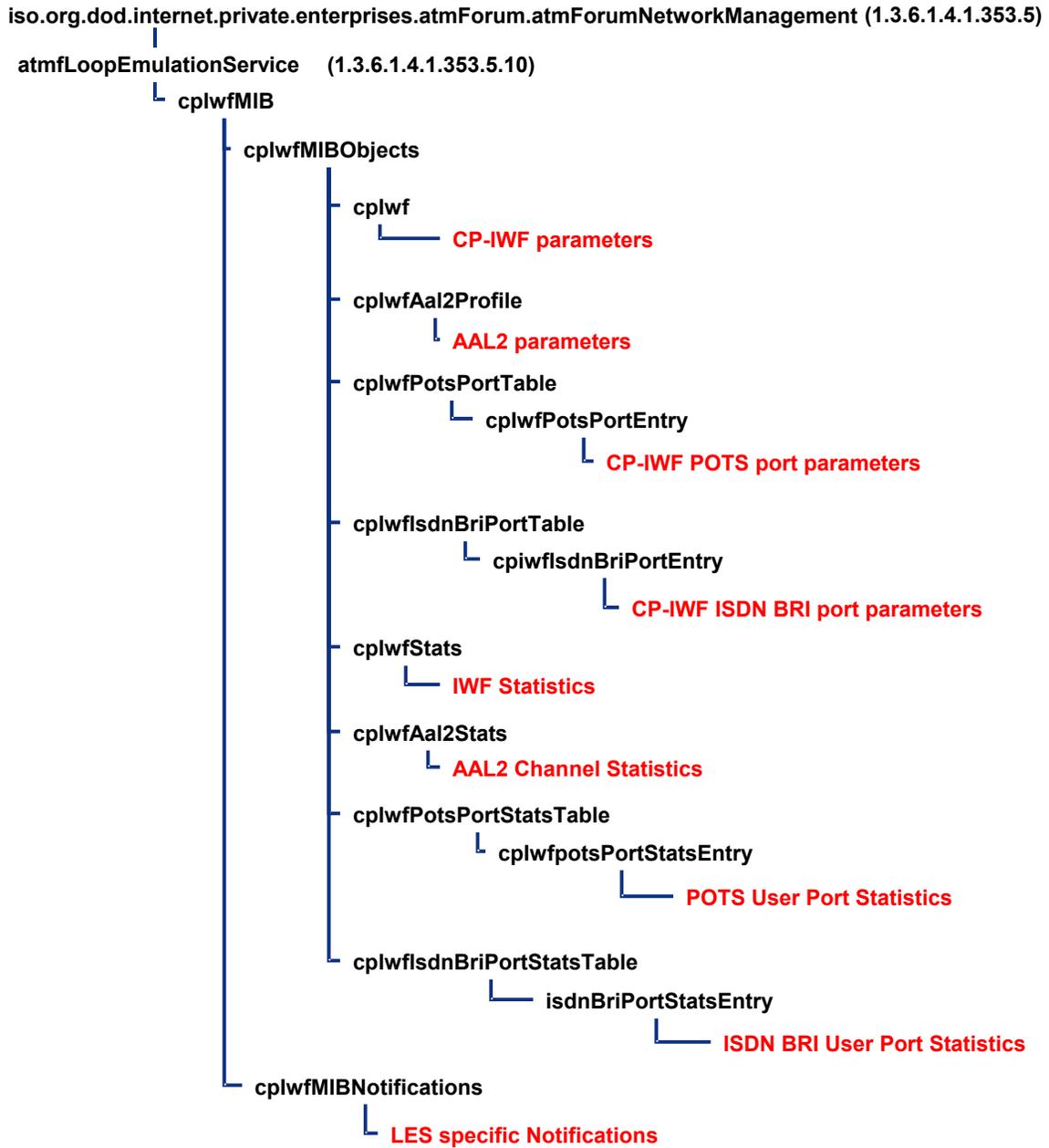


Figure 3. Structure for Configuration MIB

## 6 Relation to other MIBs

In order to promote re-use the CP-IWF MIB has been associated with other MIBs where necessary in order to provide complete management of the LES. This section describes the relationships that are required and how these other MIBs are to be used within the context of LES. LES devices shall follow the rules in this section in order to claim conformance to this specification.

### 6.1 Relation to MIB-II

#### 6.1.1 Relation to the System Group

In the MIB-II specified in RFC1213, the “system” group is defined as being mandatory for all systems such that each managed entity contains one instance of each object in the “system” group. Thus, those objects apply to the entity even if the entity’s sole functionality is the support of LES. RFC1213 is the authoritative source for the definition of the objects in the “system” group. For each textual object for which the LES device is not configured with a value, the object’s value is a string of length zero.

#### 6.1.2 Relation to the Interfaces MIB

The LES presents no interfaces as defined in the Interfaces Group. However, it is related to one or more physical interfaces in the manner shown in Figure 1. This means that SNMP agents that support LES shall implement the Interfaces MIB RFC2863 which is an evolved part of MIB-II specified in RFC1213. Furthermore, the Interfaces MIB requires that any MIB which is an adjunct of the Interfaces MIB clarify specific areas within the Interfaces MIB. These areas were intentionally left vague in the Interfaces MIB to avoid over-constraining the MIB, thereby precluding management of certain media types.

Section 4 of RFC2863 enumerates several areas which a media-specific MIB must clarify. Each of these areas is addressed in Table 1 for LES devices that implement the Interfaces MIB. The implementer is referred to RFC2863 in order to understand the general intent of these areas.

##### 6.1.2.1 Layering Model

The CP-IWF MIB shall **not** require that the sub-layers of physical interfaces of POTS and ISDN-BRI residing in the LES device be modeled within the Interfaces MIB.

Note: in reality there are sub-layers associated with the ISDN physical interface, i.e. the D + B1 and B2 channels. However, LES transparently transports these sub-layers and hence their management is outside the scope of the CP-IWF MIB, and consequently they are not required to be represented in the Interfaces MIB.

##### 6.1.2.2 Default Port Assignment

If the LES device hosts only a single CP-IWF, then the CP-IWF shall make the physical port to user port assignments at startup using factory defined default settings. The CP-IWF EMS may change these default port assignment settings, e.g., channel Id, testMode, signaling method, port label etc., after startup. If the LES device hosts more than one CP-IWF, then the procedure explained in table

1 of section 6 and section A.2.1 shall should be followed to assign physical user ports to CP-IWF user ports.

---

<b>Object</b>	<b>Mapping Guideline</b>
ifIndex	Each physical user port within the LES device is represented by an IfEntry.
ifType	The values of this object shall be as follows.  Physical POTS user port with FXO signalling - voiceFXO (101) Physical POTS user port with FXS signalling - voiceFXS (102) Physical ISDN-BRI user port - isdns (75).
ifAdminStatus	Each user port should have the persistent value retained by CP-IWF. To minimize management traffic at CP-IWF turn-up, the value of up(1) should be used. If persistency is not supported for ifAdminStatus, then the value of up(1) should be used at CP-IWF turn-up.
ifLinkUpDownTrapEnable	When the CP-IWF initializes, each user port shall set the value disabled(2) by default or to follow the previously configured (persistent) value retained by CP-IWF.
ifName	This shall store information on which CP-IWF owns this physical user port. In order to uniquely identify the CP-IWF the ifIndex.VPI.VCI combination is used since this will be different for each instance of the LES. Correspondingly the peering cpIwfXPortEntry will contain the ifIndex of this physical user ports's ifEntry. This object cannot be changed directly by a CO-IWF. A CO-IWF shall follow the following procedures for claiming and releasing physical user ports. Note the 'x' against MIB names below equal 'Pots' for POTS CP-IWF user ports and 'IsdnBri' for ISDN-BRI CP-IWF user ports.  The process of claiming a physical user port is as follows. <ol style="list-style-type: none"><li>1. An SNMP SET command is sent to the LES device to set the <b>xPhysicalPort</b> of the cpIwfXPortEntry in the CP-IWF MIB to the value of <b>ifIndex</b> of the physical user port ifEntry in the Interfaces MIB.</li><li>2. The SNMP agent on the LES device shall check that the ifName object of the appropriate ifEntry has value of zero length string. If so then it shall compose the string of “ifIndex.VPI.VCI” and write it into ifName, where ifIndex, VPI and VCI refer to the ATM physical port and VCC on</li></ol>

---

---

the LES device over which the CP-IWF is connected to the CO-IWF.

3. If successful, it shall then set the **xPhysicalPort** value within the cpIwfxPortEntry to the **ifIndex** value of the claimed port.
4. The SNMP agent shall respond with error-status of noError(0) if the assignment was successful or badValue(3) if the physical user port is already assigned to a CP-IWF.

The process for releasing a physical port is as follows.

1. An SNMP Set command is sent to the LES device to set the **xPhysicalPort** of the cpIwfxPortEntry in the CP-IWF MIB to the value of zero (unassigned).
2. The SNMP agent on the LES device shall check that the ifName object of the appropriate ifEntry has a value which is **not** a zero length string. If so then it shall set the value to a zero length string.
3. If successful, it shall then set the **xPhysicalPort** value within the cpIwfxPortEntry to zero.
4. The SNMP agent shall respond with error-status of noError(0) if the release was successful or genErr(5) if the physical user port could not be released, e.g. it was carrying a call.

In order to protect against loss of information regarding to which CP-IWF a physical port is assigned across re-initializations/reboots, ifName should be stored in non-volatile storage. This does not apply if the LES device hosts only a single CP-IWF.

---

**Table 1. ifEntry mappings for physical user ports on the LES device**

## 7 Protection Against Restart Avalanche

In the event that a large number of CP-IWFs are powered on simultaneously and they were to all send a coldStart Trap to the CO-IWF, it would very likely be swamped, leading to message losses and network congestion during the critical period of service restoration. In order to prevent such avalanches, the following behavior is suggested:

1. When a CP-IWF is powered on, it should initiate a restart timer to a random value, uniformly distributed between 0 and a maximum waiting delay (MWD). Care should be taken to avoid synchronicity of the random number generation between multiple CP-IWFs that would use the same algorithm.
2. The Media Gateway should then wait for either the end of this timer or the detection of a local user activity, such as for example an off-hook transition on an analogue port on the CP-IWF.
3. When the timer elapses, or when an activity is detected, the CP-IWF should generate the coldStart Trap and should initiate the restart procedure.

The restart procedure simply requires the CP-IWF to guarantee that the first message that the CO-IWF sees from this CP-IWF across the LES EOC is a coldStart Trap informing the CO-IWF about the restart.

## 8 MIB Definition

The text in this section defines the MIB for the remote management of the CP-IWF function as defined in af-vmoa-0145.000. The MIB is specified in SMIV2 syntax.

```
-- MIB for configuration, performance, and fault management of
-- the Loop Emulation Service (LES).

CPIWF-MIB DEFINITIONS ::= BEGIN

IMPORTS

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

    MODULE-COMPLIANCE, OBJECT-GROUP,
    NOTIFICATION-GROUP                              FROM SNMPv2-CONF;

-----
--
-- 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 Loop Emulation Service MIBs

atmForum                OBJECT IDENTIFIER ::= { enterprises 353 }

atmForumNetworkManagement OBJECT IDENTIFIER ::= { atmForum 5 }

atmfLoopEmulationService OBJECT IDENTIFIER ::= { atmForumNetworkManagement 10 }

cpIwfMIB MODULE-IDENTITY
    LAST-UPDATED "200107260000Z"
    ORGANIZATION "ATM Forum VMOA Working Group"
    CONTACT-INFO
        "The ATM Forum
        1000 Executive Parkway, Suite 200
        St. Louis, MO 63141
        United States of America
        Tel: +1 314 205 0200
        E-mail: info@atmforum.com"
    DESCRIPTION
        "This module defines a portion of the management information
        base (MIB) for managing the LES CP-IWFs. It is meant to be
        used in connection with MIB-II System Group and RFC 2863
        which defines the ifTable."
    ::= { atmfLoopEmulationService 1 }
```

```
cpIwfMIBObjects          OBJECT IDENTIFIER ::= { cpIwfMIB 1 }
cpIwfMIBNotifications    OBJECT IDENTIFIER ::= { cpIwfMIB 2 }

-- The cpIwfMIB Group

-- Implementation of this group is mandatory for all
-- systems that implement the LES as defined in af-vmoa-0145.000

-- The cpIwfMIB Group consists of the following:
--   cpIwf Group
--   cpIwfAal2Profile Group
--   cpIwf Pots Port Configuration Table
--   cpIwf ISDN-BRI Port Configuration Table
--   cpIwfAal2Stats Group
--   cpIwf Pots Port Statistics Table
--   cpIwf ISDN-BRI Port Statistics Table

-----
--
--   cpIwf Group
--

cpIwf                    OBJECT IDENTIFIER ::= { cpIwfMIBObjects 1 }

cpIwfVpi OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The VPI of the AAL2 VCC to which this CP-IWF is associated."
    ::= { cpIwf 1 }

cpIwfVci OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The VCI of the AAL2 VCC to which this CP-IWF is associated."
    ::= { cpIwf 2 }

cpIwfEchoCancellationSupport OBJECT-TYPE
    SYNTAX      INTEGER {
                    no (1),
                    yes (2)
                }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Specifies whether or not the echo cancellation facility is
        supported or not supported at the CP-IWF."
    ::= { cpIwf 3 }

cpIwfNumPotsPorts OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of POTS user ports on the CP-IWF."
    ::= { cpIwf 4 }
```

```
cpIwfNumIsdnBriPorts OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The total number of ISDN-BRI user ports on the CP-IWF."
    ::= { cpIwf 5 }

cpIwfTimingReference OBJECT-TYPE
    SYNTAX      INTEGER {
                    ntr(1),
                    adaptiveVoice(2),
                    freeRun(3)
                }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "ntr - network timing reference, voice timing derived from
        the local network interface.
        adaptiveVoice - voice timing derived from incoming cell rate.
        freeRun - voice timing derived from an internal free-running
        timing source."
    ::= { cpIwf 6 }

cpIwfPotsPortEncodingSelectionMode OBJECT-TYPE
    SYNTAX      INTEGER {
                    independent(1),
                    masterSlave(2)
                }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This object controls the encoding switching for POTS user
        ports.
        masterSlave - the profile entry used by the CP-IWF is the same
        as that selected by the CO-IWF.
        independent - the CP-IWF can select the profile entry used for
        transmission independently of the CO-IWF."
    DEFVAL { masterSlave }
    ::= { cpIwf 7 }

cpIwfIsdnBriPortEncodingSelectionMode OBJECT-TYPE
    SYNTAX      INTEGER {
                    independent(1),
                    masterSlave(2)
                }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This object controls the encoding switching for ISDN BRI user
        ports.
        masterSlave - the profile entry used by the CP-IWF is the same
        as that selected by the CO-IWF.
        independent - the CP-IWF can select the profile entry used for
        transmission independently of the CO-IWF."
    DEFVAL { masterSlave }
    ::= { cpIwf 8 }

cpIwfElcpAndPstnChannelBandwidth OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
```

```
STATUS          current
DESCRIPTION
    "The approximate maximum bandwidth of the aal2 connection with CID=8
    used to transport ELCP and PSTN signalling messages
    specified in bits per second at the physical layer."
DEFVAL { 64000 }
 ::= { cpIwf 9 }

cpIwfAdminStatus OBJECT-TYPE
SYNTAX          INTEGER {
                    up (1),
                    down (2),
                    shuttingDown (3),
                    testing (4)
                }
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION
    "This object is used to reflect the desired state of the CP-IWF. The
    actual state of the CP-IWF is given by cpIwfOperStatus. When this
    object is set to 'down', all existing calls on the CP-IWF are
    cleared immediately. If this object is set to 'shuttingDown', no
    further calls shall be accepted either incoming or outgoing on any
    of the CP-IWF user ports. Once all the calls on the CP-IWF have
    cleared gracefully the value of this object moves to 'down'."
 ::= { cpIwf 10 }

cpIwfOperStatus OBJECT-TYPE
SYNTAX          INTEGER {
                    up (1),
                    down (2),
                    testing (3)
                }
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
    "Provides the current operational status of the CP-IWF function."
 ::= { cpIwf 11 }

cpIwfRestart OBJECT-TYPE
SYNTAX          INTEGER {
                    started (1),
                    warmStart (2),
                    coldStart (3)
                }
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION
    "May be used to initiate a re-start of the CP-IWF function. A Get
    operation performed on this object will always return 'started'.
    Re-start is initiated by performing a Set operation to either
    'warmStart' or 'coldStart'.
    A warmStart means initialising all state variables within the
    CP-IWF to their starting values. A coldStart means rebooting
    the software process that implements the CP-IWF function. It is
    desirable that a coldStart should not affect the operation of other
    functions within the LES device, including other CP-IWF instances."
 ::= { cpIwf 12 }

cpIwfTestType OBJECT-TYPE
SYNTAX          INTEGER {
```

```

        selfTest (1)
    }
MAX-ACCESS    read-write
STATUS        current
DESCRIPTION   "This object is used to specify the type of test to run. The
              result of the self test will be stored in cpIwfTestResult.
              In order to run this test, the CO-IWF must first set the
              value of this object to the test that needs to be carried out.
              The CO-IWF must then set the cpIwfAdminStatus to 'testing'
              which will activate the test. To de-activate a test that does
              not self-terminate such as a loopback test, the CO-IWF must
              set the cpIwfAdminStatus to a value other than 'testing'."
 ::= { cpIwf 13 }

cpIwfTestResult OBJECT-TYPE
SYNTAX        INTEGER {
                null (1),
                success (2),
                failure (3),
                inProgress (4)
            }
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION   "Provides the result of the last self-test operation performed on
              the CP-IWF. If no self-test has been performed, this object
              should return null (1)."
```

```
 ::= { cpIwf 14 }
```

```
cpIwfTestResultText OBJECT-TYPE
SYNTAX        OCTET STRING (SIZE(0..64))
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION   "Provides textual information about the result of the last self-test
              operation performed on the CP-IWF, or a zero-length string if no
              tests have been performed since the last reset."
```

```
 ::= { cpIwf 15 }
```

```
cpIwfPlayoutBufferDepth OBJECT-TYPE
SYNTAX        Integer32
MAX-ACCESS    read-write
STATUS        current
DESCRIPTION   "The amount of packet delay variation to be accommodated on all
              ports of the CP-IWF, in milliseconds."
```

```
 DEFVAL { 20 }
 ::= { cpIwf 16 }
```

```
cpIwfImpairmentInterval OBJECT-TYPE
SYNTAX        Integer32
MAX-ACCESS    read-write
STATUS        current
DESCRIPTION   "The period over which voice impairments should be counted to
              determine whether a threshold-crossing event has occurred, in
              minutes. It is recommended that this value be set to an integral
              multiple of 5 minutes."
```

```
 DEFVAL { 15 }
 ::= { cpIwf 17 }
```

cpIwfImpairmentThreshold OBJECT-TYPE

SYNTAX Integer32  
MAX-ACCESS read-write  
STATUS current

DESCRIPTION

"If the number of impairment octets, calculated as the sum of fillerOctets and droppedOctets, that is observed on any individual POTS port or ISDN BRI port/channel during any interval of length cpIwfImpairmentInterval minutes is equal to or greater than the value of cpIwfImpairmentThreshold, then the trap cpIwfExcessImpairment will be sent to the CO-IWF. A value of zero will disable the reporting of excess impairments."

DEFVAL { 0 }  
::= { cpIwf 18 }

cpIwfV5PSTNProtocolVariant OBJECT-TYPE

SYNTAX Integer32  
MAX-ACCESS read-write  
STATUS current

DESCRIPTION

"When the applicationIdentifier indicates the use of PSTN signalling for POTS the value of this object shall be set to the national PSTN protocol variant to be used, else this object is not applicable. The value of this object shall be the 2-digit country code, as defined in the E.164 numbering plan, followed by an optional carrier code. An SNMP Set operation to a value which is not supported shall result in an SNMP Response with error status of badValue(3)."

DEFVAL { 44 }  
::= { cpIwf 19 }

cpIwfMwdForRestart OBJECT-TYPE

SYNTAX Integer32  
MAX-ACCESS read-write  
STATUS current

DESCRIPTION

"This object defines the maximum waiting delay (MWD) in seconds used during restart. When this CP-IWF is powered on, it shall initiate a restart timer to a random value, uniformly distributed between 0 and the value of this object. Upon expiry of this timer or when activity is detected this CP-IWF shall send a coldStart Trap to its peer CO-IWF and initiate the restart procedure. The CP-IWF shall guarantee that the first message that the CO-IWF sees across the LES EOC after a restart of the CP-IWF is the coldStart Trap."

DEFVAL { 600 }  
::= { cpIwf 20 }

cpIwfEocBandwidth OBJECT-TYPE

SYNTAX INTEGER (300..640000)  
MAX-ACCESS read-write  
STATUS current

DESCRIPTION

"Provides the approximate maximum bandwidth of the EOC in bits per second at the physical layer."

DEFVAL { 32000 }  
::= { cpIwf 21 }

cpIwfCurrentConfig OBJECT-TYPE

SYNTAX Integer32

```
MAX-ACCESS    read-write
STATUS        current
DESCRIPTION
    "This object provides an efficient mechanism for a
    management entity to maintain synchronization with
    a CP-IWF current level of configuration. The value
    should be persistently stored on the CP-IWF and hence
    retain its previous value following a restart event.
    The CP-IWF EMS is expected to retain a local copy of
    this value. At any time (e.g., upon processing a cold
    start trap), if the CP-IWF EMS detects a mismatch
    between its copy and the value returned by CP-IWF, the
    CP-IWF EMS may initiate configuration synchronization
    operation with the CP-IWF and update this value. The
    CP-IWF shall reset this value to zero, if the configuration
    of the CP-IWF is changed by local management action or when
    it determines that the hardware/software configuration that
    affects the service capability of the CP-IWF has changed.
    This only applies to configuration changes and not other
    changeable objects such as statistics."
DEFVAL { 0 }
 ::= { cpIwf 22 }

cpIwfTrapGeneration OBJECT-TYPE
SYNTAX        INTEGER {
                enabled(1),
                disabled_all(2),
                disabled_except_coldStart(3)
            }
MAX-ACCESS    read-write
STATUS        current
DESCRIPTION
    "Using this object, the CP-IWF EMS can globally disable all
    trap generation by the CP-IWF. By default, the CP-IWF shall
    be globally enabled to generate any/all traps that have not
    otherwise been selectively disabled. To globally suppress
    all trap generation by CP-IWF, CP-IWF EMS should set this
    object to value: disabled_all(2)."
```

```
DEFVAL { enabled }
 ::= { cpIwf 23 }

cpIwfVendorName OBJECT-TYPE
SYNTAX        OCTET STRING (SIZE(0..32))
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "The name of the vendor that produced the LES device in which
    this CP-IWF function resides."
 ::= { cpIwf 24 }

cpIwfDeviceType OBJECT-TYPE
SYNTAX        OCTET STRING (SIZE(0..32))
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "The vendor's designated model number for the LES device in which
    this CP-IWF function resides."
 ::= { cpIwf 25 }

cpIwfHardwareVersion OBJECT-TYPE
SYNTAX        OCTET STRING (SIZE(0..32))
```

```
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "The vendor's designated hardware revision for the LES device
    in which this CP-IWF function resides."
 ::= { cpIwf 26 }

cpIwfSoftwareVersion OBJECT-TYPE
    SYNTAX      OCTET STRING (SIZE(0..32))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The vendor's designated software revision for the software that
        implements the CP-IWF function."
 ::= { cpIwf 27 }

-----
--
-- cpIwfAal2Profile Group
-- This group specifies AAL2 CPS and SSCS parameters of operation
-- for AAL2 connections terminated by a CP-IWF. These include
-- I.363.2 (CPS), I.366.1 (SSSAR SSCS), I.366.2 (trunking SSCS) and
-- LES specific CPS parameters. Some of these parameters are implied
-- and are not included in this MIB however their implied values are
-- as follows.
-- - aal2SscsSstedStatus 'selected',
-- - aal2SscsSsadtStatus 'notSelected',
-- - aal2SscsServiceCategory 'audio',
-- - aal2SscsAudioServiceTransport 'enabled',
-- - aal2SscsMfR1DigitPacketTransport n/a,
-- - aal2SscsMfR2DigitPacketTransport n/a,
-- - aal2SscsCircuitModeDataTransport n/a,
-- - aal2SscsCircuitModeDataNumChannels n/a,
-- - aal2SscsFrameModeDataTransport n/a,
-- - aal2SscsFrameModeDataMaxLength n/a,
-- - aal2SscsCasSignallingTransport 'inferred by the AppId'

-- The CO-IWF is responsible for provisioning the AAL2 CPS and SSCS
-- parameters by setting appropriate values in this MIB. In the
-- absence of explicit provisioning of this group, the objects
-- in this group shall take the default values as specified.
--
-- Furthermore, these objects are read-write, however, it is possible
-- that certain AAL2 parameters may not be supported, e.g. an encoding
-- profile (aal2SscsPredefinedProfileIdentifier). In such cases an
-- attempt to set a value for an object that is not supported shall
-- result an SNMP response with an error status of badValue(3).

cpIwfAal2Profile    OBJECT IDENTIFIER ::= { cpIwfMIBObjects 2 }

aal2ApplicationIdentifier OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This attribute describes the application identifier, which
        describes the type of signaling used. The value of this object
        should be one of those values given in the administered list of
        AppIDs in section 5 of the ATM Forum document of well-known
        addresses and assigned codes which can be located at
        http://www.atmforum.com/pages/aboutatmtech/committees/
```

```
        public_assigned_codes.txt"
DEFVAL { '0000000A'H }
 ::= { cpIwfAal2Profile 1 }

aal2CpsMaxMultiplexedChannels OBJECT-TYPE
SYNTAX          INTEGER (1..255)
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION     "Maximum number of multiplexed channels."
DEFVAL { 255 }
 ::= { cpIwfAal2Profile 2 }

aal2CpsMaxSDULength OBJECT-TYPE
SYNTAX          INTEGER (45 | 64)
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION     "Maximum CPS-SDU size given in octets."
DEFVAL { 45 }
 ::= { cpIwfAal2Profile 3 }

aal2CpsCIDLowerLimit OBJECT-TYPE
SYNTAX          INTEGER (16..223)
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION     "The minimum value the CID can take for AAL2 bearer channels and
                ISDN D-channels."
DEFVAL { 16 }
 ::= { cpIwfAal2Profile 4 }

aal2CpsCIDUpperLimit OBJECT-TYPE
SYNTAX          INTEGER (16..223)
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION     "The maximum value the CID can take for AAL2 bearer channels and
                ISDN D-channels."
DEFVAL { 223 }
 ::= { cpIwfAal2Profile 5 }

aal2CpsOptimisation OBJECT-TYPE
SYNTAX          INTEGER {
                singleCpsPacketPerCpsPduNoOverlap(1),
                multipleCpsPacketsPerCpsPduWithOverlap(2)
                }
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION     "This object refers to the mode of operation of the CPS on the
                CP-IWF. The value of this object imposes a restriction on the CPS
                SDU length and hence must override the value of
                aal2CpsMaxSDULength.
                singleCpsPacketPerCpsPduNoOverlap - A single CPS Packet is
                contained within a CPS PDU and no overlap can occur into the next
                CPS PDU. If this option is selected, then Timer_CU is not
                applicable. Also the AAL2 payload size must be less than or equal
                to 44 octets.
                multipleCpsPacketsPerCpsPduWithOverlap - Multiple CPS Packets are
                contained within a CPS PDU and overlap can occur into the next CPS
```

```

        PDU. If this option is selected, then Timer_CU is applicable. Also
        Max CPS SDU size must be less than or equal to 64."
DEFVAL { singleCpsPacketPerCpsPduNoOverlap }
 ::= { cpIwfAal2Profile 6 }

aal2CpsTimerCuValue OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This parameter specifies value of the Timer_CU, in msec, for this
        VCC. This parameter has meaning only if the value of the parameter
        aal2CpsOptimisation is set to multipleCpsPacketperCpsPduWithOverlap.
        Although no default value is provided for this parameter, a value
        must be assigned to the parameter during the startup of the
        CP-IWF."
    DEFVAL { 0 }
    ::= { cpIwfAal2Profile 7 }

aal2SscsFaxDemodulationTransport OBJECT-TYPE
    SYNTAX      INTEGER {
                    disabled(1),
                    enabled(2)
                }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This specifies whether fax demodulation is enabled or disabled.
        An SNMP Set to enable(2) when fax demodulation is not supported
        must result in an SNMP response with error status of badValue(3)."
```

```

    DEFVAL { disabled }
    ::= { cpIwfAal2Profile 8 }

aal2SscsDtmfDigitPacketTransport OBJECT-TYPE
    SYNTAX      INTEGER {
                    disabled(1),
                    enabled(2)
                }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This attribute describes whether DTMF digit packet transport is
        enabled or disabled. If the parameter value specifies 'enabled',
        then type 3 dialled digit packets are only passed if the encoding
        scheme being used cannot transparently pass DTMF tones. If the
        parameter value specifies 'disabled', then a higher rate encoding
        scheme should be used to transparently pass DTMF tones."
    DEFVAL { disabled }
    ::= { cpIwfAal2Profile 9 }

aal2SscsPcmEncoding OBJECT-TYPE
    SYNTAX      INTEGER {
                    aLaw (1),
                    uLaw (2)
                }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This attribute describes the type of PCM encoding used."
    DEFVAL { aLaw }
    ::= { cpIwfAal2Profile 10 }
```

```
aal2SscsMaxSssarSduLength OBJECT-TYPE
    SYNTAX          INTEGER (493..65568)
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "This is the maximum size an SSSAR-SDU can take as defined in
        I.366.1. This parameter only applies to those AAL2 channels using
        I.366.1 SSSAR."
    DEFVAL { 1500 }
    ::= { cpIwfAal2Profile 11 }

aal2SscsProfileSource OBJECT-TYPE
    SYNTAX          INTEGER {
                        ituT (1),
                        other (2)
                    }
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "This attribute describes the source of the profile source. An
        SNMP Set on this object to an unsupported profile source must
        result in an SNMP Response with error status of badValue(3)."
```

```
    DEFVAL { other }
    ::= { cpIwfAal2Profile 12 }

aal2SscsPredefinedProfileIdentifier OBJECT-TYPE
    SYNTAX          Integer32
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "This attribute describes the predefined profile identifier. An
        SNMP Set on this object to an unsupported profile must
        result in an SNMP Response with error status of badValue(3)."
```

```
    DEFVAL { 9 }
    ::= { cpIwfAal2Profile 13 }

aal2SscsIeeeOui OBJECT-TYPE
    SYNTAX          Integer32
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "This attribute contains the IEEE Organizationally Unique
        Identifier (OUI) of the entity that specified the profile
        being used, if other than ITU-T. For example, if the source
        is the ATM Forum, the value of this object is 00A03E. This
        attribute is only meaningful if aal2SscsProfileSource
        has the value 'other'. An SNMP Set on this object to an
        unsupported profile source must result in an SNMP Response with
        error status of badValue(3)."
```

```
    DEFVAL { '00A03E'h }
    ::= { cpIwfAal2Profile 14 }

aal2SscsSsSarAssemblyTimerValue OBJECT-TYPE
    SYNTAX          Integer32
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "This object specifies the value of the segmentation reassembly
        timer, in msec, for I.366.1 SAR. The default value
        specified for this timer is effectively an infinite value per
```

```

        I.366.1."
    DEFVAL { 2147483647 }
    ::= { cpIwfAal2Profile 15 }

-----
--
--  cpIwfPotsPortTable
--

cpIwfPotsPortTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF CpIwfPotsPortEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table contains information on the configuration of the
        POTS ports on the CP-IWF in addition to the information
        contained in the ifTable about the physical interfaces to which
        the CP-IWF POTS ports are peering with currently."
    ::= { cpIwfMIBObjects 3 }

cpIwfPotsPortEntry OBJECT-TYPE
    SYNTAX      CpIwfPotsPortEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry in the cpIwfPotsPortTable that represents a single
        POTS port."
    INDEX       { potsPortNumber }
    ::= { cpIwfPotsPortTable 1 }

CpIwfPotsPortEntry ::= SEQUENCE {
    potsPortNumber          Integer32,
    potsPhysicalPort        Integer32,
    aal2ChannelId           INTEGER,
    potsPortTestType        INTEGER,
    signalingMethod         INTEGER,
    potsPortLabel           OCTET STRING
}

potsPortNumber OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The number identifying the POTS user port on the CP-IWF."
    ::= { cpIwfPotsPortEntry 1 }

potsPhysicalPort OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This has the value of the ifIndex of the ifEntry of the physical
        POTS port to which this CP-IWF POTS port is connected. The value
        of (0) has the special meaning that this POTS port is not connected
        to any physical port on the LES device."
    ::= { cpIwfPotsPortEntry 2 }

aal2ChannelId OBJECT-TYPE
    SYNTAX      INTEGER (16..255)
    MAX-ACCESS  read-write
```

```
STATUS          current
DESCRIPTION
    "The CID of the AAL2 connection transporting this port's traffic
    over the AAL2 VCC.
    When the aal2ApplicationIdentifier indicates the presence of ELCP,
    this object should not be used for CID allocation and the value of
    this object is not applicable.  In addition, if an SNMP operation
    is attempted on this object, an SNMP response with error status of
    badValue (3) should be returned."
 ::= { cpIwfPotsPortEntry 3 }

potsPortTestType OBJECT-TYPE
SYNTAX          INTEGER {
                    none (1),
                    codecLoopback (2),
                    aal2Loopback (3)
                }
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION
    "This object is used to specify the type of test to run for
    POTS ports.  There are no results stored locally for a loopback
    test.  The tests involve looping back the media stream at either
    the codec (PCM loopback) or the AAL2 layer (CPS loopback).
    In order to run these tests, the CO-IWF must first set the value of
    this object appropriate to the test that needs to be run.  The CO-IWF
    should then set the value of ifAdminStatus in the corresponding
    ifEntry to 'testing'.
    The CO-IWF should verify that the test is in progress by checking
    that the value of ifOperStatus in the corresponding ifEntry is
    equal to 'testing'.  Once testing is complete the CO-IWF must set
    the ifAdminStatus to a value other than 'testing'.
    Note that the LES device must not allow a CO-IWF to manipulate
    the ifAdminStatus of physical user ports that do not belong to
    its managed CP-IWF."
 ::= { cpIwfPotsPortEntry 4 }

signalingMethod OBJECT-TYPE
SYNTAX          INTEGER {
                    loopStart (1),
                    loopReverseBattery (2),
                    groundStart (3),
                    ddiPbxStart (4)
                }
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION
    "The signalling method to use for this user port."
DEFVAL { loopStart }
 ::= { cpIwfPotsPortEntry 5 }

potsPortLabel OBJECT-TYPE
SYNTAX          OCTET STRING (SIZE(0..32))
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION
    "Label assigned by service provider to identify this CP-IWF port.
    For example, may be used to hold Directory Number."
 ::= { cpIwfPotsPortEntry 6 }
```

```
--
-- cpIwfIsdnBriPortTable
--

cpIwfIsdnBriPortTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF CpIwfIsdnBriPortEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "This table contains information on the configuration of the
        ISDN BRI ports on the CP-IWF in addition to the information
        contained in the ifTable about the physical interfaces to which
        the CP-IWF ports are peering with currently."
    ::= { cpIwfMIBObjects 4 }

cpIwfIsdnBriPortEntry OBJECT-TYPE
    SYNTAX          CpIwfIsdnBriPortEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "An entry in the cpIwfIsdnBriPortTable that represents a single
        ISDN BRI port."
    INDEX          { isdnBriPortNumber }
    ::= { cpIwfIsdnBriPortTable 1 }

CpIwfIsdnBriPortEntry ::= SEQUENCE {
    isdnBriPortNumber      Integer32,
    isdnBriPhysicalPort   Integer32,
    aal2ChannelIdD        INTEGER,
    aal2ChannelIdB1       INTEGER,
    aal2ChannelIdB2       INTEGER,
    isdnBriPortLabel      OCTET STRING,
    isdnBriPortTestType   INTEGER
}

isdnBriPortNumber OBJECT-TYPE
    SYNTAX          Integer32
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        " The number identifying the ISDN BRI user port on the CP-IWF."
    ::= { cpIwfIsdnBriPortEntry 1 }

isdnBriPhysicalPort OBJECT-TYPE
    SYNTAX          Integer32
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "This has the value of the ifIndex of the ifEntry of the physical
        ISDN BRI port to which this CP-IWF ISDN BRI port is connected. The
        value of (0) has the special meaning that this ISDN BRI port is
        not connected to any physical port on the LES device."
    ::= { cpIwfIsdnBriPortEntry 2 }

aal2ChannelIdD OBJECT-TYPE
    SYNTAX          INTEGER (16..255)
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "The CID of the AAL2 connection transporting the D channel of this
        ISDN BRI port over the AAL2 VCC. The default value of this object is
```

determined by the formula defined in af-vmoa-0145.000 section 4.4.2. When the aal2ApplicationIdentifier indicates the presence of ELCP, this object should not be used for CID allocation and the value of this object is not applicable. In addition, if an SNMP operation is attempted on this object, an SNMP response with error status of badValue (3) should be returned."

::= { cpIwfIsdnBriPortEntry 3 }

aal2ChannelIdB1 OBJECT-TYPE

SYNTAX INTEGER (16..255)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The CID of the AAL2 connection transporting the B1 channel of this ISDN BRI port over the AAL2 VCC. The default value of this object is determined by the formula defined in af-vmoa-0145.000 section 4.4.2. When the aal2ApplicationIdentifier indicates the presence of ELCP, this object should not be used for CID allocation and the value of this object is not applicable. In addition, if an SNMP operation is attempted on this object, an SNMP response with error status of badValue (3) should be returned."

::= { cpIwfIsdnBriPortEntry 4 }

aal2ChannelIdB2 OBJECT-TYPE

SYNTAX INTEGER (16..255)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The CID of the AAL2 connection transporting the B2 channel of this ISDN BRI port over the AAL2 VCC. The default value of this object is determined by the formula defined in af-vmoa-0145.000 section 4.4.2. When the aal2ApplicationIdentifier indicates the presence of ELCP, this object should not be used for CID allocation and the value of this object is not applicable. In addition, if an SNMP operation is attempted on this object, an SNMP response with error status of badValue (3) should be returned."

::= { cpIwfIsdnBriPortEntry 5 }

isdnBriPortLabel OBJECT-TYPE

SYNTAX OCTET STRING (SIZE(0..32))

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Label assigned by service provider to identify this CP-IWF port. For example, may be used to hold Directory Number."

::= { cpIwfIsdnBriPortEntry 6 }

isdnBriPortTestType OBJECT-TYPE

SYNTAX INTEGER {  
    physicalPortLoopback (1),  
    dChannelPhysicalPortLoopback (2),  
    b1ChannelPhysicalPortLoopback (3),  
    b2ChannelPhysicalPortLoopback (4),  
    dChannelAal2Loopback (5),  
    b1ChannelAal2Loopback (6),  
    b2ChannelAal2Loopback (7)  
}

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object is used to specify the type of test to run for

ISDN-BRI ports. There are no results stored locally for a loopback test. Loopback of the whole ISDN-BRI physical user port is supported where all the D, B1 and B2 channels are looped back simultaneously, along with individual loopback of the D, B1 and B2 channels. AAL2 Loopback is also supported on a per sub-channel basis. In order to run these tests, the CO-IWF must first set the value of this object appropriate to the test that needs to be run. The CO-IWF should then set the value of ifAdminStatus in the corresponding ifEntry to 'testing'. The CO-IWF should verify that the test is in progress by checking that the value of ifOperStatus in the corresponding ifEntry is equal to 'testing'. Once testing is complete the CO-IWF must set the ifAdminStatus to a value other than 'testing'. Note that the LES device must not allow a CO-IWF to manipulate the ifAdminStatus of physical user ports that do not belong to its managed CP-IWF."

```
::= { cpIwfIsdnBriPortEntry 7 }
```

```
-----
```

```
--
```

```
-- cpIwfAal2Stats Group
```

```
--
```

```
cpIwfAal2Stats OBJECT IDENTIFIER ::= { cpIwfMIBObjects 6 }
```

```
aal2CpsInPkts OBJECT-TYPE
```

```
SYNTAX Counter32
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

```
"Number of CPS packets received"
```

```
::= { cpIwfAal2Stats 1 }
```

```
aal2CpsOutPkts OBJECT-TYPE
```

```
SYNTAX Counter32
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

```
"Number of CPS packets transmitted"
```

```
::= { cpIwfAal2Stats 2 }
```

```
aal2CpsParityErrors OBJECT-TYPE
```

```
SYNTAX Counter32
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

```
"Number of errors encountered as specified in Table 6/I.363.2
```

```
(errnum = 0)"
```

```
::= { cpIwfAal2Stats 3 }
```

```
aal2CpsSeqNumErrors OBJECT-TYPE
```

```
SYNTAX Counter32
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

```
"Number of errors encountered as specified in Table 6/I.363.2
```

```
(errnum = 1)"
```

```
::= { cpIwfAal2Stats 4 }
```

```
aal2CpsOsfMismatchErrors OBJECT-TYPE
```

```
SYNTAX Counter32
```

```
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Number of errors encountered as specified in Table 6/I.363.2
    (errnum = 2)"
 ::= { cpIwfAal2Stats 5 }

aal2CpsOsfErrors OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Number of errors encountered as specified in Table 6/I.363.2
    (errnum = 3)"
 ::= { cpIwfAal2Stats 6 }

aal2CpsHecErrors OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Number of errors encountered as specified in Table 6/I.363.2
    (errnum = 4)"
 ::= { cpIwfAal2Stats 7 }

aal2CpsOversizedSduErrors OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Number of errors encountered as specified in Table 6/I.363.2
    (errnum = 5)"
 ::= { cpIwfAal2Stats 8 }

aal2CpsReassemblyErrors OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Number of errors encountered as specified in Table 6/I.363.2
    (errnum = 6)"
 ::= { cpIwfAal2Stats 9 }

aal2CpsHecOverlapErrors OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Number of errors encountered as specified in Table 6/I.363.2
    (errnum = 7)"
 ::= { cpIwfAal2Stats 10 }

aal2CpsUuiErrors OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Number of errors encountered as specified in Table 6/I.363.2
    (errnum = 8)"
 ::= { cpIwfAal2Stats 11 }
```

```
aal2CpsCidErrors OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Number of errors encountered as specified in Table 6/I.363.2
        (errnum = 9)"
    ::= { cpIwfAal2Stats 12 }

aal2SscsOversizedSssarSduErrors OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Number of errors encountered as specified in Table 3/I.366.1
        (errnum = 10)"
    ::= { cpIwfAal2Stats 13 }

aal2SscsSssarRasTimerExpiryErrors OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Number of errors encountered as specified in Table 3/I.366.1
        (errnum = 11)"
    ::= { cpIwfAal2Stats 14 }

aal2SscsUndersizedSstedPduErrors OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Number of errors encountered as specified in Table 5/I.366.1
        (errnum = 20)"
    ::= { cpIwfAal2Stats 15 }

aal2SscsSstedPduLengthMismatchErrors OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Number of errors encountered as specified in Table 5/I.366.1
        (errnum = 21)"
    ::= { cpIwfAal2Stats 16 }

aal2SscsSstedCrcMismatchErrors OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Number of errors encountered as specified in Table 5/I.366.1
        (errnum = 22)"
    ::= { cpIwfAal2Stats 17 }

-- -----
--
-- cpIwfPotsPortStatsTable
--

cpIwfPotsPortStatsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF CpIwfPotsPortStatsEntry
```

```
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
    "This table contains performance statistics pertinent to POTS
    ports respectively in addition to the information contained in the
    ifTable about the physical interfaces to which the CP-IWF ports
    are peering with currently"
 ::= { cpIwfMIBObjects 7}

cpIwfPotsPortStatsEntry OBJECT-TYPE
SYNTAX        CpIwfPotsPortStatsEntry
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
    "An entry in the cpIwfPotsPortStatsTable that represents
    statistics for a single POTS port."
INDEX         { potsPortNumber }
 ::= { cpIwfPotsPortStatsTable 1 }

CpIwfPotsPortStatsEntry ::= SEQUENCE {
    cpIwfPotsPortActiveSeconds Counter32,
    cpIwfPotsPortFillerOctets Counter32,
    cpIwfPotsPortDroppedOctets Counter32
}

cpIwfPotsPortActiveSeconds OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Total length of time the AAL2 channel associated with this port
    has been active, in seconds."
 ::= { cpIwfPotsPortStatsEntry 1 }

cpIwfPotsPortFillerOctets OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Total number of PCM filler octets injected into active media
    stream on this port due to playout buffer underflow."
 ::= { cpIwfPotsPortStatsEntry 2 }

cpIwfPotsPortDroppedOctets OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Total number of PCM payload octets dropped due to buffer overflow
    at this port. Octets that are dropped because they arrived late,
    and which have already been substituted by filler PCM octets,
    shall not be counted."
 ::= { cpIwfPotsPortStatsEntry 3 }

-- -----
--
-- cpIwfIsdnBriPortStatsTable
--

cpIwfIsdnBriPortStatsTable OBJECT-TYPE
SYNTAX        SEQUENCE OF CpIwfIsdnBriPortStatsEntry
```

```
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
    "This table contains performance statistics pertinent to ISDN BRI
    ports respectively in addition to the information contained in the
    ifTable about the physical interfaces to which the CP-IWF ports
    are peering with currently"
 ::= { cpIwfMIBObjects 8}

cpIwfIsdnBriPortStatsEntry OBJECT-TYPE
SYNTAX        CpIwfIsdnBriPortStatsEntry
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
    "An entry in the cpIwfIsdnBriPortStatsTable that represents
    statistics for a single ISDN BRI port."
INDEX         { isdnBriPortNumber }
 ::= { cpIwfIsdnBriPortStatsTable 1 }

CpIwfIsdnBriPortStatsEntry ::= SEQUENCE {
    cpIwfIsdnBriPortB1ActiveSeconds    Counter32,
    cpIwfIsdnBriPortB1FillerOctets    Counter32,
    cpIwfIsdnBriPortB1DroppedOctets   Counter32,
    cpIwfIsdnBriPortB2ActiveSeconds    Counter32,
    cpIwfIsdnBriPortB2FillerOctets    Counter32,
    cpIwfIsdnBriPortB2DroppedOctets   Counter32
}

cpIwfIsdnBriPortB1ActiveSeconds OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Total length of time the AAL2 channel associated with this
    port/channel has been active, in seconds."
 ::= { cpIwfIsdnBriPortStatsEntry 1 }

cpIwfIsdnBriPortB1FillerOctets OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Total number of PCM filler octets injected into active media
    stream on this port/channel due to playout buffer underflow."
 ::= { cpIwfIsdnBriPortStatsEntry 2 }

cpIwfIsdnBriPortB1DroppedOctets OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Total number of PCM payload octets dropped due to buffer overflow
    on this port/channel. Octets that are dropped because they
    arrived late, and which have already been substituted by filler
    PCM octets, shall not be counted."
 ::= { cpIwfIsdnBriPortStatsEntry 3 }

cpIwfIsdnBriPortB2ActiveSeconds OBJECT-TYPE
SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
```

```
DESCRIPTION
    "Total length of time the AAL2 channel associated with this
    port/channel has been active, in seconds."
 ::= { cpIwfIsdnBriPortStatsEntry 4 }

cpIwfIsdnBriPortB2FillerOctets OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Total number of PCM filler octets injected into active media
    stream on this port/channel due to playout buffer underflow."
 ::= { cpIwfIsdnBriPortStatsEntry 5 }

cpIwfIsdnBriPortB2DroppedOctets OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Total number of PCM payload octets dropped due to buffer overflow
    on this port/channel.  Octets that are dropped because they
    arrived late, and which have already been substituted by filler
    PCM octets, shall not be counted."
 ::= { cpIwfIsdnBriPortStatsEntry 6 }

-- -----
-- The following section defines Loop Emulation Service specific
-- traps for the CP-IWF as a whole (not port specific).
--
-- CP-IWF enterprise traps group
--

cpIwfMIBNotificationPrefix OBJECT IDENTIFIER ::= { cpIwfMIBNotifications 0 }

cpIwfInsufficientPhysicalBandwidth NOTIFICATION-TYPE
OBJECTS { cpIwfUpstreamPhysicalBandwidth,
          cpIwfDownstreamPhysicalBandwidth }
STATUS      current
DESCRIPTION
    "This trap is generated when the physical layer bandwidth in either
    direction drops below the currently configured AAL2 VCC bandwidth."
 ::= { cpIwfMIBNotificationPrefix 1 }

cpIwfUpstreamPhysicalBandwidth OBJECT-TYPE
SYNTAX      Integer32
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "This object defines the new physical bandwidth in the upstream
    direction of the CP-IWF."
 ::= { cpIwfMIBObjects 9 }

cpIwfDownstreamPhysicalBandwidth OBJECT-TYPE
SYNTAX      Integer32
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "This object defines the new physical bandwidth in the downstream
    direction of the CP-IWF."
 ::= { cpIwfMIBObjects 10 }
```

```
cpIwfExcessImpairment NOTIFICATION-TYPE
  OBJECTS { cpIwfImpairmentPortType, cpIwfPortNumber }
  STATUS      current
  DESCRIPTION
    "This trap is generated when the number of impairments on any POTS
    port or ISDN BRI port/channel, measured as the sum of fillerOctets
    and droppedOctets on that port, in any given interval of
    cpIwfImpairmentInterval minutes, is equal to or greater than the
    value of cpIwfImpairmentThreshold.  If the value of
    cpIwfImpairmentThreshold is zero, then this trap is never
    generated."
  ::= { cpIwfMIBNotificationPrefix 2 }

cpIwfImpairmentPortType OBJECT-TYPE
  SYNTAX      INTEGER {
                pots (1),
                isdnBriB1 (2),
                isdnBriB2 (3)
              }
  MAX-ACCESS  read-create
  STATUS      current
  DESCRIPTION
    "This object is used within the cpIwfExcessImpairment Trap and
    identifies the type of the CP-IWF port on which the excess
    impairments event occurred."
  ::= { cpIwfMIBObjects 11 }

cpIwfPortNumber OBJECT-TYPE
  SYNTAX      INTEGER (1..240)
  MAX-ACCESS  read-create
  STATUS      current
  DESCRIPTION
    "This object is used within traps to identify the port number to
    which the trap refers.  The range of values this object can take is
    dependent on port type and is defined in af-vmoa-0145.000 section
    4.4.2"
  ::= { cpIwfMIBObjects 12 }

-- -----
--
-- Conformance information

cpIwfMIBConformance      OBJECT IDENTIFIER ::= { cpIwfMIB 3 }
cpIwfMIBCompliances      OBJECT IDENTIFIER ::= { cpIwfMIBConformance 1 }
cpIwfMIBGroups           OBJECT IDENTIFIER ::= { cpIwfMIBConformance 2 }

-- compliance statements

cpIwfMIBCompliance MODULE-COMPLIANCE
  STATUS      current
  DESCRIPTION
    "The compliance statement for SNMP entities that support LES as
    specified in af-vmoa-0145.000 of the ATM Forum.

    Note the Trap types and associated MIB objects defined in this MIB
    are required implementations to claim conformance to this MIB.

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

    - The System Group from RFC 1213
```

- ifTable and ifXTable from RFC 2863. See section 6 of this specification for interpretations of the ifTable and ifXTable objects as they apply to LES."

```
MODULE -- this module
MANDATORY-GROUPS {
    cpIwfGeneralGroup,
    cpIwfNotificationsGroup
}

GROUP          cpIwfAal2ConfigGroup
DESCRIPTION
    "This group is mandatory only for those CP-IWFs that use PVCs
    between the CP-IWF and CO-IWF. It is not required in the presence of
    SVCs as all AAL2 parameters shall be supplied during SVC setup."

GROUP          cpIwfAal2StatsGroup
DESCRIPTION
    "This group is mandatory only for those CP-IWFs that provide AAL2
    statistics."

GROUP          cpIwfPotsPortConfigGroup
DESCRIPTION
    "This group is mandatory only for those CP-IWFs
    that host POTS services."

GROUP          cpIwfPotsPortStatsGroup
DESCRIPTION
    "This group is mandatory only if the CP-IWF provides statistics for
    any POTS ports it hosts."

GROUP          cpIwfIsdnBriPortConfigGroup
DESCRIPTION
    "This group is mandatory only for those CP-IWFs
    that host ISDN BRI services."

GROUP          cpIwfIsdnBriPortStatsGroup
DESCRIPTION
    "This group is mandatory only if the CP-IWF provides statistics for
    any ISDN BRI ports it hosts."

GROUP          cpIwfPotsPortCidConfigGroup
DESCRIPTION
    "This group is mandatory for CP-IWFs that host POTS services, only
    in the absence of ELCP as a mechanism for CID allocation."

GROUP          cpIwfIsdnBriPortCidConfigGroup
DESCRIPTION
    "This group is mandatory for CP-IWFs that host ISDN BRI services,
    only in the absence of ELCP as a mechanism for CID allocation."

GROUP          cpIwfElcpPstnGroup
DESCRIPTION
    "This group is mandatory for those CP-IWFs that implement either
    the CCS signaling option or the ELCP."

GROUP          cpIwfPayoutBufferGroup
DESCRIPTION
    "This group is mandatory only for those CP-IWFs that make the
    payout buffer depth configurable and provide a means to detect
    impairments."
```

```
GROUP          cpIwfImpairmentNotificationsGroup
DESCRIPTION
    "This group is mandatory if the cpIwfPlayoutBufferGroup is
    implemented."

 ::= { cpIwfMIBCompliances 1 }

-- Units of Conformance

cpIwfGeneralGroup  OBJECT-GROUP
OBJECTS {
    cpIwfVpi,
    cpIwfVci,
    cpIwfTimingReference,
    cpIwfEchoCancellationSupport,
    cpIwfAdminStatus,
    cpIwfOperStatus,
    cpIwfRestart,
    cpIwfTestType,
    cpIwfTestResult,
    cpIwfTestResultText,
    cpIwfMwdForRestart,
    cpIwfEocBandwidth,
    cpIwfCurrentConfig,
    cpIwfTrapGeneration,
    cpIwfVendorName,
    cpIwfDeviceType,
    cpIwfHardwareVersion,
    cpIwfSoftwareVersion,
    cpIwfUpstreamPhysicalBandwidth,
    cpIwfDownstreamPhysicalBandwidth,
    cpIwfPortNumber
}
STATUS          current
DESCRIPTION
    "A collection of objects required to manage the
    CP-IWF as a whole"
 ::= { cpIwfMIBGroups 1 }

cpIwfAal2ConfigGroup  OBJECT-GROUP
OBJECTS {
    aal2ApplicationIdentifier,
    aal2CpsMaxMultiplexedChannels,
    aal2CpsMaxSDULength,
    aal2CpsCIDLowerLimit,
    aal2CpsCIDUpperLimit,
    aal2CpsOptimisation,
    aal2CpsTimerCuValue,
    aal2SscsMaxSssarSduLength,
    aal2SscsFaxDemodulationTransport,
    aal2SscsDtmfDigitPacketTransport,
    aal2SscsPcmEncoding,
    aal2SscsProfileSource,
    aal2SscsPredefinedProfileIdentifier,
    aal2SscsIeeeOui,
    aal2SscsSsSarAssemblyTimerValue
}
STATUS          current
DESCRIPTION
    "A collection of objects describing the configuration of the AAL2
```

```
        layer specific to LES"
 ::= { cpIwfMIBGroups 2 }

cpIwfPotsPortConfigGroup OBJECT-GROUP
OBJECTS {
    cpIwfNumPotsPorts,
    cpIwfPotsPortEncodingSelectionMode,
    potsPhysicalPort,
    potsPortTestType,
    signalingMethod,
    potsPortLabel
}
STATUS current
DESCRIPTION
    "A collection of objects describing the configuration of the POTS
    ports on a CP-IWF."
 ::= { cpIwfMIBGroups 3 }

cpIwfIsdnBriPortConfigGroup OBJECT-GROUP
OBJECTS {
    cpIwfNumIsdnBriPorts,
    cpIwfIsdnBriPortEncodingSelectionMode,
    isdnBriPhysicalPort,
    isdnBriPortLabel,
    isdnBriPortTestType
}
STATUS current
DESCRIPTION
    "A collection of objects describing the configuration of the ISDN
    BRI ports on a CP-IWF."
 ::= { cpIwfMIBGroups 4 }

cpIwfPotsPortCidConfigGroup OBJECT-GROUP
OBJECTS {
    aal2ChannelId
}
STATUS current
DESCRIPTION
    "Object describing the static CID allocation to a
    user-side POTS termination. This object is required
    when ELCP is not used as a mechanism for CID allocation."
 ::= { cpIwfMIBGroups 5 }

cpIwfIsdnBriPortCidConfigGroup OBJECT-GROUP
OBJECTS {
    aal2ChannelIdD,
    aal2ChannelIdB1,
    aal2ChannelIdB2
}
STATUS current
DESCRIPTION
    "A collection of objects describing the static CID
    allocations to the D, B1 and B2 channels of a user-side
    ISDN-BRI termination. These objects are required when
    ELCP is not used as a mechanism for CID allocation."
 ::= { cpIwfMIBGroups 6 }

cpIwfAal2StatsGroup OBJECT-GROUP
OBJECTS {
    aal2CpsInPkts,
    aal2CpsOutPkts,
```

```
        aal2CpsParityErrors,
        aal2CpsSeqNumErrors,
        aal2CpsOsfMismatchErrors,
        aal2CpsOsfErrors,
        aal2CpsHecOverlapErrors,
        aal2CpsHecErrors,
        aal2CpsOversizedSduErrors,
        aal2CpsReassemblyErrors,
        aal2CpsUuiErrors,
        aal2CpsCidErrors,
        aal2SscsOversizedSssarSduErrors,
        aal2SscsSssarRasTimerExpiryErrors,
        aal2SscsUndersizedSstedPduErrors,
        aal2SscsSstedPduLengthMismatchErrors,
        aal2SscsSstedCrcMismatchErrors
    }
    STATUS          current
    DESCRIPTION
        "These objects provide statistics on the AAL2 layer"
    ::= { cpIwfMIBGroups 7 }

cpIwfPotsPortStatsGroup OBJECT-GROUP
    OBJECTS {
        cpIwfPotsPortActiveSeconds,
        cpIwfPotsPortFillerOctets,
        cpIwfPotsPortDroppedOctets
    }
    STATUS          current
    DESCRIPTION
        "These objects provide statistics on the POTS ports"
    ::= { cpIwfMIBGroups 8 }

cpIwfIsdnBriPortStatsGroup OBJECT-GROUP
    OBJECTS {
        cpIwfIsdnBriPortB1ActiveSeconds,
        cpIwfIsdnBriPortB1FillerOctets,
        cpIwfIsdnBriPortB1DroppedOctets,
        cpIwfIsdnBriPortB2ActiveSeconds,
        cpIwfIsdnBriPortB2FillerOctets,
        cpIwfIsdnBriPortB2DroppedOctets
    }
    STATUS          current
    DESCRIPTION
        "These objects provide statistics on the ISDN BRI ports"
    ::= { cpIwfMIBGroups 9 }

cpIwfElcpPstnGroup OBJECT-GROUP
    OBJECTS {
        cpIwfV5PSTNProtocolVariant,
        cpIwfElcpAndPstnChannelBandwidth
    }
    STATUS          current
    DESCRIPTION
        "Objects for setting the V5 PSTN protocol variant and the
        maximum bandwidth to be used for transmission of PSTN or
        ELCP messages."
    ::= { cpIwfMIBGroups 10 }

cpIwfPlayoutBufferGroup OBJECT-GROUP
    OBJECTS {
        cpIwfPlayoutBufferDepth,
```

```
        cpIwfImpairmentInterval,  
        cpIwfImpairmentThreshold,  
        cpIwfImpairmentPortType  
    }  
    STATUS          current  
    DESCRIPTION  
        "A collection of objects used for configuring the playout  
        buffer depth and to detect impairments to do incorrect setting  
        of this buffer depth."  
    ::= { cpIwfMIBGroups 11 }  
  
cpIwfNotificationsGroup NOTIFICATION-GROUP  
    NOTIFICATIONS { cpIwfInsufficientPhysicalBandwidth }  
    STATUS          current  
    DESCRIPTION  
        "The notification(s) which a CP-IWF is required to implement"  
    ::= { cpIwfMIBGroups 12 }  
  
cpIwfImpairmentNotificationsGroup NOTIFICATION-GROUP  
    NOTIFICATIONS { cpIwfExcessImpairment }  
    STATUS          current  
    DESCRIPTION  
        "This group specifies the notification used to inform the CO-IWF  
        of impairments due to incorrect playout buffer depth, or corruption  
        or loss of AAL2 packets by the network."  
    ::= { cpIwfMIBGroups 13 }  
  
END
```

## **Appendix A: Procedures for usage of the CP-IWF MIB**

This informative appendix provides a set of procedures for common management tasks that the CP-IWF MIB supports. Procedures have been defined for the following tasks:

1. Startup of CP-IWF - This includes both initial start-up and restart.
2. Physical Port assignment to CP-IWF user port.
3. Release of Physical Port from a CP-IWF user port.
4. Testing of CP-IWF user ports.

The management of the CP-IWF is the responsibility of the CP-IWF Element Management System (EMS) of the provider of the CO-IWF. Although the LES EOC terminates at the CO-IWF, the management flow will not, especially when the CP-IWF EMS is not co-located within the same device as the CO-IWF. Hence the CO-IWF merely acts as a conduit for the management flow between the CP-IWF and CP-IWF EMS.

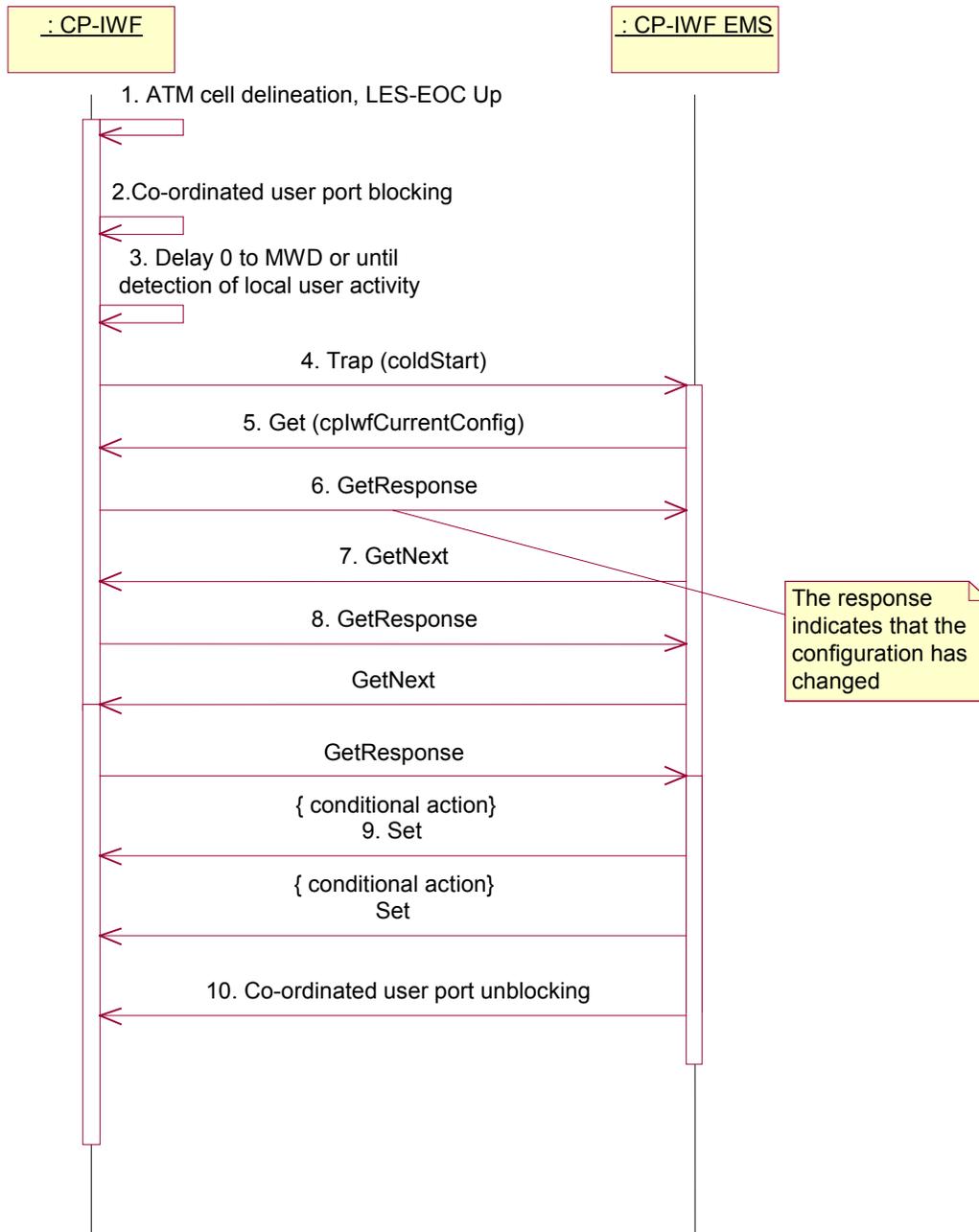
### **A.1 CP-IWF Start-up/Restart**

This procedure defines what happens during a CP-IWF initial start-up or restart.

#### **A.1.1 Basic Flow with Port Blocking**

1. The CP-IWF is powered up or restarted, ATM cell delineation is achieved and the LES EOC is activated.
2. In order to start-up in a well-known state the CP-IWF shall carry out co-ordinated blocking of all relevant user ports using an appropriate mechanism.
3. To avoid a restart avalanche a restart timer shall be initiated with a random value, uniformly distributed between 0 and the Maximum Waiting Delay (cpIwfMwdForRestart).
4. When the timer expires or activity is detected the coldStart Trap shall be sent. The CP-IWF shall interpret the subsequent Get request from the CP-IWF EMS as an acknowledgment to the Trap. If it does not get a Get request within four times the Maximum Waiting Delay then the CP-IWF should restart the random timer and resend the coldStart Trap. The CP-IWF should attempt this a minimum of two times before concluding failure of the LES EOC communications channel. In the event that the LES EOC communications channel fails, the CP-IWF should return the LES EOC channel to service upon receipt of a subsequent SNMP Get or Set request.
5. Upon receipt of the coldStart Trap the CP-IWF EMS shall SNMP Get the cpIwfCurrentConfig object to determine whether the configuration has changed since restart.
6. In this scenario the Get Response indicates that the configuration has changed.

7. The CP-IWF EMS shall initiate a capability discovery phase whereby it shall SNMP Walk the CP-IWF MIB by issuing multiple GetNext requests for MIB objects.
8. The CP-IWF shall respond with a GetResponse containing the MIB objects.
9. Once the complete CP-IWF MIB has been retrieved, the CP-IWF EMS shall check for compatibility in configuration and if necessary shall issue SNMP Set requests to change parameters that are not compatible. This is a conditional phase; if the CP-IWF configuration is already compatible then there is no need to make any modifications.
10. Upon successful configuration alignment, the CP-IWF EMS shall carry out co-ordinated unblocking of all relevant user ports using an appropriate mechanism.



**Figure 4: Procedure for CP-IWF Start-up/Restart**

## **A.1.2 Alternative Flows**

### **A.1.2.1 CP-IWF configuration has not changed**

If step 6 of the basic flow indicates that the CP-IWF configuration has not changed then steps 7-9 are not applicable and the CP-IWF EMS shall move directly to step 10.

### **A.1.2.2 Unsupported CP-IWF parameter required for compatibility with CO-IWF**

After initial capability discovery of the CP-IWF and detection of mis-alignment of configuration, the CP-IWF EMS shall issue SNMP Set requests to the CP-IWF (Step 9 of the basic flow) in order to re-align the CP-IWF configuration to that which is compatible with the CO-IWF. In certain circumstances the CP-IWF may not support a value of a parameter that is required for compatibility with the CO-IWF, e.g. an AAL2 profile. If this is the case the CP-IWF EMS shall detect this parameter is not supported based on the response it gets to the SNMP Set request. The basic flow shall terminate at step 8 and the CP-IWF EMS having concluded that the CP-IWF is incompatible shall inform its Operational Support System (OSS) appropriately.

### **A.1.2.3 Basic Flow Without Port Blocking**

Applications that do not support user port blocking and unblocking use the same basic flow except that steps 2 and 10 are not required. The CP-IWF shall use the stored ifAdmin Status to control the state of user ports at start up. The CP-IWF EMS and CO-IWF shall ensure that the configuration is compatible before any line state changes are processed.

## **A.2 Physical Port Assignment to CP-IWF User Port**

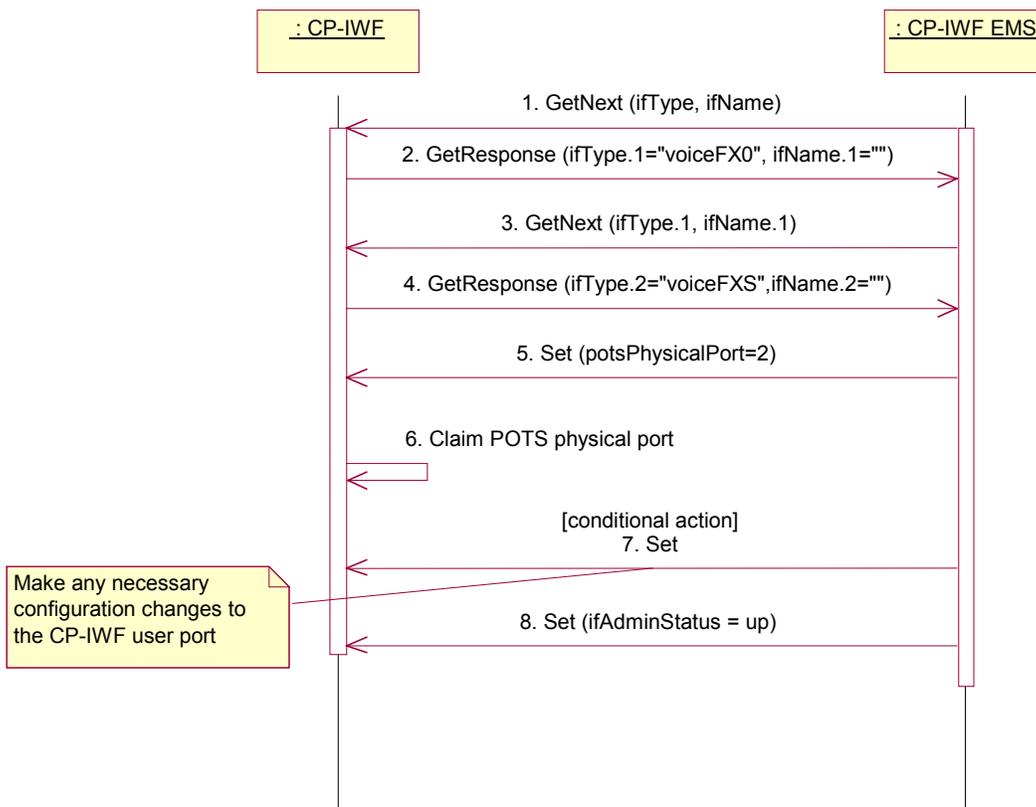
This procedure defines how physical user ports are assigned to CP-IWF user ports.

Figure 5 shows the assignment of a physical FXS voice port to a CP-IWF POTS user port. The procedure is similar and equally applicable to assignment of FX0 voice ports to CP-IWF POTS user ports and ISDN-BRI physical ports to CP-IWF ISDN-BRI user ports.

### **A.2.1 Basic Flow**

1. The CP-IWF EMS shall go through each entry in the ifTable of the physical interface MIB within the LES device and check each physical port's ifType and ifName.
2. In this scenario the GetResponse to the first request results in an incompatible voice port.
3. The CP-IWF EMS then retrieves the next entry in the ifTable.
4. The GetResponse to this request results in a match and also the ifName contains a zero length string indicating that this FXS voice port is available for use.
5. The CP-IWF EMS shall issue a Set request to the cpIwfPotsPortEntry to which this physical FXS voice port is to be assigned. This shall request that the potsPhysicalPort value be set to the ifIndex of the available FXS voice port.
6. The CP-IWF shall carry out the physical port assignment procedure as defined in Table 1.

7. Once the assignment is complete the CP-IWF EMS shall make any necessary configuration changes to the user port (e.g. changing the signaling method).
8. The CP-IWF EMS shall set the ifAdminStatus of the ifEntry associated with the FXS voice port to 'up' to put the port in-service.



**Figure 5: Procedure for assigning a physical port to a CP-IWF user port**

## A.2.2 Alternative Flows

### A.2.2.1 No applicable physical user ports available

If in the basic flow there are no physical user ports available that can be assigned to a CP-IWF user port, the basic flow shall not proceed to step 5 and the CP-IWF EMS shall inform its OSS appropriately.

### A.3 Release of a Physical Port assigned to a CP-IWF User Port

This procedure defines how a physical port that is assigned to a CP-IWF is released. Figure 6 shows the release of an ISDN-BRI physical port. The procedure is similar and equally applicable to release of POTS physical ports.

#### A.3.1 Basic Flow

1. The CP-IWF EMS shall put the ISDN-BRI port out of service by setting the ifAdminStatus of the associated ifEntry to 'down' to put the port out-of-service. This shall result in any active AAL2 channels on that port being deactivated.
2. The CP-IWF EMS shall then issue an SNMP Set request to set the isdnBriPhysicalPort of the relevant cpIwfIsdnBriPortEntry to zero. This has the special meaning that the CP-IWF user port is not connected to a physical port.
3. The CP-IWF shall carry out the physical port release procedure as defined in Table 1.

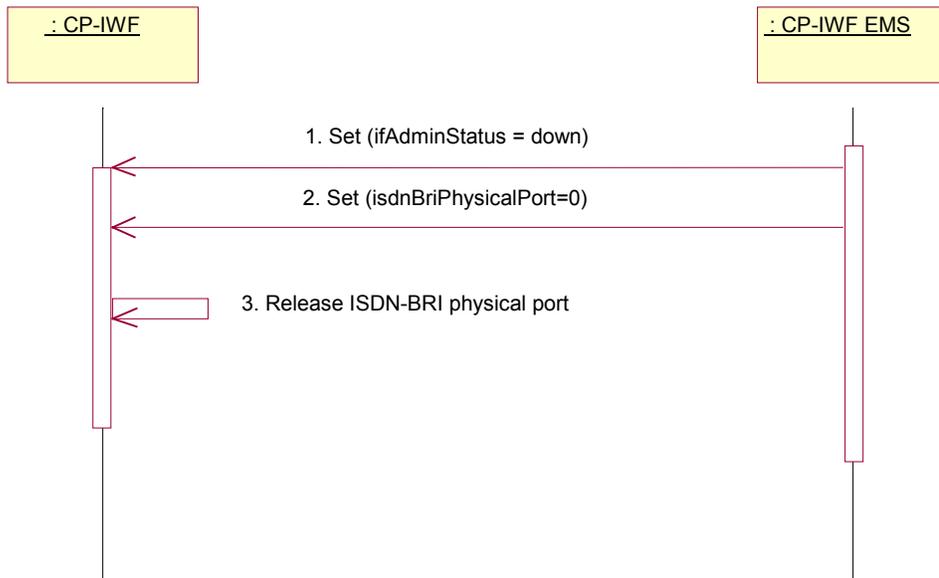


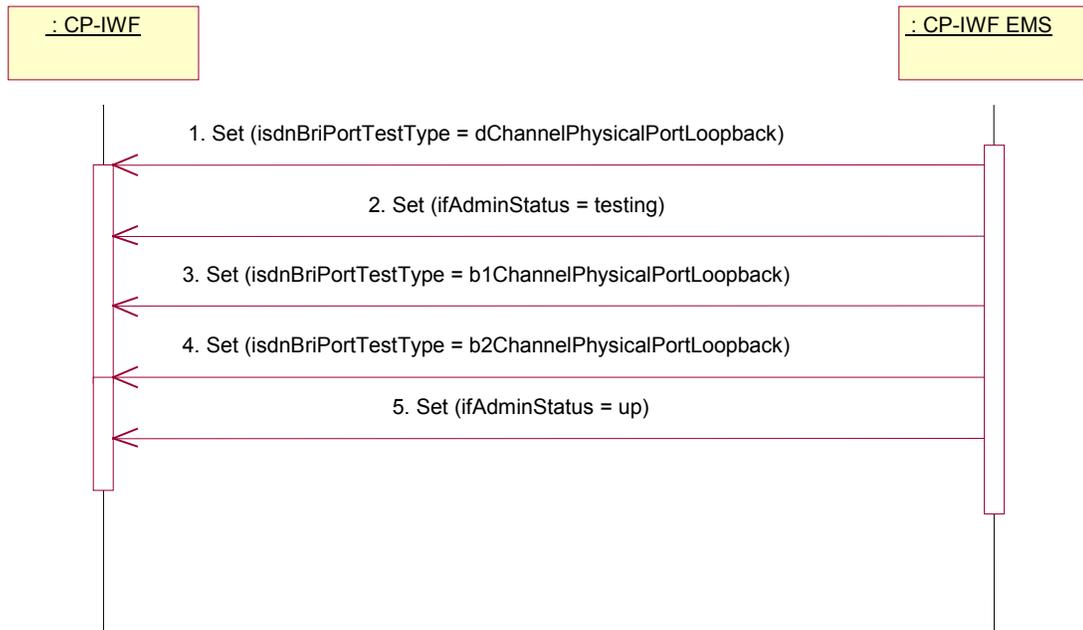
Figure 6: Procedure for releasing a physical port assigned to a CP-IWF user port

## **A.4 Loopback Testing**

This procedure defines how to carry out loopback testing. Figure 7 shows a scenario where loopback testing is carried out for the individual D, B1 and B2 channels of the ISDN-BRI physical port. The procedure is similar and equally applicable to other types of loopback tests defined for the CP-IWF.

### **A.4.1 Basic Flow**

1. The test type is set to loopback of the ISDN-BRI D-channel.
2. The CP-IWF EMS shall request the CP-IWF to put the ISDN-BRI port into the “testing” state by issuing an SNMP Set on the ifAdminStatus of the associated ISDN-BRI physical port entry in the ifTable. This shall result in any active AAL2 channels on that port being deactivated. If this action is successful the CP-IWF shall activate the appropriate test selected in isdnBriPortTestType on the ISDN-BRI port (in this case the loopback of the ISDN-BRI D-channel).
3. The CP-IWF EMS changes the test type to loopback of the ISDN-BRI B1 channel. If this action is successful then the CP-IWF shall stop the currently active test and shall activate the newly selected test on the port.
4. The CP-IWF EMS changes the test type to loopback of the ISDN-BRI B2 channel. If this action is successful then the CP-IWF shall stop the currently active test and shall activate the newly selected test on the port.
5. The CP-IWF EMS shall change the ifAdminStatus of the ISDN-BRI port back to “up” to put it in-service.



**Figure 7: Procedure for carrying out loopback tests**

## **A.4.2 Alternative Flows**

### **A.4.2.1 A loopback test results in loss of communications over the LES EOC**

It is possible that a loopback test results in failure of communications over the LES EOC and the CO-IWF is unable to deactivate the test. The CP-IWF shall autonomously deactivate any applied loopbacks upon detection of failure of communications with the CO-IWF over the LES EOC.