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Definitions of Managed Objects  
for the Internet Fibre Channel Protocol (iFCP)

Abstract

This document defines Management Information Base (MIB) objects to monitor and control the Internet Fibre Channel Protocol (iFCP) gateway instances and their associated sessions, for use with network management protocols.

This document obsoletes RFC 4369.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at <http://www.rfc-editor.org/info/rfc6173>.

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## 1. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

## 2. Introduction

iFCP (RFC 4172 [RFC4172]) provides Fibre Channel fabric functionality on an IP network in which TCP/IP switching and routing elements replace Fibre Channel components. iFCP is used between iFCP gateways. This protocol can be used by FC-to-IP-based storage gateways for Fibre Channel Protocol (FCP) storage interconnects.

Figure 1 provides an example of an interconnect between iFCP gateways.

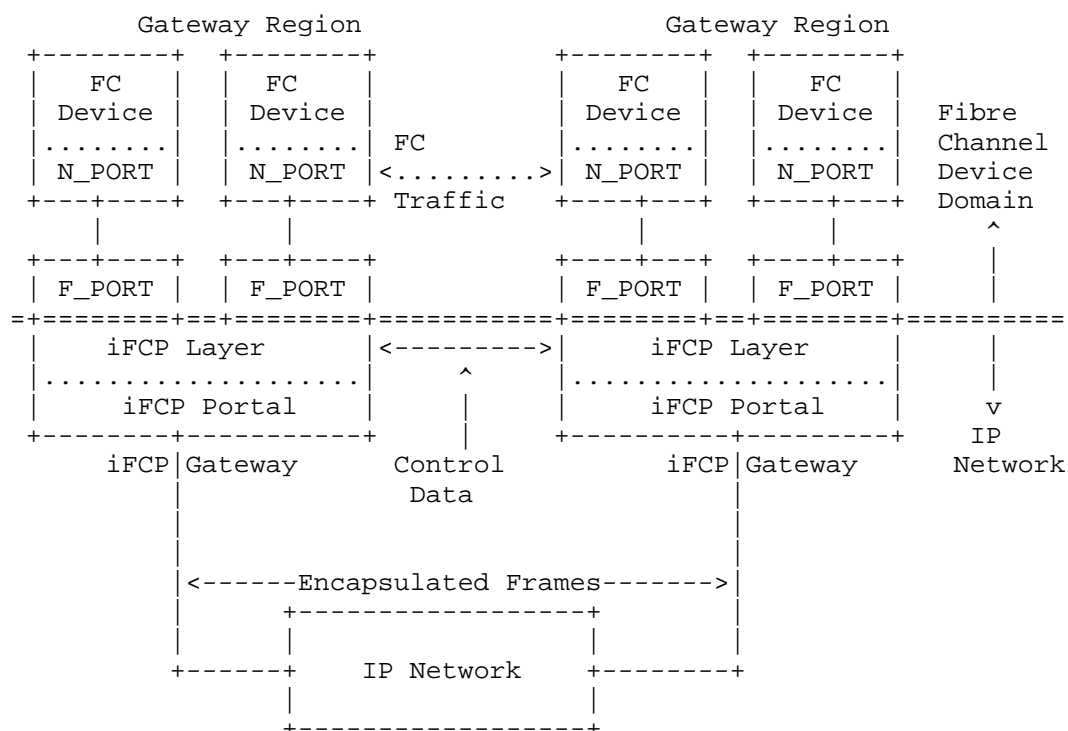


Figure 1: Interconnect between iFCP Gateways

The iFCP MIB module is designed to allow a network management protocol such as SNMP to be used to monitor and manage local iFCP gateway instances, including the configuration of iFCP sessions between gateways.

### 3. Technical Description

The iFCP MIB module is divided into sections for iFCP local gateway instance management, iFCP session management, and iFCP session statistics.

The section for iFCP gateway management provides default settings and information about each local instance. A single management entity can monitor multiple local gateway instances. Each local gateway is conceptually an independent gateway that has both Fibre Channel and IP interfaces. The default IP Time Out Value (IP\_TOV) is configurable for each gateway. Other standard MIBs, such as the Fibre Management MIB [RFC4044] or Interfaces Group MIB [RFC2863], can be used to manage non-iFCP-specific gateway parameters. The local gateway instance section provides iFCP-specific information as well as optional links to other standard management MIBs.

The iFCP session management section provides information on iFCP sessions that use one of the local iFCP gateway instances. This section allows the management of specific iFCP parameters, including changing the IP\_TOV from the default setting of the gateway.

The iFCP session statistics section provides statistical information on the iFCP sessions that use one of the local iFCP gateways. These tables augment the session management table. Additional statistical information for an iFCP gateway or session, that is not iFCP-specific, can be obtained using other standard MIBs. The iFCP statistics are provided in both high-capacity (Counter64) and low-capacity (Counter32) methods.

The following MIB module imports from SNMPv2-SMI [RFC2578], SNMPv2-TC [RFC2579], SNMPv2-CONF [RFC2580], HCNUM-TC [RFC2856], IF-MIB [RFC2863], SNMP-FRAMEWORK-MIB [RFC3411], INET-ADDRESS-MIB [RFC4001], FC-MGMT-MIB [RFC4044], ENTITY-MIB (v3) [RFC4133], and RMON2-MIB [RFC4502].

### 4. Differences from RFC 4369

As explained in [RFC6172], the iFCP address translation mode is deprecated. This document obsoletes the iFCP MIB module [RFC4369] for this change.

## 5. MIB Definition

```
IFCP-MGMT-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY,  
    OBJECT-TYPE,  
    Gauge32,  
    Integer32,  
    Unsigned32,  
    transmission  
        FROM SNMPv2-SMI
```

```
    OBJECT-GROUP,  
    MODULE-COMPLIANCE  
        FROM SNMPv2-CONF
```

```
    TEXTUAL-CONVENTION,  
    TimeStamp,  
    TruthValue,  
    StorageType  
        FROM SNMPv2-TC
```

```
-- From RFC 4502  
    ZeroBasedCounter32  
        FROM RMON2-MIB
```

```
-- From RFC 2856  
    ZeroBasedCounter64  
        FROM HCNUM-TC
```

```
-- From RFC 2863  
    InterfaceIndexOrZero  
        FROM IF-MIB
```

```
-- From RFC 3411  
    SnmpAdminString  
        FROM SNMP-FRAMEWORK-MIB
```

```
-- From RFC 4001  
    InetAddressType,  
    InetAddress,  
    InetPortNumber  
        FROM INET-ADDRESS-MIB
```

```
-- From RFC 4044
FcNameIdOrZero,
FcAddressIdOrZero
    FROM FC-MGMT-MIB
```

```
-- From RFC 4133
PhysicalIndexOrZero
    FROM ENTITY-MIB
;
```

```
ifcpMgmtMIB    MODULE-IDENTITY
    LAST-UPDATED "201103090000Z"
    ORGANIZATION "IETF STORage Maintenance (STORM) Working Group"
    CONTACT-INFO "
        Working Group Email : storm@ietf.org
        Attn: Prakash Venkatesen
        HCL Technologies
        Email: prakashvn@hcl.com"
```

DESCRIPTION

"This module defines management information specific to Internet Fibre Channel Protocol (iFCP) gateway management.

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REVISION "201103090000Z"

DESCRIPTION

"Second version of iFCP Management Module. The iFCP address translation mode is deprecated. This MIB module published as RFC 6173."

REVISION "200601170000Z"

DESCRIPTION

"Initial version of iFCP Management Module. This MIB module published as RFC 4369."

::= { transmission 230 }

```
--
-- Textual Conventions
--
```

```

IfcpIpTOVorZero ::= TEXTUAL-CONVENTION
    DISPLAY-HINT  "d"
    STATUS        current
    DESCRIPTION   "The maximum propagation delay, in seconds,
                  for an encapsulated FC frame to traverse the
                  IP network. A value of 0 implies fibre
                  channel frame lifetime limits will not be
                  enforced."
    REFERENCE    "RFC 4172, iFCP Protocol Specification"
    SYNTAX       Unsigned32 (0..3600)

```

```

IfcpLTiorZero ::= TEXTUAL-CONVENTION
    DISPLAY-HINT  "d"
    STATUS        current
    DESCRIPTION   "The value for the Liveness Test Interval
                  (LTI) being used in an iFCP connection, in
                  seconds. A value of 0 implies no Liveness
                  Test Interval will be used."
    REFERENCE    "RFC 4172, iFCP Protocol Specification"
    SYNTAX       Unsigned32 (0..65535)

```

```

IfcpSessionStates ::= TEXTUAL-CONVENTION
    STATUS        current
    DESCRIPTION   "The value for an iFCP session state."
    SYNTAX       INTEGER {down(1), openPending(2), open(3)}

```

```

IfcpAddressMode ::= TEXTUAL-CONVENTION
    STATUS        current
    DESCRIPTION   "The values for iFCP Address Translation
                  Mode."
    REFERENCE    "RFC 6172, Deprecation of iFCP Address
                  Translation Mode"
    SYNTAX       INTEGER {addressTransparent(1),
                          addressTranslation(2)}

```

```

--
-- Internet Fibre Channel Protocol (iFCP)
--

```

```

ifcpGatewayObjects      OBJECT IDENTIFIER ::= {ifcpMgmtMIB 1}
ifcpGatewayConformance OBJECT IDENTIFIER ::= {ifcpMgmtMIB 2}

```

```

--
-- Local iFCP Gateway Instance Information =====
--

```

ifcpLclGatewayInfo OBJECT IDENTIFIER ::= {ifcpGatewayObjects 1}

ifcpLclGtwyInstTable OBJECT-TYPE

SYNTAX SEQUENCE OF IfcpLclGtwyInstEntry  
 MAX-ACCESS not-accessible  
 STATUS current  
 DESCRIPTION

"Information about all local iFCP gateway instances that can be monitored and controlled. This table contains an entry for each local iFCP gateway instance that is being managed."

::= {ifcpLclGatewayInfo 1}

ifcpLclGtwyInstEntry OBJECT-TYPE

SYNTAX IfcpLclGtwyInstEntry  
 MAX-ACCESS not-accessible  
 STATUS current  
 DESCRIPTION

"An entry in the local iFCP gateway instance table.

Parameters and settings for the gateway are found here."

INDEX { ifcpLclGtwyInstIndex }

::= {ifcpLclGtwyInstTable 1}

IfcpLclGtwyInstEntry ::= SEQUENCE {

ifcpLclGtwyInstIndex Unsigned32,  
 ifcpLclGtwyInstPhyIndex PhysicalIndexOrZero,  
 ifcpLclGtwyInstVersionMin Unsigned32,  
 ifcpLclGtwyInstVersionMax Unsigned32,  
 ifcpLclGtwyInstAddrTransMode IfcpAddressMode,  
 ifcpLclGtwyInstFcBrdcstSupport TruthValue,  
 ifcpLclGtwyInstDefaultIpTOV IfcpIpTOVorZero,  
 ifcpLclGtwyInstDefaultLTInterval IfcpLTIorZero,  
 ifcpLclGtwyInstDescr SnmpAdminString,  
 ifcpLclGtwyInstNumActiveSessions Gauge32,  
 ifcpLclGtwyInstStorageType StorageType  
 }

ifcpLclGtwyInstIndex OBJECT-TYPE

SYNTAX Unsigned32 (1..2147483647)  
 MAX-ACCESS not-accessible  
 STATUS current  
 DESCRIPTION

"An arbitrary integer value to uniquely identify this iFCP gateway from other local gateway instances."

::= {ifcpLclGtwyInstEntry 1}



```

ifcpLclGtwyInstPhyIndex OBJECT-TYPE
    SYNTAX          PhysicalIndexOrZero
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "An index indicating the location of this local gateway within
        a larger entity, if one exists.  If supported, this is the
        entPhysicalIndex from the Entity MIB (Version 3), for this
        iFCP gateway.  If not supported, or if not related to a
        physical entity, then the value of this object is 0."
    REFERENCE       "Entity MIB (Version 3)"
    ::= { ifcpLclGtwyInstEntry      2}

ifcpLclGtwyInstVersionMin OBJECT-TYPE
    SYNTAX          Unsigned32 (0..255)
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The minimum iFCP protocol version supported by the local iFCP
        gateway instance."
    REFERENCE       "RFC 4172, iFCP Protocol Specification"
    ::= { ifcpLclGtwyInstEntry      3}

ifcpLclGtwyInstVersionMax OBJECT-TYPE
    SYNTAX          Unsigned32 (0..255)
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The maximum iFCP protocol version supported by the local iFCP
        gateway instance."
    REFERENCE       "RFC 4172, iFCP Protocol Specification"
    ::= { ifcpLclGtwyInstEntry      4}

ifcpLclGtwyInstAddrTransMode OBJECT-TYPE
    SYNTAX          IfcpAddressMode
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "The local iFCP gateway operating mode.  Changing this value
        may cause existing sessions to be disrupted."
    REFERENCE       "RFC 4172, iFCP Protocol Specification;
                    RFC 6172, Deprecation of iFCP Address
                    Translation Mode"
    DEFVAL          { addressTransparent }
    ::= { ifcpLclGtwyInstEntry      5}

```

## ifcpLclGtwyInstFcBrdcstSupport OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

"This value indicates whether the local iFCP gateway supports FC Broadcast. Changing this value may cause existing sessions to be disrupted."

REFERENCE "RFC 4172, iFCP Protocol Specification"

DEFVAL { false }

::= { ifcpLclGtwyInstEntry 6 }

## ifcpLclGtwyInstDefaultIpTOV OBJECT-TYPE

SYNTAX IfcpIpTOVorZero

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

"The default IP\_TOV used for iFCP sessions at this gateway. This is the default maximum propagation delay that will be used for an iFCP session. The value can be changed on a per-session basis. The valid range is 0 - 3600 seconds. A value of 0 implies that fibre channel frame lifetime limits will not be enforced."

REFERENCE "RFC 4172, iFCP Protocol Specification"

DEFVAL { 6 }

::= { ifcpLclGtwyInstEntry 7 }

## ifcpLclGtwyInstDefaultLTInterval OBJECT-TYPE

SYNTAX IfcpLTIorZero

UNITS "seconds"

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

"The default Liveness Test Interval (LTI), in seconds, used for iFCP sessions at this gateway. This is the default value for an iFCP session and can be changed on a per-session basis. The valid range is 0 - 65535 seconds. A value of 0 implies no Liveness Test Interval will be performed on a session."

REFERENCE "RFC 4172, iFCP Protocol Specification"

DEFVAL { 10 }

::= { ifcpLclGtwyInstEntry 8 }

```

ifcpLclGtwyInstDescr OBJECT-TYPE
    SYNTAX      SnmpAdminString (SIZE (0..64))
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
        "A user-entered description for this iFCP gateway."
    DEFVAL      { "" }
    ::= { ifcpLclGtwyInstEntry      9 }

ifcpLclGtwyInstNumActiveSessions OBJECT-TYPE
    SYNTAX      Gauge32 (0..4294967295)
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The current total number of iFCP sessions in the open or
        open-pending state."
    ::= { ifcpLclGtwyInstEntry      10 }

ifcpLclGtwyInstStorageType OBJECT-TYPE
    SYNTAX      StorageType
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The storage type for this row.  Parameter values defined
        for a gateway are usually non-volatile, but may be volatile
        or permanent in some configurations.  If permanent, then
        the following parameters must have read-write access:
        ifcpLclGtwyInstAddrTransMode, ifcpLclGtwyInstDefaultIpTOV,
        and ifcpLclGtwyInstDefaultLTInterval."
    DEFVAL      { nonVolatile }
    ::= { ifcpLclGtwyInstEntry      11 }

--
-- iFCP N Port Session Information =====
--

ifcpNportSessionInfo
    OBJECT IDENTIFIER ::= { ifcpGatewayObjects 2 }

ifcpSessionAttributesTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF
                IfcpSessionAttributesEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "An iFCP session consists of the pair of N_PORTS comprising
        the session endpoints joined by a single TCP/IP connection.
        This table provides information on each iFCP session"

```

currently using a local iFCP gateway instance. iFCP sessions are created and removed by the iFCP gateway instances, which are reflected in this table."

::= {ifcpNportSessionInfo 1}

ifcpSessionAttributesEntry OBJECT-TYPE

SYNTAX IfcpSessionAttributesEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Each entry contains information about one iFCP session consisting of a pair of N\_PORTS joined by a single TCP/IP connection. This table's INDEX includes ifcpLclGtwyInstIndex, which identifies the local iFCP gateway instance that created the session for the entry.

Soon after an entry is created in this table for an iFCP session, it will correspond to an entry in the tcpConnectionTable of the TCP-MIB (RFC 4022). The corresponding entry might represent a preexisting TCP connection, or it might be a newly created entry. (Note that if IPv4 is being used, an entry in RFC 2012's tcpConnTable may also correspond.) The values of ifcpSessionLclPrtlAddrType and ifcpSessionRmtPrtlIfAddrType in this table and the values of tcpConnectionLocalAddressType and tcpConnectionRemAddressType used as INDEX values for the corresponding entry in the tcpConnectionTable should be the same; this makes it simpler to locate a session's TCP connection in the TCP-MIB. (Of course, all four values need to be 'ipv4' if there's a corresponding entry in the tcpConnTable.)

If an entry is created in this table for a session, prior to knowing which local and/or remote port numbers will be used for the TCP connection, then ifcpSessionLclPrtlTcpPort and/or ifcpSessionRmtPrtlTcpPort have the value zero until such time as they can be updated to the port numbers (to be) used for the connection. (Thus, a port value of zero should not be used to locate a session's TCP connection in the TCP-MIB.)

When the TCP connection terminates, the entry in the tcpConnectionTable and the entry in this table both get deleted (and, if applicable, so does the entry in the tcpConnTable)."

INDEX { ifcpLclGtwyInstIndex, ifcpSessionIndex }

::= {ifcpSessionAttributesTable 1}

IfcpSessionAttributesEntry ::= SEQUENCE {

ifcpSessionIndex Integer32,

ifcpSessionLclPrtlIfIndex InterfaceIndexOrZero,

ifcpSessionLclPrtlAddrType InetAddressType,

```

ifcpSessionLclPrtlAddr      InetAddress,
ifcpSessionLclPrtlTcpPort   InetPortNumber,
ifcpSessionLclNpWwun        FcNameIdOrZero,
ifcpSessionLclNpFcId        FcAddressIdOrZero,
ifcpSessionRmtNpWwun        FcNameIdOrZero,
ifcpSessionRmtPrtlIfAddrType InetAddressType,
ifcpSessionRmtPrtlIfAddr    InetAddress,
ifcpSessionRmtPrtlTcpPort   InetPortNumber,
ifcpSessionRmtNpFcId        FcAddressIdOrZero,
ifcpSessionRmtNpFcIdAlias   FcAddressIdOrZero,
ifcpSessionIpTOV            IfcpIpTOVorZero,
ifcpSessionLclLTIntvl       IfcpLTIORZero,
ifcpSessionRmtLTIntvl       IfcpLTIORZero,
ifcpSessionBound            TruthValue,
ifcpSessionStorageType      StorageType
    }

```

```

ifcpSessionIndex            OBJECT-TYPE
    SYNTAX                   Integer32 (1..2147483647)
    MAX-ACCESS               not-accessible
    STATUS                   current
    DESCRIPTION

```

"The iFCP session index is a unique value used as an index to the table, along with a specific local iFCP gateway instance. This index is used because the local N Port and remote N Port information would create a complex index that would be difficult to implement."

```
 ::= {ifcpSessionAttributesEntry 1}
```

```

ifcpSessionLclPrtlIfIndex    OBJECT-TYPE
    SYNTAX                   InterfaceIndexOrZero
    MAX-ACCESS               read-only
    STATUS                   current
    DESCRIPTION

```

"This is the interface index in the IF-MIB ifTable being used as the local portal in this session, as described in the IF-MIB. If the local portal is not associated with an entry in the ifTable, then the value is 0. The ifType of the interface will generally be a type that supports IP, but an implementation may support iFCP using other protocols. This object can be used to obtain additional information about the interface."

```

    REFERENCE                "RFC 2863, The Interfaces Group MIB (IF-MIB)"
    ::= {ifcpSessionAttributesEntry 2}

```

```

ifcpSessionLclPrtlAddrType   OBJECT-TYPE
    SYNTAX                   InetAddressType
    MAX-ACCESS               read-only

```

```

STATUS                                current
DESCRIPTION
"The type of address in ifcpSessionLclIfAddr."
 ::= {ifcpSessionAttributesEntry 3}

ifcpSessionLclPrtlAddr                OBJECT-TYPE
SYNTAX                                InetAddress
MAX-ACCESS                            read-only
STATUS                                current
DESCRIPTION
"This is the external IP address of the interface being used
for the iFCP local portal in this session. The address type
is defined in ifcpSessionLclPrtlAddrType. If the value is a
DNS name, then the name is resolved once, during the initial
session instantiation."
 ::= {ifcpSessionAttributesEntry 4}

ifcpSessionLclPrtlTcpPort             OBJECT-TYPE
SYNTAX                                InetPortNumber
MAX-ACCESS                            read-only
STATUS                                current
DESCRIPTION
"This is the TCP port number that is being used for the iFCP
local portal in this session. This is normally an ephemeral
port number selected by the gateway. The value may be 0
during an initial setup period."
 ::= {ifcpSessionAttributesEntry 5}

ifcpSessionLclNpWwun                 OBJECT-TYPE
SYNTAX                                FcNameIdOrZero
MAX-ACCESS                            read-only
STATUS                                current
DESCRIPTION
"World Wide Unique Name of the local N Port. For an unbound
session, this variable will be a zero-length string."
REFERENCE                             "RFC 4172, iFCP Protocol Specification"
DEFVAL                                { " " }
 ::= {ifcpSessionAttributesEntry 6}

ifcpSessionLclNpFcId                 OBJECT-TYPE
SYNTAX                                FcAddressIdOrZero
MAX-ACCESS                            read-only
STATUS                                current

```

## DESCRIPTION

"Fibre Channel Identifier of the local N Port. For an unbound session, this variable will be a zero-length string."

REFERENCE "RFC 4172, iFCP Protocol Specification"

::= {ifcpSessionAttributesEntry 7}

ifcpSessionRmtNpWwun

OBJECT-TYPE

SYNTAX

FcNameIdOrZero

MAX-ACCESS

read-only

STATUS

current

DESCRIPTION

"World Wide Unique Name of the remote N Port. For an unbound session, this variable will be a zero-length string."

REFERENCE "RFC 4172, iFCP Protocol Specification"

DEFVAL { "" }

::= {ifcpSessionAttributesEntry 8}

ifcpSessionRmtPrtlIfAddrType

OBJECT-TYPE

SYNTAX

InetAddressType

MAX-ACCESS

read-only

STATUS

current

DESCRIPTION

"The type of address in ifcpSessionRmtPrtlIfAddr."

::= {ifcpSessionAttributesEntry 9}

ifcpSessionRmtPrtlIfAddr

OBJECT-TYPE

SYNTAX

InetAddress

MAX-ACCESS

read-only

STATUS

current

DESCRIPTION

"This is the remote gateway IP address being used for the portal on the remote iFCP gateway. The address type is defined in ifcpSessionRmtPrtlIfAddrType. If the value is a DNS name, then the name is resolved once, during the initial session instantiation."

::= {ifcpSessionAttributesEntry 10}

ifcpSessionRmtPrtlTcpPort

OBJECT-TYPE

SYNTAX

InetPortNumber

MAX-ACCESS

read-only

STATUS

current

DESCRIPTION

"This is the TCP port number being used for the portal on the remote iFCP gateway. Generally, this will be the iFCP canonical port. The value may be 0 during an initial setup period."

DEFVAL { 3420 }

::= {ifcpSessionAttributesEntry 11}

```

ifcpSessionRmtNpFcid          OBJECT-TYPE
    SYNTAX                     FcAddressIdOrZero
    MAX-ACCESS                 read-only
    STATUS                     current
    DESCRIPTION
        "Fibre Channel Identifier of the remote N Port.  For an
        unbound session, this variable will be a zero-length string."
    REFERENCE                  "RFC 4172, iFCP Protocol Specification"
    ::= {ifcpSessionAttributesEntry 12}

ifcpSessionRmtNpFcidAlias     OBJECT-TYPE
    SYNTAX                     FcAddressIdOrZero
    MAX-ACCESS                 read-only
    STATUS                     current
    DESCRIPTION
        "Fibre Channel Identifier Alias assigned by the local gateway
        for the remote N Port.  For an unbound session, this variable
        will be a zero-length string."
    REFERENCE                  "RFC 4172, iFCP Protocol Specification"
    ::= {ifcpSessionAttributesEntry 13}

ifcpSessionIpTOV              OBJECT-TYPE
    SYNTAX                     IfcpIpTOVorZero
    UNITS                      "seconds"
    MAX-ACCESS                 read-write
    STATUS                     current
    DESCRIPTION
        "The IP_TOV being used for this iFCP session.  This is the
        maximum propagation delay that will be used for the iFCP
        session.  The value can be changed on a per-session basis
        and initially defaults to ifcpLclGtwyInstDefaultIpTOV for
        the local gateway instance.  The valid range is 0 - 3600
        seconds.  A value of 0 implies fibre channel frame lifetime
        limits will not be enforced."
    REFERENCE                  "RFC 4172, iFCP Protocol Specification"
    ::= {ifcpSessionAttributesEntry 14}

ifcpSessionLclLTIntvl         OBJECT-TYPE
    SYNTAX                     IfcpLTIorZero
    UNITS                      "seconds"
    MAX-ACCESS                 read-only
    STATUS                     current
    DESCRIPTION
        "The Liveness Test Interval (LTI) used for this iFCP session.
        The value can be changed on a per-session basis and initially
        defaults to ifcpLclGtwyInstDefaultLTInterval for the local

```



gateway instance. The valid range is 0 - 65535 seconds.  
A value of 0 implies that the gateway will not originate  
Liveness Test messages for the session."

REFERENCE "RFC 4172, iFCP Protocol Specification"  
::= {ifcpSessionAttributesEntry 15}

ifcpSessionRmtLTIntvl	OBJECT-TYPE
SYNTAX	IfcpLTIorZero
UNITS	"seconds"
MAX-ACCESS	read-only
STATUS	current
DESCRIPTION	

"The Liveness Test Interval (LTI) as requested by the remote gateway instance to use for this iFCP session. This value may change over the life of the session. The valid range is 0 - 65535 seconds. A value of 0 implies that the remote gateway has not been requested to originate Liveness Test messages for the session."

REFERENCE "RFC 4172, iFCP Protocol Specification"  
::= {ifcpSessionAttributesEntry 16}

ifcpSessionBound	OBJECT-TYPE
SYNTAX	TruthValue
MAX-ACCESS	read-only
STATUS	current
DESCRIPTION	

"This value indicates whether this session is bound to a specific local and remote N Port. Sessions by default are unbound and ready for future assignment to a local and remote N Port."

REFERENCE "RFC 4172, iFCP Protocol Specification"  
::= {ifcpSessionAttributesEntry 17}

ifcpSessionStorageType	OBJECT-TYPE
SYNTAX	StorageType
MAX-ACCESS	read-only
STATUS	current
DESCRIPTION	

"The storage type for this row. Parameter values defined for a session are usually non-volatile, but may be volatile or permanent in some configurations. If permanent, then ifcpSessionIpTOV must have read-write access."

DEFVAL { nonVolatile }  
::= {ifcpSessionAttributesEntry 18}

--

-- Local iFCP Gateway Instance Session Statistics =====

--

```

ifcpSessionStatsTable          OBJECT-TYPE
    SYNTAX                     SEQUENCE OF
                                IfcpSessionStatsEntry
    MAX-ACCESS                 not-accessible
    STATUS                     current
    DESCRIPTION
        "This table provides statistics on an iFCP session."
        ::= { ifcpNportSessionInfo 2}

ifcpSessionStatsEntry          OBJECT-TYPE
    SYNTAX                     IfcpSessionStatsEntry
    MAX-ACCESS                 not-accessible
    STATUS                     current
    DESCRIPTION
        "Provides iFCP-specific statistics per session."
        AUGMENTS {ifcpSessionAttributesEntry}
        ::= { ifcpSessionStatsTable 1}

IfcpSessionStatsEntry ::= SEQUENCE {
    ifcpSessionState            IfcpSessionStates,
    ifcpSessionDuration         Unsigned32,
    ifcpSessionTxOctets         ZeroBasedCounter64,
    ifcpSessionRxOctets         ZeroBasedCounter64,
    ifcpSessionTxFrames         ZeroBasedCounter64,
    ifcpSessionRxFrames         ZeroBasedCounter64,
    ifcpSessionStaleFrames      ZeroBasedCounter64,
    ifcpSessionHeaderCRCErrors  ZeroBasedCounter64,
    ifcpSessionFcPayloadCRCErrors ZeroBasedCounter64,
    ifcpSessionOtherErrors      ZeroBasedCounter64,
    ifcpSessionDiscontinuityTime Timestamp
}

ifcpSessionState              OBJECT-TYPE
    SYNTAX                     IfcpSessionStates
    MAX-ACCESS                 read-only
    STATUS                     current
    DESCRIPTION
        "The current session operating state."
        ::= { ifcpSessionStatsEntry 1}

ifcpSessionDuration           OBJECT-TYPE
    SYNTAX                     Unsigned32 (0..4294967295)
    MAX-ACCESS                 read-only
    STATUS                     current
    DESCRIPTION
        "This indicates, in seconds, how long the iFCP session has
        been in an open or open-pending state.  When a session is
        down, the value is reset to 0."

```

```
::= {ifcpSessionStatsEntry 2}
```

```
ifcpSessionTxOctets          OBJECT-TYPE
    SYNTAX                    ZeroBasedCounter64
    MAX-ACCESS                read-only
    STATUS                    current
    DESCRIPTION
```

"The total number of octets transmitted by the iFCP gateway for this session. Discontinuities in the value of this counter can occur at reinitialization of the management system, and at other times as indicated by the value of ifcpSessionDiscontinuityTime."

```
::= {ifcpSessionStatsEntry 3}
```

```
ifcpSessionRxOctets          OBJECT-TYPE
    SYNTAX                    ZeroBasedCounter64
    MAX-ACCESS                read-only
    STATUS                    current
    DESCRIPTION
```

"The total number of octets received by the iFCP gateway for this session. Discontinuities in the value of this counter can occur at reinitialization of the management system, and at other times as indicated by the value of ifcpSessionDiscontinuityTime."

```
::= {ifcpSessionStatsEntry 4}
```

```
ifcpSessionTxFrames          OBJECT-TYPE
    SYNTAX                    ZeroBasedCounter64
    MAX-ACCESS                read-only
    STATUS                    current
    DESCRIPTION
```

"The total number of iFCP frames transmitted by the gateway for this session. Discontinuities in the value of this counter can occur at reinitialization of the management system, and at other times as indicated by the value of ifcpSessionDiscontinuityTime."

```
::= {ifcpSessionStatsEntry 5}
```

```
ifcpSessionRxFrames          OBJECT-TYPE
    SYNTAX                    ZeroBasedCounter64
    MAX-ACCESS                read-only
    STATUS                    current
    DESCRIPTION
```

"The total number of iFCP frames received by the gateway for this session. Discontinuities in the value of this counter can occur at reinitialization of the management system, and at other times as indicated by the value of ifcpSessionDiscontinuityTime."

```
 ::= {ifcpSessionStatsEntry 6}
```

```
ifcpSessionStaleFrames          OBJECT-TYPE
    SYNTAX                      ZeroBasedCounter64
    MAX-ACCESS                  read-only
    STATUS                      current
    DESCRIPTION
```

"The total number of received iFCP frames that were stale and discarded by the gateway for this session. Discontinuities in the value of this counter can occur at reinitialization of the management system, and at other times as indicated by the value of ifcpSessionDiscontinuityTime."

```
 ::= {ifcpSessionStatsEntry 7}
```

```
ifcpSessionHeaderCRCErrors      OBJECT-TYPE
    SYNTAX                      ZeroBasedCounter64
    MAX-ACCESS                  read-only
    STATUS                      current
    DESCRIPTION
```

"The total number of Cyclic Redundancy Check (CRC) errors that occurred in the frame header, detected by the gateway for this session. Usually, a single Header CRC error is sufficient to terminate an iFCP session. Discontinuities in the value of this counter can occur at reinitialization of the management system, and at other times as indicated by the value of ifcpSessionDiscontinuityTime."

```
 ::= {ifcpSessionStatsEntry 8}
```

```
ifcpSessionFcPayloadCRCErrors   OBJECT-TYPE
    SYNTAX                      ZeroBasedCounter64
    MAX-ACCESS                  read-only
    STATUS                      current
    DESCRIPTION
```

"The total number of CRC errors that occurred in the Fibre Channel frame payload, detected by the gateway for this session. Discontinuities in the value of this counter can occur at reinitialization of the management system, and at other times as indicated by the value of ifcpSessionDiscontinuityTime."

```
 ::= {ifcpSessionStatsEntry 9}
```

```
ifcpSessionOtherErrors          OBJECT-TYPE
    SYNTAX                      ZeroBasedCounter64
    MAX-ACCESS                  read-only
    STATUS                      current
    DESCRIPTION
```

"The total number of errors, other than errors explicitly measured, detected by the gateway for this session."

Discontinuities in the value of this counter can occur at reinitialization of the management system, and at other times as indicated by the value of ifcpSessionDiscontinuityTime."

::= {ifcpSessionStatsEntry 10}

ifcpSessionDiscontinuityTime	OBJECT-TYPE
SYNTAX	TimeStamp
MAX-ACCESS	read-only
STATUS	current
DESCRIPTION	

"The value of sysUpTime on the most recent occasion at which any one (or more) of the ifcpSessionStatsTable counters suffered a discontinuity. The relevant counters are the specific Counter64-based instances associated with the ifcpSessionStatsTable: ifcpSessionTxOctets, ifcpSessionRxOctets, ifcpSessionTxFrames, ifcpSessionRxFrames, ifcpSessionStaleFrames, ifcpSessionHeaderCRCErrors, ifcpSessionFcPayloadCRCErrors, and ifcpSessionOtherErrors. If no such discontinuities have occurred since the last reinitialization of the local management subsystem, then this object contains a zero value."

::= {ifcpSessionStatsEntry 11}

--  
 -- Low-Capacity Statistics  
 --

ifcpSessionLcStatsTable	OBJECT-TYPE
SYNTAX	SEQUENCE OF
	IfcpSessionLcStatsEntry
MAX-ACCESS	not-accessible
STATUS	current
DESCRIPTION	

"This table provides low-capacity statistics for an iFCP session. These are provided for backward compatibility with systems that do not support Counter64-based objects. At 1-Gbps rates, a Counter32-based object can wrap as often as every 34 seconds. Counter32-based objects can be sufficient for many situations. However, when possible, it is recommended to use the high-capacity statistics in ifcpSessionStatsTable based on Counter64 objects."

::= {ifcpNportSessionInfo 3}

ifcpSessionLcStatsEntry	OBJECT-TYPE
SYNTAX	IfcpSessionLcStatsEntry
MAX-ACCESS	not-accessible
STATUS	current

## DESCRIPTION

"Provides iFCP-specific statistics per session."

AUGMENTS {ifcpSessionAttributesEntry}  
 ::= {ifcpSessionLcStatsTable 1}

```
IfcpSessionLcStatsEntry ::= SEQUENCE {
    ifcpSessionLcTxOctets      ZeroBasedCounter32,
    ifcpSessionLcRxOctets      ZeroBasedCounter32,
    ifcpSessionLcTxFrames      ZeroBasedCounter32,
    ifcpSessionLcRxFrames      ZeroBasedCounter32,
    ifcpSessionLcStaleFrames    ZeroBasedCounter32,
    ifcpSessionLcHeaderCRCErrors ZeroBasedCounter32,
    ifcpSessionLcFcPayloadCRCErrors ZeroBasedCounter32,
    ifcpSessionLcOtherErrors    ZeroBasedCounter32
}
```

```
ifcpSessionLcTxOctets      OBJECT-TYPE
    SYNTAX                  ZeroBasedCounter32
    MAX-ACCESS              read-only
    STATUS                  current
    DESCRIPTION
```

"The total number of octets transmitted by the iFCP gateway for this session."

::= {ifcpSessionLcStatsEntry 1}

```
ifcpSessionLcRxOctets      OBJECT-TYPE
    SYNTAX                  ZeroBasedCounter32
    MAX-ACCESS              read-only
    STATUS                  current
    DESCRIPTION
```

"The total number of octets received by the iFCP gateway for this session."

::= {ifcpSessionLcStatsEntry 2}

```
ifcpSessionLcTxFrames      OBJECT-TYPE
    SYNTAX                  ZeroBasedCounter32
    MAX-ACCESS              read-only
    STATUS                  current
    DESCRIPTION
```

"The total number of iFCP frames transmitted by the gateway for this session."

::= {ifcpSessionLcStatsEntry 3}

```
ifcpSessionLcRxFrames      OBJECT-TYPE
    SYNTAX                  ZeroBasedCounter32
    MAX-ACCESS              read-only
    STATUS                  current
```

## DESCRIPTION

"The total number of iFCP frames received by the gateway for this session."

::= {ifcpSessionLcStatsEntry 4}

ifcpSessionLcStaleFrames

OBJECT-TYPE

SYNTAX

ZeroBasedCounter32

MAX-ACCESS

read-only

STATUS

current

## DESCRIPTION

"The total number of received iFCP frames that were stale and discarded by the gateway for this session."

::= {ifcpSessionLcStatsEntry 5}

ifcpSessionLcHeaderCRCErrors

OBJECT-TYPE

SYNTAX

ZeroBasedCounter32

MAX-ACCESS

read-only

STATUS

current

## DESCRIPTION

"The total number of CRC errors that occurred in the frame header, detected by the gateway for this session. Usually, a single Header CRC error is sufficient to terminate an iFCP session."

::= {ifcpSessionLcStatsEntry 6}

ifcpSessionLcFcPayloadCRCErrors

OBJECT-TYPE

SYNTAX

ZeroBasedCounter32

MAX-ACCESS

read-only

STATUS

current

## DESCRIPTION

"The total number of CRC errors that occurred in the Fibre Channel frame payload, detected by the gateway for this session."

::= {ifcpSessionLcStatsEntry 7}

ifcpSessionLcOtherErrors

OBJECT-TYPE

SYNTAX

ZeroBasedCounter32

MAX-ACCESS

read-only

STATUS

current

## DESCRIPTION

"The total number of errors, other than errors explicitly measured, detected by the gateway for this session."

::= {ifcpSessionLcStatsEntry 8}

=====

```

ifcpCompliances
    OBJECT IDENTIFIER ::= {ifcpGatewayConformance 1}

ifcpGatewayCompliance MODULE-COMPLIANCE
    STATUS deprecated
    DESCRIPTION
        "This MODULE-COMPLIANCE has been deprecated because address
        translation mode has been deprecated in the iFCP standard. It has
        the implementation requirements for iFCP MIB module compliance."
    MODULE -- this module
    MANDATORY-GROUPS {
        ifcpLclGatewayGroup,
        ifcpLclGatewaySessionGroup,
        ifcpLclGatewaySessionStatsGroup,
        ifcpLclGatewaySessionLcStatsGroup
    }

    OBJECT ifcpSessionLclPrtlAddrType
    SYNTAX InetAddressType { ipv4(1), ipv6(2) }
    DESCRIPTION
        "Support is only required for global IPv4
        and IPv6 address types."
    OBJECT ifcpSessionRmtPrtlIfAddrType
    SYNTAX InetAddressType { ipv4(1), ipv6(2) }
    DESCRIPTION
        "Support is only required for global IPv4
        and IPv6 address types."

    OBJECT ifcpLclGtwyInstAddrTransMode
    SYNTAX IfcpAddressMode {addressTransparent(1),
                           addressTranslation(2)}
    DESCRIPTION
        "This object must support addressTransparent(1) and
        addressTranslation(2)."
```

::= {ifcpCompliances 1}

```

ifcpGatewayComplianceNoTranslation MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "Implementation requirements for iFCP MIB module compliance.
        Address translation mode has been deprecated in the iFCP standard."
    REFERENCE
        "RFC 4172, iFCP Protocol Specification;
        RFC 6172, Deprecation of iFCP Address
        Translation Mode"
    MODULE -- this module
```



```

MANDATORY-GROUPS {
    ifcpLclGatewayGroup,
    ifcpLclGatewaySessionGroupNoTranslation,
    ifcpLclGatewaySessionStatsGroup,
    ifcpLclGatewaySessionLcStatsGroup
}

OBJECT      ifcpSessionLclPrtlAddrType
SYNTAX      InetAddressType { ipv4(1), ipv6(2) }
DESCRIPTION
    "Support is only required for global IPv4
    and IPv6 address types."

OBJECT      ifcpSessionRmtPrtlIfAddrType
SYNTAX      InetAddressType { ipv4(1), ipv6(2) }
DESCRIPTION
    "Support is only required for global IPv4
    and IPv6 address types."

OBJECT      ifcpLclGtwyInstAddrTransMode
SYNTAX      IfcpAddressMode {addressTransparent(1)}
DESCRIPTION
    "Support is only required for addressTransparent(1)."
```

::= {ifcpCompliances 2}

ifcpGroups OBJECT IDENTIFIER ::= {ifcpGatewayConformance 2}

ifcpLclGatewayGroup OBJECT-GROUP

```

    OBJECTS {
        ifcpLclGtwyInstPhyIndex,
        ifcpLclGtwyInstVersionMin,
        ifcpLclGtwyInstVersionMax,
        ifcpLclGtwyInstAddrTransMode,
        ifcpLclGtwyInstFcBrdcstSupport,
        ifcpLclGtwyInstDefaultIpTOV,
        ifcpLclGtwyInstDefaultLTInterval,
        ifcpLclGtwyInstDescr,
        ifcpLclGtwyInstNumActiveSessions,
        ifcpLclGtwyInstStorageType
    }
    STATUS current
    DESCRIPTION
        "iFCP local device info group.  This group provides
        information about each gateway."
    ::= {ifcpGroups 1}

```

## ifcpLclGatewaySessionGroup OBJECT-GROUP

```
OBJECTS {
    ifcpSessionLclPrtlIfIndex,
    ifcpSessionLclPrtlAddrType,
    ifcpSessionLclPrtlAddr,
    ifcpSessionLclPrtlTcpPort,
    ifcpSessionLclNpWwun,
    ifcpSessionLclNpFcid,
    ifcpSessionRmtNpWwun,
    ifcpSessionRmtPrtlIfAddrType,
    ifcpSessionRmtPrtlIfAddr,
    ifcpSessionRmtPrtlTcpPort,
    ifcpSessionRmtNpFcid,
    ifcpSessionRmtNpFcidAlias,
    ifcpSessionIpTOV,
    ifcpSessionLclLTIntvl,
    ifcpSessionRmtLTIntvl,
    ifcpSessionBound,
    ifcpSessionStorageType
}
```

STATUS deprecated

## DESCRIPTION

"This OBJECT-GROUP has been deprecated because address translation mode has been deprecated in the iFCP standard. iFCP Session group. This group provides information about each iFCP session currently active between iFCP gateways."

::= {ifcpGroups 4}

## ifcpLclGatewaySessionStatsGroup OBJECT-GROUP

```
OBJECTS {
    ifcpSessionState,
    ifcpSessionDuration,
    ifcpSessionTxOctets,
    ifcpSessionRxOctets,
    ifcpSessionTxFrames,
    ifcpSessionRxFrames,
    ifcpSessionStaleFrames,
    ifcpSessionHeaderCRCErrors,
    ifcpSessionFcPayloadCRCErrors,
    ifcpSessionOtherErrors,
    ifcpSessionDiscontinuityTime
}
```

STATUS current

## DESCRIPTION

"iFCP Session Statistics group. This group provides statistics with 64-bit counters for each iFCP session currently active between iFCP gateways. This group is only required for agents that can support Counter64-based data types."

::= {ifcpGroups 5}

## ifcpLclGatewaySessionLcStatsGroup OBJECT-GROUP

OBJECTS {  
ifcpSessionLcTxOctets,  
ifcpSessionLcRxOctets,  
ifcpSessionLcTxFrames,  
ifcpSessionLcRxFrames,  
ifcpSessionLcStaleFrames,  
ifcpSessionLcHeaderCRCErrors,  
ifcpSessionLcFcPayloadCRCErrors,  
ifcpSessionLcOtherErrors  
}

STATUS current

## DESCRIPTION

"iFCP Session Low-Capacity Statistics group. This group provides statistics with low-capacity 32-bit counters for each iFCP session currently active between iFCP gateways. This group is only required for agents that do not support Counter64-based data types, or that need to support SNMPv1 applications."

::= {ifcpGroups 6}

## ifcpLclGatewaySessionGroupNoTranslation OBJECT-GROUP

OBJECTS {  
ifcpSessionLclPrtlIfIndex,  
ifcpSessionLclPrtlAddrType,  
ifcpSessionLclPrtlAddr,  
ifcpSessionLclPrtlTcpPort,  
ifcpSessionLclNpWwun,  
ifcpSessionLclNpFcid,  
ifcpSessionRmtNpWwun,  
ifcpSessionRmtPrtlIfAddrType,  
ifcpSessionRmtPrtlIfAddr,  
ifcpSessionRmtPrtlTcpPort,  
ifcpSessionRmtNpFcid,  
ifcpSessionIpTOV,  
ifcpSessionLclLTIntvl,  
ifcpSessionRmtLTIntvl,  
ifcpSessionBound,  
ifcpSessionStorageType  
}

```
STATUS current
DESCRIPTION
"iFCP Session group.  This group provides information
about each iFCP session currently active between iFCP
gateways."
 ::= { ifcpGroups 7 }

END
```

## 6. Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

Changing the following object values, with a MAX-ACCESS of read-write, may cause disruption in storage traffic:

```
ifcpLclGtwyInstAddrTransMode
ifcpLclGtwyInstFcBrdcstSupport
ifcpLclGtwyInstDefaultIpTOV
ifcpLclGtwyInstDefaultLTInterval
ifcpSessionIpTOV
```

Changing the following object value, with a MAX-ACCESS of read-write, may cause a user to lose track of the iFCP gateway:

```
ifcpLclGtwyInstDescr
```

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. It is thus important to control even GET and/or NOTIFY access to these objects and possibly to even encrypt the values of these objects when sending them over the network via SNMP.

The following object tables provide information about storage traffic sessions, and can indicate to a user who is communicating and exchanging storage data:

```
ifcpLclGtwyInstTable
ifcpSessionAttributesTable
```

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example, by using IPsec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

## 7. IANA Considerations

The MIB module in this document uses the following IANA-assigned OBJECT IDENTIFIER value recorded in the SMI Numbers registry:

Descriptor	OBJECT IDENTIFIER value
-----	-----
ifcpMgmtMIB	{ transmission 230 }

## 8. References

### 8.1. Normative References

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- [RFC3411] Harrington, D., Presuhn, R., and B. Wijnen, "An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks", STD 62, RFC 3411, December 2002.
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- [RFC4133] Bierman, A. and K. McCloghrie, "Entity MIB (Version 3)", RFC 4133, August 2005.
- [RFC4172] Monia, C., Mullendore, R., Travostino, F., Jeong, W., and M. Edwards, "iFCP - A Protocol for Internet Fibre Channel Storage Networking", RFC 4172, September 2005.
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- [RFC6172] Black, D. and D. Peterson, "Deprecation of the Internet Fibre Channel Protocol (iFCP) Address Translation Mode", RFC 6172, March 2011.

## 8.2. Informative References

- [RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet Standard Management Framework", RFC 3410, December 2002.

## 9. Acknowledgments

Credit goes to the authors of [RFC4369] (listed below) for preparing the first version of the iFCP MIB module. I wish to thank David Black, Tom Talpey, and David Harrington for their significant inputs on this update.

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