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Definitions of Managed Objects For iFCP

Status of this Memo

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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it defines a basic set of managed objects for SNMP-based monitoring and management of the Internet Fibre Channel Protocol (iFCP).

This memo specifies a MIB module in a manner that is compliant to the SMIv2. The set of objects is consistent with the SNMP framework and existing SNMP standards.

This memo is a product of the IP Storage (IPS) working group

within the Internet Engineering Task Force. Comments are solicited and should be addressed to the working group's mailing list at ips@ece.cmu.edu and/or the authors.

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1. Introduction

The iFCP protocol provides Fibre Channel fabric functionality on an IP network in which TCP/IP switching and routing elements replace Fibre Channel components. This draft provides a mechanism to monitor and control iFCP Gateway instances, and their associated sessions, using SNMP.

2. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2571 [RFC2571].
- Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in STD 16, RFC 1155 [RFC1155], STD 16, RFC 1212 [RFC1212] and RFC 1215 [RFC1215]. The second version, called SMIv2, is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].
- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [RFC1157]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [RFC1901] and RFC 1906 [RFC1906]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [RFC1906], RFC 2572 [RFC2572] and RFC 2574 [RFC2574].
- Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [RFC1157]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [RFC1905].
- A set of fundamental applications described in RFC 2573 [RFC2573] and the view-based access control mechanism described in RFC 2575 [RFC2575].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [RFC2570].

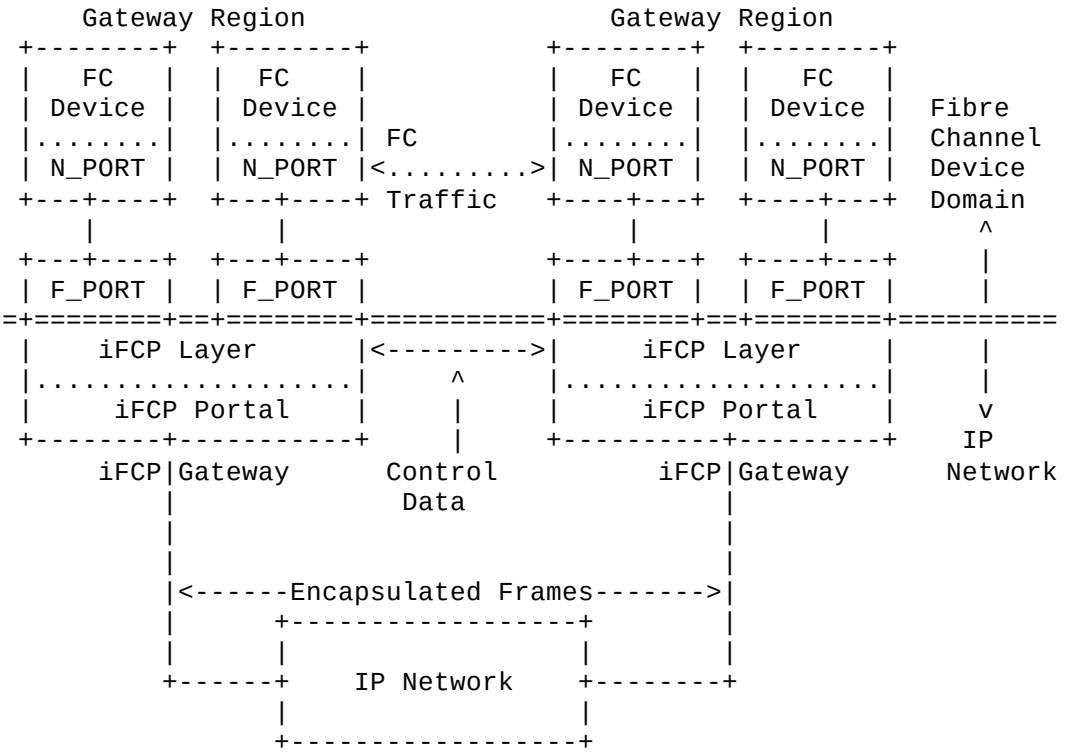
Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be

semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

3. Overview

The iFCP protocol can be used by FC to IP based storage gateways for FCP storage interconnects. Figure 1 provides an example interconnect between iFCP gateways.



The iFCP MIB is designed to allow SNMP to be used to monitor and manage local iFCP gateway instances, including the configuration of iFCP sessions between gateways.

4. Technical Description

The MIB 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. Other standard MIBs, such as the Fibre Management MIB [FCMGT01], the Interfaces Group MIB [RFC2863] and

MIB II [RFC1213] 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 are using one of the local iFCP gateway instances. This section allows the management of specific iFCP parameters.

The iFCP session statistics section provides statistical information on the iFCP sessions that are using 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 standard and low-capacity (counter32) methods.

5. MIB Definition

```
IFCP-MGMT-MIB DEFINITIONS ::= BEGIN
--
--  IETF iFCP Management Information Base (MIB)
--
IMPORTS
    MODULE-IDENTITY,
    OBJECT-TYPE,
    Counter32,
    Counter64,
    Integer32,
    Unsigned32,
    experimental
         FROM SNMPv2-SMI

    OBJECT-GROUP,
    MODULE-COMPLIANCE
         FROM SNMPv2-CONF

    TEXTUAL-CONVENTION,
    TruthValue
         FROM SNMPv2-TC

--  From RFC 2571
    SnmpAdminString
           FROM SNMP-FRAMEWORK-MIB

--  From RFC 2851
    InetAddressType,
    InetAddress
         FROM INET-ADDRESS-MIB

--  From IETF Fibre Channel Management MIB, RFC TBD
    FcNameIdOrZero,
    FcAddressId
         FROM FC-MGMT-MIB
```

```
      ;

ifcpMgmtMIB  MODULE-IDENTITY
      LAST-UPDATED "0210080000Z"
      ORGANIZATION "IETF IPS Working Group"
      CONTACT-INFO "
        Attn: Kevin Gibbons
              Nishan Systems
              3850 North First Street
              San Jose, CA 95134
              USA
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              email : kgibbons@nishansystems.com

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              Nortel Networks
              3 Federal Street
              Billerica, MA  01821
              USA
              Tel : +1 978 288-7708
              email : travos@nortelnetworks.com
                    "

      DESCRIPTION "The MIB for internet Fibre Channel Protocol
                   (iFCP) management."

      -- an IETF number has not yet been assigned
           ::=  {experimental 4371}

  IfIndexType      ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "Represents possible interface indexes that
                    can be used on the iFCP gateway.  This can
                    be used as an index for the IF-MIB ifTable,
                    if supported by the system, or other
                    interface table, to obtain additional
                    information about the interface."
    REFERENCE      "RFC 2863, The Interfaces Group MIB (IF-MIB)"
```

```
    SYNTAX         Integer32 (1..2147483647)

  IfcpVersionType  ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "Represents the iFCP version supported."
    SYNTAX         INTEGER (0..255)

  PortType         ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "The value for a TCP Port being used for
                    an iFCP session.  The canonical port for
                    iFCP is 3420."
    REFERENCE      "draft-ietf-ips-ifcp-13.txt"
    SYNTAX         INTEGER (0..65535)

  IpTOVor0Type     ::= TEXTUAL-CONVENTION
    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      "draft-ietf-ips-ifcp-13.txt"
    SYNTAX         INTEGER (0..3600)

  LTIor0Type   ::= TEXTUAL-CONVENTION
    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      "draft-ietf-ips-ifcp-13.txt"
    SYNTAX         INTEGER (0..65535)

  IfcpSessionStateType ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "The value for an iFCP session state."
    SYNTAX         INTEGER {down(0), openPending(1), open(2)}

  IfcpAddressModeType ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION    "The values for iFCP Address Translation
                    Mode."
    REFERENCE      "draft-ietf-ips-ifcp-13.txt"
    SYNTAX         INTEGER {addressTransparent(0),
                            addressTranslation(1)}

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

ifcpGatewayObj          OBJECT IDENTIFIER ::= {ifcpMgmtMIB 1}
ifcpGatewayConformance  OBJECT IDENTIFIER ::= {ifcpMgmtMIB 2}
```

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

ifcpLclGatewayObjInfo OBJECT IDENTIFIER ::= {ifcpGatewayObj 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 controled.  This table contains an entry for each
 local iFCP Gateway instance that is being managed."
    ::= {ifcpLclGatewayObjInfo 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          Unsigned32,
    ifcpLclGtwyInstVersionMin        IfcpVersionType,
    ifcpLclGtwyInstVersionMax        IfcpVersionType,
    ifcpLclGtwyInstAddrTransMode     IfcpAddressModeType,
    ifcpLclGtwyInstFcBrdcstSupport   TruthValue,
    ifcpLclGtwyInstDefaultIpTOV      IpTOVor0Type,
    ifcpLclGtwyInstDefaultLTInterval LTIor0Type,
    ifcpLclGtwyInstDescr             SnmpAdminString,
    ifcpLclGtwyInstNumActiveSessions Unsigned32
                                    }

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            Unsigned32 (0..2147483647)
    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 2), for this iFCP
 Gateway.  If not supported it is either an index into a chassis
 MIB, as supported by the system, or 0."
    REFERENCE      "RFC 2737, Entity MIB (Version 2)"
    ::= {ifcpLclGtwyInstEntry      2}

ifcpLclGtwyInstVersionMin OBJECT-TYPE
    SYNTAX            IfcpVersionType
    MAX-ACCESS        read-only
    STATUS            current
    DESCRIPTION
"The minimum iFCP protocol version supported by the local iFCP
 gateway instance."
    REFERENCE      "draft-ietf-ips-ifcp-13.txt"
    ::= {ifcpLclGtwyInstEntry      3}

ifcpLclGtwyInstVersionMax OBJECT-TYPE
    SYNTAX            IfcpVersionType
    MAX-ACCESS        read-only
    STATUS            current
    DESCRIPTION
"The maximum iFCP protocol version supported by the local iFCP
 gateway instance."
    REFERENCE      "draft-ietf-ips-ifcp-13.txt"
    ::= {ifcpLclGtwyInstEntry      4}

ifcpLclGtwyInstAddrTransMode OBJECT-TYPE
    SYNTAX            IfcpAddressModeType
    MAX-ACCESS        read-write
    STATUS            current
    DESCRIPTION
"The local iFCP gateway operating mode.  Changing this value may
 cause existing sessions to be disrupted."
    DEFVAL            { addressTranslation }
    ::= {ifcpLclGtwyInstEntry      5}

ifcpLclGtwyInstFcBrdcstSupport OBJECT-TYPE
    SYNTAX            TruthValue
    MAX-ACCESS        read-write
    STATUS            current
    DESCRIPTION
"Whether the local iFCP gateway supports FC Broadcast.  Changing
 this value may cause existing sessions to be disrupted."
    DEFVAL            { false }
    ::= {ifcpLclGtwyInstEntry      6}

ifcpLclGtwyInstDefaultIpTOV OBJECT-TYPE
    SYNTAX            IpTOVor0Type
    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."
    DEFVAL            { 6 }
    ::= {ifcpLclGtwyInstEntry      7}

ifcpLclGtwyInstDefaultLTInterval OBJECT-TYPE
    SYNTAX            LTIor0Type
    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."
    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            Unsigned32 (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}

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

ifcpNportSessionInfo     OBJECT IDENTIFIER ::= {ifcpGatewayObj 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
"An entry in the session table."
    INDEX { ifcpLclGtwyInstIndex, ifcpSessionIndex }
    ::= {ifcpSessionAttributesTable 1}

IfcpSessionAttributesEntry ::= SEQUENCE {
    ifcpSessionIndex            Integer32,
    ifcpSessionLclPrtlIfIndex   IfIndexType,
    ifcpSessionLclPrtlAddrType  InetAddressType,
    ifcpSessionLclPrtlAddr      InetAddress,
    ifcpSessionLclPrtlTcpPort   PortType,
    ifcpSessionLclNpWwun        FcNameIdOrZero,
    ifcpSessionLclNpFcid        FcAddressId,
    ifcpSessionRmtNpWwun        FcNameIdOrZero,
    ifcpSessionRmtPrtlIfAddrType InetAddressType,
    ifcpSessionRmtPrtlIfAddr    InetAddress,
    ifcpSessionRmtPrtlTcpPort   PortType,
    ifcpSessionRmtNpFcid        FcAddressId,
    ifcpSessionRmtNpFcidAlias   FcAddressId,
    ifcpSessionIpTOV            IpTOVor0Type,
    ifcpSessionLclLTIntvl       LTIor0Type,
    ifcpSessionRmtLTIntvl       LTIor0Type,
    ifcpSessionBound            TruthValue
                                    }

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 an complex index that
 would be difficult to implement."
    ::= {ifcpSessionAttributesEntry 1}

ifcpSessionLclPrtlIfIndex       OBJECT-TYPE
    SYNTAX                      IfIndexType
    MAX-ACCESS                  read-only
    STATUS                      current
    DESCRIPTION
"This is the local interface in the ifTable being used as the
 local portal in this session, as described in the IF-MIB.
 This can be used as an index for the ifTable 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."
    ::= {ifcpSessionAttributesEntry 4}

ifcpSessionLclPrtlTcpPort          OBJECT-TYPE
    SYNTAX                         PortType
    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."
    ::= {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 empty."
    DEFVAL                         { "" }
    ::= {ifcpSessionAttributesEntry 6}

ifcpSessionLclNpFcid               OBJECT-TYPE
    SYNTAX                         FcAddressId
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"Fibre Channel Identifier of the local N Port.  For an unbound
 session this variable will be empty"
    ::= {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 empty."
    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."
    ::= {ifcpSessionAttributesEntry 10}

ifcpSessionRmtPrtlTcpPort          OBJECT-TYPE
    SYNTAX                          PortType
    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."
    DEFVAL                          { 3420 }
    ::= {ifcpSessionAttributesEntry 11}

ifcpSessionRmtNpFcid               OBJECT-TYPE
    SYNTAX                          FcAddressId
    MAX-ACCESS                      read-only
    STATUS                          current
    DESCRIPTION
"Fibre Channel Identifier of the remote N Port.  For an unbound
 session this variable will be empty."
    ::= {ifcpSessionAttributesEntry 12}

ifcpSessionRmtNpFcidAlias          OBJECT-TYPE
    SYNTAX                          FcAddressId
    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 empty."
    ::= {ifcpSessionAttributesEntry 13}

ifcpSessionIpTOV                   OBJECT-TYPE
```

```
    SYNTAX                          IpTOVor0Type
    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."
    ::= {ifcpSessionAttributesEntry 14}

ifcpSessionLclLTIntvl               OBJECT-TYPE
    SYNTAX                          LTIor0Type
    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."
    ::= {ifcpSessionAttributesEntry 15}

ifcpSessionRmtLTIntvl               OBJECT-TYPE
    SYNTAX                          LTIor0Type
    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."
    ::= {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."
    ::= {ifcpSessionAttributesEntry 17}

--
-- 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
"iFCP specific statistics per session."
    AUGMENTS {ifcpSessionAttributesEntry}
    ::= {ifcpSessionStatsTable 1}

IfcpSessionStatsEntry ::= SEQUENCE {
    ifcpSessionState               IfcpSessionStateType,
    ifcpSessionDuration            Unsigned32,
    ifcpSessionTxFrames            Counter64,
    ifcpSessionRxFrames            Counter64,
    ifcpSessionStaleFrames         Counter64,
    ifcpSessionHeaderCRCErrors     Counter64,
    ifcpSessionFcPayloadCRCErrors  Counter64,
    ifcpSessionOtherErrors         Counter64
                                   }

ifcpSessionState                   OBJECT-TYPE
    SYNTAX                         IfcpSessionStateType
    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}

ifcpSessionTxFrames                OBJECT-TYPE
    SYNTAX                         Counter64
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of iFCP frames transmitted since the
 connection was first established."
```

```
    ::= {ifcpSessionStatsEntry 3}

ifcpSessionRxFrames                OBJECT-TYPE
    SYNTAX                         Counter64
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of iFCP frames received since the
 connection was first established."
    ::= {ifcpSessionStatsEntry 4}

ifcpSessionStaleFrames             OBJECT-TYPE
    SYNTAX                         Counter64
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of received iFCP frames that were stale and
 discarded since the connection was first established."
    ::= {ifcpSessionStatsEntry 5}

ifcpSessionHeaderCRCErrors         OBJECT-TYPE
    SYNTAX                         Counter64
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of CRC errors that occurred in the frame
 header, detected since the connection was first established.
 Usually, a single Header CRC error is sufficient to
 terminate an iFCP session."
    ::= {ifcpSessionStatsEntry 6}

ifcpSessionFcPayloadCRCErrors      OBJECT-TYPE
    SYNTAX                         Counter64
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of CRC errors that occurred in the Fibre
 Channel frame payload detected since the connection was first
 established."
    ::= {ifcpSessionStatsEntry 7}

ifcpSessionOtherErrors             OBJECT-TYPE
    SYNTAX                         Counter64
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of errors, other then errors explicitly
 measured, detected since the connection was first established."
    ::= {ifcpSessionStatsEntry 8}

--
-- Low Capacity Statistics
--
```

```
ifcpSessionLcStatsTable            OBJECT-TYPE
    SYNTAX                         SEQUENCE OF
                                     IfcpSessionLcStatsEntry
    MAX-ACCESS                     not-accessible
    STATUS                         current
    DESCRIPTION
"This table provides low capacity statistics on an iFCP session.
 This is provided for backward compatibility with systems that
 do not support Counter64."
    ::= {ifcpNportSessionInfo 3}

ifcpSessionLcStatsEntry            OBJECT-TYPE
    SYNTAX                         IfcpSessionLcStatsEntry
    MAX-ACCESS                     not-accessible
    STATUS                         current
    DESCRIPTION
"iFCP specific statistics per session."
    AUGMENTS {ifcpSessionAttributesEntry}
    ::= {ifcpSessionLcStatsTable 1}

IfcpSessionLcStatsEntry ::= SEQUENCE {
    ifcpSessionLcTxFrames           Counter32,
    ifcpSessionLcRxFrames           Counter32,
    ifcpSessionLcStaleFrames        Counter32,
    ifcpSessionLcHeaderCRCErrors    Counter32,
    ifcpSessionLcFcPayloadCRCErrors Counter32,
    ifcpSessionLcOtherErrors        Counter32
                                   }

ifcpSessionLcTxFrames              OBJECT-TYPE
    SYNTAX                         Counter32
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of iFCP frames transmitted since the
 connection was first established."
    ::= {ifcpSessionLcStatsEntry 1}

ifcpSessionLcRxFrames              OBJECT-TYPE
    SYNTAX                         Counter32
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of iFCP frames received since the
 connection was first established."
    ::= {ifcpSessionLcStatsEntry 2}

ifcpSessionLcStaleFrames           OBJECT-TYPE
    SYNTAX                         Counter32
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of received iFCP frames that were stale and
 discarded since the connection was first established."
```

```
    ::= {ifcpSessionLcStatsEntry 3}

ifcpSessionLcHeaderCRCErrors       OBJECT-TYPE
    SYNTAX                         Counter32
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of CRC errors that occurred in the frame
 header, detected since the connection was first established.
 Usually, a single Header CRC error is sufficient to
 terminate an iFCP session."
    ::= {ifcpSessionLcStatsEntry 4}

ifcpSessionLcFcPayloadCRCErrors    OBJECT-TYPE
    SYNTAX                         Counter32
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of CRC errors that occurred in the Fibre
 Channel frame payload detected since the connection was first
 established."
    ::= {ifcpSessionLcStatsEntry 5}

ifcpSessionLcOtherErrors           OBJECT-TYPE
    SYNTAX                         Counter32
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of errors, other then errors explicitly
 measured, detected since the connection was first established."
    ::= {ifcpSessionLcStatsEntry 6}

--=========================================================

ifcpGroups OBJECT IDENTIFIER ::= {ifcpGatewayConformance 1}

ifcpLclGatewayGroup OBJECT-GROUP
    OBJECTS {
    ifcpLclGtwyInstPhyIndex,
    ifcpLclGtwyInstVersionMin,
    ifcpLclGtwyInstVersionMax,
    ifcpLclGtwyInstAddrTransMode,
    ifcpLclGtwyInstFcBrdcstSupport,
    ifcpLclGtwyInstDefaultIpTOV,
    ifcpLclGtwyInstDefaultLTInterval,
    ifcpLclGtwyInstDescr,
    ifcpLclGtwyInstNumActiveSessions
           }
    STATUS current
    DESCRIPTION
        "iFCP local device info group"
    ::= {ifcpGroups 1}

ifcpLclGatewaySessionGroup OBJECT-GROUP
```

```
    OBJECTS {
    ifcpSessionLclPrtlIfIndex,
    ifcpSessionLclPrtlAddrType,
    ifcpSessionLclPrtlAddr,
    ifcpSessionLclPrtlTcpPort,
    ifcpSessionLclNpWwun,
    ifcpSessionLclNpFcid,
    ifcpSessionRmtNpWwun,
    ifcpSessionRmtPrtlIfAddrType,
    ifcpSessionRmtPrtlIfAddr,
    ifcpSessionRmtPrtlTcpPort,
    ifcpSessionRmtNpFcid,
    ifcpSessionRmtNpFcidAlias,
    ifcpSessionIpTOV,
    ifcpSessionLclLTIntvl,
    ifcpSessionRmtLTIntvl,
    ifcpSessionBound
           }
    STATUS current
    DESCRIPTION
        "iFCP Session group"
    ::= {ifcpGroups 4}

ifcpLclGatewaySessionStatsGroup OBJECT-GROUP
    OBJECTS {
    ifcpSessionState,
    ifcpSessionDuration,
    ifcpSessionTxFrames,
    ifcpSessionRxFrames,
    ifcpSessionStaleFrames,
    ifcpSessionHeaderCRCErrors,
    ifcpSessionFcPayloadCRCErrors,
    ifcpSessionOtherErrors
           }
    STATUS current
    DESCRIPTION
        "iFCP Session Statistics group"
    ::= {ifcpGroups 5}

ifcpLclGatewaySessionLcStatsGroup OBJECT-GROUP
    OBJECTS {
    ifcpSessionLcTxFrames,
    ifcpSessionLcRxFrames,
    ifcpSessionLcStaleFrames,
    ifcpSessionLcHeaderCRCErrors,
    ifcpSessionLcFcPayloadCRCErrors,
    ifcpSessionLcOtherErrors
           }
    STATUS current
    DESCRIPTION
        "iFCP Session Low Capacity Statistics group"
    ::= {ifcpGroups 6}

ifcpCompliances OBJECT IDENTIFIER ::= {ifcpGatewayConformance 2}
```

```
ifcpGatewayComplianceV1 MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
"Minimum implementation for iFCP MIB compliance."
    MODULE       -- this module
    MANDATORY-GROUPS {
        ifcpLclGatewayGroup
                    }
    ::= {ifcpCompliances 1}

END
```

6. Security Considerations

There are a number of management objects defined in this MIB that have 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.

SNMPv1 by itself is not a secure environment. 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.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [RFC2574] and the View-based Access Control Model RFC 2575 [RFC2575] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, 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.

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10. Full Copyright Statement