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Definitions of Managed Objects for iFCP

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Abstract

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

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
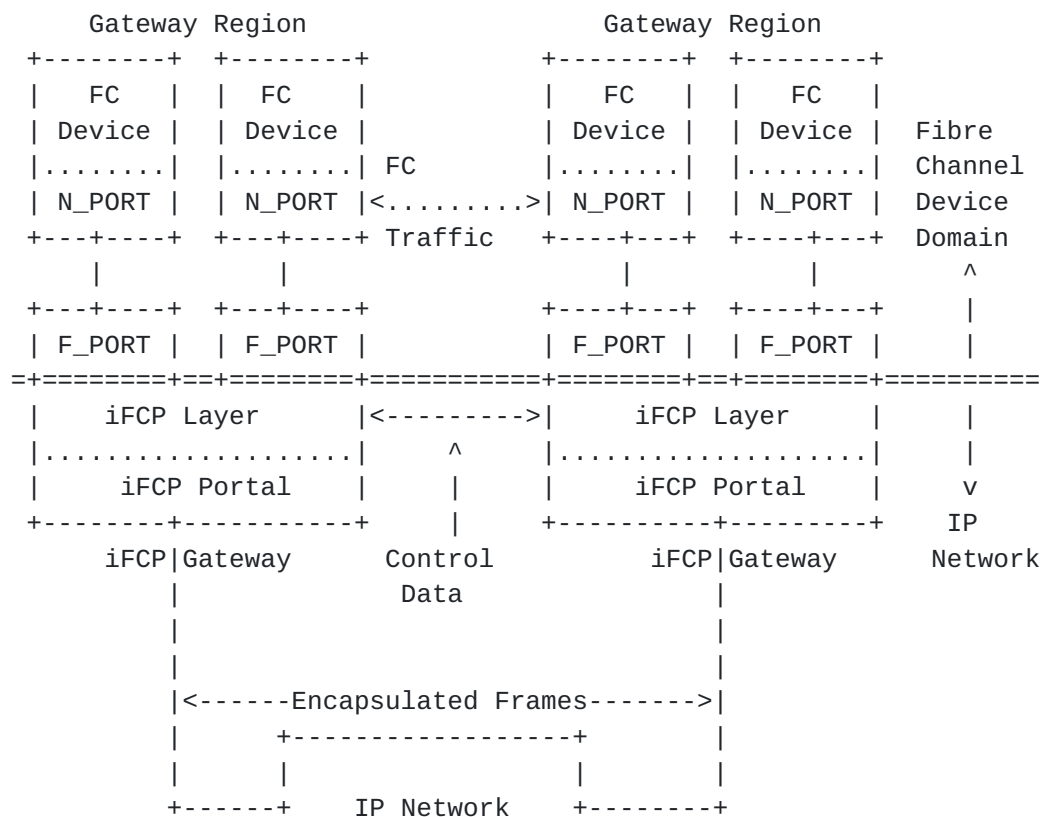ips@ece.cmu.edu and/or the authors.

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1. 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].

2. Introduction

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.

```
     Gateway Region                      Gateway Region
 +--------+  +--------+          +--------+  +--------+
 |   FC   |  |   FC   |          |   FC   |  |   FC   |
 | Device |  | Device |          | Device |  | Device |   Fibre
 |........|  |........| FC       |........|  |........|   Channel
 | N_PORT |  | N_PORT |<.........>| N_PORT |  | N_PORT |   Device
 +---+----+  +---+----+ Traffic  +----+---+  +----+---+   Domain
     |           |                    |           |         ^
 +---+----+  +---+----+          +----+---+  +----+---+      |
 | F_PORT |  | F_PORT |          | F_PORT |  | F_PORT |      |
 =+========+==+========+==========+========+==+========+==========
     |     iFCP Layer    |<--------->|    iFCP Layer    |     |
 |....................|      ^    |....................|     |
 |      iFCP Portal    |      |    |      iFCP Portal    |     v
 +--------+-----------+      |    +----------+---------+     IP
     iFCP|Gateway        Control      iFCP|Gateway      Network
         |               Data              |
         |                                 |
         |                                 |
         |<------Encapsulated Frames------->|
         |        +-----------------+      |
         |        |                 |      |
     +------+    IP Network    +--------+
```

```
                    |                |
                    +------------------+
```

The iFCP MIB Module is designed to allow 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 [FCMGT01] 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 are using 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 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.

[4]. **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 2021
    ZeroBasedCounter32
        FROM RMON2-MIB

--    From RFC 2856
    ZeroBasedCounter64
        FROM HCNUM-TC

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

--    From RFC 2863
    InterfaceIndexOrZero
        FROM IF-MIB

--    From RFC 3291
    InetAddressType,
    InetAddress,
    InetPortNumber
        FROM INET-ADDRESS-MIB

--   From IETF Entity MIB v3, RFC TBD
-- RFC Ed.: replace TBD with RFC number assigned to the
--          Entity MIB v3, and remove this note
    PhysicalIndexOrZero
        FROM ENTITY-MIB

--   From IETF Fibre Channel Management MIB, RFC TBD
-- RFC Ed.: replace TBD with RFC number assigned to the Fibre
--          Channel Management MIB, and remove this note
    FcNameIdOrZero,
    FcAddressIdOrZero
```

```
           FROM FC-MGMT-MIB
      ;


ifcpMgmtMIB   MODULE-IDENTITY
      LAST-UPDATED "200501230000Z"
      ORGANIZATION "IETF IPS Working Group"
      CONTACT-INFO "
        Attn: Kevin Gibbons
              McDATA Corporation
              4555 Great America Pkwy
              Santa Clara, CA 95054-1208
              USA
              Tel: +1 408 567-5765
              Fax: +1 408 567-0063
              Email: kevin.gibbons@mcdata.com

              Charles Monia
```

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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.

                  Copyright (C) The Internet Society (2005).
                  This version of this MIB module is part of
                  RFC ZZZZ;  see the RFC itself for
```

```
                      full legal notices."
-- RFC Ed.: replace ZZZZ with actual RFC number assigned to
--          this document and remove this note
        REVISION     "200501230000Z"
        DESCRIPTION "Initial version of iFCP Management Module.
                     This MIB published as RFC ZZZZ."
-- RFC Ed.: replace ZZZZ with RFC number assigned to this
--          document and remove this note
-- remove from final version  ::=  { transmission 9999 }
        ::=  { transmission YYYY }
-- RFC Ed.: enter the IANA assigned number to this MIB for YYYY,
--          and remove this note


--
--  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       "iFCP Protocol Specification, RFC XXXX"
-- RFC Ed.: throughout this document, replace XXXX with the
--          RFC number assigned to the iFCP Protocol Spec.,
--          and remove this note
     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       "iFCP Protocol Specification, RFC XXXX"
     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       "iFCP Protocol Specification, RFC XXXX"
      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        "iFCP Protocol Specification, RFC XXXX"
    ::= {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       "iFCP Protocol Specification, RFC XXXX"
    ::= {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       "iFCP Protocol Specification, RFC XXXX"
    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."
    REFERENCE       "iFCP Protocol Specification, RFC XXXX"
    DEFVAL            { false }
    ::= {ifcpLclGtwyInstEntry      6}


ifcpLclGtwyInstDefaultIpTOV OBJECT-TYPE
    SYNTAX            IfcpIpTOVorZero
    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       "iFCP Protocol Specification, RFC XXXX"
    DEFVAL            { 6 }
```

```
    ::= {ifcpLclGtwyInstEntry      7}


ifcpLclGtwyInstDefaultLTInterval OBJECT-TYPE
    SYNTAX            IfcpLTIorZero
    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       "iFCP Protocol Specification, RFC XXXX"
    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.  Paramater values defined
 for a gateway are usually non-volatile, but may be volatile
 or read-only in some configurations."
    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
"An entry in the session table."
     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 an 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       "iFCP Protocol Specification, RFC XXXX"
        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       "iFCP Protocol Specification, RFC XXXX"
        ::= {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       "iFCP Protocol Specification, RFC XXXX"
        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       "iFCP Protocol Specification, RFC XXXX"
    ::= {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       "iFCP Protocol Specification, RFC XXXX"
    ::= {ifcpSessionAttributesEntry 13}
```

```
ifcpSessionIpTOV                    OBJECT-TYPE
    SYNTAX                          IfcpIpTOVorZero
    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       "iFCP Protocol Specification, RFC XXXX"
    ::= {ifcpSessionAttributesEntry 14}

ifcpSessionLclLTIntvl               OBJECT-TYPE
    SYNTAX                          IfcpLTIorZero
    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       "iFCP Protocol Specification, RFC XXXX"
    ::= {ifcpSessionAttributesEntry 15}

ifcpSessionRmtLTIntvl               OBJECT-TYPE
    SYNTAX                          IfcpLTIorZero
    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       "iFCP Protocol Specification, RFC XXXX"
    ::= {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       "iFCP Protocol Specification, RFC XXXX"
    ::= {ifcpSessionAttributesEntry 17}

ifcpSessionStorageType          OBJECT-TYPE
    SYNTAX                      StorageType
    MAX-ACCESS                  read-only
    STATUS                      current
    DESCRIPTION
"The storage type for this row.  Paramater values defined
 for a session are usually non-volatile, but may be volatile
 or read-only in some configurations."
    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 on this session since
 the iFCP connection was first established."
    ::= {ifcpSessionStatsEntry 3}

ifcpSessionRxOctets              OBJECT-TYPE
    SYNTAX                       ZeroBasedCounter64
    MAX-ACCESS                   read-only
    STATUS                       current
    DESCRIPTION
"The total number of octets received by on this session since
 the iFCP connection was first established."
    ::= {ifcpSessionStatsEntry 4}
```

```
ifcpSessionTxFrames                OBJECT-TYPE
    SYNTAX                         ZeroBasedCounter64
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of iFCP frames transmitted since the
 connection was first established."
    ::= {ifcpSessionStatsEntry 5}

ifcpSessionRxFrames                OBJECT-TYPE
    SYNTAX                         ZeroBasedCounter64
    MAX-ACCESS                     read-only
    STATUS                         current
    DESCRIPTION
"The total number of iFCP frames received since the
 connection was first established."
    ::= {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 since the connection was first established."
    ::= {ifcpSessionStatsEntry 7}

ifcpSessionHeaderCRCErrors         OBJECT-TYPE
    SYNTAX                         ZeroBasedCounter64
    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 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 since the connection was first
 established."
```

```
    ::= {ifcpSessionStatsEntry 9}


ifcpSessionOtherErrors              OBJECT-TYPE
    SYNTAX                          ZeroBasedCounter64
    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 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's counters
 suffered a discontinuity.  The relevant counters are the
 specific Counter64 based instances associated with
 ifcpSessionStatsTable.  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
 1Gbps 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 on this session since
 the iFCP connection was first established."
    ::= {ifcpSessionLcStatsEntry 1}

ifcpSessionLcRxOctets               OBJECT-TYPE
    SYNTAX                          ZeroBasedCounter32
    MAX-ACCESS                      read-only
    STATUS                          current
    DESCRIPTION
"The total number of octets received by on this session since
 the iFCP connection was first established."
    ::= {ifcpSessionLcStatsEntry 2}

ifcpSessionLcTxFrames               OBJECT-TYPE
    SYNTAX                          ZeroBasedCounter32
    MAX-ACCESS                      read-only
    STATUS                          current
    DESCRIPTION
"The total number of iFCP frames transmitted since the
 connection was first established."
    ::= {ifcpSessionLcStatsEntry 3}

ifcpSessionLcRxFrames               OBJECT-TYPE
    SYNTAX                          ZeroBasedCounter32
```

```
    MAX-ACCESS                    read-only
    STATUS                        current
    DESCRIPTION
"The total number of iFCP frames received since the
 connection was first established."
    ::= {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 since the connection was first established."
    ::= {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 since the connection was first established.
 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 since the connection was first
 established."
    ::= {ifcpSessionLcStatsEntry 7}


ifcpSessionLcOtherErrors          OBJECT-TYPE
    SYNTAX                        ZeroBasedCounter32
    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 8}


--=======================================================
```

```
ifcpCompliances
        OBJECT IDENTIFIER ::= {ifcpGatewayConformance 1}
```

```
ifcpGatewayCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
"Implementation requirements for iFCP MIB compliance."
    MODULE        -- this module
    MANDATORY-GROUPS {
        ifcpLclGatewayGroup,
        ifcpLclGatewaySessionGroup,
        ifcpLclGatewaySessionStatsGroup,
        ifcpLclGatewaySessionLcStatsGroup
                    }
    ::= {ifcpCompliances 1}

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 current
    DESCRIPTION
"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 which
 do not support Counter64 based data types, or need to
 support SNMPv1 applications."
     ::= {ifcpGroups 6}
```

```
END
```

5. IANA Considerations

IANA is requested to make a unique MIB OID assignment under the
transmission branch.

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 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.

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              December 2002.

   [FC-FS]   Fibre Channel Framing and Signaling Interface,
              ANSI/INCITS 373:2003.

   [FC-GS]   Fibre Channel - Generic Services, NCITS 348-2000.

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