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K. Gibbons
McDATA Corporation
C. Monia
Consultant
J. Tseng
Riverbed Technology
F. Travostino
Nortel
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Definitions of Managed Objects for Internet Fibre Channel Protocol (iFCP)

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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Abstract

The iFCP protocol (RFC 4172) 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 document provides a mechanism to monitor and control iFCP Gateway instances, and their associated sessions, using SNMP.

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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 Fibre Channel Protocol (FCP) storage interconnects. Figure 1 provides an example of an interconnect between iFCP gateways.

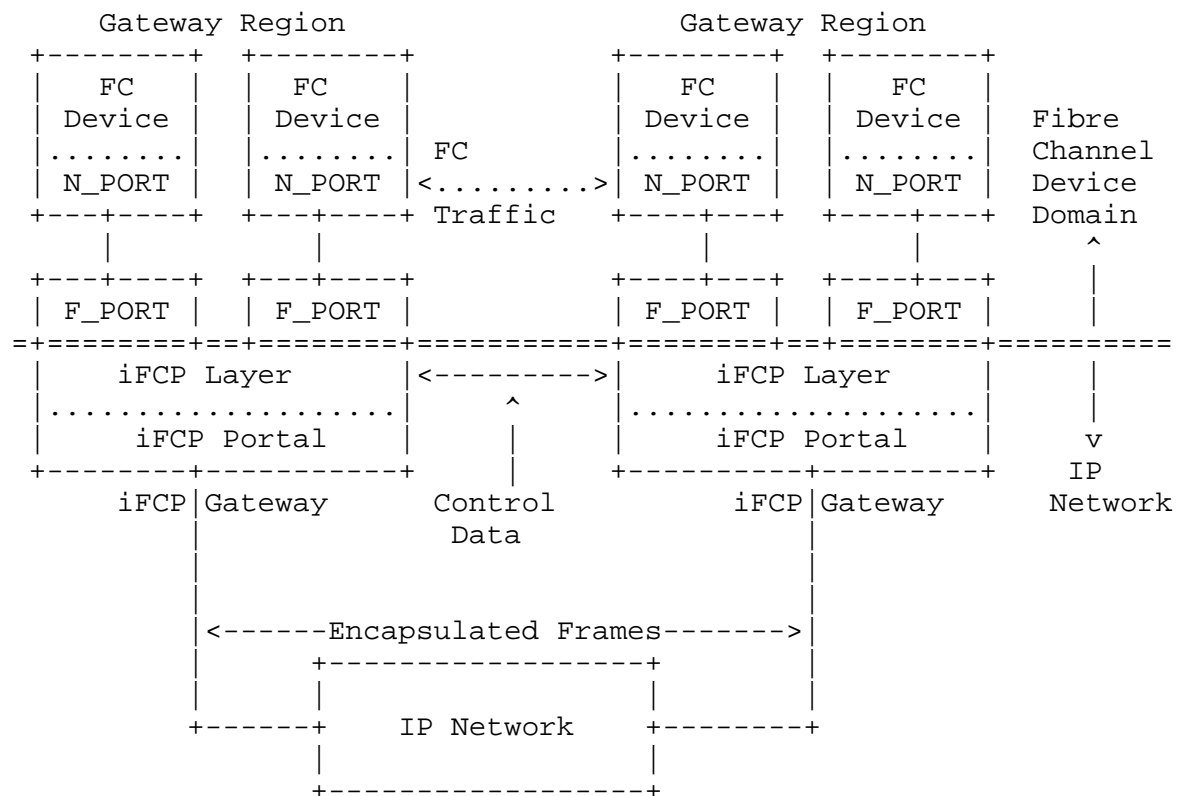


Figure 1: Interconnect between iFCP Gateways

The iFCP MIB Module is designed to allow 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 standard and low-capacity (counter32) methods.

The following MIB module imports from RMON2-MIB [RFC2021], SNMPv2-SMI [RFC2578], SNMPv2-TC [RFC2579], SNMPv2-CONF [RFC2580], HCNM-TC [RFC2856], IF-MIB [RFC2863], SNMP-FRAMEWORK-MIB [RFC3411], INET-ADDRESS-MIB [RFC4001], FC-MGMT-MIB [RFC4044], and ENTITY-MIB (v3) [RFC4133].

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 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 "200601170000Z"
ORGANIZATION "IETF IPS Working Group"
CONTACT-INFO "
Attn: Kevin Gibbons
McDATA Corporation
4555 Great America Pkwy
Santa Clara, CA 95054-1208 USA
Phone: (408) 567-5765
EMail: kevin.gibbons@mcdata.com

Charles Monia
Consultant
7553 Morevern Circle
San Jose, CA 95135 USA
EMail: charles_monia@yahoo.com

Josh Tseng
Riverbed Technology
501 2nd Street, Suite 410
San Francisco, CA 94107 USA
Phone: (650) 274-2109
EMail: joshtseng@yahoo.com

Franco Travostino
Nortel
600 Technology Park Drive
Billerica, MA 01821 USA
Phone: (978) 288-7708
EMail: travos@nortel.com"

DESCRIPTION

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

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REVISION "200601170000Z"

DESCRIPTION

```

        "Initial version of iFCP Management Module.
        This MIB 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 4172, iFCP Protocol Specification"
    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"
    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       "RFC 4172, iFCP Protocol Specification"
    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       "RFC 4172, iFCP Protocol Specification"
    DEFVAL          { 6 }
    ::= { ifcpLclGtwyInstEntry      7 }

ifcpLclGtwyInstDefaultLTInterval OBJECT-TYPE
    SYNTAX          IfcpLTlorZero
    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 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                                "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
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
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
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 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 current
    DESCRIPTION
    "Implementation requirements for iFCP MIB 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."

```

```
 ::= {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 that do not support Counter64-based data types, or that need to support SNMPv1 applications."

::= {ifcpGroups 6}

END

5. IANA Considerations

The IANA has made a unique MIB OID assignment under the transmission branch for IFCP-MGMT-MIB.

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.

7. Normative References

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8. Informative References

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Authors' Addresses

Kevin Gibbons
McDATA Corporation
4555 Great America Pkwy
Santa Clara, CA 95054-1208 USA

Phone: (408)567-5765
EMail: kevin.gibbons@mcddata.com

Charles Monia
Consultant
7553 Morevern Circle
San Jose, CA 95135 USA

EMail: charles_monia@yahoo.com

Josh Tseng
Riverbed Technology
501 2nd Street, Suite 410
San Francisco, CA 94107 USA

Phone: (650)274-2109
EMail: joshtseng@yahoo.com

Franco Travostino
Nortel
600 Technology Park Drive
Billerica, MA 01821 USA

Phone: (978)288-7708
EMail: travos@nortel.com

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