Definitions of Managed Objects for FCIP

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2. Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP based internets. In particular it defines objects for managing a FCIP device, as defined in [FCIP]. This MIB is defined such that it can be viewed as an extension to the existing FC Management Framework Integration MIB, as specified in [FCMGMT].
3. 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
4. Overview of FCIP Device Based Interconnection Model

Note that the FCIP Device is fully described in [FCIP] from a functional point of view; whereas this section describes the FCIP Device from management point of view.

The FCIP device is modeled as a "gateway" FC Connectivity Unit, since the FCIP device acts as a gateway connection unit to bridge the FC onto the IP technology.

The FCIP devices provides IP-based interconnection model to interconnect the FC fabric elements. In this model, the FCIP-devices, along with their IP-network, provides a new FCIP transport network. The FC fabric elements (FC-FEs) will support the Logical FC Links in their overlay network that resides on this FCIP transport network.

This IP-based FCIP Interconnection Model supports the following topology:
- The FCIP-based transport network is formed by interconnecting the FCIP-devices.
- Each FCIP device has one or more FCIP Entities.
- Peer FCIP Entities are connected by FCIP Links.
- Each FCIP Link contains one or more Data Engine.
- The FCIP-device can work as a stand-alone box or as part of a FC fabric element.

5. Relationship to other MIBs

Objects accessible from other MIBs applicable to FCIP devices have not been included in this MIB.

5.1 Relationship to the ‘TCP’ group of MIB-II

This group is mandatory for all systems which implement TCP. Objects relevant to TCP must be obtained from this group.

5.2 Relationship to the ‘interfaces’ MIB

The ‘interfaces’ group is defined as being mandatory for all systems and contains information on an entity’s interfaces. Each FCIP Link will run over a physical link described by objects in this group.

5.3 Relationship to the Fabric Element MIB

The Fabric Element MIB, RFC 2837 is assumed for FC functionality managed objects.
6. MIB Definitions

FCIP-MGMT-MIB DEFINITIONS ::= BEGIN

IMPORTS

OBJECT-TYPE,
MODULE-IDENTITY,
Unsigned32,
IpAddress,
mib-2 FROM SNMPv2-SMI

TEXTUAL-CONVENTION FROM SNMPv2-TC

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

fcipMgmtMIB MODULE-IDENTITY
LAST-UPDATED "200104200000Z"
ORGANIZATION "IETF IPFC Working Group"
CONTACT-INFO "Sudar Akkala
LightSand Communications Inc,
375 Los Coches Street
Milpitas, CA 95035 USA.
Tel: +1 408 404 3150
Fax: +1 408 941 2166
Email: sudara@lightsand.com"
DESCRIPTION "The FCIP management MIB module."
 ::= { mib-2 8889 } -- TO BE ASSIGNED by IANA

fcipMgmtObjects OBJECT IDENTIFIER ::= { fcipMgmtMIB 1 }
fcipMgmtConformance OBJECT IDENTIFIER ::= { fcipMgmtMIB 2 }
fcipMgmtConfig OBJECT IDENTIFIER ::= { fcipMgmtObjects 1 }
fcipMgmtCompliances OBJECT IDENTIFIER ::= { fcipMgmtConformance 1 }
fcipMgmtGroups OBJECT IDENTIFIER ::= { fcipMgmtConformance 2 }

-- Textual conventions

FcFabricWWId ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION "Represents the Worldwide Name (WWN; IEEE 124-bit
variety) associated with a Fibre Channel (FC)
entity."
SYNTAX OCTET STRING (SIZE(16))

FcDomainId ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION "Represents the Domain Identifier associated
with a FC entity."
SYNTAX OCTET STRING (SIZE(1))

--
-- The FCIP group
--
-- This group defines the global scalar objects applicable to FCIP
devices only
--

fcFcipMode OBJECT-TYPE
SYNTAX INTEGER {
  e-port-mode(1),
  b-port-mode(2)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"It indicates the mode in which the FCIP-device operates"
::= { fcipMgmtConfig 1 }

fcFcipDynIpConfType OBJECT-TYPE
SYNTAX INTEGER {
  not-applied (1),
  lsp (2)
}
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"Indicates the type of discovery protocol used to discover remote
FCIP entities."
::= { fcipMgmtConfig 2 }

fcFcipFabricWWN OBJECT-TYPE
SYNTAX FcFabricWWId
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The World Wide Name of this FCIP device."
::= { fcipMgmtConfig 3 }

--
-- fcFcipEntityTable
--

-- The FCIP Entity table contains information about this entity’s existing
-- FCIP entities.
fcFcipEntityTable OBJECT-TYPE
SYNTAX SEQUENCE OF FcFcipEntityEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A table containing FCIP entity specific information."
::= { fcipMgmtConfig 4 }

FcFcipEntityEntry OBJECT-TYPE
SYNTAX FcFcipEntityEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A conceptual row of the FCIP entity table containing information
about a particular FCIP entity."
INDEX { fcFcipEntityId }
::= { fcFcipEntityTable 1 }

FcFcipEntityEntry ::= SEQUENCE {
  fcFcipEntityId                  Unsigned32,
  fcFcipEntityIpAddr              IpAddress,
  fcFcipEntityTcpConnPort         Unsigned32,
  fcFcipEntitySACKOption          INTEGER,
  fcFcipEntitySeqNumWrap          INTEGER,
  fcFcipEntityPHBIpOption         INTEGER
}

fcFcipEntityId   OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The FCIP entity identifier."
::= { fcFcipEntityEntry 1 }

fcFcipEntityIpAddr   OBJECT-TYPE
SYNTAX IpAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The IP address of the FCIP entity."
::= { fcFcipEntityEntry 2 }

fcFcipEntityTcpConnPort   OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"A TCP port other than the FCIP Well-Known port on which the FCIP entity
entity listens for new TCP connection requests."
::= { fcFcipEntityEntry 3 }

fcFcipEntitySACKOption OBJECT-TYPE
SYNTAX INTEGER {
   enabled(1),
   disabled(2)
}
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"Indicates whether the TCP Selective Acknowledgement Option is enabled
to allow the receiver end to acknowledge multiple lost packets in a single
ACK, enabling faster recovery."
::= { fcFcipEntityEntry 4 }

fcFcipEntitySeqNumWrap OBJECT-TYPE
SYNTAX INTEGER {
   supported(1),
   not-supported(2)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Indicates whether the protection against sequence number wrap is supported
or not."
::= { fcFcipEntityEntry 5 }

fcFcipEntityPHBIpOption OBJECT-TYPE
SYNTAX INTEGER {
   supported(1),
   not-supported(2)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Indicates whether a PHB IP QoS is implemented or not."
::= { fcFcipEntityEntry 6 }

--
-- fcFcipLinkTable
--

-- The FCIP link table contains information about this FCIP device’s existing
-- FCIP links.
fcFcipLinkTable OBJECT-TYPE
SYNTAX SEQUENCE OF FcFcipLinkEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A table containing FCIP link specific information."
::= { fcipMgmtConfig 5 }

FcFcipLinkEntry OBJECT-TYPE
SYNTAX FcFcipLinkEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A conceptual row of the FCIP link table containing information about
a particular FCIP link."
INDEX { fcFcipEntityId, fcFcipLinkIndex, fcFcipLinkIfIndex }
::= { fcFcipLinkTable 1 }

FcFcipLinkEntry ::= SEQUENCE {
  fcFcipLinkIndex               Unsigned32,
  fcFcipLinkIfIndex             INTEGER,
  fcFcipLinkCost                Unsigned32,
  fcFcipLinkRemFcipEntityWWN    FcFabricWWId,
  fcFcipLinkRemFcipEntityId     Unsigned32,
  fcFcipLinkRemFcipEntityIpAddr IpAddress
}

fcFcipLinkIndex     OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A unique value for each FCIP link within a FCIP entity."
::= { fcFcipLinkEntry 1 }

fcFcipLinkIfIndex     OBJECT-TYPE
SYNTAX INTEGER
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A unique value that identifies the interface on this FCIP device
to which this link pertains. The interface identified by a particu-
lar value of this object is the same interface as identified
by the same value of the ifIndex object, defined in RFC 2233."
::= { fcFcipLinkEntry 2 }

fcFcipLinkCost     OBJECT-TYPE

SYNTAX Unsigned32
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"It indicates the cost associated with this FCIP Link."
::= { fcFcipLinkEntry 3 }

fcFcipLinkRemFcipEntityWWN OBJECT-TYPE
SYNTAX FcFabricWWId
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"The World Wide Name of the remote FC Fabric Entity."
::= { fcFcipLinkEntry 4 }

fcFcipLinkRemFcipEntityId OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"The remote FCIP entity’s identifier."
::= { fcFcipLinkEntry 5 }

fcFcipLinkRemFcipEntityIpAddr OBJECT-TYPE
SYNTAX IpAddress
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"The IP address of the remote FCIP entity."
::= { fcFcipLinkEntry 6 }

--
-- fcFcipTcpConnTable
--

-- The FCIP TCP Connection table contains information about existing TCP
-- connections. Each FCIP link within a FCIP entity manages one or more
-- TCP connections. The FCIP entity employs a Data Engine for each TCP
-- connection for handling FC frame encapsulation, de-encapsulation and
-- transmission of FCIP frames on the connection.

fcFcipTcpConnTable OBJECT-TYPE
SYNTAX SEQUENCE OF FcFcipTcpConnEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A table containing FCIP specific information about this FCIP device’s
existing TCP connections."
::= { fcipMgmtConfig 6 }

fcTcpConnEntry OBJECT-TYPE
SYNTAX FcFcipTcpConnEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A conceptual row of the FCIP TCP Connection table containing information
about a particular TCP connection."
INDEX { fcFcipEntityId,
        fcFcipLinkIndex,
        fcFcipTcpConnLocalPort }
::= { fcFcipTcpConnTable 1 }

FcFcipTcpConnEntry ::= SEQUENCE {
    fcFcipTcpConnLocalPort      INTEGER,
    fcFcipTcpConnRemPort        INTEGER,
    fcFcipTcpConnPurpose        INTEGER {
        control(1),
        data(2),
        both(3)
    },
    fcFcipTcpConnRWSize         Unsigned32,
    fcFcipTcpConnMSS            Unsigned32,
    fcFcipTcpConnTimeOut        Unsigned32
}

fcFcipTcpConnLocalPort OBJECT-TYPE
SYNTAX INTEGER (0..65535)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The local port number for this TCP connection."
::= { fcFcipTcpConnEntry 1 }

fcFcipTcpConnRemPort OBJECT-TYPE
SYNTAX INTEGER (0..65535)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The remote port number for this TCP connection."
::= { fcFcipTcpConnEntry 2 }

fcFcipTcpConnPurpose OBJECT-TYPE
SYNTAX INTEGER {
    control(1),
    data(2),
    both(3)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The nature of messages that get transmitted on this TCP connection."
::= { fcFcipTcpConnEntry 3 }

fcFcipTcpConnRWSize OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The advertised TCP Receiver Window size for this TCP connection."
::= { fcFcipTcpConnEntry 4 }

fcFcipTcpConnMSS OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The TCP Maximum Segment Size(MSS) for this TCP connection."
::= { fcFcipTcpConnEntry 5 }

fcFcipTcpConnTimeOut OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The timeout value for this TCP connection."
::= { fcFcipTcpConnEntry 6 }

--
-- fcFcipDynamicRouteTable
--

-- The FCIP dynamic route table contains information about this FCIP
device's routing information that is dynamically discovered by SLP.
The FCIP device will use SLPv2 protocol for dynamically discovering
other FCIP entities, and populate this table for Destination Address
Identifier to connecting FCIP link information.

fcFcipDynamicRouteTable OBJECT-TYPE
SYNTAX SEQUENCE OF FcFcipDynamicRouteEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A table containing FCIP Route specific information."
::= { fcipMgmtConfig 7 }

fcFcipDynamicRouteEntry OBJECT-TYPE
FCIP Dynamic Route Table

SYNTAX FcFcipDynamicRouteEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A conceptual row of the FCIP Dynamic Route Table containing information about a particular FCIP route."
INDEX { fcFcipEntityId, fcFcipDynamicRouteIndex }
::= { fcFcipDynamicRouteTable 1 }

FcFcipDynamicRouteEntry ::= SEQUENCE {
    fcFcipDynamicRouteIndex        Unsigned32,
    fcFcipDynamicRouteDID          FcDomainId,
    fcFcipDynamicRouteLinkIndex    Unsigned32
}

fcFcipDynamicRouteIndex OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"An index that uniquely identifies an entry in the FCIP dynamic Route table."
::= { fcFcipDynamicRouteEntry 1 }

fcFcipDynamicRouteDID OBJECT-TYPE
SYNTAX FcDomainId
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"8 bit ID of the remote Fibre Channel Domain that is reachable from this FCIP device."
::= { fcFcipDynamicRouteEntry 2 }

fcFcipDynamicRouteLinkIndex OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Indicates the FCIP link that is used to reach this domain(specified by the previous object ’fcFcipDynamicRouteDID’) on the remote FCIP device."
::= { fcFcipDynamicRouteEntry 3 }

--
-- fcFcipStaticRouteTable
--
-- The FCIP static route table contains information about this FCIP
-- device's routing information that is created by the Network Admin.
-- In the absence of dynamic discovery of remote FCIP entities, the
-- Network Manager will figure out all the remote FCIP devices that
-- are reachable from this device, and populate this table with FCIP
-- link information for each Domain Id.

fcFcipStaticRouteTable OBJECT-TYPE
SYNTAX    SEQUENCE OF FcFcipStaticRouteEntry
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION
  "A table containing FCIP Route specific information."
 ::= { fcipMgmtConfig 8 }

fcFcipStaticRouteEntry OBJECT-TYPE
SYNTAX    FcFcipStaticRouteEntry
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION
  "A conceptual row of the FCIP Static Route Table containing information
  about a particular FCIP route."
INDEX { fcFcipEntityId, fcFcipStaticRouteIndex }
 ::= { fcFcipStaticRouteTable 1 }

FcFcipStaticRouteEntry ::= SEQUENCE {
  fcFcipStaticRouteIndex               Unsigned32,
  fcFcipStaticRouteDID                 FcDomainId,
  fcFcipStaticRouteRemFcipEntityWWN    FcFabricWWId,
  fcFcipStaticRouteRemFcipEntityId     Unsigned32,
  fcFcipStaticRouteRemFcipEntityIpAddr IpAddress
}

fcFcipStaticRouteIndex    OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
  "An index that uniquely identifies an entry in the FCIP dynamic Route table."
 ::= { fcFcipStaticRouteEntry  1 }

fcFcipStaticRouteDID    OBJECT-TYPE
SYNTAX FcDomainId
MAX-ACCESS read-write
STATUS current
DESCRIPTION
  "8 bit ID of the remote Fibre Channel Domain that is reachable from
this FCIP device.
 ::= { fcFcipStaticRouteEntry 2 }

fcFcipStaticRouteRemFcipEntityWWN OBJECT-TYPE
SYNTAX FcFabricWWId
MAX-ACCESS read-write
STATUS current
DESCRIPTION
 "The World Wide Name of the remote FC Fabric Entity."
 ::= { fcFcipStaticRouteEntry 3 }

fcFcipStaticRouteRemFcipEntityId OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-write
STATUS current
DESCRIPTION
 "The remote FCIP entity’s identifier."
 ::= { fcFcipStaticRouteEntry 4 }

fcFcipStaticRouteRemFcipEntityIpAddr OBJECT-TYPE
SYNTAX IpAddress
MAX-ACCESS read-write
STATUS current
DESCRIPTION
 "The IP address of the remote FCIP entity."
 ::= { fcFcipStaticRouteEntry 5 }

END

11. References:

[FCIP] Rajagopal, M., et al "Fiber Channel Over TCP/IP (FCIP)",

for Describing SNMP Management Frameworks", RFC 2571, April
1999.

of Management Information for TCP/IP-based Internets", STD


[RFC1215] M. Rose, "A Convention for Defining Traps for use with the

[RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J.,


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