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Definitions of Managed Objects for Character Stream Devices using SMIV2

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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1. Introduction

This memo defines an extension to the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it defines objects for the management of character stream devices.

2. The SNMPv2 Network Management Framework

The SNMPv2 Network Management Framework consists of four major components. They are:

- o RFC 1442 [1] which defines the SMI, the mechanisms used for describing and naming objects for the purpose of management.
- o STD 17, RFC 1213 [2] defines MIB-II, the core set of managed objects for the Internet suite of protocols.

- o RFC 1445 [3] which defines the administrative and other architectural aspects of the framework.
- o RFC 1448 [4] which defines the protocol used for network access to managed objects.

The Framework permits new objects to be defined for the purpose of experimentation and evaluation.

2.1. Object Definitions

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the subset of Abstract Syntax Notation One (ASN.1) defined in the SMI. In particular, each object type is named by an OBJECT IDENTIFIER, an administratively assigned name. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the descriptor, to refer to the object type.

3. Overview

The Character MIB applies to ports that carry a character stream, whether physical or virtual, serial or parallel, synchronous or asynchronous. The most common example of a character stream device is a hardware terminal port with an RS-232 interface. Another common hardware example is a parallel printer port, say with a Centronics interface. The concept also includes virtual terminal ports, such as a software connection point for a remote console.

The Character MIB is mandatory for all systems that offer character stream ports. This includes, for example, terminal servers, general-purpose time-sharing hosts, and even such systems as a bridge with a (virtual) console port. It may or may not include character ports that do not support network sessions, depending on the system's needs.

The Character MIB's central abstraction is a port. Physical ports have a one-to-one correspondence with hardware ports. Virtual ports are software entities analogous to physical ports, but with no hardware connector.

Each port supports one or more sessions. A session represents a virtual connection that carries characters between the port and some partner. Sessions typically operate over a stack of network protocols. A typical session, for example, uses Telnet over TCP.

The MIB comprises one base object and two tables, detailed in the following sections. The tables contain objects for ports and sessions.

The MIB intentionally contains no distinction between what is often called permanent and operational or volatile data bases. For the purposes of this MIB, handling of such distinctions is implementation specific.

3.1. Relationship to Interface MIB

The Character MIB does not relate directly to the Interface MIB [1], since it is not intrinsically a network interface. On the other hand, in most implementations where it is present, it will be above a physical sublayer interface, such as the RS-232-like [2] or Parallel-printer-like [3] MIBs. Such physical interfaces typically are represented by a row in the interface table (ifTable), identified by a value of ifIndex.

4. Definitions

CHARACTER-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
Counter32, Integer32, Gauge32, TimeTicks
FROM SNMPv2-SMI
AutonomousType, InstancePointer
FROM SNMPv2-TC
InterfaceIndex
FROM IF-MIB
transmission, mib-2
FROM RFC1213-MIB
MODULE-COMPLIANCE, OBJECT-GROUP
FROM SNMPv2-CONF;

char MODULE-IDENTITY

LAST-UPDATED "9405261700Z"
ORGANIZATION "IETF Character MIB Working Group"
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```

        E-mail: rlstewart@eng.xyplex.com"
DESCRIPTION
    "The MIB module for character stream devices."
 ::= { mib-2 19 }

PortIndex ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "d"
    STATUS current
    DESCRIPTION
        "A unique value, greater than zero, for each
        character port in the managed system.  It is
        recommended that values are assigned contiguously
        starting from 1.  The value for each interface sub-
        layer must remain constant at least from one re-
        initialization of the entity's network management
        system to the next re-initialization.

        In a system where the character ports are attached
        to hardware represented by an ifIndex, it is
        conventional, but not required, to make the
        character port index equal to the corresponding
        ifIndex."
    SYNTAX Integer32
```

-- Generic Character information

```
charNumber OBJECT-TYPE
    SYNTAX Integer32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The number of entries in charPortTable, regardless
        of their current state."
    ::= { char 1 }
```

-- the Character Port table

```
charPortTable OBJECT-TYPE
    SYNTAX SEQUENCE OF CharPortEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "A list of port entries.  The number of entries is
        given by the value of charNumber."
    ::= { char 2 }
```

charPortEntry OBJECT-TYPE
SYNTAX CharPortEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
 "Status and parameter values for a character port."
INDEX { charPortIndex }
::= { charPortTable 1 }

CharPortEntry ::=
SEQUENCE {
 charPortIndex
 PortIndex,
 charPortName
 DisplayString,
 charPortType
 INTEGER,
 charPortHardware
 AutonomousType,
 charPortReset
 INTEGER,
 charPortAdminStatus
 INTEGER,
 charPortOperStatus
 INTEGER,
 charPortLastChange
 TimeTicks,
 charPortInFlowType
 INTEGER,
 charPortOutFlowType
 INTEGER,
 charPortInFlowState
 INTEGER,
 charPortOutFlowState
 INTEGER,
 charPortInCharacters
 Counter32,
 charPortOutCharacters
 Counter32,
 charPortAdminOrigin
 INTEGER,
 charPortSessionMaximum
 INTEGER,
 charPortSessionNumber
 Gauge32,
 charPortSessionIndex
 INTEGER,
 charPortInFlowTypes

```
        OCTET STRING,
charPortOutFlowTypes
        OCTET STRING,
charPortLowerIfIndex
        InterfaceIndex
    }

charPortIndex OBJECT-TYPE
    SYNTAX PortIndex
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "A unique value for each character port, perhaps
        corresponding to the same value of ifIndex when the
        character port is associated with a hardware port
        represented by an ifIndex."
    ::= { charPortEntry 1 }

charPortName OBJECT-TYPE
    SYNTAX DisplayString (SIZE (0..32))
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "An administratively assigned name for the port,
        typically with some local significance."
    ::= { charPortEntry 2 }

charPortType OBJECT-TYPE
    SYNTAX INTEGER { physical(1), virtual(2) }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The port's type, 'physical' if the port represents
        an external hardware connector, 'virtual' if it does
        not."
    ::= { charPortEntry 3 }

charPortHardware OBJECT-TYPE
    SYNTAX AutonomousType
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "A reference to hardware MIB definitions specific to
        a physical port's external connector.  For example,
        if the connector is RS-232, then the value of this
        object refers to a MIB sub-tree defining objects
        specific to RS-232.  If an agent is not configured
        to have such values, the agent returns the object
```

```

identifier:

    nullHardware OBJECT IDENTIFIER ::= { 0 0 }
"
 ::= { charPortEntry 4 }

charPortReset OBJECT-TYPE
    SYNTAX INTEGER { ready(1), execute(2) }
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "A control to force the port into a clean, initial
        state, both hardware and software, disconnecting all
        the port's existing sessions. In response to a
        get-request or get-next-request, the agent always
        returns 'ready' as the value. Setting the value to
        'execute' causes a reset."
    ::= { charPortEntry 5 }

charPortAdminStatus OBJECT-TYPE
    SYNTAX INTEGER { enabled(1), disabled(2), off(3),
        maintenance(4) }
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "The port's desired state, independent of flow
        control. 'enabled' indicates that the port is
        allowed to pass characters and form new sessions.
        'disabled' indicates that the port is allowed to
        pass characters but not form new sessions. 'off'
        indicates that the port is not allowed to pass
        characters or have any sessions. 'maintenance'
        indicates a maintenance mode, exclusive of normal
        operation, such as running a test.

        'enabled' corresponds to ifAdminStatus 'up'.
        'disabled' and 'off' correspond to ifAdminStatus
        'down'. 'maintenance' corresponds to ifAdminStatus
        'test'."
    ::= { charPortEntry 6 }

charPortOperStatus OBJECT-TYPE
    SYNTAX INTEGER { up(1), down(2),
        maintenance(3), absent(4), active(5) }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The port's actual, operational state, independent

```

of flow control. 'up' indicates able to function normally. 'down' indicates inability to function for administrative or operational reasons. 'maintenance' indicates a maintenance mode, exclusive of normal operation, such as running a test. 'absent' indicates that port hardware is not present. 'active' indicates up with a user present (e.g. logged in).

'up' and 'active' correspond to ifOperStatus 'up'.
 'down' and 'absent' correspond to ifOperStatus 'down'.
 'maintenance' corresponds to ifOperStatus 'test'."

::= { charPortEntry 7 }

charPortLastChange OBJECT-TYPE

SYNTAX TimeTicks

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime at the time the port entered its current operational state. If the current state was entered prior to the last reinitialization of the local network management subsystem, then this object contains a zero value."

::= { charPortEntry 8 }

-- charPortInFlowType is deprecated in favor of

-- charPortInFlowTypes

charPortInFlowType OBJECT-TYPE

SYNTAX INTEGER { none(1), xonXoff(2), hardware(3),
 ctsRts(4), dsrDtr(5) }

MAX-ACCESS read-write

STATUS deprecated

DESCRIPTION

"The port's type of input flow control. 'none' indicates no flow control at this level or below. 'xonXoff' indicates software flow control by recognizing XON and XOFF characters. 'hardware' indicates flow control delegated to the lower level, for example a parallel port.

'ctsRts' and 'dsrDtr' are specific to RS-232-like ports. Although not architecturally pure, they are included here for simplicity's sake."

::= { charPortEntry 9 }

-- charPortOutFlowType is deprecated in favor of
-- charPortOutFlowTypes

charPortOutFlowType OBJECT-TYPE

SYNTAX INTEGER { none(1), xonXoff(2), hardware(3),
ctsRts(4), dsrDtr(5) }

MAX-ACCESS read-write

STATUS deprecated

DESCRIPTION

"The port's type of output flow control. 'none' indicates no flow control at this level or below. 'xonXoff' indicates software flow control by recognizing XON and XOFF characters. 'hardware' indicates flow control delegated to the lower level, for example a parallel port.

'ctsRts' and 'dsrDtr' are specific to RS-232-like ports. Although not architecturally pure, they are included here for simplicity's sake."

::= { charPortEntry 10 }

charPortInFlowState OBJECT-TYPE

SYNTAX INTEGER { none(1), unknown(2), stop(3), go(4) }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current operational state of input flow control on the port. 'none' indicates not applicable. 'unknown' indicates this level does not know. 'stop' indicates flow not allowed. 'go' indicates flow allowed."

::= { charPortEntry 11 }

charPortOutFlowState OBJECT-TYPE

SYNTAX INTEGER { none(1), unknown(2), stop(3), go(4) }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current operational state of output flow control on the port. 'none' indicates not applicable. 'unknown' indicates this level does not know. 'stop' indicates flow not allowed. 'go' indicates flow allowed."

::= { charPortEntry 12 }

charPortInCharacters OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Total number of characters detected as input from the port since system re-initialization and while the port operational state was 'up', 'active', or 'maintenance', including, for example, framing, flow control (i.e. XON and XOFF), each occurrence of a BREAK condition, locally-processed input, and input sent to all sessions."

::= { charPortEntry 13 }

charPortOutCharacters OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Total number of characters detected as output to the port since system re-initialization and while the port operational state was 'up', 'active', or 'maintenance', including, for example, framing, flow control (i.e. XON and XOFF), each occurrence of a BREAK condition, locally-created output, and output received from all sessions."

::= { charPortEntry 14 }

charPortAdminOrigin OBJECT-TYPE

SYNTAX INTEGER { dynamic(1), network(2), local(3),
 none(4) }

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The administratively allowed origin for establishing session on the port. 'dynamic' allows 'network' or 'local' session establishment. 'none' disallows session establishment."

::= { charPortEntry 15 }

charPortSessionMaximum OBJECT-TYPE

SYNTAX INTEGER (-1..2147483647)

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The maximum number of concurrent sessions allowed on the port. A value of -1 indicates no maximum. Setting the maximum to less than the current number of sessions has unspecified results."

::= { charPortEntry 16 }

charPortSessionNumber OBJECT-TYPE
SYNTAX Gauge32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The number of open sessions on the port that are in
 the connecting, connected, or disconnecting state."
 ::= { charPortEntry 17 }

charPortSessionIndex OBJECT-TYPE
SYNTAX INTEGER (0..2147483647)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "The value of charSessIndex for the port's first or
 only active session. If the port has no active
 session, the agent returns the value zero."
 ::= { charPortEntry 18 }

charPortInFlowTypes OBJECT-TYPE
SYNTAX OCTET STRING (SIZE (1))
MAX-ACCESS read-write
STATUS current
DESCRIPTION
 "The port's types of input flow control at the
 software level. Hardware-level flow control is
 independently controlled by the appropriate
 hardware-level MIB.

 A value of zero indicates no flow control.
 Depending on the specific implementation, any or
 all combinations of flow control may be chosen by
 adding the values:

 128 xonXoff, recognizing XON and XOFF characters
 64 enqHost, ENQ/ACK to allow input to host
 32 enqTerm, ACK to allow output to port
 "
 ::= { charPortEntry 19 }

charPortOutFlowTypes OBJECT-TYPE
SYNTAX OCTET STRING (SIZE (1))
MAX-ACCESS read-write
STATUS current
DESCRIPTION
 "The port's types of output flow control at the
 software level. Hardware-level flow control is
 independently controlled by the appropriate

hardware-level MIB.

A value of zero indicates no flow control.
Depending on the specific implementation, any or
all combinations of flow control may be chosen by
adding the values:

```
128  xonXoff, recognizing XON and XOFF characters
64   engHost, ENQ/ACK to allow input to host
32   engTerm, ACK to allow output to port
"
```

```
::= { charPortEntry 20 }
```

charPortLowerIfIndex OBJECT-TYPE

SYNTAX InterfaceIndex

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The ifIndex value of the lower level hardware supporting
this character port, zero if none."

```
::= { charPortEntry 21 }
```

-- the Character Session table

charSessTable OBJECT-TYPE

SYNTAX SEQUENCE OF CharSessEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A list of port session entries."

```
::= { char 3 }
```

charSessEntry OBJECT-TYPE

SYNTAX CharSessEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Status and parameter values for a character port
session."

INDEX { charSessPortIndex, charSessIndex }

```
::= { charSessTable 1 }
```

CharSessEntry ::=

SEQUENCE {

charSessPortIndex

PortIndex,

charSessIndex

```

        INTEGER,
charSessKill
        INTEGER,
charSessState
        INTEGER,
charSessProtocol
        AutonomousType,
charSessOperOrigin
        INTEGER,
charSessInCharacters
        Counter32,
charSessOutCharacters
        Counter32,
charSessConnectionId
        InstancePointer,
charSessStartTime
        TimeTicks
    }

```

charSessPortIndex OBJECT-TYPE

SYNTAX PortIndex

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of charPortIndex for the port to which
this session belongs."

::= { charSessEntry 1 }

charSessIndex OBJECT-TYPE

SYNTAX INTEGER (1..2147483647)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The session index in the context of the port, a
non-zero positive integer. Session indexes within a
port need not be sequential. Session indexes may be
reused for different ports. For example, port 1 and
port 3 may both have a session 2 at the same time.
Session indexes may have any valid integer value,
with any meaning convenient to the agent
implementation."

::= { charSessEntry 2 }

charSessKill OBJECT-TYPE

SYNTAX INTEGER { ready(1), execute(2) }

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"A control to terminate the session. In response to a get-request or get-next-request, the agent always returns 'ready' as the value. Setting the value to 'execute' causes termination."

::= { charSessEntry 3 }

charSessState OBJECT-TYPE

SYNTAX INTEGER { connecting(1), connected(2),
disconnecting(3) }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current operational state of the session, disregarding flow control. 'connected' indicates that character data could flow on the network side of session. 'connecting' indicates moving from nonexistent toward 'connected'. 'disconnecting' indicates moving from 'connected' or 'connecting' to nonexistent."

::= { charSessEntry 4 }

charSessProtocol OBJECT-TYPE

SYNTAX AutonomousType

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The network protocol over which the session is running. Other OBJECT IDENTIFIER values may be defined elsewhere, in association with specific protocols. However, this document assigns those of known interest as of this writing."

::= { charSessEntry 5 }

wellKnownProtocols OBJECT IDENTIFIER ::= { char 4 }

protocolOther OBJECT IDENTIFIER ::= { wellKnownProtocols 1 }
 protocolTelnet OBJECT IDENTIFIER ::= { wellKnownProtocols 2 }
 protocolRlogin OBJECT IDENTIFIER ::= { wellKnownProtocols 3 }
 protocolLat OBJECT IDENTIFIER ::= { wellKnownProtocols 4 }
 protocolX29 OBJECT IDENTIFIER ::= { wellKnownProtocols 5 }
 protocolVtp OBJECT IDENTIFIER ::= { wellKnownProtocols 6 }

charSessOperOrigin OBJECT-TYPE

SYNTAX INTEGER { unknown(1), network(2), local(3) }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

```
    "The session's source of establishment."
 ::= { charSessEntry 6 }

charSessInCharacters OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "This session's subset of charPortInCharacters."
    ::= { charSessEntry 7 }

charSessOutCharacters OBJECT-TYPE
    SYNTAX Counter32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "This session's subset of charPortOutCharacters."
    ::= { charSessEntry 8 }

charSessConnectionId OBJECT-TYPE
    SYNTAX InstancePointer
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "A reference to additional local MIB information.
        This should be the highest available related MIB,
        corresponding to charSessProtocol, such as Telnet.
        For example, the value for a TCP connection (in the
        absence of a Telnet MIB) is the object identifier of
        tcpConnState. If an agent is not configured to have
        such values, the agent returns the object
        identifier:

            nullConnectionId OBJECT IDENTIFIER ::= { 0 0 }
        "
    ::= { charSessEntry 9 }

charSessStartTime OBJECT-TYPE
    SYNTAX TimeTicks
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The value of sysUpTime in MIB-2 when the session
        entered connecting state."
    ::= { charSessEntry 10 }
```

```
-- conformance information

charConformance OBJECT IDENTIFIER ::= { char 5 }

charGroups      OBJECT IDENTIFIER ::= { charConformance 1 }
charCompliances OBJECT IDENTIFIER ::= { charConformance 2 }

-- compliance statements

charCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for SNMPv2 entities
        which have Character hardware interfaces."

    MODULE -- this module
        MANDATORY-GROUPS { charGroup }
    ::= { charCompliances 1 }

-- units of conformance

charGroup      OBJECT-GROUP
    OBJECTS { charNumber, charPortIndex, charPortName,
        charPortType, charPortHardware, charPortReset,
        charPortAdminStatus, charPortOperStatus,
        charPortLastChange,
        charPortInFlowState, charPortOutFlowState,
        charPortAdminOrigin, charPortSessionMaximum,
        charPortInFlowTypes, charPortOutFlowTypes,
        charPortInCharacters, charPortOutCharacters,
        charPortSessionNumber, charPortSessionIndex,
        charPortLowerIfIndex,
        charSessPortIndex, charSessIndex,
        charSessKill, charSessState,
        charSessProtocol, charSessOperOrigin,
        charSessInCharacters, charSessOutCharacters,
        charSessConnectionId, charSessStartTime }
    STATUS current
    DESCRIPTION
        "A collection of objects providing information
        applicable to all Character interfaces."
    ::= { charGroups 1 }

END
```


5. Acknowledgements

This memo was produced by the IETF Character MIB Working Group.

6. References

- [1] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Structure of Management Information for version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1442, SNMP Research, Inc., Hughes LAN Systems, Dover Beach Consulting, Inc., Carnegie Mellon University, April 1993.
- [2] McCloghrie, K., and M. Rose, Editors, "Management Information Base for Network Management of TCP/IP-based internets: MIB-II", STD 17, RFC 1213, Hughes LAN Systems, Performance Systems International, March 1991.
- [3] Galvin, J., and K. McCloghrie, "Administrative Model for version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1445, Trusted Information Systems, Hughes LAN Systems, April 1993.
- [4] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Protocol Operations for version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1448, SNMP Research, Inc., Hughes LAN Systems, Dover Beach Consulting, Inc., Carnegie Mellon University, April 1993.
- [5] McCloghrie, K., and F. Kastenholz, "Evolution of the Interfaces Group of MIB-II", RFC 1573, Hughes LAN Systems, FTP Software, January 1994.
- [6] Stewart, B., "Definitions of Managed Objects for RS-232-like Hardware Devices using SMIV2", RFC 1659, Xyplex, Inc., July 1994.
- [7] Stewart, B., "Definitions of Managed Objects for Parallel-printer-like Hardware Devices using SMIV2", RFC 1660, Xyplex, Inc., July 1994.

7. Security Considerations

Security issues are not discussed in this memo.

8. Author's Address

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