Definitions of Managed Objects for the Delegation of Management Scripts

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

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes a set of managed objects that allow the delegation of management scripts to distributed managers.
Table of Contents

1 Introduction .................................................. 3
2 The SNMP Management Framework ................................ 3
3 Overview ........................................................ 4
3.1 Terms ...................................................... 5
4 Requirements and Design Issues ............................... 6
4.1 Script Languages ........................................... 6
4.2 Script Transfer ............................................ 7
4.3 Script Execution ........................................... 8
5 Structure of the MIB ........................................... 9
5.1 Language Group ............................................ 9
5.2 Script Group ............................................... 10
5.3 Code Group ............................................... 11
5.4 Launch Group ............................................. 11
5.5 Run Group ................................................. 11
6 Definitions .................................................... 12
7 Usage Examples ............................................... 49
7.1 Pushing a Script via SNMP .................................. 49
7.2 Pulling a Script from a URL ................................ 50
7.3 Modifying an Existing Script ................................ 50
7.4 Removing an Existing Script ................................ 51
7.5 Creating a Launch Button .................................. 51
7.6 Launching a Script ........................................ 52
7.7 Suspending a Running Script ............................... 52
7.8 Resuming a Suspended Script ............................. 53
7.9 Terminating a Running Script .............................. 53
7.10 Removing a Terminated Script ............................. 54
7.11 Removing a Launch Button ................................ 54
8 VACM Configuration Examples ................................ 54
8.1 Sandbox for Guests ........................................ 55
8.2 Sharing Scripts ........................................... 55
8.3 Emergency Scripts ......................................... 56
9 IANA Considerations .......................................... 57
10 Security Considerations ...................................... 57
11 Intellectual Property ......................................... 59
12 Changes from RFC 2592 ...................................... 59
13 Acknowledgments ............................................ 61
14 References .................................................. 61
15 Editors’ Addresses .......................................... 63
16 Full Copyright Statement ..................................... 64
1. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes a set of managed objects that allow the delegation of management scripts to distributed managers.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

2. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

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

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [RFC2570].
Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

3. Overview

The Script MIB module defined in this memo can be used to delegate management functions to distributed managers. Management functions are defined as management scripts written in a management scripting language. This MIB makes no assumptions about the language itself and even allows distribution of compiled native code, if an implementation is able to execute native code under the control of this MIB.

The Script MIB defines a standard interface for the delegation of management functions based on the Internet management framework. In particular, it provides the following capabilities:

1. Capabilities to transfer management scripts to a distributed manager.
2. Capabilities for initiating, suspending, resuming and terminating management scripts.
3. Capabilities to transfer arguments for management scripts.
4. Capabilities to monitor and control running management scripts.
5. Capabilities to transfer the results produced by running management scripts.

This memo does not address any additional topics like the generation of notifications or how to address remote agents from a Script MIB implementation.
3.1. Terms

This section defines the terms used throughout this memo.

- A ‘distributed manager’ is a processing entity which is capable of performing network management functions. For the scope of this memo, a distributed manager is assumed to implement the Script MIB.

- A ‘higher-level manager’, or just ‘manager’, is a processing entity or human who initiates and controls the operations performed by one or more distributed managers.

- A ‘management script’ is a set of instructions written in an executable language which implements a management function.

- A ‘management scripting language’ is a language used to write management scripts. The term scripting language does not imply that the language must have the characteristics of scripting languages (e.g., string orientation, interpretation, weak typing). The MIB defined in this memo also allows to control management scripts written in arbitrary compiled system programming languages.

- A ‘distributed manager’ can be decomposed into an ‘SNMP entity’ which implements the Script MIB defined in this memo and the ‘runtime system’ that executes scripts. The Script MIB sees the runtime system as the managed resource which is controlled by the MIB.

  The runtime system can act as an SNMP application, according to the SNMP architecture defined in RFC 2571 [RFC2571]. For example, a runtime system which sends SNMP requests to other SNMP entities will act as a command generator application. The SNMP applications in the runtime system may use the same SNMP engine which also serves the command responder application used to implement the Script MIB, but they are not required to do so.

- A ‘launch button’ is the conceptual button used to start the execution of a management script. It assigns control parameters to a management script. In particular, it defines the ownership of the scripts started from a launch button. The ownership can be used by the language runtime system to enforce security profiles on a running management script.
4. Requirements and Design Issues

This section discusses some general requirements that have influenced the design of the Script MIB.

- The Script MIB must not make any assumptions about specific languages or runtime systems.

- The Script MIB must provide mechanisms that help to avoid new management problems (e.g., script version problems).

- The Script MIB must provide SNMP interfaces to all functions required to delegate management scripts. However, other protocols might be used in addition if they provide a significant improvement in terms of convenience for implementation or performance.

- The Script MIB must be organized so that access can be controlled effectively by using view-based access control [RFC2575].

The following sections discuss some design issues in more detail.

4.1. Script Languages

The Script MIB defined in this memo makes no assumption about the script language. This MIB can therefore be used in combination with different languages (such as Tcl or Java) and/or different versions of the same language. No assumptions are made about the format in which management scripts are transferred.

The Script MIB provides access to information about the language versions supported by a Script MIB implementation so that a manager can learn about the capabilities provided by an implementation. Languages and language versions are identified as follows:

1. The language is identified by an object identifier. Object identifier for well-known languages will be registered by the Internet Assigned Numbers Authority (IANA). Enterprise specific languages can also be registered in the enterprise specific OID subtree.

2. A particular version of a language is identified by a language version number. The combination of a language object identifier and a language version is in most cases sufficient to decide whether a script can be executed or not.
3. Different implementations of the same language version might have
differences due to ambiguities in the language definition or
additional language features provided by an implementor. An
additional object identifier value is provided which identifies
the organization which provides the implementation of a language.
This might be used by scripts that require a particular
implementation of a language.

4. Finally, there might be different versions of a language
implementation. A version number for the language implementation
is provided so that the manager can also distinguish between
different implementations from the same organization of a
particular language version.

The version numbers can either be used by a manager to select the
language version required to execute a particular script or to select
a script that fits the language versions supported by a particular
Script MIB implementation.

An additional table lists language extensions that provide features
not provided by the core language. Language extensions are usually
required to turn a general purpose language into a management
language. In many cases, language extensions will come in the form
of libraries that provide capabilities like sending SNMP requests to
remote SNMP agents or accessing the local MIB instrumentation. Every
extension is associated with a language and carries its own version
numbers.

4.2. Script Transfer

There are two different ways to transfer management scripts to a
distributed manager. The first approach requires that the manager
pushes the script to the distributed manager. This is therefore
called the ‘push model’. The second approach is the ‘pull model’
where the manager tells the distributed manager the location of the
script and the distributed manager retrieves the script itself.

The MIB defined in this memo supports both models. The ‘push model’
is realized by a table which allows a manager to write scripts by
sending a sequence of SNMP set requests. The script can be split
into several fragments in order to deal with SNMP message size
limitations.

The ‘pull model’ is realized by the use of Uniform Resource Locators
(URLs) [RFC2396] that point to the script source. The manager writes
the URL which points to the script source to the distributed manager.
by sending an SNMP set request. The distributed manager is then responsible for retrieving the document using the protocol specified in the URL. This allows the use of protocols like FTP [RFC959] or HTTP [RFC2616] to transfer large management scripts efficiently.

The Script MIB also allows management scripts that are hard-wired into the Script MIB implementation. Built-in scripts can either be implemented in a language runtime system, or they can be built natively into the Script MIB implementation. The implementation of the ‘push model’ or the ‘pull model’ is not required.

Scripts can be stored in non-volatile storage. This allows a distributed manager to restart scripts if it is restarted (off-line restart). A manager is not required to push scripts back into the distributed manager after a restart if the script is backed up in non-volatile storage.

Every script is identified by an administratively assigned name. This name may be used to derive the name which is used to access the script in non-volatile storage. This mapping is implementation specific. However, the mapping must ensure that the Script MIB implementation can handle scripts with the same administrative name owned by different managers. One way to achieve this is to use the script owner in addition to the script name in order to derive the internal name used to refer to a particular script in non-volatile storage.

4.3. Script Execution

The Script MIB permits execution of several instances of the same or different management scripts. Script arguments are passed as OCTET STRING values. Scripts return a single result value which is also an OCTET STRING value. The semantic interpretation of result values is left to the invoking manager or other management scripts. A script invoker must understand the format and semantics of both the arguments and the results of the scripts that it invokes.

Scripts can also export complex results through a MIB interface. This allows a management application to access and use script results in the same manner as it processes any other MIB data. However, the Script MIB does not provide any special support for the implementation of MIBs through scripts.

Runtime errors terminate active scripts. An exit code and a human readable error message is left in the MIB. A notification containing the exit code, the error message and a timestamp is generated when a script terminates with an error exit code.
Script arguments and results do not have any size limitations other than the limits imposed by the SMI and the SNMP protocol. However, implementations of this MIB might have further restrictions. A script designer might therefore choose to return the results via other mechanisms if the script results can be very large. One possibility is to return a URL as a script result which points to the file containing the script output.

Executing scripts have a status object attached which allows script execution to be suspended, resumed, or aborted. The precise semantics of the suspend and resume operations are language and runtime system dependent. Some runtime systems may choose to not implement the suspend/resume operations.

A history of finished scripts is kept in the MIB. A script invoker can collect results at a later point in time (offline operation). Control objects can be used to control how entries in the history are aged out if the table fills up.

5. Structure of the MIB

This section presents the structure of the MIB. The objects are arranged into the following groups:

- language group (smLangTable, smExtsnTable)
- script group (smScriptTable)
- script code group (smCodeTable)
- script launch group (smLaunchTable)
- running script group (smRunTable)

5.1. Language Group

The smLanguageGroup is used to provide information about the languages and the language extensions supported by a Script MIB implementation. This group includes two tables. The smLangTable lists all languages supported by a Script MIB implementation and the smExtsnTable lists the extensions that are available for a given language.
5.2. Script Group

The smScriptGroup consists of a single table, called the smScriptTable. The smScriptTable lists all scripts known to a Script MIB implementation. The smScriptTable contains objects that allow the following operations:

- Download scripts from a URL (pull model)
- Read scripts from local non-volatile storage
- Store scripts in local non-volatile storage
- Delete scripts from local non-volatile storage
- List permanent scripts (that cannot be changed or removed)
- Read and modify the script status (enabled, disabled, editing)

A status object called smScriptOperStatus allows a manager to obtain the current status of a script. It is also used to provide an error indication if an attempt to invoke one of the operations listed above fails. The status change of a script can be requested by modifying the associated smScriptAdminStatus object.

The source of a script is defined by the smScriptSource object. This object may contain a URL pointing to a remote location which provides access to the management script. The script source is read from the smCodeTable (described below) or from non-volatile storage if the smScriptSource object contains an empty URL. The smScriptStorageType object is used to distinguish between scripts read from non-volatile storage and scripts read from the smCodeTable.

Scripts are automatically loaded once the smScriptAdminStatus object is set to 'enabled'. Loading a script includes retrieving the script (probably from a remote location), compiling the script for languages that require a compilation step, and making the code available to the runtime system. The smScriptOperStatus object is used to indicate the status of the loading process. This object will start in the state 'retrieving', switch to the state 'compiling' and finally reach the state 'enabled'. Errors during the retrieval or compilation phase will result in an error state such as 'compilationFailed'.
5.3. Code Group

The smCodeGroup consists of a single table, called the smCodeTable, which provides the ability to transfer and modify scripts via SNMP set requests. In particular, the smCodeTable allows the following operations:

- Download scripts via SNMP (push model)
- Modify scripts via SNMP (editing)

The smCodeTable lists the code of a script. A script can be fragmented over multiple rows of the smCodeTable in order to handle SNMP message size limitations. Modifications of the smCodeTable are only possible if the associated smScriptOperStatus object has the value ‘editing’. The Script MIB implementation reloads the modified script code once the smScriptOperStatus changes to ‘enabled’ again.

The implementation of the smCodeGroup is optional.

5.4. Launch Group

The smLaunchGroup contains a single table, the smLaunchTable. An entry in the smLaunchTable represents a launch button which can be used to start a script. The smLaunchTable allows the following operations:

- Associate a script with an owner used during script execution
- Provide arguments and parameters for script invocation
- Invoke scripts with a single set operation

The smLaunchTable describes scripts and their parameters that are ready to be launched. An entry in the smLaunchTable attaches an argument to a script and control values which, for example, define the maximum number of times that a script invoked from a particular row in the smLaunchTable may be running concurrently.

An entry in the smLaunchTable also defines the owner which will be used to associate permissions with the script execution.

5.5. Run Group

The smRunGroup contains a single table, called the smRunTable, which lists all scripts that are currently running or have terminated recently. The smRunTable contains objects that allow the following operations:
o retrieve status information from running scripts
o control running scripts (suspend, resume, abort)
o retrieve results from recently terminated scripts
o control the remaining maximum lifetime of a running script
o control how long script results are accessible

Every row in the smRunTable contains the argument passed during script invocation, the result produced by the script and the script exit code. The smRunTable also provides information about the current run state as well as start and end time-stamps. There are three writable objects in the smRunTable. The smRunLifeTime object defines the maximum time a running script may run before it is terminated by the Script MIB implementation. The smRunExpireTime object defines the time that a completed script can stay in the smRunTable before it is aged out. The smRunControl object allows running scripts to be suspended, resumed, or aborted.

6. Definitions

DISMAN-SCRIPT-MIB DEFINITIONS ::= BEGIN

IMPORTS
MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
Integer32, Unsigned32, mib-2
FROM SNMPv2-SMI
RowStatus, TimeInterval, DateAndTime, StorageType, DisplayString
FROM SNMPv2-TC

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

SnmpAdminString
FROM SNMP-FRAMEWORK-MIB;

scriptMIB MODULE-IDENTITY
LAST-UPDATED "200108210000Z"
ORGANIZATION "IETF Distributed Management Working Group"
CONTACT-INFO
"WG EMail: disman@dorothy.bmc.com
Subscribe: disman-request@dorothy.bmc.com

Chair: Randy Presuhn
BMC Software, Inc."
DESCRIPTION
"This MIB module defines a set of objects that allow to
delegate management scripts to distributed managers."

REVISION "200108210000Z"

DESCRIPTION
"Revised version, published as RFC 3165.

This revision introduces several new objects: smScriptError,
smScriptLastChange, smLaunchError, smLaunchLastChange,
smLaunchRowExpireTime, smRunResultTime, and smRunErrorTime.

The following existing objects were updated: the maximum
value of smRunLifeTime now disables the timer, an
autostart value was added to the smLaunchAdminStatus
object, and a new expired state was added to the
smLaunchOperStatus object.

A new smScriptException notification has been added to
support runtime error notifications.

Created new conformance and compliance statements that
take care of the new objects and notifications.

Clarifications have been added in several places to remove
ambiguities or contradictions that were discovered and
reported by implementors."
REVISION "1999022221800Z"
DESCRIPTION
"Initial version, published as RFC 2592."
::= { mib-2 64 }

--
-- The groups defined within this MIB module:
--
smObjects       OBJECT IDENTIFIER ::= { scriptMIB 1 }
smNotifications OBJECT IDENTIFIER ::= { scriptMIB 2 }
smConformance   OBJECT IDENTIFIER ::= { scriptMIB 3 }

--
-- Script language and language extensions.
--
-- This group defines tables which list the languages and the
-- language extensions supported by a Script MIB implementation.
-- Languages are uniquely identified by object identifier values.
--
smLangTable OBJECT-TYPE
   SYNTAX      SEQUENCE OF SmLangEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
     "This table lists supported script languages."
   ::= { smObjects 1 }

smLangEntry OBJECT-TYPE
   SYNTAX      SmLangEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
     "An entry describing a particular language."
   INDEX { smLangIndex }
   ::= { smLangTable 1 }

SmLangEntry ::= SEQUENCE {
   smLangIndex         Integer32,
   smLangLanguage      OBJECT IDENTIFIER,
   smLangVersion       SnmpAdminString,
   smLangVendor        OBJECT IDENTIFIER,
   smLangRevision      SnmpAdminString,
   smLangDescr         SnmpAdminString
}

smLangIndex OBJECT-TYPE
SYNTAX      Integer32 (1..2147483647)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "The locally arbitrary, but unique identifier associated with this language entry.

The value is expected to remain constant at least from one re-initialization of the entity’s network management system to the next re-initialization.

Note that the data type and the range of this object must be consistent with the definition of smScriptLanguage."
::= { smLangEntry 1 }

smLangLanguage OBJECT-TYPE
SYNTAX      OBJECT IDENTIFIER
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "The globally unique identification of the language."
::= { smLangEntry 2 }

smLangVersion OBJECT-TYPE
SYNTAX      SnmpAdminString (SIZE (0..32))
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "The version number of the language. The zero-length string shall be used if the language does not have a version number.

It is suggested that the version number consist of one or more decimal numbers separated by dots, where the first number is called the major version number."
::= { smLangEntry 3 }

smLangVendor OBJECT-TYPE
SYNTAX      OBJECT IDENTIFIER
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "An object identifier which identifies the vendor who provides the implementation of the language. This object identifier SHALL point to the object identifier directly below the enterprise object identifier {1 3 6 1 4 1} allocated for the vendor. The value must be the object identifier (0 0) if the vendor is not known."
::= { smLangEntry 4 }

smLangRevision OBJECT-TYPE
SYNTAX SnmpAdminString (SIZE (0..32))
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The version number of the language implementation.
The value of this object must be an empty string if version number of the implementation is unknown.
It is suggested that the value consist of one or more decimal numbers separated by dots, where the first number is called the major version number."
::= { smLangEntry 5 }

smLangDescr OBJECT-TYPE
SYNTAX SnmpAdminString
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A textual description of the language."
::= { smLangEntry 6 }

smExtsnTable OBJECT-TYPE
SYNTAX SEQUENCE OF SmExtsnEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "This table lists supported language extensions."
::= { smObjects 2 }

smExtsnEntry OBJECT-TYPE
SYNTAX SmExtsnEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "An entry describing a particular language extension."
INDEX { smLangIndex, smExtsnIndex }
::= { smExtsnTable 1 }

SmExtsnEntry ::= SEQUENCE {
  smExtsnIndex Integer32,
  smExtsnExtension OBJECT IDENTIFIER,
  smExtsnVersion SnmpAdminString,
  smExtsnVendor OBJECT IDENTIFIER,
  smExtsnRevision SnmpAdminString,
}
smExtnDescr SnmpAdminString

smExtnIndex OBJECT-TYPE
SYNTAX Integer32 (1..2147483647)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The locally arbitrary, but unique identifier associated with this language extension entry.
The value is expected to remain constant at least from one re-initialization of the entity’s network management system to the next re-initialization."
::= { smExtnEntry 1}

smExtnExtension OBJECT-TYPE
SYNTAX OBJECT IDENTIFIER
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The globally unique identification of the language extension."
::= { smExtnEntry 2 }

smExtnVersion OBJECT-TYPE
SYNTAX SnmpAdminString (SIZE (0..32))
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The version number of the language extension. It is suggested that the version number consist of one or more decimal numbers separated by dots, where the first number is called the major version number."
::= { smExtnEntry 3 }

smExtnVendor OBJECT-TYPE
SYNTAX OBJECT IDENTIFIER
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"An object identifier which identifies the vendor who provides the implementation of the extension. The object identifier value should point to the OID node below the enterprise OID {1 3 6 1 4 1} allocated for the vendor. The value must be the object identifier {0 0} if the vendor is not known."
::= { smExtnEntry 4 }
smExtnRevision OBJECT-TYPE
SYNTAX       SnmpAdminString (SIZE (0..32))
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION  "The version number of the extension implementation. The value of this object must be an empty string if version number of the implementation is unknown. It is suggested that the value consist of one or more decimal numbers separated by dots, where the first number is called the major version number."
 ::= { smExtnEntry 5 }

smExtnDescr OBJECT-TYPE
SYNTAX       SnmpAdminString
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION  "A textual description of the language extension."
 ::= { smExtnEntry 6 }

-- Scripts known by the Script MIB implementation.
--
-- This group defines a table which lists all known scripts. Scripts can be added and removed through manipulation of the
-- smScriptTable.
--
smScriptObjects OBJECT IDENTIFIER ::= { smObjects 3 }

smScriptTable OBJECT-TYPE
SYNTAX       SEQUENCE OF SmScriptEntry
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION  "This table lists and describes locally known scripts."
 ::= { smScriptObjects 1 }

smScriptEntry OBJECT-TYPE
SYNTAX       SmScriptEntry
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION  "An entry describing a particular script. Every script that is stored in non-volatile memory is required to appear in this script table."
INDEX { smScriptOwner, smScriptName }  ::=  { smScriptTable 1 }

SmScriptEntry ::= SEQUENCE {
  smScriptOwner       SnmpAdminString,
  smScriptName        SnmpAdminString,
  smScriptDescr       SnmpAdminString,
  smScriptLanguage    Integer32,
  smScriptSource      DisplayString,
  smScriptAdminStatus INTEGER,
  smScriptOperStatus  INTEGER,
  smScriptStorageType StorageType,
  smScriptRowStatus   RowStatus,
  smScriptError       SnmpAdminString,
  smScriptLastChange  DateAndTime
}

smScriptOwner OBJECT-TYPE
SYNTAX      SnmpAdminString (SIZE (0..32))
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"The manager who owns this row in the smScriptTable."
 ::=  { smScriptEntry 1 }

smScriptName OBJECT-TYPE
SYNTAX      SnmpAdminString (SIZE (1..32))
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"The locally-unique, administratively assigned name for this script. This object allows an smScriptOwner to have multiple entries in the smScriptTable.

This value of this object may be used to derive the name (e.g. a file name) which is used by the Script MIB implementation to access the script in non-volatile storage. The details of this mapping are implementation specific. However, the mapping needs to ensure that scripts created by different owners with the same script name do not map to the same name in non-volatile storage."
 ::=  { smScriptEntry 2 }

smScriptDescr OBJECT-TYPE
SYNTAX      SnmpAdminString
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"A description of the purpose of the script."
::= { smScriptEntry 3 }

smScriptLanguage OBJECT-TYPE
SYNTAX Integer32 (0..2147483647)
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The value of this object type identifies an entry in the
smLangTable which is used to execute this script.
The special value 0 may be used by hard-wired scripts
that can not be modified and that are executed by
internal functions.

Set requests to change this object are invalid if the
value of smScriptOperStatus is 'enabled' or 'compiling'
and will result in an inconsistentValue error.

Note that the data type and the range of this object must
be consistent with the definition of smLangIndex."
::= { smScriptEntry 4 }

smScriptSource OBJECT-TYPE
SYNTAX DisplayString
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This object either contains a reference to the script
source or an empty string. A reference must be given
in the form of a Uniform Resource Locator (URL) as
defined in RFC 2396. The allowed character sets and the
encoding rules defined in RFC 2396 section 2 apply.

When the smScriptAdminStatus object is set to 'enabled',
the Script MIB implementation will 'pull' the script
source from the URL contained in this object if the URL
is not empty.

An empty URL indicates that the script source is loaded
from local storage. The script is read from the smCodeTable
if the value of smScriptStorageType is volatile. Otherwise,
the script is read from non-volatile storage.

Note: This document does not mandate implementation of any
specific URL scheme. An attempt to load a script from a
nonsupported URL scheme will cause the smScriptOperStatus
to report an 'unknownProtocol' error."
Set requests to change this object are invalid if the value of smScriptOperStatus is ‘enabled’, ‘editing’, ‘retrieving’ or ‘compiling’ and will result in an inconsistentValue error.

DEFVAL { ''H }
 ::= { smScriptEntry 5 }

smScriptAdminStatus OBJECT-TYPE
SYNTAX  INTEGER {
    enabled(1),
    disabled(2),
    editing(3)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The value of this object indicates the desired status of the script. See the definition of smScriptOperStatus for a description of the values.

When the smScriptAdminStatus object is set to ‘enabled’ and the smScriptOperStatus is 'disabled' or one of the error states, the Script MIB implementation will 'pull' the script source from the URL contained in the smScriptSource object if the URL is not empty."
DEFVAL { disabled }
 ::= { smScriptEntry 6 }

smScriptOperStatus OBJECT-TYPE
SYNTAX  INTEGER {
    enabled(1),
    disabled(2),
    editing(3),
    retrieving(4),
    compiling(5),
    noSuchScript(6),
    accessDenied(7),
    wrongLanguage(8),
    wrongVersion(9),
    compilationFailed(10),
    noResourcesLeft(11),
    unknownProtocol(12),
    protocolFailure(13),
    genericError(14)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The actual status of the script in the runtime system. The value of this object is only meaningful when the value of the smScriptRowStatus object is ‘active’.

The smScriptOperStatus object may have the following values:

- ‘enabled’ indicates that the script is available and can be started by a launch table entry.
- ‘disabled’ indicates that the script cannot be used.
- ‘editing’ indicates that the script can be modified in the smCodeTable.
- ‘retrieving’ indicates that the script is currently being loaded from non-volatile storage or a remote system.
- ‘compiling’ indicates that the script is currently being compiled by the runtime system.
- ‘noSuchScript’ indicates that the script does not exist at the smScriptSource.
- ‘accessDenied’ indicates that the script cannot be loaded from the smScriptSource due to a lack of permissions.
- ‘wrongLanguage’ indicates that the script cannot be loaded from the smScriptSource because of a language mismatch.
- ‘wrongVersion’ indicates that the script cannot be loaded from the smScriptSource because of a language version mismatch.
- ‘compilationFailed’ indicates that the compilation failed.
- ‘noResourcesLeft’ indicates that the runtime system does not have enough resources to load the script.
- ‘unknownProtocol’ indicates that the script could not be loaded from the smScriptSource because the requested protocol is not supported.
- ‘protocolFailure’ indicates that the script could not be loaded from the smScriptSource because of a protocol failure.
- ‘genericError’ indicates that the script could not be
The 'retrieving' and 'compiling' states are transient states which will either lead to one of the error states or the 'enabled' state. The 'disabled' and 'editing' states are administrative states which are only reached by explicit management operations.

All launch table entries that refer to this script table entry shall have an smLaunchOperStatus value of 'disabled' when the value of this object is not 'enabled'.

```
DEFVAL { disabled }
::= { smScriptEntry 7 }
```

smScriptStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-create
STATUS current
DESCRIPTION "This object defines whether this row and the script controlled by this row are kept in volatile storage and lost upon reboot or if this row is backed up by non-volatile or permanent storage.

The storage type of this row always complies with the value of this entry if the value of the corresponding RowStatus object is 'active'.

However, the storage type of the script controlled by this row may be different, if the value of this entry is 'non-volatile'. The script controlled by this row is written into local non-volatile storage if the following condition becomes true:

(a) the URL contained in the smScriptSource object is empty and
(b) the smScriptStorageType is 'nonVolatile' and
(c) the smScriptOperStatus is 'enabled'

Setting this object to 'volatile' removes a script from non-volatile storage if the script controlled by this row has been in non-volatile storage before. Attempts to set this object to permanent will always fail with an inconsistentValue error.

The value of smScriptStorageType is only meaningful if the value of the corresponding RowStatus object is 'active'.

"
If smScriptStorageType has the value permanent(4), then all objects whose MAX-ACCESS value is read-create must be writable, with the exception of the smScriptStorageType and smScriptRowStatus objects, which shall be read-only.

DEFVAL { volatile }

::= { smScriptEntry 8 }

smScriptRowStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
  "A control that allows entries to be added and removed from this table.

Changing the smScriptRowStatus from 'active' to 'notInService' will remove the associated script from the runtime system.

Deleting conceptual rows from this table may affect the deletion of other resources associated with this row. For example, a script stored in non-volatile storage may be removed from non-volatile storage.

An entry may not exist in the 'active' state unless all required objects in the entry have appropriate values. Rows that are not complete or not in service are not known by the script runtime system.

Attempts to 'destroy' a row or to set a row 'notInService' while the smScriptOperStatus is 'enabled' will result in an inconsistentValue error.

Attempts to 'destroy' a row or to set a row 'notInService' where the value of the smScriptStorageType object is 'permanent' or 'readOnly' will result in an inconsistentValue error.

The value of this object has no effect on whether other objects in this conceptual row can be modified."

::= { smScriptEntry 9 }

smScriptError OBJECT-TYPE
SYNTAX SnmpAdminString
MAX-ACCESS read-only
STATUS current
DESCRIPTION
  "This object contains a descriptive error message if the
transition into the operational status 'enabled' failed. Implementations must reset the error message to a zero-length string when a new attempt to change the script status to 'enabled' is started.

```snmp
DEFVAL { ''H }
::= { smScriptEntry 10 }
```

**smScriptLastChange**
- **SYNTAX**: DateAndTime
- **MAX-ACCESS**: read-only
- **STATUS**: current
- **DESCRIPTION**: The date and time when this script table entry was last modified. The value ‘0000000000000000’H is returned if the script table entry has not yet been modified.

```
DEFVAL { '0000000000000000'H }
::= { smScriptEntry 11 }
```

-- Access to script code via SNMP

-- The smCodeTable allows script code to be read and modified via SNMP.

**smCodeTable**
- **SYNTAX**: SEQUENCE OF SmCodeEntry
- **MAX-ACCESS**: not-accessible
- **STATUS**: current
- **DESCRIPTION**: This table contains the script code for scripts that are written via SNMP write operations.

```
::= { smScriptObjects 2 }
```

**smCodeEntry**
- **SYNTAX**: SmCodeEntry
- **MAX-ACCESS**: not-accessible
- **STATUS**: current
- **DESCRIPTION**: An entry describing a particular fragment of a script.

```
INDEX { smScriptOwner, smScriptName, smCodeIndex }
::= { smCodeTable 1 }
```

SmCodeEntry ::= SEQUENCE {
  smCodeIndex        Unsigned32,
smCodeIndex OBJECT-TYPE
SYNTAX         Unsigned32 (1..4294967295)
MAX-ACCESS     not-accessible
STATUS         current
DESCRIPTION    "The index value identifying this code fragment."
::= { smCodeEntry 1 }

smCodeText OBJECT-TYPE
SYNTAX         OCTET STRING (SIZE (1..1024))
MAX-ACCESS     read-create
STATUS         current
DESCRIPTION    "The code that makes up a fragment of a script. The format of this code fragment depends on the script language which is identified by the associated smScriptLanguage object."
::= { smCodeEntry 2 }

smCodeRowStatus OBJECT-TYPE
SYNTAX         RowStatus
MAX-ACCESS     read-create
STATUS         current
DESCRIPTION    "A control that allows entries to be added and removed from this table.

The value of this object has no effect on whether other objects in this conceptual row can be modified."
::= { smCodeEntry 3 }

--
-- Script execution.
--
-- This group defines tables which allow script execution to be initiated, suspended, resumed, and terminated. It also provides a mechanism for keeping a history of recent script executions and their results.
--

smRunObjects OBJECT IDENTIFIER ::= { smObjects 4 }

smLaunchTable OBJECT-TYPE
SYNTAX         SEQUENCE OF SmLaunchEntry
MAX-ACCESS     not-accessible
status current
description "This table lists and describes scripts that are ready
to be executed together with their parameters."
::= { smRunObjects 1 }

smLaunchEntry OBJECT-TYPE
SYNTAX SmLaunchEntry
MAX-ACCESS not-accessible
STATUS current
description "An entry describing a particular executable script."
INDEX { smLaunchOwner, smLaunchName }
::= { smLaunchTable 1 }

SmLaunchEntry ::= SEQUENCE {
  smLaunchOwner               SnmpAdminString,
  smLaunchName                SnmpAdminString,
  smLaunchScriptOwner         SnmpAdminString,
  smLaunchScriptName          SnmpAdminString,
  smLaunchArgument            OCTET STRING,
  smLaunchMaxRunning          Unsigned32,
  smLaunchMaxCompleted        Unsigned32,
  smLaunchLifeTime            TimeInterval,
  smLaunchExpireTime          TimeInterval,
  smLaunchStart               Integer32,
  smLaunchControl             INTEGER,
  smLaunchAdminStatus         INTEGER,
  smLaunchOperStatus          INTEGER,
  smLaunchRunIndexNext        Integer32,
  smLaunchStorageType         StorageType,
  smLaunchRowStatus           RowStatus,
  smLaunchError               SnmpAdminString,
  smLaunchLastChange          DateAndTime,
  smLaunchRowExpireTime       TimeInterval
}

smLaunchOwner OBJECT-TYPE
SYNTAX SnmpAdminString (SIZE (0..32))
MAX-ACCESS not-accessible
STATUS current
description "The manager who owns this row in the smLaunchTable. Every
instance of a running script started from a particular entry
in the smLaunchTable (i.e. entries in the smRunTable) will
be owned by the same smLaunchOwner used to index the entry
in the smLaunchTable. This owner is not necessarily the same
as the owner of the script itself (smLaunchScriptOwner)."
::= { smLaunchEntry 1 }

smLaunchName OBJECT-TYPE
SYNTAX     SnmpAdminString (SIZE (1..32))
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION
 "The locally-unique, administratively assigned name for this
 launch table entry. This object allows an smLaunchOwner to
 have multiple entries in the smLaunchTable. The smLaunchName
 is an arbitrary name that must be different from any other
 smLaunchTable entries with the same smLaunchOwner but can be
 the same as other entries in the smLaunchTable with
 different smLaunchOwner values. Note that the value of
 smLaunchName is not related in any way to the name of the
 script being launched."
::= { smLaunchEntry 2 }

smLaunchScriptOwner OBJECT-TYPE
SYNTAX     SnmpAdminString (SIZE (0..32))
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
 "The value of this object in combination with the value of
 smLaunchScriptName identifies the script that can be
 launched from this smLaunchTable entry. Attempts to write
 this object will fail with an inconsistentValue error if
 the value of smLaunchOperStatus is 'enabled'."
::= { smLaunchEntry 3 }

smLaunchScriptName OBJECT-TYPE
SYNTAX     SnmpAdminString (SIZE (0..32))
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
 "The value of this object in combination with the value of
 smLaunchScriptOwner identifies the script that can be
 launched from this smLaunchTable entry. The zero-length
 string may be used to point to a non-existing script.

 Attempts to write this object will fail with an
 inconsistentValue error if the value of smLaunchOperStatus
 is 'enabled'."
DEFVAL { ''H }
::= { smLaunchEntry 4 }

smLaunchArgument OBJECT-TYPE
SYNTAX     OCTET STRING
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION  "The argument supplied to the script. When a script is
invoked, the value of this object is used to initialize
the smRunArgument object."
DEFVAL { "H" }
 ::= { smLaunchEntry 5 }

smLaunchMaxRunning OBJECT-TYPE
SYNTAX      Unsigned32 (1..4294967295)
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION  "The maximum number of concurrently running scripts that may
be invoked from this entry in the smLaunchTable. Lowering
the current value of this object does not affect any scripts
that are already executing."
DEFVAL { 1 }
 ::= { smLaunchEntry 6 }

smLaunchMaxCompleted OBJECT-TYPE
SYNTAX      Unsigned32 (1..4294967295)
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION  "The maximum number of finished scripts invoked from this
entry in the smLaunchTable allowed to be retained in the
smRunTable. Whenever the value of this object is changed
and whenever a script terminates, entries in the smRunTable
are deleted if necessary until the number of completed
scripts is smaller than the value of this object. Scripts
whose smRunEndTime value indicates the oldest completion
time are deleted first."
DEFVAL { 1 }
 ::= { smLaunchEntry 7 }

smLaunchLifeTime OBJECT-TYPE
SYNTAX      TimeInterval
UNITS       "centi-seconds"
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION  "The default maximum amount of time a script launched
from this entry may run. The value of this object is used
to initialize the smRunLifeTime object when a script is
launched. Changing the value of an smLaunchLifeTime
instance does not affect scripts previously launched from
smLaunchExpireTime OBJECT-TYPE
SYNTAX      TimeInterval
UNITS       "centi-seconds"
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The default maximum amount of time information about a script launched from this entry is kept in the smRunTable after the script has completed execution. The value of this object is used to initialize the smRunExpireTime object when a script is launched. Changing the value of an smLaunchExpireTime instance does not affect scripts previously launched from this entry."
DEFVAL { 360000 }
 ::= { smLaunchEntry 9 }

smLaunchStart OBJECT-TYPE
SYNTAX      Integer32 (0..2147483647)
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"This object is used to start the execution of scripts. When retrieved, the value will be the value of smRunIndex for the last script that started execution by manipulating this object. The value will be zero if no script started execution yet.

A script is started by setting this object to an unused smRunIndex value. A new row in the smRunTable will be created which is indexed by the value supplied by the set-request in addition to the value of smLaunchOwner and smLaunchName. An unused value can be obtained by reading the smLaunchRunIndexNext object.

Setting this object to the special value 0 will start the script with a self-generated smRunIndex value. The consequence is that the script invoker has no reliable way to determine the smRunIndex value for this script invocation and that the invoker has therefore no way to obtain the results from this script invocation. The special value 0 is however useful for scheduled script invocations.

If this object is set, the following checks must be
performed:

1) The value of the smLaunchOperStatus object in this entry of the smLaunchTable must be ‘enabled’.
2) The values of smLaunchScriptOwner and smLaunchScriptName of this row must identify an existing entry in the smScriptTable.
3) The value of smScriptOperStatus of this entry must be ‘enabled’.
4) The principal performing the set operation must have read access to the script. This must be checked by calling the isAccessAllowed abstract service interface defined in RFC 2271 on the row in the smScriptTable identified by smLaunchScriptOwner and smLaunchScriptName. The isAccessAllowed abstract service interface must be called on all columnar objects in the smScriptTable with a MAX-ACCESS value different than ‘not-accessible’. The test fails as soon as a call indicates that access is not allowed.
5) If the value provided by the set operation is not 0, a check must be made that the value is currently not in use. Otherwise, if the value provided by the set operation is 0, a suitable unused value must be generated.
6) The number of currently executing scripts invoked from this smLaunchTable entry must be less than smLaunchMaxRunning.

Attempts to start a script will fail with an inconsistentValue error if one of the checks described above fails.

Otherwise, if all checks have been passed, a new entry in the smRunTable will be created indexed by smLaunchOwner, smLaunchName and the new value for smRunIndex. The value of smLaunchArgument will be copied into smRunArgument, the value of smLaunchLifeTime will be copied to smRunLifeTime, and the value of smLaunchExpireTime will be copied to smRunExpireTime.

The smRunStartTime will be set to the current time and the smRunState will be set to ‘initializing’ before the script execution is initiated in the appropriate runtime system.

Note that the data type and the range of this object must be consistent with the smRunIndex object. Since this object might be written from the scheduling MIB, the
data type Integer32 rather than Unsigned32 is used."
DEFVAL { 0 }
::= { smLaunchEntry 10 }

smLaunchControl OBJECT-TYPE
SYNTAX      INTEGER {
    abort(1),
    suspend(2),
    resume(3),
    nop(4)
}
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"This object is used to request a state change for all
running scripts in the smRunTable that were started from
this row in the smLaunchTable.

Setting this object to abort(1), suspend(2) or resume(3)
will set the smRunControl object of all applicable rows
in the smRunTable to abort(1), suspend(2) or resume(3)
respectively. The phrase ‘applicable rows’ means the set of
rows which were created from this entry in the smLaunchTable
and whose value of smRunState allows the corresponding
state change as described in the definition of the
smRunControl object. Setting this object to nop(4) has no
effect.

Attempts to set this object lead to an inconsistentValue
error only if all implicated sets on all the applicable
rows lead to inconsistentValue errors. It is not allowed
to return an inconsistentValue error if at least one state
change on one of the applicable rows was successful."
DEFVAL { nop }
::= { smLaunchEntry 11 }

smLaunchAdminStatus OBJECT-TYPE
SYNTAX      INTEGER {
    enabled(1),
    disabled(2),
    autostart(3)
}
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The value of this object indicates the desired status of
this launch table entry. The values enabled(1) and
autostart(3) both indicate that the launch table entry
should transition into the operational enabled(1) state as soon as the associated script table entry is enabled(1).

The value autostart(3) further indicates that the script is started automatically by conceptually writing the value 0 into the associated smLaunchStart object during the transition from the 'disabled' into the 'enabled' operational state. This is useful for scripts that are to be launched on system start-up."

DEFVAL { disabled }
 ::= { smLaunchEntry 12 }

smLaunchOperStatus OBJECT-TYPE
SYNTAX INTEGER {
   enabled(1),
   disabled(2),
   expired(3)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value of this object indicates the actual status of this launch table entry. The smLaunchOperStatus object may have the following values:

- 'enabled' indicates that the launch table entry is available and can be used to start scripts.
- 'disabled' indicates that the launch table entry can not be used to start scripts.
- 'expired' indicates that the launch table entry can not be used to start scripts and will disappear as soon as all smRunTable entries associated with this launch table entry have disappeared.

The value 'enabled' requires that the smLaunchRowStatus object is active. The value 'disabled' requires that there are no entries in the smRunTable associated with this smLaunchTable entry."

DEFVAL { disabled }
 ::= { smLaunchEntry 13 }

smLaunchRunIndexNext OBJECT-TYPE
SYNTAX Integer32 (1..2147483647)
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"This variable is used for creating rows in the smRunTable. The value of this variable is a currently unused value for smRunIndex, which can be written into the smLaunchStart object associated with this row to launch a script.

The value returned when reading this variable must be unique for the smLaunchOwner and smLaunchName associated with this row. Subsequent attempts to read this variable must return different values.

This variable will return the special value 0 if no new rows can be created.

Note that the data type and the range of this object must be consistent with the definition of smRunIndex."

::= { smLaunchEntry 14 }

smLaunchStorageType OBJECT-TYPE
SYNTAX     StorageType
MAX-ACCESS read-create
STATUS      current
DESCRIPTION

"This object defines if this row is kept in volatile storage and lost upon reboot or if this row is backed up by stable storage.

The value of smLaunchStorageType is only meaningful if the value of the corresponding RowStatus object is active.

If smLaunchStorageType has the value permanent(4), then all objects whose MAX-ACCESS value is read-create must be writable, with the exception of the smLaunchStorageType and smLaunchRowStatus objects, which shall be read-only."

DEFVAL { volatile }
::= { smLaunchEntry 15 }

smLaunchRowStatus OBJECT-TYPE
SYNTAX     RowStatus
MAX-ACCESS read-create
STATUS      current
DESCRIPTION

"A control that allows entries to be added and removed from this table.

Attempts to 'destroy' a row or to set a row 'notInService' while the smLaunchOperStatus is 'enabled' will result in an inconsistentValue error."
Attempts to 'destroy' a row or to set a row 'notInService' where the value of the smLaunchStorageType object is 'permanent' or 'readOnly' will result in an inconsistentValue error.

The value of this object has no effect on whether other objects in this conceptual row can be modified.

::= {smLaunchEntry 16}

smLaunchError OBJECT-TYPE
SYNTAX        SnmpAdminString
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION    "This object contains a descriptive error message if an attempt to launch a script fails. Implementations must reset the error message to a zero-length string when a new attempt to launch a script is started."
DEFVAL { ''H }
::= {smLaunchEntry 17}

smLaunchLastChange OBJECT-TYPE
SYNTAX        DateAndTime
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION    "The date and time when this launch table entry was last modified. The value '0000000000000000'H is returned if the launch table entry has not yet been modified. Note that a change of smLaunchStart, smLaunchControl, smLaunchRunIndexNext, smLaunchRowExpireTime, or the resetting of smLaunchError is not considered a change of this launch table entry."
DEFVAL { '0000000000000000'H }
::= {smLaunchEntry 18}

smLaunchRowExpireTime OBJECT-TYPE
SYNTAX        TimeInterval
UNITS         "centi-seconds"
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION    "The value of this object specifies how long this row remains in the 'enabled' or 'disabled' operational state. The value reported by this object ticks backwards. When the value reaches 0, it stops ticking backward and the row is deleted if there are no smRunTable entries associated with
this smLaunchTable entry. Otherwise, the smLaunchOperStatus changes to 'expired' and the row deletion is deferred until there are no smRunTable entries associated with this smLaunchTable entry.

The smLaunchRowExpireTime will not tick backwards if it is set to its maximum value (2147483647). In other words, setting this object to its maximum value turns the timer off.

The value of this object may be set in order to increase or reduce the remaining time that the launch table entry may be used. Setting the value to 0 will cause an immediate row deletion or transition into the 'expired' operational state.

It is not possible to set this object while the operational status is 'expired'. Attempts to modify this object while the operational status is 'expired' leads to an inconsistentValue error.

Note that the timer ticks backwards independent of the operational state of the launch table entry."

DEFVAL { 2147483647 } ::= { smLaunchEntry 19 }

smRunTable OBJECT-TYPE
SYNTAX       SEQUENCE OF SmRunEntry
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION  "This table lists and describes scripts that are currently running or have been running in the past."
 ::= { smRunObjects 2 }

smRunEntry OBJECT-TYPE
SYNTAX       SmRunEntry
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION  "An entry describing a particular running or finished script."
INDEX { smLaunchOwner, smLaunchName, smRunIndex }
 ::= { smRunTable 1 }

SmRunEntry ::= SEQUENCE {
  smRunIndex        Integer32,
smRunArgument OCTET STRING,
smRunStartTime DateAndTime,
smRunEndTime DateAndTime,
smRunLifeTime TimeInterval,
smRunExpireTime TimeInterval,
smRunExitCode INTEGER,
smRunResult OCTET STRING,
smRunControl INTEGER,
smRunState INTEGER,
smRunError SnmpAdminString,
smRunResultTime DateAndTime,
smRunErrorTime DateAndTime
}

smRunIndex OBJECT-TYPE
SYNTAX Integer32 (1..2147483647)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The locally arbitrary, but unique identifier associated with this running or finished script. This value must be unique for all rows in the smRunTable with the same smLaunchOwner and smLaunchName.

Note that the data type and the range of this object must be consistent with the definition of smLaunchRunIndexNext and smLaunchStart."
 ::= { smRunEntry 1 }

smRunArgument OBJECT-TYPE
SYNTAX OCTET STRING
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The argument supplied to the script when it started."
DEFVAL { ''H }
 ::= { smRunEntry 2 }

smRunStartTime OBJECT-TYPE
SYNTAX DateAndTime
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The date and time when the execution started. The value '0000000000000000'H is returned if the script has not started yet."
DEFVAL { '0000000000000000' }
smRunEndTime OBJECT-TYPE
SYNTAX       DateAndTime
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION  
"The date and time when the execution terminated. The value '0000000000000000’H is returned if the script has not terminated yet."
DEFVAL { '0000000000000000’H }
::= { smRunEntry 4 }

smRunLifeTime OBJECT-TYPE
SYNTAX       TimeInterval
UNITS        "centi-seconds"
MAX-ACCESS   read-write
STATUS       current
DESCRIPTION  
"This object specifies how long the script can execute. This object returns the remaining time that the script may run. The object is initialized with the value of the associated smLaunchLifeTime object and ticks backwards. The script is aborted immediately when the value reaches 0.

The value of this object may be set in order to increase or reduce the remaining time that the script may run. Setting this value to 0 will abort script execution immediately, and, if the value of smRunExpireTime is also 0, will remove this entry from the smRunTable once it has terminated.

If smRunLifeTime is set to its maximum value (2147483647), either by a set operation or by its initialization from the smLaunchLifeTime object, then it will not tick backwards. A running script with a maximum smRunLifeTime value will thus never be terminated with a 'lifeTimeExceeded' exit code.

The value of smRunLifeTime reflects the real-time execution time as seen by the outside world. The value of this object will always be 0 for a script that finished execution, that is smRunState has the value ‘terminated’.

The value of smRunLifeTime does not change while a script is suspended, that is smRunState has the value ‘suspended’. Note that this does not affect set operations. It is legal to modify smRunLifeTime via set operations while a script is suspended."
::= { smRunEntry 5 }
smRunExpireTime OBJECT-TYPE
SYNTAX TimeInterval
UNITS "centi-seconds"
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"The value of this object specifies how long this row can
exist in the smRunTable after the script has terminated.
This object returns the remaining time that the row may
exist before it is aged out. The object is initialized with
the value of the associated smLaunchExpireTime object and
ticks backwards. The entry in the smRunTable is destroyed
when the value reaches 0 and the smRunState has the value
‘terminated’.

The value of this object may be set in order to increase or
reduce the remaining time that the row may exist. Setting
the value to 0 will destroy this entry as soon as the
smRunState has the value ‘terminated’.
"
::= { smRunEntry 6 }

smRunExitCode OBJECT-TYPE
SYNTAX INTEGER {
    noError(1),
    halted(2),
    lifeTimeExceeded(3),
    noResourcesLeft(4),
    languageError(5),
    runtimeError(6),
    invalidArgument(7),
    securityViolation(8),
    genericError(9)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value of this object indicates the reason why a
script finished execution. The smRunExitCode code may have
one of the following values:

- ‘noError’, which indicates that the script completed
  successfully without errors;

- ‘halted’, which indicates that the script was halted
  by a request from an authorized manager;

- ‘lifeTimeExceeded’, which indicates that the script
  exited because a time limit was exceeded;"
- ‘noResourcesLeft’, which indicates that the script exited because it ran out of resources (e.g. memory);

- ‘languageError’, which indicates that the script exited because of a language error (e.g. a syntax error in an interpreted language);

- ‘runtimeError’, which indicates that the script exited due to a runtime error (e.g. a division by zero);

- ‘invalidArgument’, which indicates that the script could not be run because of invalid script arguments;

- ‘securityViolation’, which indicates that the script exited due to a security violation;

- ‘genericError’, which indicates that the script exited for an unspecified reason.

If the script has not yet begun running, or is currently running, the value will be ‘noError’.

```plaintext
defval { noError } ::= { smRunEntry 7 }
```

```plaintext
smRunResult OBJECT-TYPE
SYNTAX OCTET STRING
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The result value produced by the running script. Note that the result may change while the script is executing."
defval { ''H }
 ::= { smRunEntry 8 }
```

```plaintext
smRunControl OBJECT-TYPE
SYNTAX INTEGER {
  abort(1),
  suspend(2),
  resume(3),
  nop(4)
}
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"The value of this object indicates the desired status of the script execution defined by this row.

Setting this object to ‘abort’ will abort execution if the
```
value of smRunState is ‘initializing’, ‘executing’, ‘suspending’, ‘suspended’ or ‘resuming’. Setting this object to ‘abort’ when the value of smRunState is ‘aborting’ or ‘terminated’, or if the implementation can determine that the attempt to abort the execution would fail, will result in an inconsistentValue error.

Setting this object to ‘suspend’ will suspend execution if the value of smRunState is ‘executing’. Setting this object to ‘suspend’ will cause an inconsistentValue error if the value of smRunState is not ‘executing’ or if the implementation can determine that the attempt to suspend the execution would fail.

Setting this object to ‘resume’ will resume execution if the value of smRunState is ‘suspending’ or ‘suspended’. Setting this object to ‘resume’ will cause an inconsistentValue error if the value of smRunState is not ‘suspended’ or if the implementation can determine that the attempt to resume the execution would fail.

Setting this object to nop(4) has no effect."

DEFVAL { nop }
 ::= { smRunEntry 9 }

smRunState OBJECT-TYPE
 SYNTAX INTEGER {
   initializing(1),
   executing(2),
   suspending(3),
   suspended(4),
   resuming(5),
   resuming(6),
   terminated(7)
 }
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The value of this object indicates the script’s execution state. If the script has been invoked but has not yet begun execution, the value will be ‘initializing’. If the script is running, the value will be ‘executing’.

A running script which received a request to suspend execution first transitions into a temporary ‘suspending’ state. The temporary ‘suspending’ state changes to ‘suspended’ when the script has actually been suspended. The temporary ‘suspending’ state changes back to ‘executing’ if
the attempt to suspend the running script fails.

A suspended script which received a request to resume execution first transitions into a temporary ‘resuming’ state. The temporary ‘resuming’ state changes to ‘running’ when the script has actually been resumed. The temporary ‘resuming’ state changes back to ‘suspended’ if the attempt to resume the suspended script fails.

A script which received a request to abort execution but which is still running first transitions into a temporary ‘aborting’ state.

A script which has finished its execution is ‘terminated’.

::= { smRunEntry 10 }

smRunError OBJECT-TYPE
SYNTAX   SnmpAdminString
MAX-ACCESS read-only
STATUS    current
DESCRIPTION "This object contains a descriptive error message if the script startup or execution raised an abnormal condition. An implementation must store a descriptive error message in this object if the script exits with the smRunExitCode 'genericError'."
DEFVAL { ''H }
::= { smRunEntry 11 }

smRunResultTime OBJECT-TYPE
SYNTAX    DateAndTime
MAX-ACCESS read-only
STATUS    current
DESCRIPTION "The date and time when the smRunResult was last updated. The value ‘0000000000000000’H is returned if smRunResult has not yet been updated after the creation of this smRunTable entry."
DEFVAL { '0000000000000000'H }
::= { smRunEntry 12 }

smRunErrorTime OBJECT-TYPE
SYNTAX    DateAndTime
MAX-ACCESS read-only
STATUS    current
DESCRIPTION "The date and time when the smRunError was last updated. The value ‘0000000000000000’H is returned if smRunError
has not yet been updated after the creation of this
smRunTable entry.
DEFVAL { ’0000000000000000’H }
 ::= { smRunEntry 13 }

--
-- Notifications. The definition of smTraps makes notification
-- registrations reversible (see STD 58, RFC 2578).
--

smTraps OBJECT IDENTIFIER ::= { smNotifications 0 }

smScriptAbort NOTIFICATION-TYPE
  OBJECTS     { smRunExitCode, smRunEndTime, smRunError }
  STATUS      current
  DESCRIPTION
    "This notification is generated whenever a running script
    terminates with an smRunExitCode unequal to ‘noError’."
 ::= { smTraps 1 }

smScriptResult NOTIFICATION-TYPE
  OBJECTS     { smRunResult }
  STATUS      current
  DESCRIPTION
    "This notification can be used by scripts to notify other
    management applications about results produced by the
    script.

    This notification is not automatically generated by the
    Script MIB implementation. It is the responsibility of
    the executing script to emit this notification where it
    is appropriate to do so."
 ::= { smTraps 2 }

smScriptException NOTIFICATION-TYPE
  OBJECTS     { smRunError }
  STATUS      current
  DESCRIPTION
    "This notification can be used by scripts to notify other
    management applications about script errors.

    This notification is not automatically generated by the
    Script MIB implementation. It is the responsibility of
    the executing script or the runtime system to emit this
    notification where it is appropriate to do so."
 ::= { smTraps 3 }

-- conformance information

smCompliances OBJECT IDENTIFIER ::= { smConformance 1 }
smGroups OBJECT IDENTIFIER ::= { smConformance 2 }

-- compliance statements

smCompliance2 MODULE-COMPLIANCE
STATUS current
DESCRIPTION "The compliance statement for SNMP entities which implement
the Script MIB."
MODULE -- this module
MANDATORY-GROUPS {
    smLanguageGroup, smScriptGroup2, smLaunchGroup2,
    smRunGroup2, smNotificationsGroup2
}
GROUP smCodeGroup
DESCRIPTION "The smCodeGroup is mandatory only for those implementations
that support the downloading of scripts via SNMP."
OBJECT smScriptSource
MIN-ACCESS read-only
DESCRIPTION "The smScriptSource object is read-only for implementations
that are not able to download script code from a URL."
OBJECT smCodeText
DESCRIPTION "A compliant implementation need only support write access to
the smCodeText object only during row creation."
OBJECT smLaunchArgument
DESCRIPTION "A compliant implementation has to support a minimum size
for smLaunchArgument of 255 octets."
OBJECT smRunArgument
DESCRIPTION "A compliant implementation has to support a minimum size
for smRunArgument of 255 octets."
OBJECT smRunResult
DESCRIPTION "A compliant implementation has to support a minimum size
for smRunResult of 255 octets."
OBJECT smRunState
DESCRIPTION "A compliant implementation does not have to support script
suspension and the smRunState ‘suspended’. Such an
implementation will change into the ‘suspending’ state
when the smRunControl is set to ‘suspend’ and remain in this
state until smRunControl is set to ‘resume’ or the script
terminates."
::= { smCompliances 2 }

smLanguageGroup OBJECT-GROUP
  OBJECTS {
    smLangLanguage, smLangVersion,
    smLangVendor, smLangRevision,
    smLangDescr, smExtsnExtension,
    smExtsnVersion, smExtsnVendor,
    smExtsnRevision, smExtsnDescr
  }
STATUS   current
DESCRIPTION
  "A collection of objects providing information about the
capabilities of the scripting engine."
::= { smGroups 1 }

smScriptGroup2 OBJECT-GROUP
  OBJECTS {
    smScriptDescr, smScriptLanguage,
    smScriptSource, smScriptAdminStatus,
    smScriptOperStatus, smScriptStorageType,
    smScriptRowStatus, smScriptError,
    smScriptLastChange
  }
STATUS   current
DESCRIPTION
  "A collection of objects providing information about
  installed scripts."
::= { smGroups 7 }

smCodeGroup OBJECT-GROUP
  OBJECTS {
    smCodeText, smCodeRowStatus
  }
STATUS   current
DESCRIPTION
  "A collection of objects used to download or modify scripts
  by using SNMP set requests."
::= { smGroups 3 }

smLaunchGroup2 OBJECT-GROUP
  OBJECTS {
    smLaunchScriptOwner, smLaunchScriptName,
    smLaunchArgument, smLaunchMaxRunning,
    smLaunchMaxCompleted, smLaunchLifeTime,
    smLaunchExpireTime, smLaunchStart,
    smLaunchControl, smLaunchAdminStatus,
    smLaunchOperStatus, smLaunchRunIndexNext,
smLaunchStorageType, smLaunchRowStatus,
smLaunchError, smLaunchLastChange,
smLaunchRowExpireTime
)
STATUS current
DESCRIPTION
"A collection of objects providing information about scripts
that can be launched."
::= { smGroups 8 }

smRunGroup2 OBJECT-GROUP
OBJECTS {
    smRunArgument, smRunStartTime,
    smRunEndTime, smRunLifeTime,
    smRunExpireTime, smRunExitCode,
    smRunResult, smRunState,
    smRunControl, smRunError,
    smRunResultTime, smRunErrorTime
}
STATUS current
DESCRIPTION
"A collection of objects providing information about running
scripts."
::= { smGroups 9 }

smNotificationsGroup2 NOTIFICATION-GROUP
NOTIFICATIONS {
    smScriptAbort,
    smScriptResult,
    smScriptException
}
STATUS current
DESCRIPTION
"The notifications emitted by the Script MIB."
::= { smGroups 10 }

--
-- Deprecated compliance and conformance group definitions
-- from RFC 2592.
--

smCompliance MODULE-COMPLIANCE
STATUS deprecated
DESCRIPTION
"The compliance statement for SNMP entities which implement
the Script MIB."
MODULE -- this module
MANDATORY-GROUPS {
smLanguageGroup, smScriptGroup, smLaunchGroup, smRunGroup

GROUP   smCodeGroup
DESCRIPTION
"The smCodeGroup is mandatory only for those implementations
that support the downloading of scripts via SNMP."
OBJECT   smScriptSource
MIN-ACCESS read-only
DESCRIPTION
"The smScriptSource object is read-only for implementations
that are not able to download script code from a URL."
OBJECT   smCodeText
DESCRIPTION
"A compliant implementation need only support write access
to the smCodeText object during row creation."
OBJECT   smLaunchArgument
DESCRIPTION
"A compliant implementation has to support a minimum size
for smLaunchArgument of 255 octets."
OBJECT   smRunArgument
DESCRIPTION
"A compliant implementation has to support a minimum size
for smRunArgument of 255 octets."
OBJECT   smRunResult
DESCRIPTION
"A compliant implementation has to support a minimum size
for smRunResult of 255 octets."
OBJECT   smRunState
DESCRIPTION
"A compliant implementation does not have to support script
suspension and the smRunState ‘suspended’. Such an
implementation will change into the ‘suspending’ state
when the smRunControl is set to ‘suspend’ and remain in this
state until smRunControl is set to ‘resume’ or the script
terminates."
::= { smCompliances 1 }

smScriptGroup OBJECT-GROUP
OBJECTS { smScriptDescr, smScriptLanguage,
smScriptSource, smScriptAdminStatus,
smScriptOperStatus, smScriptStorageType,
smScriptRowStatus
}
STATUS      deprecated
DESCRIPTION
"A collection of objects providing information about
installed scripts."
::= { smGroups 2 }

smLaunchGroup OBJECT-GROUP
OBJECTS {
   smLaunchScriptOwner, smLaunchScriptName,
   smLaunchArgument, smLaunchMaxRunning,
   smLaunchMaxCompleted, smLaunchLifeTime,
   smLaunchExpireTime, smLaunchStart,
   smLaunchControl, smLaunchAdminStatus,
   smLaunchOperStatus, smLaunchRunIndexNext,
   smLaunchStorageType, smLaunchRowStatus
}
STATUS      deprecated
DESCRIPTION
"A collection of objects providing information about scripts
that can be launched."

::= { smGroups 4 }

smRunGroup OBJECT-GROUP
OBJECTS {
   smRunArgument, smRunStartTime,
   smRunEndTime, smRunLifeTime,
   smRunExpireTime, smRunExitCode,
   smRunResult, smRunState,
   smRunControl, smRunError
}
STATUS      deprecated
DESCRIPTION
"A collection of objects providing information about running
scripts."

::= { smGroups 5 }

smNotificationsGroup NOTIFICATION-GROUP
NOTIFICATIONS {
   smScriptAbort,
   smScriptResult
}
STATUS      deprecated
DESCRIPTION
"The notifications emitted by the Script MIB."

::= { smGroups 6 }

END
7. Usage Examples

This section presents some examples that explain how a manager can use the Script MIB defined in this memo. The purpose of these examples is to explain the steps that are normally used to delegate management scripts.

7.1. Pushing a Script via SNMP

This example explains the steps performed by a manager to push a script into a distributed manager.

1. The manager first checks the smLangTable and the smExtsnTable in order to select the appropriate script or language.

2. The manager creates a row in the smScriptTable by issuing an SNMP set-request. The smScriptRowStatus object is set to 'createAndWait' and the smScriptSource object is set to an empty string. The smScriptLanguage object is set to the language in which the script was written. The smScriptStorageType object is set to 'volatile' to indicate that the script will be loaded via the smCodeTable. The smScriptOwner is set to a string which identifies the principal who owns the new row. The smScriptName defines the administratively assigned unique name for the script.

3. The manager sets the smScriptRowStatus object to 'active' and the smScriptAdminStatus object to 'editing'.

4. The manager pushes the script to the distributed manager by issuing a couple of SNMP set-requests to fill the smCodeTable.

5. Once the whole script has been transferred, the manager sends a set-request to set the smScriptAdminStatus object to 'enabled'. The Script MIB implementation now makes the script accessible to the runtime system. This might include the compilation of the script if the language requires a compilation step.

6. The manager polls the smScriptOperStatus object until the value is either 'enabled' or one of the error status codes. The script can only be used if the value of smScriptOperStatus is 'enabled'.

7. If the manager wants to store the script in local non-volatile storage, it should send a set-request which changes the smScriptStorageType object to 'nonVolatile'.
7.2. Pulling a Script from a URL

This example explains the steps performed by a manager to cause a
distributed manager to pull a script from a URL.

1. The manager first checks the smLangTable and the smExtsnTable in
order to select the appropriate script or language.

2. The manager creates a row in the smScriptTable by issuing an SNMP
set-request. The smScriptRowStatus object is set to
'createAndWait' and the smScriptSource object is set to the URL
which points to the script source. The smScriptLanguage object is
set to the language in which the script was written. The
smScriptOwner is set to a string which identifies the principal
who owns the new row. The smScriptName defines the
administratively assigned unique name for the script.

3. The manager sets the smScriptRowStatus object to 'active'.

4. The manager sends a set-request to set the smScriptAdminStatus
object to 'enabled'. The Script MIB implementation now makes the
script accessible to the runtime system. This causes a retrieval
operation to pull the script from the URL stored in
smScriptSource. This retrieval operation might be followed by a
compile operation if the language requires a compilation step.

5. The manager polls the smScriptOperStatus object until the value is
either 'enabled' or one of the error status codes. The script can
only be used if the value of smScriptOperStatus is 'enabled'.

6. If the manager wants to store the script in local non-volatile
storage, it should send a set-request which changes the
smScriptStorageType object to 'nonVolatile'.

7.3. Modifying an Existing Script

This section explains how a manager can modify a script by sending
SNMP set-requests.

1. First, the script is de-activated by setting the
smScriptAdminStatus to 'disabled'.

2. The manager polls the smScriptOperStatus object until the value is
'disabled'.

3. The manager sets smScriptSource to an empty string and
smScriptAdminStatus to 'editing'. This makes the script source
available in the smCodeTable.
4. The manager polls the smScriptOperStatus object until the value is
   ‘editing’.

5. The manager sends SNMP set-requests to modify the script in the
   smCodeTable.

6. The manager sends a set-request to set the smScriptAdminStatus
   object to ‘enabled’. The Script MIB implementation now makes the
   script accessible to the runtime system. This might include the
   compilation of the script if the language requires a compilation
   step.

7. The manager polls the smScriptOperStatus object until the value is
   either ‘enabled’ or one of the error status codes. The script can
   only be used if the value of smScriptOperStatus is ‘enabled’.

7.4. Removing an Existing Script

This section explains how a manager can remove a script from a
distributed manager.

1. First, the manager sets the smScriptAdminStatus to ‘disabled’.
   This will ensure that no new scripts can be started while running
   scripts finish their execution.

2. The manager polls the smScriptOperStatus object until the value is
   ‘disabled’.

3. The manager sends an SNMP set-request to change the
   smScriptRowStatus object to ‘destroy’. This will remove the row
   and all associated resources from the Script MIB implementation.

7.5. Creating a Launch Button

This section explains how a manager can create a launch button for
starting a script.

1. The manager, who is identified by an smLaunchOwner value, first
   chooses a name for the new row in the smLaunchTable. The manager
   sends an SNMP set-request to set the smLaunchRowStatus object for
   this smLaunchOwner and smLaunchName to ‘createAndWait’.

2. The manager fills the new smLaunchTable row with all required
   parameters. The smLaunchScriptOwner and smLaunchScriptName values
   point to the script that should be started from this launch
   button.

3. The manager sets the smLaunchRowStatus object to ‘active’.
4. The manager sends a set-request to change smLaunchAdminStatus to ‘enabled’ once the new smLaunchTable row is complete.

5. The manager polls the smLaunchOperStatus object until the value is ‘enabled’.

7.6. Launching a Script

This section explains the suggested way to launch a script from a given launch button.

1. The manager first retrieves the value of smLaunchRunIndexNext from the launch button selected to start the script.

2. The manager sends an SNMP set-request to set the smLaunchStart object to the value obtained in step 1. This will launch the script if all necessary pre-conditions are satisfied (see the definition of smLaunchStart for more details). The manager can also provide the smLaunchArgument in the same set-request that is used to start the script. Upon successful start, a new row will be created in the smRunTable indexed by smLaunchOwner, smLaunchName and the value written to smLaunchStart.

3. The manager polls the smRunState object until the value is either ‘executing’ (the default case), ‘suspended’ or ‘terminated’.

The first step is not required. A manager can also try to guess an unused value for smRunIndex if the manager wants to start the script in a single transaction. A manager can also use the special value 0 if it does not care about the smRunIndex.

7.7. Suspending a Running Script

This section explains how a manager can suspend a running script.

1. The manager sets the smRunControl object of the running script or the smLaunchControl object of the launch button used to start the running script to ‘suspend’. Setting smLaunchControl will suspend all running scripts started from the launch button while smRunControl will only suspend the running script associated with the smRunControl instance.

2. The manager polls the smRunState object until the value is either ‘suspended’, ‘executing’, or ‘terminated’. If the value is ‘suspended’, then the suspend operation was successful. If the value is ‘executing’, then the attempt to suspend the script
failed. The value ‘terminated’ can be received in cases where the suspend operation failed and the running script terminated between the polls.

Note that the set operation in the first step can lead to an inconsistentValue error which indicates that the suspend operation failed (e.g., because the runtime system does not support suspend/resume). There is no need to poll smRunState in this case.

7.8. Resuming a Suspended Script

This section explains how a manager can resume a suspended script.

1. The manager sets the smRunControl object of the running script or the smLaunchControl object of the launch button used to start the running script to ‘resume’. Setting smLaunchControl will resume all running scripts started from the launch button while smRunControl will only resume the running script associated with the smRunControl instance.

2. The manager polls the smRunState object until the value is either ‘suspended’, ‘executing’, or ‘terminated’. If the value is ‘executing’, then the resume operation was successful. If the value is ‘suspended’, then the attempt to resume the script failed. The value ‘terminated’ can be received in cases where the resume operation was successful and the running script terminated between the polls.

Note that the set operation in the first step can lead to an inconsistentValue error which indicates that the resume operation failed (e.g., because the runtime system does not support suspend/resume). There is no need to poll smRunState in this case.

7.9. Terminating a Running Script

This section explains two ways to terminate a running script. The first approach is as follows:

1. The manager sets the smRunControl object of the running script or the smLaunchControl object of the launch button used to start the running script to ‘abort’. Setting smLaunchControl will abort all running scripts started from the launch button while smRunControl will only abort the running script associated with the smRunControl instance.

2. The manager polls the smRunState object until the value is ‘terminated’.

Levi & Schoenwaelder Standards Track [Page 53]
The second way to terminate a script is to set the smRunLifeTime to zero which causes the runtime system to terminate the script with a 'lifeTimeExceeded' exit code:

1. The manager changes the value of smRunLifeTime to 0. This causes the Script MIB implementation to abort the script because the remaining life time has expired.

2. The manager polls the smRunState object until the value is 'terminated'.

Note that changing the smRunLifeTime value can also be used to increase the permitted lifetime of a running script. For example, a manager can choose to set smRunLifeTime to a small fixed time interval and increase the value periodically. This strategy has the nice effect that scripts terminate automatically if the manager loses contact with the Script MIB engine.

7.10. Removing a Terminated Script

This section explains how a manager can remove a terminated script.

1. The manager changes the smRunExpireTime to 0. This causes the Script MIB implementation to destroy the smRunTable entry of the terminated script.

7.11. Removing a Launch Button

This section explains how a manager can remove a launch button from a distributed manager.

1. First, the manager sets the smLaunchAdminStatus to 'disabled'. This will ensure that no new scripts can be started from this launch button while running scripts finish their execution.

2. The manager polls the smLaunchOperStatus object until the value is 'disabled'.

3. The manager sends an SNMP set-request to change the smLaunchRowStatus object to 'destroy'. This will remove the row and all associated resources from the Script MIB implementation.

8. VACM Configuration Examples

This section shows how the view-based access control model defined in RFC 2575 [RFC2575] can be configured to control access to the Script MIB.
8.1. Sandbox for Guests

The first example demonstrates how to configure VACM to give the members of the VACM group "guest" limited access to the Script MIB. The MIB views defined below give the members of the "guest" group a sandbox where they can install and start their own scripts, but not access any other scripts maintained by the Script MIB implementation.

\[
\text{vacmAccessReadView."guest"."".usm.authNoPriv} = \text{"guestReadView"}
\text{vacmAccessWriteView."guest"."".usm.authNoPriv} = \text{"guestWriteView"}
\]

The guestReadView grants read access to the smLangTable, the smExtsnTable and to all the table entries owned by "guest":

\[
\text{guestReadView:\n}\text{smLangTable} \quad \text{(included)}
\text{smExtsnTable} \quad \text{(included)}
\text{smScriptObjects.*.*."guest"} \quad \text{(included)}
\text{smRunObjects.*.*."guest"} \quad \text{(included)}
\]

The guestWriteView grants write access to all the table entries owned by "guest":

\[
\text{guestWriteView:\n}\text{smScriptObjects.*.*."guest"} \quad \text{(included)}
\text{smRunObjects.*.*."guest"} \quad \text{(included)}
\]

8.2. Sharing Scripts

This example demonstrates how VACM can be used to share a repository of scripts between the members of the "senior" and the members of the "junior" VACM group:

\[
\text{vacmAccessReadView."junior"."".usm.authNoPriv} = \text{"juniorReadView"}
\text{vacmAccessWriteView."junior"."".usm.authNoPriv} = \text{"juniorWriteView"}
\]

\text{juniorReadView:\n}\text{smLangTable} \quad \text{(included)}
\text{smExtsnTable} \quad \text{(included)}
\text{smScriptObjects.*.*."junior"} \quad \text{(included)}
\text{smRunObjects.*.*."junior"} \quad \text{(included)}
\text{smScriptObjects.*.*."utils"} \quad \text{(included)}

\text{juniorWriteView:\n}\text{smScriptObjects.*.*."junior"} \quad \text{(included)}
\text{smRunObjects.*.*."junior"} \quad \text{(included)}
\]
The definitions above allow the members of the "junior" VACM group to start the scripts owned by "utils" in addition to the script the members of the "junior" VACM group installed themselves. This is accomplished by giving the members of "junior" read access to scripts in "utils". This allows members of "junior" to create entries in the smLaunchTable which refer to scripts in "utils", and to launch those scripts using these entries in the smLaunchTable.

```plaintext
vacmAccessReadView."senior"."".usm.authNoPriv = "seniorReadView"
vacmAccessWriteView."senior"."".usm.authNoPriv = "seniorWriteView"

seniorReadView:
  smLangTable        (included)
  smExtnsTable       (included)
  smScriptObjects.*.*.*."senior"  (included)
  smRunObjects.*.*.*."senior"     (included)
  smScriptObjects.*.*.*."utils"   (included)

seniorWriteView:
  smScriptObjects.*.*.*."senior"  (included)
  smRunObjects.*.*.*."senior"     (included)
  smScriptObjects.*.*.*."utils"   (included)
```

The definitions for the members of the "senior" VACM group allow to start the scripts owned by "utils" in addition to the script the members of the "senior" VACM group installed themself. The third write access rule in the seniorWriteView also grants the permission to install scripts owned by "utils". The members of the "senior" VACM group therefore have the permissions to install and modify scripts that can be called by the members of the "junior" VACM group.

8.3. Emergency Scripts

This example demonstrates how VACM can be used to allow the members of the "junior" VACM group to launch scripts that are executed with the permissions associated with the "emergency" owner. This works by adding the following rules to the juniorReadView and the juniorWriteView:

```plaintext
juniorReadView:
  smScriptObjects.*.*.*."emergency" (included)
  smRunObjects.*.*.*."emergency"     (included)

juniorWriteView
  smLaunchStart."emergency"       (included)
  smLaunchArgument."emergency"   (included)
```
The rules added to the juniorReadView grant read access to the scripts, the launch buttons and the results owned by "emergency". The rules added to the juniorWriteView grant write permissions to the smLaunchStart and smLaunchArgument variables owned by "emergency". Members of the "junior" VACM group can therefore start scripts that will execute under the owner "emergency".

seniorReadView:
  smScriptObjects.*.*.*."emergency" (included)
  smRunObjects.*.*.*."emergency"   (included)

seniorWriteView:
  smScriptObjects.*.*.*."emergency" (included)
  smRunObjects.*.*.*."emergency"   (included)

The rules added to the seniorReadView and the seniorWriteView will give the members of the "senior" VACM group the rights to install emergency scripts and to configure appropriate launch buttons.

9. IANA Considerations

The Internet Assigned Numbers Authority (IANA) is responsible for maintaining a MIB module (IANA-LANGUAGE-MIB) which provides OID registrations for well-known languages. The IANA language registry is intended to reduce interoperability problems by providing a single list of well-known languages. However, it is of course still possible to register languages in private OID spaces. Registering languages in private OID spaces is especially attractive if a language is used for experimentation or if a language is only used in environments where the distribution of MIB modules with the language registration does not cause any maintenance problems.

Any additions or changes to the list of languages registered via IANA require Designated Expert Review as defined in the IANA guidelines [RFC2434]. The Designated Expert will be selected by the IESG Area Director for the IETF Operations and Management Area.

10. Security Considerations

There are a number of management objects defined in this MIB that have a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.
SNMPv1 by itself is not a secure environment. Even if the network itself is secure (for example by using IPSec), even then, there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in this MIB.

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

It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

This MIB provides the ability to distribute applications written in an arbitrary language to remote systems in a network. The security features of the languages available in a particular implementation should be taken into consideration when deploying an implementation of this MIB.

To facilitate the provisioning of access control by a security administrator using the View-Based Access Control Model (VACM) defined in [RFC 2575] for tables in which multiple users may need to independently create or modify entries, the initial index is used as an "owner index". Such an initial index has a syntax of SnmpAdminString, and can thus be trivially mapped to a securityName or groupName as defined in VACM, in accordance with a security policy.

All entries in related tables belonging to a particular user will have the same value for this initial index. For a given user’s entries in a particular table, the object identifiers for the information in these entries will have the same subidentifiers (except for the "column" subidentifier) up to the end of the encoded owner index. To configure VACM to permit access to this portion of the table, one would create vacmViewTreeFamilyTable entries with the value of vacmViewTreeFamilySubtree including the owner index portion, and vacmViewTreeFamilyMask "wildcarding" the column subidentifier. More elaborate configurations are possible.

The VACM access control mechanism described above provides control over SNMP access to Script MIB objects. There are a number of other access control issues that are outside of the scope of this MIB. For example, access control on URLs, especially those that use the file scheme, must be realized by the underlying operating system. A mapping of the owner index value to a local operating system security
user identity should be used by an implementation of this MIB to
close access to operating system resources when resolving URLs or
executing scripts.

11. Intellectual Property

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12. Changes from RFC 2592

The following list documents major changes from the previous version
of this document, published as RFC 2592:

- Updated the boilerplate and the references.
- Added revision clauses to the module identity macro.
- Various typos have been fixed.
- Added SIZE restriction to smScriptName which is consistent with
  smLaunchScriptName. Added DEFVAL and some clarifying text on the
  usage of a zero-length string to smLaunchScriptName.
- Clarified under which conditions changes to smScriptLanguage are
  invalid.
- Added new smScriptError and smLaunchError objects.
- Setting smRunLifeTime to its maximum value now disables the timer
  so that scripts can run forever.
- Added the ‘autostart’ value to the smLaunchAdminStatus object which allows to launch scripts during the disable->enabled transition of smLaunchOperStatus.

- Added an additional step to the "creating a launch button" procedure which sets the smLaunchRowStatus to active.

- Added a final polling step in the procedure to launch a script.

- Added a final polling step in the procedure to terminate a running script.

- Removed the requirement that smRunError is a zero-length string while the smRunExitCode has the value ‘noError’.

- Added new smScriptLastChange, smLaunchLastChange, smRunResultTime, and smRunErrorTime objects.

- Added some additional boilerplate text to the security considerations section.

- Added a new smLaunchRowExpireTime object and a new ‘expired’ state to the smLaunchOperStatus object.

- Clarified that the smRunState object reports the actual state if attempts to suspend or resume scripts fail.

- Clarified the conditions under which set operations to smLaunchControl and smRunControl can lead to inconsistentValue errors.

- Added procedures for suspending/resuming/removing running scripts to section 7.

- Added text to the smScriptStorageType description to better highlight the difference between the storage type of the script row entry and the script itself.

- Updated the smCompliances statement to not require write access to the smCodeText object after row creation.

- Deprecated smCompliance, smScriptGroup, smLaunchGroup, smRunGroup, smNotificationsGroup and created smCompliance2, smScriptGroup2, smLaunchGroup2, smRunGroup2 and smNotificationsGroup2 that take care of the new objects and notifications.
13. Acknowledgments

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14. References


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