SCSI Device Management
(SCSI MIB)

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Networked Storage Architecture

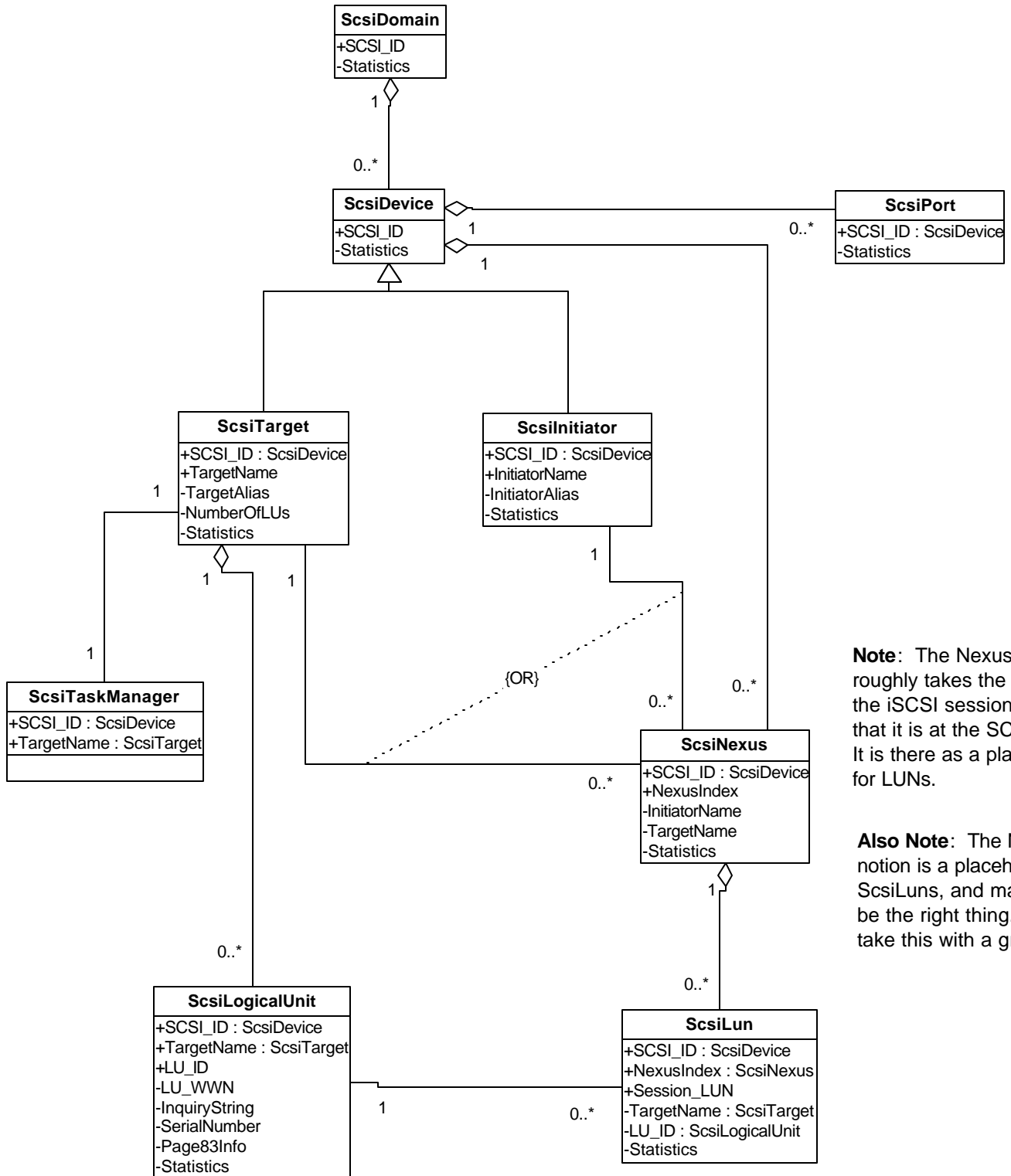Hewlett-Packard Co.

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Device Management

- ## MIB is a description of data to manage a device
  - Constructed using SMI-v2 language
  - Accessed via SNMP (v1,v2,v3)
  - MIBs can have relationship to other MIBs
    - Some standard MIBs use the deviceID from the device MIB to index their tables (printer MIB)
  - A SCSI MIB should have a relationship to any SCSI transport MIBs such that a management application can find related things
    - Device table in a SCSI MIB should be relatable to "initiator table" in iSCSI MIB

Device Management

- SCSI expertise is here in T10

- ?Should the SCSI MIB be developed

  - T10? (SCSI knowledge)

  - IETF? (Std MIBs)

  - SNIA? (mgmt focus)

- Web site containing iSCSI documents and drawings:
  http://www.haifa.il.ibm.com/satran/ips

- iSCSI MIB is draft-ietf-iscsi-mib-00.txt

SCSI MIB UML Drawing (Version 1 - 5/2/2001)

ScsiDomain
+SCSI_ID
-Statistics

1 ◇

0..*

ScsiDevice
+SCSI_ID
-Statistics

1 ◇

ScsiPort
+SCSI_ID : ScsiDevice
-Statistics

0..*

1

ScsiTarget
+SCSI_ID : ScsiDevice
+TargetName
-TargetAlias
-NumberOfLUs
-Statistics

ScsiInitiator
+SCSI_ID : ScsiDevice
+InitiatorName
-InitiatorAlias
-Statistics

1

1

1

1

Note: The Nexus object roughly takes the place of the iSCSI session, except that it is at the SCSI level. It is there as a placeholder for LUNs.

ScsiTaskManager
+SCSI_ID : ScsiDevice
+TargetName : ScsiTarget

{OR}

0..*

0..*

Also Note: The Nexus notion is a placeholder for ScsiLuns, and may well not be the right thing. Please take this with a grain of salt.

ScsiNexus
+SCSI_ID : ScsiDevice
+NexusIndex
-InitiatorName
-TargetName
-Statistics

0..*

1

0..*

0..*

ScsiLogicalUnit
+SCSI_ID : ScsiDevice
+TargetName : ScsiTarget
+LU_ID
-LU_WWN
-InquiryString
-SerialNumber
-Page83Info
-Statistics

1

ScsiLun
+SCSI_ID : ScsiDevice
+NexusIndex : ScsiNexus
+Session_LUN
-TargetName : ScsiTarget
-LU_ID : ScsiLogicalUnit
-Statistics

0..*

Note: Attributes marked with a plus sign "+" are used to index the table in which they appear. Non-index attributes are marked with a dash "-".

SCSI MIB + iSCSI MIB UML Drawing (Version 3 - 5/2/2001)

iSCSIInstance
+iSCSI_ID
-Statistics

iScsiListenPort
+iSCSI_ID : iSCSIInstance
+IP_Address
+TCP_Port
-Statistics

iScsiTarget
+iSCSI_ID : iSCSIInstance
+WWUI
-TargetAlias
-NumberOfLUs
-Statistics

iScsiInitiator
+iSCSI_ID : iSCSIInstance
+WWUI
-InitiatorAlias
-Statistics

{OR}

iScsiSession
+iSCSI_ID : iSCSIInstance
+SessionIndex
-Session_ID
-SessionType
-InitiatorWWUI
-TargetWWUI
-Authentication
-R2TState : boolean
-NConnections
-Statistics
-PotentialSession

iScsiConnection
+iSCSI_ID : iSCSIInstance
+Session_ID : iScsiSession
+Connection_ID
-Local_IP
-Local_TCP
-Remote_IP
-Remote_TCP
-ConnectState

Note: LUN belongs in this MIB, but I'm not so sure about the LU.

iScsiLu
+iSCSI_ID : iSCSIInstance
+WWUI : iScsiTarget
+LU_ID
-Statistics

iScsiLun
+iSCSI_ID : iSCSIInstance
+SessionIndex : iScsiSession
+Session_LUN
-WWUI : iScsiTarget
-LU_ID : iScsiLu
-Statistics

Note: Although Logical Units and LUNs are represented in this MIB, they do not convey information that is better reflected at the SCSI level. However, iSCSI is also aware at least of LUNs, if not logical units, since the LUN is a part of its header. It may therefore keep iSCSI-level statistics, such as the number of each type of iSCSI request and response addressed to or from the LUN. These could not be kept at the SCSI layer, since SCSI is not (and should not be) knowledgable about its transports.

Note: Attributes marked with a plus sign "+" are used to index the table in which they appear. Non-index attributes are marked with a dash "-".
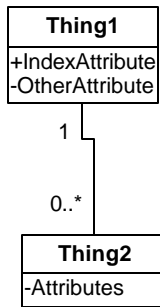
UML Drawing Key

Thing1

+IndexAttribute
-OtherAttribute

1

0..*

Thing2

-Attributes

Association - There are zero or more Thing2 instances associated with each Thing1. A Thing2 is associated with exactly one Thing1.

Thing3

1

0..*
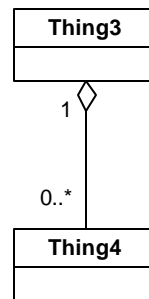
Thing4

Aggregation - Each Thing3 contains zero or more Thing4 instances. A Thing4 belongs to exactly one Thing3 and cannot exist without a Thing3.

Thing5
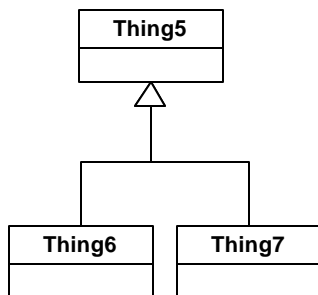
Thing6

Thing7

Inheritance - Each Instance of Thing7 or Thing6 is also a Thing5. A Thing5 must be either a Thing6 or Thing7. Thing6 has the attributes of Thing5 + Thing6; Thing7 has the attributes of Thing5 + Thing7.

Reading UML: "I will pick up the hook. You will see something new. Two Things. And I call them Thing One and Thing Two." -- Dr. Seuss

New iSCSI MIB Table Structure
draft-ietf-ips-iscsi-00.txt
iSCSI MIB Team
4/18/2001

```
                                    ┌─────────────┐
                                    │  iSCSIMgmt  │
                                    └──────┬──────┘
                ┌──────────────────────────┼──────────────────────────┐
        ┌───────────────────┐    ┌──────────────────┐    ┌────────────────────┐
        │ iSCSIConformance  │    │  iSCSIObjects    │    │ iSCSINotifications │
        └───────────────────┘    └────────┬─────────┘    └────────────────────┘
                                  ┌────────────────────┐
                                  │ iSCSIInstanceInfo  │
                                  └────────┬───────────┘
                          ┌────────────────┴────────────────┐
                  ┌──────────────────┐      ┌ ─ ─ ─ ─ ─ ─ ─ ┐
                  │ InstanceObjects  │        InstanceTables
                  └────────┬─────────┘      └ ─ ─ ─ ─ ─ ─ ─ ┘
```

```
      ┌────────────────┬───────────────────┬───────────────────────┐
┌──────────────┐  ┌──────────────┐   ┌──────────────┐      ┌──────────────┐
│ ListenPortInfo│  │  SessionInfo │   │  TargetInfo  │      │ InitiatorInfo│
└──────────────┘  └──────────────┘   └──────────────┘      └──────────────┘
```

ListenPortInfo:
- ListenPort Tables (dashed)
- ListenPort Objects

SessionInfo:
- Session Tables (dashed)
- Session Objects
  - ConnectionInfo
    - Connection Tables (dashed)
    - Connection Objects

TargetInfo:
- Target Tables (dashed)
- Target Objects
  - AccessListInfo
    - AccessList Tables (dashed)
    - AccessList Objects

InitiatorInfo:
- Initiator Tables (dashed)
- Initiator Objects

```
┌──────────┐
│  *Info   │
└────┬─────┘
     │
 ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
 │  ┌──────────────────┐          ┌ ─ ─ ─ ─ ─ ┐
 │  │ *AttributesTable │            Target
 │  └────────┬─────────┘          │  Tables   │
 │     ┌──────────────────┐       └ ─ ─ ─ ─ ─ ┘
 │     │ *AttributesEntry │
 │     └──────────────────┘
 │  ┌──────────────────┐  ▲
 │  │ *StatisticsTable │  :
 │  └────────┬─────────┘  :
 │     ┌──────────────────┐
 │     │ *StatisticsEntry │
 │     └──────────────────┘
 │  ┌──────────┐
 │  │ *Scalars │
 │  └──────────┘
 └ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
    ┌──────────┐
    │ *Objects │
    └──────────┘
```

Dashed boxes saying something like Target Tables are used as a short-hand to denote the structure on the left. Just replace the * with whatever word comes before Tables, and you've got it. Each set of tables contains three tables, plus an object under which to put scalars. Statistics and Attributes are kept separate, so more variables may be added later without making them look disorderly. Each Info structure also contains an Objects structure, under which contained objects may be added with their own tables.

```
 ┈┈┈┈┈┈┈┈┈┈▶
      Augments
```

```
                    ┌─────────────┐
                    │  Instance   │
                    └──────┬──────┘
        ┌──────────────┬───┴──────┬──────────────┐
  ┌──────────┐  ┌───────────┐ ┌──────────┐ ┌──────────────┐
  │  Target  │  │ Initiator │ │ Session  │ │  ListenPort  │
  └────┬─────┘  └───────────┘ └────┬─────┘ └──────────────┘
       │                           │
  ┌──────────────┐         ┌──────────────┐
  │  AccessList  │         │  Connection  │
  └──────────────┘         └──────────────┘
```