



iSCSI Management API (IMA): ANSI Standard to Discover and Manage iSCSI Resources on a Host System

A Storage Networking Industry Association (SNIA), IP Storage Forum, and IP Storage Technical Working Group white paper.

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Introduction

Internet SCSI (iSCSI) is an industry standard developed to enable transmission of SCSI block commands over TCP/IP networks. The iSCSI standard was ratified in 2003 and since then it has gained broad industry acceptance. Many OS and storage vendors have released iSCSI products based on this standard and these implementations have matured over the last 3 years largely due to the innovation, education, and marketing of IP-based SAN Solutions by the SNIA IP Storage Technical Working Group (IPS-TWG), the SNIA IP Storage Forum (IPSF), and the associated member companies.

Wide adoption of iSCSI brings a new kind of problem – how to manage iSCSI initiators in a heterogeneous environment. To solve this problem the SNIA IPS-TWG developed the iSCSI Management Application Programming Interface (IMA) which was approved as an ANSI (American National Standards Institute) standard in August 2007. SNIA is working with INCITS (International Committee for Information Technology Standards) to make IMA an international standard by submitting the standard to the ISO (International Standards Organization).

IMA provides a standard API to configure and manage multiple iSCSI software initiators, iSCSI hardware initiators (HBAs), and network interface cards (NIC) from multiple

vendors without worrying about compatibility. It also eliminates the need for iSCSI management applications to write custom code for different NICs and iSCSI HBAs, making it easier and quicker to support multiple NICs and iSCSI HBAs from different vendors. It also drives down integration and test costs, speeding up the time to get products to market.

IMA Architecture

IMA is architected to be modular, consisting of a library and Plugins. A particular implementation can be developed in one of the following two ways.

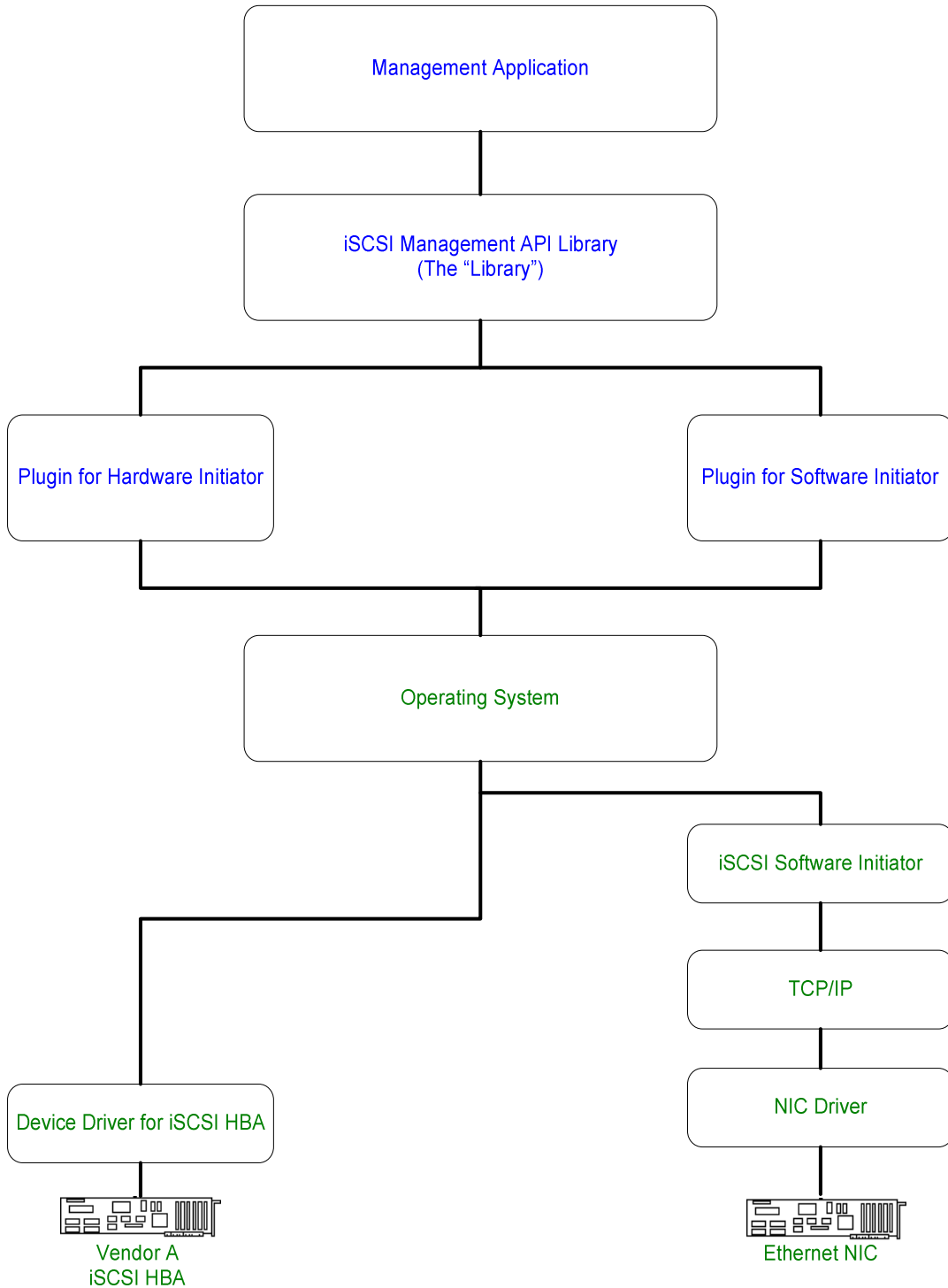
- A library
- A library in combination with one or more plugins.

If an implementation uses a library without plugins then either the plugin functionality is built into the library itself or the library is able to interface with vendor specific modules using a pre-existing interface. These vendor specific modules would provide functionality equivalent to plugins.

The library provides an interface that applications use to perform iSCSI management. Among other things, the library is responsible for loading plugins and dispatching requests from a management application to the appropriate plugin(s).

Plugins are provided by iSCSI HBA vendors to manage their hardware. Typically, a plugin will take a request in the generic format provided by the library and then translate that request into a vendor specific format and forward the request on to the vendor's device driver. In practice, a plugin may use a DLL (Dynamic Link Library) or shared object library to communicate with the device driver. Also, it may communicate with multiple device drivers. Ultimately, the method a plugin uses to accomplish its work is entirely vendor specific.

The figure below shows a simple block diagram of how the iSCSI Management API library and plugins fit into the total iSCSI management application architecture.



IMA Objects

The core element of iSCSI Management API (IMA) is the object ID (OID) which “uniquely” identifies an object. IMA includes the following objects

- PLUGIN
- NODE(iSCSI Node)
- LHBA(Logical HBA)
- PHBA(Physical HBA)
- NETWORK_PORTAL
- PORTAL_GROUP
- TARGET
- Etc.(for a complete list of available object types, please refer to the IMA specification <http://www.t11.org/ftp/t11/admin/iso/07-621v0.pdf>)

These objects are implemented and owned either by the “Library” or a “Plugin”. IMA provides methods that will act on a particular object in addition to set/get various properties associated with that object. When an object ID is supplied as a parameter to an API call, the library uses this value to determine if it should handle the call itself or direct the call to one or more plugins.

Library

The library provides an interface that applications use to perform iSCSI management. Among other things, the library is responsible for loading plugins and dispatching requests from a management application to the appropriate plugin(s).

A typical Library implementation:

- Provides an entry point to all API’s listed in the IMA specification.
- Implements all APIs which are listed as mandatory to implement.
- Attempts to perform or cause the performance of all of the actions that are specified for an API when all parameters to that API are valid.

- Fails an API call if the implementation is aware that one of the requirements specified for that API cannot be satisfied.

Plugins

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Summary

IMA V1.1.6 became an ANSI standard in August 2007 and has been submitted for ISO approval. The SNIA IPS-TWG is working on the next generation of IMA to bring in changes related to security, etc. This new version of IMA will be backward compatible with IMA 1.1.6. With its extensible architecture, IMA will help to speed up the adoption of IP Storage by enabling interoperability between iSCSI initiators, NICs, iSCSI host bus adapters (HBA) and iSCSI management applications through a standard interface. For more information on SNIA standards activities including IMA, visit http://www.snia.org/tech_activities/standards/curr_standards/

About the SNIA IP Storage Forum (IPSF)

The SNIA IP Storage Forum offers a vendor-neutral environment for end users to become informed on the current and future directions of IP-based storage technology. The IPSF is composed of leading IP storage vendors driving the broad adoption of IP-based SAN storage solutions around the world. The IPSF goals are to drive the adoption of IP-based Storage Area Network (SAN) solutions through global marketing initiatives and end-user education. For more information and to become a member, visit www.snia.org/ipstorage