Automation of Storage Provisioning with Storage Provisioning Manager

Surabhi S

M.Tech, SJCE Mysuru

Abstract—Storage Provisioning Manager (SPM) is part of the storage component that provides a secure management interface to storage. Storage Provisioning means assigning storage in terms of server disk space. In order to provision storage, a network is needed. Without SPM, the user must open multiple consoles to provision storage to the server. To establish zoning (connection), user must work with network console as well as storage console and to perform the volume creation he/she must work with Array (Storage device) console. Separate Management Consoles are used to manage Vendor specific storage arrays. With SPM, it is possible to manage the arrays from various vendors with a single User interface. SPM can be used to manage network information also. The current version of SPM UI is not supported on all browsers due the use of Silverlight technology. Hence a new UI development using HTML5 technology has been undertaken.

Index Terms—SPM,LUN(Logical Unit Number),WWN

I. INTRODUCTION

Data centre has three main components: server, network and storage. Communication between these must be made easier. The server has no storage of its own. Server and storage device communicate with the help of network. Storage device is called **Array.** Components of a typical disk array include an integrated subsystem of: Disk controllers (typically RAIDS), Disk drives, Power supplies and Management software.

A storage array has cache memory and advanced functionality, like RAID and virtualization. RAID is commonly known as Redundant Array of Independent Disks or Redundant Array of Inexpensive Disks.

The basic idea of RAID is to combine multiple small, disk drives into an array of disk drives which yields performance exceeding that of a Single Large Expensive Drive (SLED). Additionally, this array of drives appears to the computer as a single logical storage unit or drive. RAID level is from 0 to 6 and any managing software must support all the RAID levels.RAID-5 is the best choice in multi-user environments which are not write performance sensitive.

A **disk array controller** is a device which manages the physical disk drives and presents them to the computer as logical units.

A Storage Array will have one or more storage pools. A storage pool is a group of disk drives and typically configured with a specific RAID level. Each storage pool may have one or more volumes, as known as logical disks. When a volume is presented on a server, it is said to be a LUN. Each LUN will have an identifier, typically identified by a number.

Presenting a volume on a server and ensuring LUN visibility from the server is termed as Storage Provisioning. Once the volume is presented on a server, applications running on the server can store the data on the LUN.

Servers are of different kinds: DL (Density Line), ML (Maximum Expansion),SL(Scalable) and BL(Blade systems).Blade Servers are ideal for Data centers. Blade servers are rack mountable and offer maximum computing power.

A host bus adapter (HBA) is an I/O interface used to connect a host system (server) to other network and storage devices.

Storage Area Network(SAN) is used for connection. SAN is a dedicated storage network which provides access to consolidated, block level storage. SANs primarily are used to make storage devices (such as disk arrays and tape libraries) accessible to servers so that the devices appear as locally attached to the operating system. A SAN typically has its own network of storage devices that are generally not accessible through the regular network by regular devices.

SAN uses storage switches, also known as interconnects, to connect servers and storage devices. A SAN cannot be accessed without an intermediary unit (Server/Mainframe).

SANs are primarily used in a large data environment for data storage. They are expensive to setup, but easy to maintain. SANs provide a central storage area for taking tape backups.

Separate consoles are available for Server, Array and Network. User has to work with multiple consoles like Network, Server and array in order to present volume to the server.

SPM eliminates the need to use multiple consoles by providing all the necessary information about Array, RAID, Server and Network (SAN) in a single user interface and allows user to provision service at once.

II. LITERATURE SURVEY

Insight Management Console is available for Array, Server and Network. In order to provision volume, storage admin has to first create a LUN (volume) in Array. In order to present this volume, he must obtain port details of server by working with Server console. Once this is done, volume is presented to server. The storage admin must also configure the SAN zoning. Zoning specifies which volume is associated with a server and makes it easy to know further.

SPM provides a secure, service-centric management interface to storage, allowing storage requests to be fulfilled with appropriate storage services defined in a storage catalog and securely automating storage management tasks by interfacing directly with storage arrays for controlled execution of various storage operations [1].

Arrays must be made known to SPM using some plug-ins or adapters. New arrays can be integrated into SPM via the creation of a Generic Array Adapter. The responsibility of an adapter is to take operation requests from SPM, perform them on an array, and return response information back to SPM[2].

For traditional storage pool entries that do not use SPM, the request is submitted to the storage administrator using existing processes. The System admin requests Storage admin for storage to be provided. Storage admin creates volume, presents LUN, configures SAN zoning and presents volume to storage using Insight Management Consoles specific to Array and Network. Storage admin provides storage details to the System admin. The elapsed time for these operations can be hours, days or weeks[1].

Manual provisioning involves performance issues. If there is an immediate requirement of storage provisioning, it cannot be allotted when required. There is no fast response with manual provisioning.

SAN configuration, RAID requirements and other requirements must be specified by the user every time. There is no automation in the overall process. This degrades performance. Hence some automation is required to improve responsiveness.

Existing SPM UI is not supported on all browsers. Additional plug-in is required to use the product. Current version of SPM can only run on Internet Explorer (IE). It has limited portability and cannot be used in hand held devices.

Current implementation is done using Silverlight. Microsoft stops Silverlight support in the upcoming years and Silverlight requires additional plug-in. Hence a migration is needed.

III. PROPOSED SOLUTION

Storage Provisioning Manager (SPM) is a Graphical User Interface (GUI) based application that automates the process of provisioning storage service to the server.
Array, Network and Provisioning operations can be performed with a single user interface.

The details of Array and Network are imported into SPM catalog. Catalog is a file based storage that stores Array and network information.

System admin requests SPM for provisioning service. Storage admin creates the volume but zoning is automated.
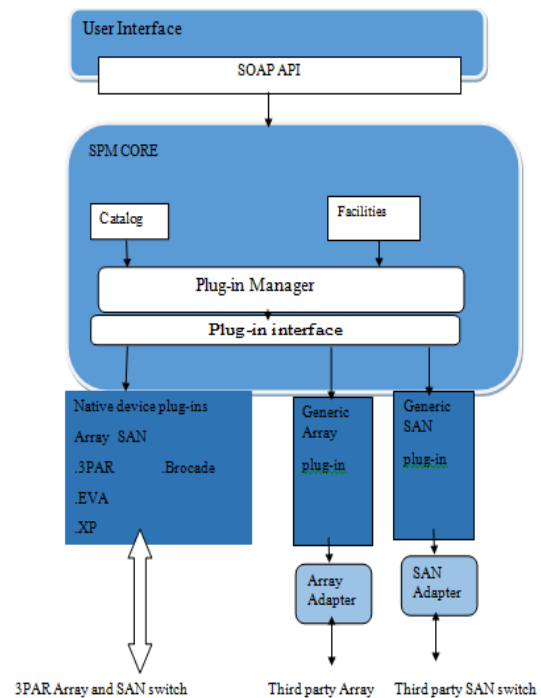

Figure 1 Proposed SPM Architecture

The User Interface is changed to Single Page Application (SPA) architecture and MVC (Model View Controller) pattern from Silverlight. The main objective is to build a more interactive application which is supported by all major browsers without requiring any additional plug-ins.

In SPA, the client sends requests to server and server replies back with the entire html page. The entire client page is loaded only during the initial request and for the subsequent interactions, the request response is Ajax. With Ajax requests, entire page is not loaded; only the portion of the page requiring update is loaded. This approach saves time taken for the reloading of entire page.

Model includes all the necessary data for application. View is presented to user and Controller acts as an interface between the SPM Core and the View. SOAP calls to SPM Core are made at Controller level.

View consists of CSHTML and Angular JS. This pattern is supported on all browsers. No additional plug-in is required to run the application. It is portable to hand-held devices as well.

User interface provides a secure interface for communication with SPM. Multiple screens are presented to the user after authenticated user logs in. User can make selections for importing array, storage pools, volumes and other operations.

Security is achieved using zoning and authentication. Authentication is achieved using a Login screen.

SPM Core has catalog and facilities. Catalog is a database that stores details of imported resources. Catalog is queried to obtain results for various operations performed.

Facilities are authentication and the way of querying the SPM Core.

A plug-in is a library that contains one or more provider implementations, that work together to extend SPM for a common purpose. For example, a plug-in may add support for a new class of storage devices, or define a new requirement type that can be used in storage requests.

Each plug-in provides basic information, such as author and version, to the plug-in manager by implementing a plug-in info class.

Plug-in manager discovers, loads, and then exposes externally developed functionality to the other core components.

Arrays and SAN switches can be attached to plug-ins.

If Array and Network configuration are not known, adapters are used to make know the configuration details to SPM.

The two main functionalities are importing resources and provisioning storage to server.

a) Importing resources

Importing resource is to store the details of resources(array, volume, storage pool, and network) in the SPM catalog.

To import any resource, its credentials are to be provided. Array username, password must be entered. Array is imported if the credentials match.

Once credentials match, list of resources are displayed. This includes domain information also. User can make the selection. Once user selects the required resource, the resource is imported into catalog. All the details of resources are placed in the catalog.

b) Storage Provisioning

Storage provisioning is presenting a volume to the server (host). If requirements are added, it is called service provisioning. Array and Storage details are selected. Required volume can be chosen from array.

Host details include entry name, operating system and LUN number to be chosen.

Zoning is done to specify network details to present volume. A World Wide Number (WWN) is provided which is the unique identifier of Host Bus Adapter (HBA). HBA is an I/O interface connecting server with network and storage devices.

Once volume and zoning information is provided, the service is provisioned. Service can be given a name and a short description.

MVC design pattern is supported on all browsers. No additional plug-in is required. It gives more responsiveness compared to the existing one.

The application can be easily ported onto handheld devices and it is highly portable.

IV. CONCLUSION

Storage provisioning manager is software that provisions storage to servers automatically.

SPM provides an authenticated connection to various resources like arrays and network, does zoning and provisioning automatically and thus reduces user effort.

Migration from current implementation technology improves performance and responsiveness and enhances browser support.

REFERENCES

[1] Faster storage provisioning in the HP Matrix Operating Environment, Technical white paper,hp.
[2] Storage Provisioning Manager (SPM), Array Adapter Development Specification,Version 2.2.2
[3] Storage Provisioning Manager Plug-in Developers Guide, Hewlett-Packard Company
[4] Wikipedia.org
[5] HP Storage Provisioning Manager (SPM) User Guide
[6] SPM adapter for EMC® Symmetrix® VMAX®