Make Storage Management Automation a Reality

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Management Tasks Are Time – Consuming

![Graph showing time distribution of staff in different tasks.](image-url)
Storage Outages Are Persistent

Unplanned/Planned Storage Outage

- Vendor Hardware/Software Failure: 72%
- Natural/Unnatural Disaster: 11%
- Vendor Support Patch Failure: 8%
- Human Error: 39%

Source: Storage – Wave 18 | © 2014 451 Research, LLC. www.451research.com
a. **Most automation tools today specialize in focused areas**: Application, Server, Cloud, Process.

b. There are two types of Automation products; **Stand-alone and Embedded**.

c. All automation tools are composed of three main functions; **Workflow Design Studio, Automation Engine and Integration Framework**.

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**HDS Target Automation**

HDS automation focuses on simplifying use and management of HDS infrastructure.

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**Source:**
- Know the IT Process Automation Vendor Landscape to Shortlist the Best Vendors for Your Organization, Gartner, 26 August 2013
- Best Practices for Implementing Automation in Data Centers With Cloud and Virtualized Environments, Gartner, 30 August 2013
Improving the Storage Provisioning Process

TYPICAL PROVISIONING PROCESS

1. Storage request received
2. Provisioning process does not enable proper data placement
3. Storage is provisioned without optimized placement process
4. Costly, inefficient storage allocation, probably on Tier 1

POOR VISIBILITY

WASTEFUL PROVISIONING
Automation Director Enables Intelligent Storage Configurations

SERVICE CLASS OPTIMIZED PROVISIONING PROCESS

1. Standardized service class storage request received
2. Service classes reconciled against catalog
3. Allocation aligned to catalog’s tiers of service
4. Cost-efficient storage allocation

COST EFFICIENT PROVISIONING
Features

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Hitachi Automation Director – Product Overview

- Intelligent infrastructure automation
  - Leverages and requires Hitachi Command Suite (HCS)

- Storage focus (Initially)
  - Provisioning (First release)
  - Optimization (Future release)
  - Resilience (Future release)

- Infrastructure as a Service
  - Service Catalog
  - Application integration

- Significant operating expenditure (opex) savings
  - Abstraction of storage infrastructure
  - Intelligent automation engine (placement)
  - Defined / repeatable services

Key Features

**Intelligent Engine**
- Matches storage to request
- Distributes workload

**Service Portal**
- Self-service
- Predefined services – best practices
- Service builder

**End to End**
- Provisioning
- Replication
- Apply thresholds
- VMware connectivity

**CLI / API**
- RESTful API
- Controls services
- Application integration focus
HAD: Solution Overview

**Predefined Services**

- Add new service template
  - Developer of Hitachi partner
  - Developer of Customer

- Customize/Store/Share Expert knowledge
  - Expert Storage Admin

- Easily execute services in safety
  - Novic Storage Admin

**Service Catalog**

- = Admin’s own Services
- Administer Policies
- Perform Services

**Black Box on Infrastructure Classes**

- Automation Engine & Abstraction

**Hitachi**

- Provide Best/Good practice

**Developer of Hitachi partner**

**Developer of Customer**
HAD Core Features & Best Practice Services

Core Features

- **Abstraction Layer**
  - Storage Classification
  - Infrastructure Group
  - Service Grouping

- **Infrastructure Support**
  - Multiple Hitachi Device Manager (HDvM) Support
  - Full HDS Block Array Support
  - Hitachi Dynamic Tiering (HDT) & Hitachi Dynamic Provisioning (HDP)
  - Support

Best Practice Services

- **Provisioning Services**
  - Oracle DB Provisioning
  - SQL Server, Exchange
  - Xen Desktop on HyperV Cluster, Vsphere
  - Generic Application Service

- **Automation Engine**
  - Execution Engine W/ Scheduler
  - Task Management
  - HTML5 UI
  - REST API

- **Application Integrated Services**
  - VMware Datastore
  - Oracle Database Expansion

- **Service Builder w/ Workflow Components**
  - Smart Provisioning
  - In System Replication
  - Add-like Provisioning
Service & Task Management

- Template, Service and Task

- Workflow definition
- Environment independent
- Portable (import/export)
- Created using Service Builder

- Deployed template to be executable
- Environment dependent
- Configured for the environment
- Created on HAD Server

- Unit of actual execution
- Scheduled task
- Stop, suspend/resume
How to use “service” and “template”? 

Create 4 variations from the same template

Select a service along with requests

Storage Provisioning Service Catalog

- Provisioning Service (High Performance)
- Provisioning Service (Low Cost)
- Provisioning Service (Large)
- Provisioning Service (Small)

Service Administrator

Provisioning Template

Production group

High Performance

Large size

Account group
Smart Provisioning Process Overview – Pool Selection

Set of Selectable Pools

1. Separate pools into 2 groups ((a) and (b))

   (a) Pools where the **Usage Rate** is lower than the average

   - UR=5%
   - UR=20%
   - UR=70%
   - UR=20%
   - UR=5%
   - UR=20%

   **Step 2**

   Ascending sort by the **Busy Rate**

   - Pool 1: UR=5%, BR=10%
   - Pool 2: UR=20%, BR=15%
   - Pool 3: UR=20%, BR=30%
   - Pool 4: UR=5%, BR=40%
   - Pool 5: UR=20%, BR=70%

   (b) Pools where the **Usage Rate** is higher than the average

   - UR=70%
   - UR=40%
   - UR=70%
   - UR=70%
   - UR=40%
   - UR=70%
   - UR=20%
   - UR=20%

   **Step 3**

   Ascending Sort by the **Usage Rate**

   - Pool 6: UR=40%
   - Pool 7: UR=70%
   - Pool 8: UR=70%

Smaller **Busy Rate** is prioritized

Smaller **Usage Rate** is prioritized

**Data collection interval of “Busy Rate” can be customized by HDvM property file setting**

**UR**: Usage Rate

**BR**: Busy Rate

* Pool **Usage Rate** is calculated using allocated capacity in HDT/HDT pools.

* Busy Rate is the performance metric of Parity Group that is related with the pool.
The following operation type of templates are provided as pre-defined.

<table>
<thead>
<tr>
<th>Storage Operation Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocate Volumes</td>
<td>Provide intelligent selection of pool by capacity and performance</td>
</tr>
<tr>
<td>Allocate Volumes with Replication</td>
<td>Add pair configuration of In-system replication (V1:Shadow Image)</td>
</tr>
<tr>
<td>Allocate-like Volumes</td>
<td>Allocate a new volume of similar type with already allocated volume</td>
</tr>
</tbody>
</table>

**Replication**

![Replication Diagram]

**Allocate-Like**

![Allocate-Like Diagram]
Smart Provisioning – Predefined Templates

The following application type of templates are provided as pre-defined.

<table>
<thead>
<tr>
<th>Application Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Database</td>
</tr>
<tr>
<td>VMware Datastore</td>
</tr>
<tr>
<td>SQL Server</td>
</tr>
<tr>
<td>Exchange</td>
</tr>
<tr>
<td>XenDesktop on Hyper-V Cluster</td>
</tr>
<tr>
<td>XenDesktop on vSphere</td>
</tr>
<tr>
<td>Generic application service</td>
</tr>
</tbody>
</table>

- Typical volume usage of application specific is already defined.
  - e.g., data volume, redo log volume, archive volume

- Volume capacity and number of volumes are already defined based on Global Support Services’ best practice.
Automation Director provides Application Integrated templates to provide pre-defined end-to-end type of templates.

- **Oracle DB Expansion**
  - Allocate Volumes + Oracle Disk Group Expansion
  - Allocate-like Volumes + Oracle Disk Group Expansion

- **VMware Datastore Creation**
  - Allocate Volumes + Vmware Datastore Creation
Automation Director connects to multiple Device Managers
- to gather storage system information
- to operate storage systems

Specify credential of HDvM account who can access resources on HDvM

Link & Launch to Device Manager is available to deep storage management
Classification criteria of Storage based on physical characteristics

- Pool type (HDP/HDT)
- Array Type (Hitachi Virtual Storage Platform G1000 (VSP G1000), Hitachi Virtual Storage Platform (VSP), Hitachi Universal Storage Platform V (USP V), Hitachi Unified Storage VM (HUS VM), Hitachi Unified Storage 100 (HUS 100), Hitachi Adaptable Modular Storage (AMS))
- Disk Type (SSD/SAS 15K/SAS 10K/SATA)
- Internal / External
- RAID level (0/1/0+1/5/6)
- Disk size
- Number of drives in pool

Can be specified in Service Definition

Will be used for pool selection of Smart Provisioning
HAD select a proper pool for provisioning based on
- Storage Profile – specified in Service definition
- Infrastructure Group – accessible from Service (Service Group)

If IG-1 is accessible and needs **Gold** Tier storage, Select one of pools here
Configuration – How Smart Provisioning and Configuration Work

Smart Provisioning service determines an appropriate pool from Storage Class among multiple arrays, HDvMs and HTnMs in the capacity and performance perspective. Admins can manage their infrastructure as Black Box.

Production Dev Accounting
Platinum Storage Class
Gold Storage Class
Silver Storage Class
HCSA SQL Service

Just select and submit a service

Vol Use: Database
# Vols: 5
Class: Platinum
Vol Use: Log
# Vols: 2
Class: Silver

RG x SCG
HDvM 1 HDvM 2 HDvM 3 HDvM 4
HTnM
HTnM
HTnM
HTnM
HTnM
HTnM
HCSA

HAD

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Access control is managed by grouping and association with access privilege

- **User Group** – permission to Service Group (submit / modify)
- **Service Group** – assign Infrastructure groups as accessible resources
- **Infrastructure Group** – group of resources managed by HDvM
Configuration – Service Grouping and Access Control

Role – What permissions User Group has for a Service Group

Assign – What resources Service Group can access to

User Group

Permission Management

Service Group

Users

Submit

Infrastructure Group

Resource Group

Resource Management

Device Manager

Device Manager

Manage Resource

Services
Service Builder Overview

- Service Builder provides features to enable customers to customize their Template.
  - Modify a template (including product’s predefined template) to fit them into their datacenter operation.
  - Create a brand new service component (be a step of a service flow) by utilizing existing customer’s automated scenario (implemented in a OS script) for utilizing into their own template. (Refer to appendix)

- Service Builder is a powerful tool for a developer to create templates
- User can create a new template reusing and extending existing templates of Smart Provisioning
- Service Builder provides several plug-ins as building blocks of templates
- Service Builder has also capability to create new plug-ins

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Service Builder Overview

- Keywords for understanding basics of the Service Builder

**Plug-in component** *

A plug-in component is a fundamental component of a Template. A Template may contain multiple plug-in components to perform its purpose.

**Flow**

The flow defines the processing sequence of plug-in components. Each Template requires a flow.

**Step**

The step is the executed unit of a flow. Plug-in components are executed at each step of the flow. A step provides property information at the time of execution.

*Use Plug-in components like “Email Notification Plug-in” and so on, can customize user’s own template as needed.*
Flow of Use Case – Service Builder

- **Use Case**
  Add a function to a template by putting an existing plug-in component into the service.

1. Copy an ‘Allocate Volumes for Oracle’ Template as a base.

2. Put an Email Notification Plug-in
REST API (overview)

- REST based web API
  - a web service using HTTP following REST principles.
  - easy to integrate web application which is capable for HTTP communication

- Operations/interfaces using the HTTP methods.
  - using GET, PUT, POST, DELETE for target resources

- API request format will be in the form of a hypertext string (XML/JSON)

- API response format has provision to provide either a XML and/or JSON data.
  - The format of the response data will be controlled via a parameter in the request data.

- Most of functions on Graphical User Interface (GUI) is available via API
  - Service management (submit/edit), task management, group management, etc.
HAD API is designed and implemented in **REST** format. The HAD API has the following resources as an operation target. All functions are implemented as an operation for one of these resources.

<table>
<thead>
<tr>
<th>#</th>
<th>Resource</th>
<th>Example of function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Service</td>
<td>Get a list, Submit, Edit, Delete, etc.</td>
</tr>
<tr>
<td>2</td>
<td>Schedule</td>
<td>Get a list of scheduled services, Cancel, etc.</td>
</tr>
<tr>
<td>3</td>
<td>Task</td>
<td>Stop a task, resubmit a task, Archive a task, etc.</td>
</tr>
<tr>
<td>4</td>
<td>TaskHistory</td>
<td>Get a list, Delete a task history, etc.</td>
</tr>
<tr>
<td>5</td>
<td>PropertyDefinition</td>
<td>Get a properties of a service, etc.</td>
</tr>
<tr>
<td>6</td>
<td>PropertyValue</td>
<td>Get a list of property value, edit, etc.</td>
</tr>
<tr>
<td>7</td>
<td>ServiceGroup</td>
<td>Creating a service group, etc.</td>
</tr>
<tr>
<td>8</td>
<td>Other resources</td>
<td>Get a user information, Get a version information</td>
</tr>
</tbody>
</table>

* Note that all API list is available in Appendix.
Questions and Discussion

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Upcoming WebTechs

- **WebTechs**, 9 a.m. PT, 12 p.m. ET
  - *Storage Virtualization Is Dead or Long Live Storage Virtualization?*, February 26
  - *Social Innovation – Transform to Thrive*, March 11
  - *IT Economics Transparency*, March 25

- **Check** [www.hds.com/webtech](http://www.hds.com/webtech) for
  - Links to the recording, the presentation, and Q&A (available next week)
  - Schedule and registration for upcoming WebTech sessions

Questions will be posted in the HDS Community: [http://community.hds.com/groups/webtech](http://community.hds.com/groups/webtech)
Thank You