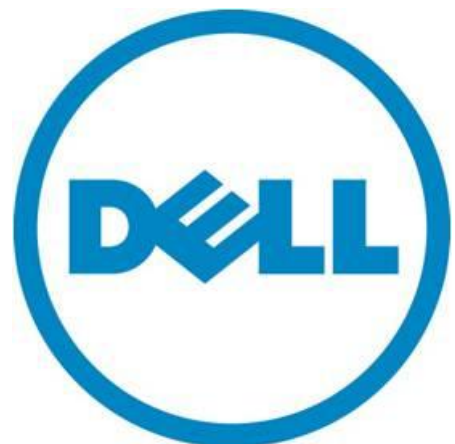


Provisioning and Extensibility Overview for Dell VIS Self-Service Creator

A Dell Technical White Paper

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Overview

With the advent of private cloud, end-to-end provisioning must be completely automated and zero touch. When a user requests a new workload, all aspects of the provisioning process must occur automatically and completely.

This white paper provides an overview of provisioning, extensibility, and integration options available with VIS Self-Service Creator. Due to the depth of VIS Self-Service Creator capabilities, we are focusing on key deployment methods of VMware Clones, WIM Imaging, RHEL Kickstart, and extensibility surrounding those provisioning methods within this white paper. Implementation details on these, or other provisioning methods, are available in the *VIS Self-Service Creator User Guide*.

This white paper does not discuss the mapping of your specific IT and business policies, procedures, and standards into the VIS Self-Service Creator, which is critical for a successful implementation. Dell Global Services consultants provide both planning and implementation support for VIS Self-Service Creator and virtualization environments. For additional details on Dell Global Services offerings, refer to <http://www.dell.com/services>.

Details on the underlying hardware and hypervisor configuration utilized to support VIS Self-Service Creator solutions are available in a separate Dell white paper, “VMware vSphere Reference Architecture for Small Medium Business”, available at <http://www.dell.com/virtualization/businessready>. Additional reference architectures are available at <http://www.dell.com/vis> that may meet your needs.

VIS Self-Service Creator Concepts

Within this white paper, we utilized several VIS Self-Service Creator specific terms. For readers who are not familiar with VIS Self-Service Creator, we provide a brief description of each term we utilize.

Custom Properties: User-defined name-value pairs that are used extensively within VIS-Self Service Creator. This may also refer to system-defined name-value pairs. These name-value pairs may contain a wide variety of information including system owner, workload details, or customer defined settings.

Build Profile: A user-defined list of custom properties which may be associated with one or more blueprints. These are typically used to define a set of properties that may be applied to multiple blueprints.

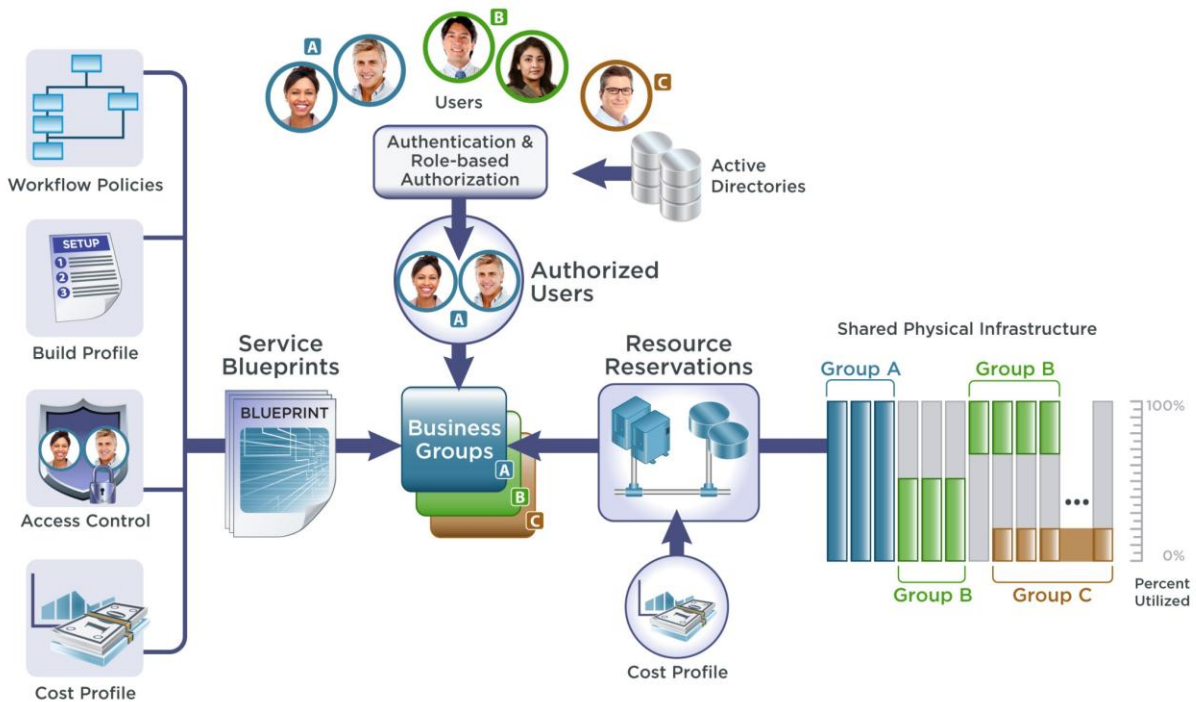
Blueprints: The construct used to define the lifecycle of a workload including approval requirements, provisioning methods, custom properties, lease, and archival time. Blueprints may be accessible by one or more provisioning groups. Blueprints also may include a single build profile.

Provisioning Group: The method of identifying users or groups who can access VIS Self-Service Creator. Users or groups may be granted access to one or more roles within the provisioning group, including administrative, support, and end-user roles. Users may be a member of one or more provisioning groups. Access to blueprints is also defined at the provisioning group.

Reservations: The method in which an administrator allocates resources to a provisioning group. Reservations are comprised of the targeted hypervisor, memory allocation, storage path selection, network settings, and usage allocation.

For more details on these or other terms, refer to the *VIS Self-Service Creator User Guide*.

Figure 1: VIS Self-Service Creator Overview



Workload Lifecycle

Virtually everything has a lifecycle associated with it. In the IT world, the lifecycle of a workload typically starts with the requestor's original requirements and ends with the final decommissioning of the workload. At its core, VIS Self-Service Creator manages the complete lifecycle of workloads in your environment. The workload lifecycle can be defined into six steps:



VIS Self-Service Creator provides users a self-service portal to select and deploy resources automatically and manage the resource throughout its lifecycle. The out-of-the-box workflows help to automate workload deployment and management for virtual servers and desktops. Each of these workflow steps can also be extensively customized to meet the needs the organization.

Next, we will describe extensibility and integration options available within VIS Self-Service Creator.

Extensibility and Integration Options

VIS Self-Service Creator offers a variety of methods to customize the user's experience, leverage existing provisioning systems and integrate with existing business processes. While many of these features are available through the user interface or custom scripting, the most advanced extensibility features may require support from Dell Services to achieve full benefit. In this section, we provide an introduction to the extensibility and integration options.

Scripting Framework

VIS Self-Service Creator provides administrators a robust scripting framework that enables the setting and retrieval of custom properties for use throughout the provisioning process. Custom properties are name-value pairs that can be set by administrators at multiple levels within VIS Self-Service Creator including reservation, build profile, and blueprints. These custom properties are tracked on a workload by workload basis. Optionally, custom properties may also be displayed to workload requesters and approvers for additional input.

At multiple event-driven stages in the workload lifecycle, administrators can execute scripts utilizing this robust framework. The executed scripts are granted access to all properties associated with the specific workload. In addition to reading custom properties, the executing scripts can create or modify the custom properties associated with the request for consumption by later scripts. For organizations with well-defined IT lifecycle processes, administrators can often execute their existing provisioning script with little or no modification.

Table 1 contains a small subset of sample custom properties provided by VIS Self-Service Creator. For a complete list, refer to the *VIS Self-Service Creator User Guide*.

Table 1: Sample Custom Properties

Custom Property Name	Description
VirtualMachine.Admin.Name	Name of the machine as generated by VIS Self-Service Creator.
VirtualMachine.Admin.Owner	Username of the machine's owner.
VirtualMachine.Admin.Hostname	Name of the host on which the machine resides.
VirtualMachine.Memory.Size	Size of the machine's memory in MB.
VirtualMachine.Storage.Name	Storage path the machine is on.
VirtualMachine.CPU.Count	Number of CPUs allocated to a machine.
VirtualMachine.Network0.MacAddress	MAC address of network device N.
VirtualMachine.Network0.Name	Name of network to which network device N in machine is attached.

RESTful API

For advanced integration with business process management systems, existing corporate portals, or other systems, the VIS Self-Service Creator RESTful API provides a common method of communication. Services available through the RESTful API include workload requests, workload controls (power on, power off, etc), and reporting information. The RESTful APIs are integrated with a robust security framework to control access. Due to the advanced nature of the RESTful API, an engagement with Dell Services is recommended to achieve optimal integration.

Custom Workflows

At its core, VIS Self-Service Creator is a powerful workflow engine based on Microsoft Windows Workflow Foundations. Working with Dell Services, customers can create powerful new workflows and models within VIS Self-Service Creator. This advanced integration and customization provides virtually limitless opportunities to customize VIS Self-Service Creator to work with your existing environment and business processes. To integrate custom workflows, an engagement with Dell Services is required.

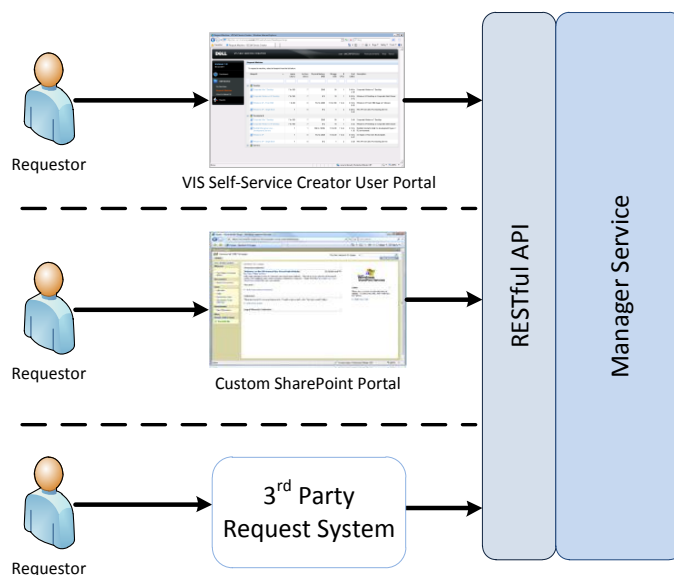
The scripting framework, RESTful API, and Customer Workflows can be utilized in various steps of the workflow. For the remainder of this whitepaper, we will discuss each step of the workload lifecycle in detail and explain potential customization options to meet your business needs.

Request Workflow

The workload lifecycle starts with the request. Out-of-the-box, VIS Self-Service Creator offers a rich web-based user portal for authorized users. The portal allows users to request workloads from an administrator defined catalog. This provides the administrator the ability to grant access to the right workloads to the right users.

Provisioning groups are the VIS Self-Service Creator concept of grouping users within your organization. Users can be members of one or more provisioning groups. For instance, your sales team may need to be part of the sales provisioning group, but not part of your development provisioning group. Provisioning group membership is defined and controlled by Active Directory groups and user accounts. Custom integration with external LDAP services is also available.

Figure 2: Request Workflow Extensibility



The request workflow has various customization and integration options. Within the administrator’s UI, the portal can be easily rebranded with the customer’s logo and name. With the assistance of Dell Services, the comprehensive customization of the self-service portal is possible. Customizations ranging from esthetic changes to the expansion of the portal are possible using the framework with VIS Self-Service Creator.

Advanced integration with a third party system such as Microsoft SharePoint or BMC Remedy is also possible. Custom integration can trigger the provisioning of the workload on VIS Self-Service Creator for customers who currently manage workload requests through Microsoft SharePoint. At the appropriate step in the Microsoft SharePoint workflow, a RESTful API call is performed to the VIS Self-Service Creator server, starting the workflow. Integration with existing corporate portals is also possible, utilizing the RESTful API.

Approval Workflow

VIS Self-Service Creator provides customers the ability to create complex, multi-level approval workflows. Approval workflow possibilities vary from no approval, to complex multi-level approvals. Each approver is notified both by email and by in-application notification of an approval requiring their attention. At each step, approvers can approve or deny the request. Additionally, custom properties associated with the specific request can be modified. Examples of these properties include the daily cost associated with the requested workload.

Approvals may also be required only when a request exceeds levels defined by the administrator, such as vCPU count, memory size, storage size, or lease time. Requests below these defined limits may proceed without the need for further approval.

VIS Self-Service Creator may be configured to request approvals both before the provisioning process starts and after it completes. If your organization requires security or administrator signoff of newly built machines, specific team approvals can be requested after the provisioning process has completed, but prior to sending notification to the requesting user. In environments where the provisioning

process is not completely automated end-to-end, this also provides an opportunity for manual intervention.

With custom integration, workflows may be modified to allow the approval actions via email or through external systems such as Microsoft SharePoint.

Provisioning Workflow

Since all environments are not the same, VIS Self-Service Creator offers a variety of workflows to integrating with your existing environment. Integration options are available at multiple touch points enabling maximum flexibility. In this section, we will discuss provisioning by VMware templates, WIM provisioning, and RHEL Kickstart. Refer to the *VIS Self-Service Creator User Guide* and *Support Matrix* for details on other provisioning methods.

Pre- and Post-Provisioning Scripts

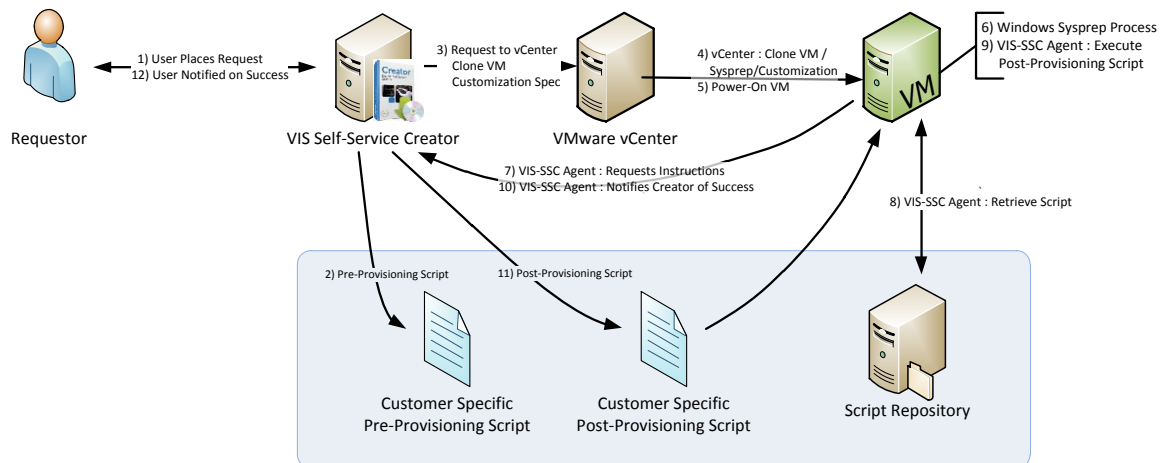
Prior to the execution of the workload provisioning process, some organizations require preparatory work to be executed. VIS Self-Service Creator can be configured to execute a pre-provisioning script to complete any necessary preparatory work. Some potential uses for pre-provisioning scripts include the pre-configuration of enterprise certificates. Since this script executes through the scripting framework, it will have access to read or modify the custom properties. These custom properties can be utilized to pass name-value pairs to other scripts executed during post-provisioning.

Once the provisioning process is complete, a second script can be executed to complete any post-provisioning work. For instance, information regarding the new workload may need to be populated in a configuration management database or network management system. Through the scripting framework, a customer created script may access custom properties including machine owner, workload description, and lease time for use in updating the configuration management database (CMDB) or network management system (NMS).

VMware Templates

The most popular method of virtual machine provisioning is by leveraging VMware clones. In many mature VMware environments, VMware Template clones are utilized for most, if not all, provisioning requests. VIS Self-Service Creator leverages the functionality of vCenter to instantiate these clones to provisioned workloads.

Figure 3: VMware Template Extensibility Overview



With VMware clones, administrators create a master image (template) and a customization spec within vCenter. VMware Template clones provide an easy way to build and maintain a master image. VMware customization specs provide the ability to customize your OS deployments. For Windows OSs, customization specs also alleviate the need for administrators to sysprep systems and create potentially complex sysprep.xml or sysprep.inf files.

Requestors may be offered options to customize their workload size to meet their needs. Memory size and vCPU count may be selected from an administrator defined range. Additionally, administrators have the option to override the VMware Templates disk allocation methodology to require thick or thin allocation of storage.

Window specific customization options, including administrator password, domain joining credentials, license key, and the computer accounts target organizational unit in Active Directory, are set within the vCenter customization specification. With the use of a custom workflow, a customer specific post-provisioning script can be executed on the guest operating system.

Linux deployment also utilizes vCenter Customization Specification for basic time zone, DNS, and domain settings. In addition, VIS Self-Service Creator can execute a customer provided script post-clone. Administrators specify the script's path on the clone's local disk or NFS mount. Since this script executes within the VIS Self-Service Creator framework, it has access to all custom properties and the ability to create new properties.

Once the provisioning process is completed, a post-provisioning script may be executed. A common use for a post-provisioning script is to utilize the custom properties to install workload specific software such as web servers or database servers. Additionally, these scripts can be utilized to further automate the deployment process. In some environments, these scripts are used to update network monitoring systems or inventory databases with key information regarding the newly created workload, including system owner or user provided description.

vCenter Template cloning is a very disk intensive operation. By default, VIS Self-Service Creator limits itself to two concurrent clone operations; however this maximum can be increased if needed. To achieve the best possible clone performance, Dell recommends utilizing storage arrays, like Dell EqualLogic arrays, that implement VMware vStorage API for Array Integration (VAAI.) VAAI can offload the clone of the VMware template to the array, resulting in a substantial decrease in clone time and clone induced network load.

WIM Imaging

Windows Imaging Format (WIM) is a Microsoft specific file-based imaging technology used to deploy Windows Operating Systems. With WIM imaging, it is possible to deploy Windows XP, Windows 7 and Windows 2003/2008 workloads to VMware, Microsoft Hyper-V R2, and XenServer Hypervisors.

Preparation

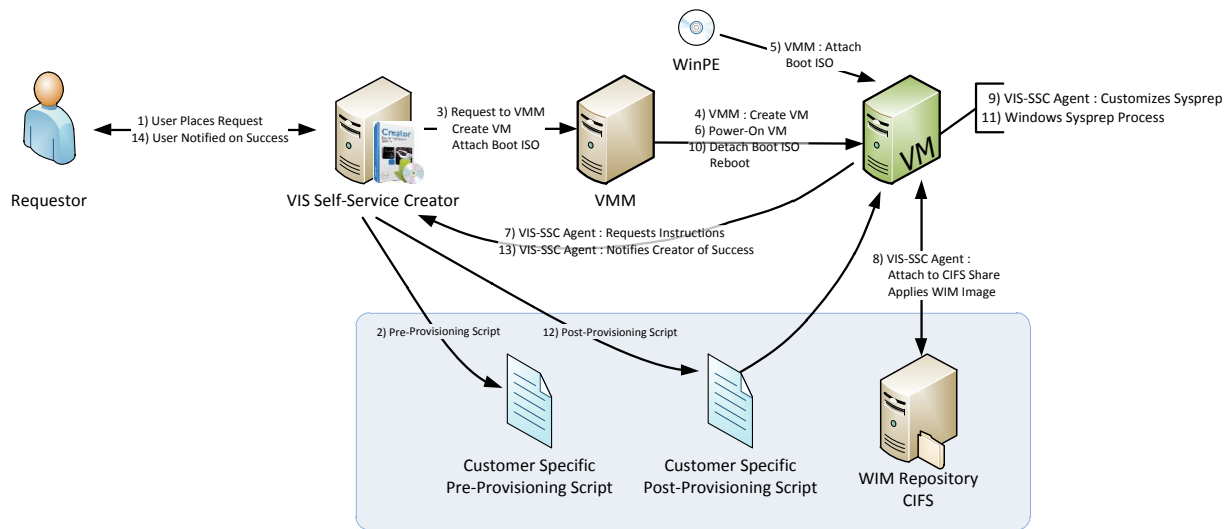
WIM Imaging is a manually intensive process compared to VMware cloning. To create a master image, administrators typically create an empty virtual machine, then install and configure the operating system and other applications. Since different hypervisors present virtual hardware differently, it is recommended for master image creation to occur on the same hypervisor as the workload is targeted for deployment. For instance, a WIM image created on a Hyper-V Virtual Machine (VM) may not function appropriately when deployed in a VMware VM.

Once the master image is created, the administrator must create a sysprep.inf or unattend.xml file, sysprep the image, and power off the VM. To ease future updates of the master image, it is advisable to take a hypervisor level snapshot prior to executing sysprep. While in the powered-off state, the master image is captured using the Microsoft ImageX utility and stored on a CIFS accessible file server. Typically this is accomplished by booting into a WinPE environment.

Deployment

VIS Self-Service Creator leverages existing WIM imaging provisioning ecosystems. Provisioning workloads from a WIM image requires a modified WinPE boot disk. VIS Self-Service Creator includes a utility to quickly build the customized WinPE boot disk. During the request process, requestors may customize the virtual machines vCPU, memory, and storage size within administrator specified limits.

Figure 4: WIM Imaging Extensibility Overview



Utilizing the custom WinPE boot disk, the WIM image is deployed from the customers WIM CIFS share. Once the image is deployed, VIS Self-Service Creator can modify the sysprep.inf or unattend.xml files utilized by the Windows SysPrep process during first boot. Sysprep settings are defined as custom properties within VIS Self-Service Creator. With an .inf-based version of Sysprep, as used in Windows XP and Windows 2003, any setting can be changed or added. With .xml-based versions of Sysprep, as used in Windows 7 and Windows 2008, key sysprep settings listed in Table 2 can be modified.

Table 2: Modifiable Sysprep Properties for Windows 7 & 2008

Sysprep Section	Sysprep Property
GuiUnattended	AdminPassword
	EncryptedAdminPassword
	TimeZone
UserData	ProductKey
	FullName
	ComputerName
Identification	OrgName
	DomainAdmin
	DomainAdminPassword
	JoinDomain
	JoinWorkgroup

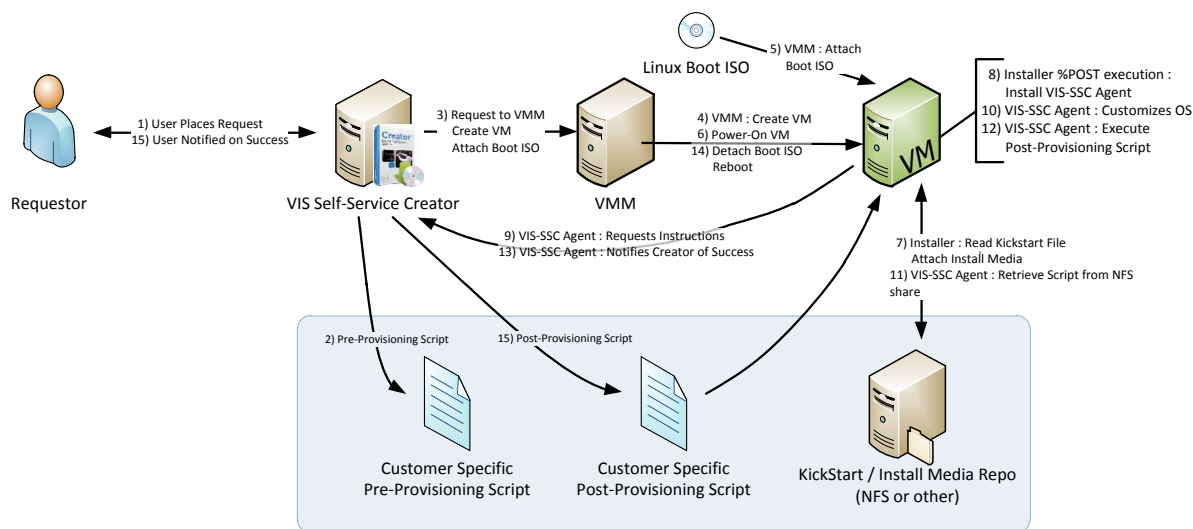
For multi-national environments, where time zones need to be set appropriately to the end users locality, the WIM image can be modified on a per request basis without the need to create and maintain multiple WIM images or utilize group policy objects (GPOs). Additionally, Active Directory and license key information can be modified to allow the use of a common WIM image over multiple domains or business units.

With the use of a custom workflow, post-provisioning scripts can be executed within the guest OS system utilizing the VIS Self-Service Creator scripting framework. Through the use of custom properties, the customer may be prompted for specific software to be installed. A common use would be to install new Windows features, such as IIS, that was not part of the base WIM image.

RHEL Kickstart

Red Hat Kickstart is a scripting installation method utilized primarily, but not exclusively, by Red Hat Enterprise Linux (RHEL). At its core is the kickstart.cfg file, an installation answer file consumed by Anaconda, the Red Hat installer. For organizations with a large Linux installation, kickstart is a very popular deployment method allowing advanced customization of the deployed workload. With Red Hat Kickstart, Linux workloads can be provisioned to VMware, Microsoft Hyper-V R2, and XenServer Hypervisors.

Figure 5: RHEL Kickstart Extensibility Overview



VIS Self-Service Creator utilizes a customer-provided Linux boot ISO to start the kickstart process. Embedded within the boot ISO is the location and name of the kickstart.cfg file to be utilized. VIS Self-Service Creator leverages the customer’s existing kickstart provisioning environment and method with the minor addition of a runtime agent executed at the end of the kickstart %post section. The runtime agent will configure hostname, DNS, and IP, if necessary.

Additionally, the agent can execute a customer-provided script post-install. Administrators can specify the path of the script on local disk or NFS mount. Since this script executes within the VIS Self-Service Creator framework, it has access to all custom properties and the ability to create new properties. Common uses include the installation of software packages or the synchronization of content to newly provisioned systems.

SUSE AutoYaST

VIS Self-Service Creator integrates with the AutoYaST process in a similar method as RHEL Kickstart. With AutoYaST, Administrators modify the AutoYast.xml to install and execute the VIS Self-Service Creator runtime agent. Other than this change, the integration and functionality is similar to the RHEL Kickstart, as described above.

Other Out of the Box Methods

In addition to the methods listed above, VIS Self-Service Creator offers support for a variety of OS Provisioning, Connection Brokers, and post-provisioning installation systems. Refer to the *VIS Self-Service Creator Support Matrix* for specific supported versions and the *VIS Self-Service Creator User Guide* for information regarding depth of integration and features supported.

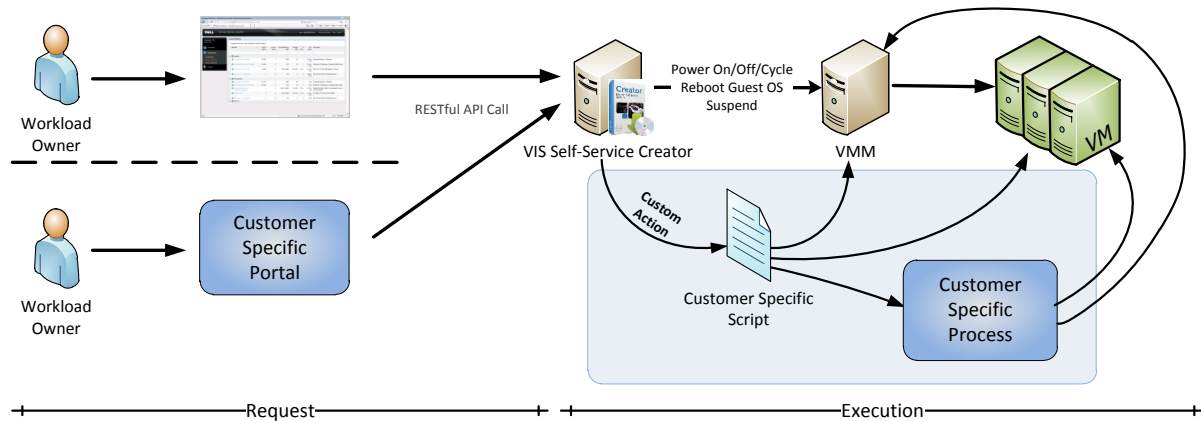
Custom Provisioning Methods

The modular-workflow-based approach of VIS Self-Service Creator allows the addition of new provisioning workflows. With assistance from Dell Services, IT organizations that have different or unique provisioning methods can create custom workflows to automate their existing provisioning processes. For example, custom workflows can integrate with various internal corporate databases such as Oracle or SQL to gather internal data to make decisions within a workflow. Additionally, VIS Self-Service Creator can integrate with SharePoint to fetch IP addresses, machine names or other key information.

Manage Workflow

Once the workload provisioning process has completed, the workload moves into the manage phase. During this phase, the workload is up, running, and ready for end user use. To provide more functionality to the workload owner, VIS Self-Service Creator allows event-driven execution of workload tasks through the end-user portal.

Figure 6: Manage Workflow Extensibility Overview



Workload management features built into VIS Self-Service Creator include the ability for end-users to reboot the guest OS, power-cycle, power-on, and power-off workloads. Access to these actions can be controlled by the administrator on a blueprint-by-blueprint basis. Each request is sent to the appropriate hypervisor which executes the requested action.

Also available is the option to re-provision the workload. With re-provisioning, the running workload is shutdown, deleted, and rebuilt using the provisioning workflow. Since it is an existing workload, hostname and static IPs remain constant, new approvals are not required, and the lease time is not extended. This is an excellent fit for test and development environments where users need the ability to rebuild workloads quickly and without administrator interaction.

Custom Integration

For organizations that require additional functionality, VIS Self-Service Creator contains an extensible event-driven framework to execute customer business logic (workflows or existing scripts). By modifying an XML-based configuration file, administrators are able to dynamically extend the end-user portal by adding the customer’s tasks to the workload context menu. Tasks available for user execution are controlled on a blueprint-by-blueprint basis.

For example, if a user needs to kick off a VM level snapshot, the administrator can create a script utilizing VMware PowerCLI to connect to vCenter and execute the snapshot creation. If the user needs to roll back the snapshot, another script can be executed to roll back the snapshot. These scripts execute within the VIS Self-Service Creator framework and have access to read, modify, and create custom properties associated with the workload.

Virtually any task that can be scripted can be executed through VIS Self-Service Creator. Typically, these tasks are specific to the organization’s needs, such as the synchronization of content to a webserver or restarting of processes.

With Dell Services, integration can be extended further into a robust snapshot management portal. Extensions to the VIS Self-Service Creator User Interface allow a Snapshot Manager portal where users can create, commit, and rollback snapshots.

Archive Workflow

The archive workflow is triggered at the end of the workloads lease. Out-of-the-box, the VM is gracefully powered down and remains in this state until the archive time expires. If your environment requires more extensive functionality, a post-execution script may be called. Some customers may wish to move the workload from your production tier-1 storage pool to a lower tier of storage during the archive period. By leveraging a VMware PowerCLI script, the workloads VMDK file can be migrated to a lower tier of storage.

Destroy Workflow

At the end of the workload lifecycle is the destroy workflow. During this workflow, the workload is removed from VIS Self-Service Creator and deleted from disk.

Prior to the execution of the destroy workflow, a pre-workflow script can be executed. One common use is for organizations that have data protection requirements such as Sarbanes-Oxley. Prior to the deletion of the workload, a customer-provided script can copy the virtual disks to alternative, long-term storage.

Out-of-the-box, VIS Self-Service Creator also provides features to clean up Active Directory (AD). Once the workload is deleted, the AD computer account can be disabled, deleted, renamed, or moved to another Active Directory Organizational Unit.

If further cleanup processes are necessary, a customer-specific post-execution script may be executed. Configuration management databases or network monitoring systems can be notified of the deletion of the workload. This aids in keeping those systems up-to-date without the need for manual intervention.

Summary

VIS Self-Service Creator provides customization and extensibility options to integrate seamlessly with existing provisioning and business processes. Utilizing the rich scripting framework, Administrators are able to utilize their existing environment with little modification. For advanced customizations, the RESTful API and custom workflows provide virtually limitless integration options.

Additional Resources

- *VIS Self-Service Creator User Guide*, <https://partners.dynamicops.com/DellVISCreator>
- *VIS Self-Service Creator Release Notes*, <https://partners.dynamicops.com/DellVISCreator>
- *VIS Self-Service Creator Reference Architectures*, <http://www.dell.com/vis>
- *VIS Self-Service Creator Support Matrix*, <http://www.dell.com/vis>
- *VMware vSphere™ Reference Architecture for Small Medium Business*, <http://www.dell.com/virtualization/businessready>
- *EqualLogic White Papers & Tech Reports*, <http://www.equallogic.com/resourcecenter/documentcenter.aspx>