IT as a Service: Simplifying Application and Storage Provisioning Using NetApp OnCommand Workflow Automation and System Center Orchestrator 2012 R2

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Abstract

NetApp® OnCommand® Workflow Automation (WFA) provides a mechanism for standardizing data center automation activities. It enables one-click automation and deployment of Microsoft applications by enabling the use of best practices related to NetApp storage. This report describes the integration of WFA with System Center Orchestrator (SCO) to execute WFA workflows through the WFA REST APIs.
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1 Overview

1.1 Problem Statement
With the progressive increase in the utilization of server, network, and storage resources, data centers over time are susceptible to sprawl. Virtualization of storage and servers has, to a certain extent, addressed this sprawl. In order to further increase the simplicity and flexibility, cloud computing offers a compelling solution to eliminate software silos.

1.2 Automating Microsoft Application Installation and Storage Provisioning
Automating and virtualizing Microsoft applications on NetApp storage delivers significant benefits, including:

- Server and storage hardware cost reduction
- Space and power savings
- Improved server use
- Simplified management
- A repeatable, proven process to deploy the infrastructure
- Reduced human error, resulting from fewer manual processes
- Advanced storage management, provisioning, backup, and data recovery features
- A shared virtual infrastructure that supports multiple platforms and applications

1.3 Technology Solution
This integration pack–based solution is a tightly integrated software automation and management stack based on Microsoft System Center and NetApp OnCommand Workflow Automation components. Our goal is to provide an integrated deployment and management experience that allows customers to easily implement on-premises Microsoft application environments in both production and test environments.

NetApp OnCommand Workflow Automation (WFA) is a powerful framework for automating application deployment tasks along with storage management tasks, and it enables efficiency, flexibility, and repeatability of best practices in a NetApp storage infrastructure. WFA comes with predefined, supported base building blocks, including the capability to customize and extend the workflow templates to suit specific customer scenarios. It also features a REST Service API to allow WFA workflows to be triggered from an orchestration application.

System Center Orchestrator (SCO) software integrates enterprise management systems and automates standard operations. It provides out-of-the-box workflows for data centers and can also be extended and customized to suit particular deployment requirements.

This document describes the steps to build an Orchestrator Integration Pack (OIP) using the SCO 2012 R2 Quick Integration Kit command-line interface (QIK CLI) and PowerShell that can be imported into SCO 2012 R2. It provides the necessary parameters to invoke the WFA REST APIs that are used to execute and manage the WFA storage automation workflows in the form of templates. This document contains:

- An architectural overview of how SCO and OnCommand WFA can be integrated
- An overview of the WFA REST API and the SCO operations available with the integration
- A walkthrough of how to execute the SCO flows in the OIP to execute any other WFA workflow

1.4 Use Case Summary
Automation is a key theme among modern data center administrators that enables most administrators to automate almost every aspect of their daily operations, including application deployments and repeated storage management tasks. This package is a multipurpose platform designed to accommodate
application workloads in an enterprise setting and it is also for lab environments. Before delving into what this platform offers, let’s discuss the challenges faced by storage and application administrators.

- Automate application and storage provisioning.
- Reduce storage provisioning round-trip time.
- Empower application admins to provision application and storage based on their expertise.
- Make sure that best practices are followed.
- Provision application and storage for disaster recovery and data archival based on the RPO and RTO.

The key features that this solution offers are:

- Easier deployment of enterprise applications
  The solution enables application administrators to choose and execute the workflow by filling in a minimal set of values. WFA and SCO make sure that application and storage are provisioned from the right resource pool and presented to the right host. Easier deployment is enabled by the use of PowerShell in the form of WFA templates that automate the Microsoft application installation. The template provides enormous flexibility to install the required parameters for each application.

- Storage provisioning
  The solution enables the creation of provisioning workflows in WFA. It also assigns resource pools and access control to templates appropriately. Storage provisioning is provided by NetApp Data ONTAP® procedures based on a consistent architecture. All operational procedures developed through the use of these allow consistency of operations and permits the solutions team to provide operational tools.

- Workload-optimized storage
  With NetApp Unified Storage Architecture, All Flash FAS (AFF), and other flash technologies, this framework enables the workload to be organized based on specific tiers and characteristic requirements. As a result, administrators can maintain the necessary service-level agreement and control resource utilization while multiple workloads are deployed on the same platform.

2 Software Components and Integration

This section describes how the solution components are integrated to implement the desired level of automation and provisioning. In this architecture, SCSM is leveraged to provide customized self-service provisioning and lifecycle management along with a secure portal where authorized administrators, developers, or business users can request new IT services and manage existing resources.

In this report, SCSM leverages SCO workflows, specifically, NetApp OIP packages for WFA, to call WFA for storage provisioning and management. The storage automation can extend from providing simple LUN provisioning all the way to managing entire data center environments and their associated storage.

The sections that follow provide a technical walkthrough of individual components, their setup details, and workflow configurations to provide automated provisioning solutions in a virtualized data center.
2.1 NetApp Workflow Automation

The NetApp OnCommand management software portfolio delivers a suite of monitoring and automation tools used to simplify storage-related tasks, especially in large shared-storage infrastructures. NetApp WFA is a framework used to automate storage-provisioning tasks. It combines feature richness and simplicity and can be customized easily to support specific needs and scenarios. WFA comes with predefined base building blocks to fulfill individual provisioning requirements.

Using WFA provides the following advantages:

- Eliminates manual intervention for storage management tasks such as provisioning, migration, and decommissioning.
- Reduces long provisioning cycles.
- Eliminates the possibility of errors that may occur during manual configuration.
- Optimizes the storage systems in order to leverage it fully for a specific application.
- Allows easy migration to cloud since using the cloud requires a high level of automation, which cannot rely on manual processes.
- Allows the orchestration of storage automation architecture and general-purpose data center to meet customers’ process needs.


A standard compliant WSDL interface enables triggering WFA workflows from almost any source and orchestration software. WFA relies on NetApp OnCommand for an up-to-date overview of the storage landscape.

NetApp OnCommand Unified Manager provides a single human interface and an application programming interface (API) for integration with other types of management software. The API uses well-
defined XML objects for communication to provide transparency and interoperability. For easy integration, the NetApp Manageability Software Developer’s Kit provides libraries for all major programming languages that use the NetApp DataFabric® Manager API.

2.2 Quick Integration Kit

The SCO 2012 R2 Quick Integration Kit (QIK) enables you to extend your library of activities with new custom integration packs and activities. QIK features a command-line interface (CLI) wizard that allows you to describe how to run CLIs (such as Windows commands, SSH, or PowerShell) and capture their output as published data.

2.3 System Center Service Manager for Service Catalog

System Center 2012 Service Manager provides an integrated platform for automating and adapting your organization’s IT service management best practices, such as those found in Microsoft Operations Framework and the Information Technology Infrastructure Library. It provides built-in processes for incident and problem resolution, change control, and asset lifecycle management.

Assumption

NetApp assumes that relevant WFA workflows exist to demonstrate how discovery, execution, and tracking status work. NetApp also assumes that SCSM-SCO integration is already in place. Creating WFA workflows is beyond the scope of this document. For more information about creating WFA workflows, refer to the NetApp WFA Community page.

Integration: Getting Started

This section describes how to build a custom OIP using System Center Orchestrator 2012 R2 and the System Center 2012 R2 Orchestrator Integration Toolkit.

The QIK CLI wizard provides a mechanism for quickly creating activities without the need for programming by utilizing the readily available libraries of PowerShell from Microsoft and other community sources.

The following procedure demonstrates how to use the QIK CLI to build an integration pack.

1. Start the Opalis QIK CLI installation wizard and complete the installation by following the instructions on the screen.
After the default installation of QIK, a shortcut appears on your desktop.

2. Launch the Orchestrator QIK CLI wizard and click Next.
3. Enter the name and location where the assembly file will be created. Click Next.

4. Click Add.
5. In the Add/Edit Command window, enter the name of the command and select the mode as Run Windows PowerShell.

6. In the Arguments tab, enter the following PowerShell script to invoke the WFA workflow. From the Parameters section, select and add the parameters that will be passed to the script.

```
Set-ExecutionPolicy remotesigned -Force; .\ExecWF-Mod-PSV2-WebService.ps1; Invoke_WFA_Workflow -arg '($arg)' -wfaserverhostname '$(wfaserverhostname)' -uuid '$(uuid)' -wfname '$(wfname)' -wfapassword '$(wfapassword)' -wfausername
```
7. In the Published Data tab, select and add the variable names that will be published as output from the script.

8. Click Next and wait for the process to create a .NET assembly.
9. After the wizard completes, click Build Integration Pack to start the creation of OIP.

10. Enter the OIP details and select the resource file dll, created in the previous step.
11. Click Next. The Activities page appears with the OIP name selected.

12. Click Next and select the .ps1 file that contains the code to invoke the web services to invoke the WFA workflow.
13. Select the Orchestrator OPI path and name. Click Next and wait for the OIP creation to complete.
14. Use the Deployment wizard to register the OIP created previously with the Orchestrator Management Server. Deploy the OIP to run the book designer.

15. Launch the Deployment Manager wizard.

16. Next, register the OIP into the Orchestrator server. Right-click Integration Packs and select Register IP with the Orchestrator Management Server.

17. Click Next.
18. Click Add and browse to select the OIP created using the QIK.

19. Click Next and click Finish to register the OIP with the Orchestrator Management Server.
20. After the OIP is registered and appears in the Integration Packs list, right-click the OIP and select Deploy IP to Runbook Server or Runbook Designer.

21. Select the OIP from the list and click Next.
22. Select the computer name, which in our case is the local orchestrator server. Click Next.

23. Click Next to complete the installation/deployment of the OIP to the Runbook Server/Designer and accept the default settings.
24. Wait for the wizard to complete deploying the OIP to the Orchestrator Server.

After the deployment completes, the OIP appears in the list of orchestrator packs under the Activities pane.
25. Create a new runbook and drag and drop the OIP into the runbook. Double-click Invoke WFA Workflow OIP to view a list of parameters that can be used to invoke a desired workflow.

Calling a WFA Storage Workflow from Service Manager (SCSM)

Next, let’s modify the runbook created previously and add an initialized data element that passes the data from initialized data to invoke the WFA workflow. The Initialize Data OIP is configured to receive input from the SCSM self-service portal for storage provisioning.
Next, log in to the SCSM portal that has the SCSM and orchestrator integration configured. Invoke a PASS element that internally calls the Orchestrator runbook and provisions the storage for the applications.

**Integrating WFA in SCSM Self-Service Portal**

This section discusses how the System Center 2012 R2 Orchestrator and Service Manager components enable deploying and managing service offerings and how System Center responds to end-user service requests. This capability allows administrators to automate, standardize, and offer self-service IT processes in the private and public cloud. Refer to the following link to integrate Service Manager and Orchestrator with examples.

Figure 2 shows an example of the NetApp Self Service Portal for application and storage provisioning in a private cloud. It provides different offerings such as Microsoft application provisioning, VM provisioning, and storage provisioning, and it passes the necessary parameters to SCO and, in turn, to the WFA.
Tracking Status: Understanding the Results of the Execution

You can monitor the status of the execution by issuing a REST GET operation for failure or completion. Alternatively, administrators can log into WFA and monitor the execution status, as shown in the following screenshots.
3 Conclusion

This solution enables on-demand provisioning and management of Microsoft applications such as Exchange, SQL, SharePoint, and Lync from a self-service portal. OnCommand Workflow Automation can be used to store the necessary templates to install and customize application deployments. These templates can be modified to meet specific customer scenarios.

With this solution, application administrators can deploy applications on appropriate storage tiers to optimize the performance needs of the applications.

This solution provides in-depth monitoring capabilities with the virtue of OnCommand Insight, which analyzes tier assignments and allows you to load-balance your entire application portfolio across the storage fabric. It enables improving application performance and driving up the efficiency levels of your existing storage resources in order to maximize resource investment.

Appendix

PowerShell Script

```powershell
powershell {
function Invoke_WFA_Workflow {
    param(
        [Parameter(Mandatory=$True,ValueFromPipeline=$True,ValueFromPipelineByPropertyName=$True)]
        [string[]]$arg,

        [Parameter(Mandatory=$True,ValueFromPipeline=$True,ValueFromPipelineByPropertyName=$True)]
        [string[]]$wfaserverhostname,

        [Parameter(Mandatory=$True,ValueFromPipeline=$True,ValueFromPipelineByPropertyName=$True)]
        [string[]]$uuid,

        [Parameter(Mandatory=$True,ValueFromPipeline=$True,ValueFromPipelineByPropertyName=$True)]
        [string[]]$wftemplateid
    )
}
}```
$wfname, $wafpassword, $wfausername

# Function to pretty-print XML
function WriteXmlToScreen ($xml) {
    $StringWriter = New-Object System.IO.StringWriter
    $XmlWriter = New-Object System.Xml.XmlTextWriter $StringWriter
    $xmlWriter.Formatting = "indented"
    $xml.WriteTo($XmlWriter)
    $XmlWriter.Flush()
    $StringWriter.Flush()
    Write-Output $StringWriter.ToString()
}

# Credential - admin:admin
$password = ConvertTo-SecureString $wafpassword -AsPlainText -Force
$credential = New-Object System.Management.Automation.PSCredential ($wfausername, $password)

$URI1 = "https://$wfaserverhostname/rest/workflows/$uuid/jobs"
$URI2 = "https://$wfaserverhostname/rest/workflows?name=$wfName"

$body = "<workflowInput>
    <userInputValues>
    <userInputEntry value='$arg' key='stringArgument'/>
    </userInputValues>
    <executionDateAndTime></executionDateAndTime>
    <comments></comments>
</workflowInput>"

# Disable certificate validation using certificate policy that ignores all certificates
add-type @"using System.Net;

    public class IDontCarePolicy : ICertificatePolicy {
        public IDontCarePolicy() {}
        public bool CheckValidationResult(
                ServicePoint sPoint, X509Certificate cert,
                WebRequest wRequest, int certProb) {
            return true;
        }
    }
"
[System.Net.ServicePointManager]::CertificatePolicy = new-object IDontCarePolicy

# Execute the rest call.
Try {
    # Example: Execute a Workflow
    echo "$URI1";
    $output = Invoke-WebRequest -Uri $URI1 -Credential $credential -Method Post -ContentType application/xml -Body $body
    # Example: Get Workflow Information
    #echo "$URI2";
Extracting Properties of a Workflow

```powershell
#$output = Invoke-WebRequest -Uri $URI2 -Credential $credential -Method Get -ContentType application/xml
}
Catch
{
    echo $_.Exception | format-list -force
}
#WriteXmlToScreen ([xml]"$output")
}

$hostname = "10.72.71.49";
$uuid = "f7c89b22-21a0-4a7f-80b2-b6d8bb33b1c9";
$wfname = "TestWorkflow";
#>
References

NetApp OnCommand Workflow Automation Community Site

The NetApp WFA Community site has a substantial amount of information related to WFA and how to get started orchestrating and automating your storage in the cloud.

OnCommand Workflow Automation Training

NetAppU also offers the WFA 2.0 Getting Started Series to assist those who want to learn how to use WFA for automation and orchestration. You need your NetApp credentials to access this training.

The following training videos are also available in the communities at this time:

- Workflow Automation Technical Introduction
- Building Your First Workflow
- Applying Role-Based Access Control to Your Workflows
- Building Your First Script-Based Custom Data Source Using a File
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