IBM Tivoli Storage Productivity Center

Workflow User's Guide

Version 4.1

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> **Note:**
> Before using this information and the product it supports, read the information in "Notices" on page 31.

Contents

Preface

IBM Tivoli Storage Productivity Center is a suite of storage infrastructure management software that can centralize, automate, and simplify the management of complex and heterogeneous storage environments. IBM Tivoli Storage Productivity Center can help to improve storage capacity utilization and administrative efficiency. It is an agile storage infrastructure that can respond to on demand storage needs.

Who should read this guide

This publication is intended for administrators or users who are using IBM® Tivoli® Storage Productivity Center and IBM Tivoli Provisioning Manager (or alternatively IBM Tivoli Intelligent Orchestrator). It presents the use of storage provisioning workflows. To perform the tasks described here, you may need to refer to the user guides for IBM Tivoli Storage Productivity Center and IBM Tivoli Provisioning Manager. See "Publications" for the installation manual titles and order numbers.

What this guide contains

This guide contains the following chapters:
- Chapter 1, "Introduction," on page 1

  Introduces workflows and the entities involved in the provisioning process.
- Chapter 2, "Installing and configuring Tivoli Storage Productivity Center storage workflows," on page 3

  Describes a sample installation.
- Chapter 3, "Automating storage provisioning with IBM Tivoli Storage Productivity Center workflows," on page 9

  Describes how to use the storage provisioning workflows with the graphical user interface.
- Chapter 4, "IBM Tivoli Storage Productivity Center workflows as building blocks," on page 15

  This chapter gives development information and lists workflows and sub-workflows by type.
- Chapter 5, "Workflow scenario," on page 21

  A scenario is provided to walk you through the process of using workflows with the graphical user interface.
- Chapter 6, "Troubleshooting," on page 25

  Lists log file names and describes common problems.

Publications

This section lists publications in the IBM Tivoli Storage Productivity Center library and other related publications. It also describes how to access publications online, how to order publications, and how to submit comments on publications.

IBM Tivoli Storage Productivity Center publications

The following table lists IBM Tivoli Storage Productivity Center publications.

Publication Title	Order Number
IBM Tivoli Storage Productivity Center Installation and Configuration Guide	GC32-1774
IBM Tivoli Storage Productivity Center User's Guide	GC32-1775
IBM Tivoli Storage Productivity Center Messages	GC32-1776
IBM Tivoli Storage Productivity Center Command-line Interface Reference	GC32-1777
IBM Tivoli Storage Productivity Center Problem Determination Guide	GC32-1778

IBM Tivoli Provisioning Manager publications

The following table lists IBM Tivoli Provisioning Manager publications.

Publication Title	Order Number
Tivoli Provisioning Manager Release Notes	GI11-4706
Tivoli Provisioning Manager Installation Guide for Windows	GC32-1654
Tivoli Provisioning Manager Installation Guide for Linux	GC32-1655
Tivoli Provisioning Manager Installation Guide for AIX	GC32-1656
Tivoli Provisioning Manager Installation Guide for Solaris	GC32-1666
Tivoli Provisioning Manager Migration Guide for Windows	GC32-1657
Tivoli Provisioning Manager Migration Guide for Linux	GC32-1658
Tivoli Provisioning Manager Migration Guide for Unix	GC32-1659
Tivoli Provisioning Manager Problem Determination and Troubleshooting Guide	GC32-1660

IBM Tivoli Intelligent Orchestrator publications

The following table lists IBM Tivoli Intelligent Orchestrator publications:

Publication Title	Order Number
Tivoli Intelligent Orchestrator Problem Determination and Troubleshooting Guide	GC32-1650

IBM International Technical Support Center publications (Redbooks and Redpapers)

The International Technical Support Center (ITSC) publishes Redbooks® and Redpapers, which provide information on specialized topics. You can order publications through your IBM representative or the IBM branch office serving your locality. You can also search for and order books of interest to you by visiting the IBM Redbooks home page at: http://www.redbooks.ibm.com/redbooks.

The following Redpaper contains information on how Tivoli Provisioning Manager models storage components and how those components are managed using Tivoli Storage Productivity Center workflows:

Title	Order Number
An Introduction to Storage Provisioning with Tivoli Provisioning Manager and Tivoli Storage Productivity Center	REDP 3900-00

Translations

Selected publications have been translated into languages other than American English. Contact your IBM representative for more information about the translated publications and whether these translations are available in your country.

Accessing publications online

You can access all IBM Tivoli Storage Productivity Center publications in the IBM Tivoli Storage Productivity Center Information Center. The following Web site includes a link to the Information Center:

http://www.ibm.com/servers/storage/software/center/index.html

The Information Center contains the most recent version of the books in the product library in PDF or HTML formats, or both. Translated documents are also available for some products.

You can access the *Developing automation packages* guide from the Tivoli Provisioning Manager Information Center at the following web site:

http://publib.boulder.ibm.com/infocenter/tivihelp/v13r1/topic/com.ibm.tivoli.tpm.wkf.doc/workflows/cwkf_wkfovw.html

Note: If you print PDF documents on other than letter-sized paper, select the **Fit to page** check box in the **Adobe® Acrobat Print** dialog. This option is available when you click **File → Print**. **Fit to page** ensures that the full dimensions of a letter-sized page print on the paper that you are using.

Ordering publications

You can order many IBM Tivoli Storage Productivity Center publications online at the following Web site: **[Wrong site]**

```
http://www.ibm.com/shop/publications/order
```

You can also order by telephone by calling one of these numbers:
* In the United States: 800-879-2755
* In Canada: 800-426-4968

Providing feedback about publications

If you have comments or suggestions about the product and documentation, provide your feedback at the following Web site: http://www.ibm.com/systems/support/storage/software/tpc/

Contacting customer support

For support for this product, you can contact IBM customer support in one of the following ways:
* Go to the technical support Web site by starting at http://www.ibm.com/servers/storage/support/software/tpc/.

- Customers in the United States can also call 1-800-IBM-SERV (1-800-426-7378).
- International customers should consult the Web site for customer support telephone numbers.

You can also review the *IBM Software Support Handbook*, which is available on our Web site at http://techsupport.services.ibm.com/guides/handbook.html.

When you contact customer support, be prepared to provide identification information for your company so that support personnel can readily assist you. Company identification information may also be needed to access various online services available on the Web site. See "Reporting a problem" for details.

The support Web site offers extensive information, including a guide to support services (the IBM Software Support Handbook); frequently asked questions (FAQs); and documentation for all IBM Software products, including Release Notes®, Redbooks, and white papers. The documentation for some product releases is available in both PDF and HTML formats. Translated documents are also available for some product releases.

Reporting a problem

Please have the following information ready when you report a problem:
- The Fabric Manager version, release, modification, and service level number.
- The communication protocol (for example, TCP/IP), version, and release number you are using.
- The activity you were doing when the problem occurred, listing the steps you followed before the problem occurred.
- The exact text of any error messages.

Depending on the problem, you may also want to provide the following information:
- The switch vendor, model, and firmware level
- The HBA vendor, model, driver level, OS platform it is running with
- The storage device vendor, model, and code

Chapter 1. Introduction

A workflow is a series of steps that can be run sequentially on IBM Tivoli Provisioning Manager or IBM Tivoli Intelligent Orchestrator to provision your environment automatically. Using the storage workflows provided by IBM Tivoli Storage Productivity Center, you can automate most of the steps of what today is the manual process of storage provisioning to compensate for the increasing demand and complexity of storage. These workflows provide control and configuration of IBM and major vendors' products and can be run consistently and without error by any level of administrator or operator.

The following tasks apply specifically to storage management through IBM Tivoli Storage Productivity Center:

- Run the workflows provided to perform zone management and storage volume management operations
- Use the Java™ helpers to create customized workflows or customize the workflows that are provided to meet your needs (rather than starting from scratch to create your own workflows).

For details about performing the two tasks described above, refer to the following information, which is available in the Tivoli Provisioning Manager online Information Center:

- The online help
- *Developing automation packages*

A detailed example of using storage workflows is presented in Chapter 5, "Workflow scenario," on page 21.

Tivoli Provisioning Manager represents systems and their components by Data Center Model (DCM) objects, which are instances of DCM logical devices. For each DCM logical device, a set of attributes and a set of logical device operations are defined. Each operation can be a basic operation on a device, an invocation of a workflow, or an invocation of another logical device operation on the same or on another device. The workflows translate the logical device operations into commands that are specific to the underlying physical device.

The following descriptions summarize the entities involved in the provisioning process:

logical device operation
> A logical device operation (LDO) provides a layer of abstraction from the physical operations defined by specific device drivers or workflows. Different device drivers can implement device-specific operations for the same set of logical device operations. A logical device operation is not device-specific, but the workflows called by a logical device operation are device-specific. For example, creating a volume on an IBM storage device is different from creating a volume on an EMC storage device. A different set of workflows are used for different storage devices. Therefore, you invoke the logical device operation rather than directly invoking the workflows.

workflow
> A workflow is a representation of the steps that are performed in a data

center environment in order to complete a provisioning operation. A workflow can be called from other workflows. In this way, workflows make it possible to create a library of processes and best practices that can meet any data center process requirement.

Java helper

Java helpers, which are used in workflows, provide the interface interaction with data center devices. Java helpers are simply another method by which you can interact with data center components. They allow you to accomplish tasks that otherwise cannot be accomplished via the native workflow language (like invoking web services, or parsing XML documents, and so forth).

Chapter 4, "IBM Tivoli Storage Productivity Center workflows as building blocks," on page 15 describes the workflows and logical device operations supported by Tivoli Storage Productivity Center. For additional details, see the automation package README file.

Chapter 2. Installing and configuring Tivoli Storage Productivity Center storage workflows

To use the storage provisioning workflows, you will need to use two machines: one running IBM Tivoli Storage Productivity Center and one running IBM Tivoli Provisioning Manager. All components of IBM Tivoli Storage Productivity Center must be installed on the same machine. You must have a license for Tivoli Storage Productivity Center Standard Edition. For more information about licenses, see the *IBM Tivoli Storage Productivity Center Installation and Configuration Guide*.

Note: Either Tivoli Provisioning Manager or Tivoli Intelligent Orchestrator may be installed. Tivoli Provisioning Manager is a subset of Tivoli Intelligent Orchestrator. The instructions and documentation are available at http://www.ibm.com/ software/tivoli/products/prov-mgr/ (for Tivoli Provisioning Manager) and http://www.ibm.com/software/tivoli/products/intell-orch/ (for Tivoli Intelligent Orchestrator). This installation assumes that Tivoli Provisioning Manager is being used. In the context of this manual, Tivoli Provisioning Manager and Tivoli Intelligent Orchestrator may be considered synonymous.

Agent Coexistence

What do we mean by "coexistence"? Coexistence refers to the ability for the Tivoli Provisioning Manager and Tivoli Storage Productivity Center agents to reside on the same endpoint (managed server) at the same time.

Tivoli Provisioning Manager and Tivoli Storage Productivity Center both rely on the Tivoli Common Agent Services to provide any necessary agent management infrastructure. In order for the Tivoli Provisioning Manager and Tivoli Storage Productivity Center Common Agents to coexist on the same endpoint at the same time, they must be installed in unique directories and listen on unique ports.

By default, the Common Agent listens (binds) on three TCP ports: 9510, 9514 and 9515. There are three scenarios that must be considered when planning for Common Agent coexistence between Tivoli Provisioning Manager and Tivoli Storage Productivity Center.

Scenario 1: Tivoli Provisioning Manager is already deployed to the data center (before Tivoli Storage Productivity Center is installed).

If Tivoli Provisioning Manager has already been deployed to the data center, it is likely that the agents will have already been deployed to all of the endpoints, thus these default ports will already be bound to the Tivoli Provisioning Manager Common Agent. In this situation, it is necessary to specify a different port (other than 9510) when performing the installation of the Tivoli Storage Productivity Center Common Agent. The Tivoli Storage Productivity Center Common Agent installer will take the base port specified by the user, add four and five to that number and occupy the resulting port numbers. For example, if you specify port 9540 during the Tivoli Storage Productivity Center agent installation wizard, the agent will occupy ports 9540, 9544 and 9545 upon successful installation. Also note that the Tivoli Storage Productivity Center Common Agent must be installed to a different directory than the Tivoli Provisioning Manager Common Agent which is already installed.

If you are performing a silent installation of the Tivoli Storage Productivity Center Common Agent, these are the parameters in the setup_agents.iss response file that must be modified to accomodate these changes:

-P installLocation="<insert_some_unique_location>"
-V varCAPort="9540"

Scenario 2: Tivoli Storage Productivity Center is already deployed to the data center (before Tivoli Provisioning Manager is installed).

If Tivoli Storage Productivity Center has already been deployed to the data center, it is likely that the agents will have already been deployed to all of the endpoints, thus these default ports will already be bound to the Tivoli Storage Productivity Center Common Agent. In this situation, it is necessary to specify a different port (other than 9510) and install-path when performing the installation of the Tivoli Provisioning Manager Common Agent.

In order to modify these two installation parameters, you must set two parameters on the Configuration Template before deploying the Software Stack TCA_Stack in Tivoli Provisioning Manager. The two parameters that must be set are:

install-path
CA-Listening-Port

As seen in the following diagram (for example):
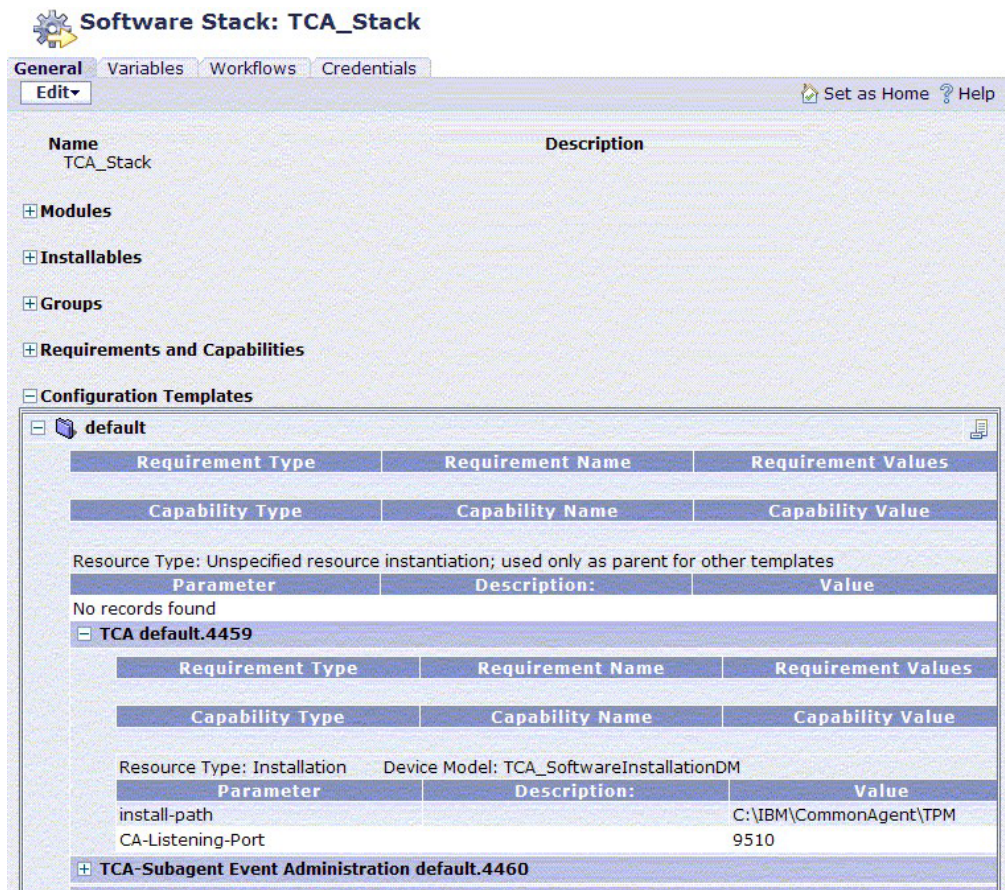
Note: The diagram, the CA-Listening-Port is set to 9510. If Tivoli Storage Productivity Center is already occupying this port, the template will need to be set to an alternate value, as we have previously described.

Scenario 3: Neither Tivoli Provisioning Manager nor Tivoli Storage Productivity Center are already installed.

In this particular scenario, you have a choice of installing Tivoli Provisioning Manager or Tivoli Storage Productivity Center first. The recommended practice is to allow the Tivoli Provisioning Manager Common Agent to listen on the default ports, while the Tivoli Storage Productivity Center Common Agent listens on some unique range of ports (Scenario 1, if Tivoli Storage Productivity Center is not already installed in the data center).

Installing storage workflows

The installation described in this chapter assumes that Tivoli Provisioning Manager (or Tivoli Intelligent Orchestrator, whichever is chosen) has not been previously installed.

The storage workflows are installed on the machine running Tivoli Provisioning Manager. They should be installed after you have installed IBM Tivoli Storage Productivity Center version 3.3.1 on a separate machine.

The helpers and workflows are included in an automation package, which you can download from the following Web site: http://www.ibm.com/software/ondemandcatalog/automation. Search for **tpc automation package**. Click **Go**.

Download the following:
- IBM Tivoli Storage Productivity Center Automation Package, version 3.3.1.

This package will contain the README file, the setup and initialization/discovery/DCM synchronization workflows, fabric and disk building block workflows, and the relevant Java helpers to support these workflows.

1. On the machine where you have installed Tivoli Storage Productivity Center, create a user ID **TPCUser** as a system user ID with administrator privileges. Note the host, Tivoli Storage Productivity Center Device Server port, user name, and operating system password of TPCUser. This information must be provided to the **TPC_Configure** workflow in step 1 on page 6.

   Note: The rest of this procedure is done on the machine where you will install Tivoli Provisioning Manager.

2. Install the Tivoli Provisioning Manager Version 5.1 following the instructions in the Tivoli Provisioning Manager Installation Guide for your operating system.

3. Shut down Tivoli Provisioning Manager.

4. Install the tcdriver. If you have not previously done so, download the tpc automation package from the following Web site:

   `http://www.ibm.com/software/ondemandcatalog/automation`

   Follow the instructions in the README file for the tcdriver (IBMTPC_*language*_v331.html), where *language* indicates the language:
   en – English
   cs – Czech
   de – German
   es – Spanish

> fr – French
> hu – Hungarian
> it – Italian
> ja – Japanese
> ko – Korean
> pl – Polish
> ru – Russian
> pt_BR – Brazilian Portuguese
> zh_CN – Simplified Chinese
> zh_TW – Traditional Chinese

To install the tcdriver, do the following:

a. Place the tcdriver file in the `%TIO_HOME%/drivers` directory.

b. Run the following command:

```
%TIO_HOME%/tools/tc-driver-manager.cmd InstallDriver IBMTPC
```

To uninstall the tcdriver, shut down the Tivoli Provisioning Manager server and run the following command:

```
%TIO_HOME%/tools/tc-driver-manager.cmd uninstallDriver IBMTPC
```

Note: If some DCM objects are associated with the Device models specified in the TPC automation package, the `forceuninstallDriver` command should be used to uninstall the tcdriver.

To reinstall the tcdriver, stop Tivoli Provisioning Manager, place the tcdriver file in the %TIO_HOME%/drivers directory, and run the following command:

```
%TIO_HOME%/tools/tc-driver-manager.cmd forceInstallDriver IBMTPC
-overwrite=true
```

5. Restart Tivoli Provisioning Manager.

Configuring and initializing workflows

Setting up storage provisioning workflows consists of running the **TPC_Configure** and **TPC_Initialize** workflows.

Tivoli Storage Productivity Center storage provisioning workflows are run in the Tivoli Provisioning Manager GUI.

The **TPC_Configure** and then **TPC_Initialize** workflows are run in that order for the first time. **TPC_Configure** can also be run any time you want to point to a new Tivoli Storage Productivity Center install. **TPC_Initialize** can be run at any time to update the DCM storage components to reflect the current environment in Tivoli Storage Productivity Center, although it should be run with care because user-defined information associated with Tivoli Storage Productivity Center SAN objects might be lost.

1. Run the **TPC_Configure** workflow.

   a. Open the Tivoli Provisioning Manager console.

   b. In the left pane, expand **Configuration** ➔ **Workflow**.

   c. The TPC workflows will be listed. Choose **TPC_Configure**.

   d. Select **Execute** ➔ **Run** to run the **TPC_Configure** workflow.

   e. Enter the host (either an IP address or a resolvable DNS name for the host), TPC DEVICE SERVER port, user name, and password of the machine where IBM Tivoli Storage Productivity Center is installed. The default user name and port are:
   > User name — **TPCUser**

Port — **9550**

   f. Click **Run**.

2. Using the Tivoli Storage Productivity Center GUI, run the necessary device discoveries, scans, and probes to ensure that Tivoli Storage Productivity Center is aware of all SAN elements. See *IBM Tivoli Storage Productivity Center User's Guide* for information on running discoveries, scans, and probes.

3. Run the **TPC_Initialize** workflow to initialize the Tivoli Provisioning Manager data center model with SAN information. This workflow loads the SAN Fabric and Volume information into Tivoli Provisioning Manager.

   Note: If you have run TPC_Initialize earlier, you may already have some SAN entities populated in your DCM. Ensure these existing entities are associated with the correct device model before running TPC_Initialize again. This is necessary for the correct operation of TPC_Initialize and TPC_Clear_DCM. To ensure this, follow the instructions in step 4. Once you have all existing DCM entities associated with the correct device model, proceed to run TPC_Initialize, and then go through step 4 again for the newly discovered entities.

   a. In the Tivoli Provisioning Manager console, expand **Configuration → Workflow**.

   b. The TPC workflows will be listed. Choose **TPC_Initialize**.

   c. Select **Execute → Run** to run the **TPC_Initialize** workflow.

   d. Click **Run**.

   Note: When IBM Tivoli Storage Productivity Center is installed on AIX®, you must apply the WebSphere® Application Express™ (embedded) Cumulative Fix 12 to the embedded IBM WebSphere Application Server server in your Tivoli Storage Productivity Center installation. By default, this server is located in

   `/opt/IBM/TPC/device/apps/was`

   You can download 5.1.1 CF12 at http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg24013498

   Also be sure to apply the Java SDK SR5 at http://www-1.ibm.com/support/docview.wss?rs=180&uid=swg24010272

4. Verify that storage subsystems, storage pools, and fabrics are associated with the required workflows.

   For each storage subsystem, do the following:

   a. Expand **Inventory → Manage Inventory → Storage Subsystem** and click a storage subsystem name.

   b. Select the **Workflows** tab and verify that the following storage subsystem workflows are associated with the subsystem.
        TPC_SS_AttachVolHostWWPN
        TPC_SS_CreateStorageVolume
        TPC_SS_CreateStorageVolumeWithName
        TPC_SS_DetachVolHostWWPN
        TPC_SS_GetStorageVolumes
        TPC_SS_RemoveStorageVolume

   c. If the storage subsystem workflows are not associated with the subsystem, follow these steps.

      1) In the **Workflows** tab, Click **Edit → Assign Device Driver**. A list of device drivers is displayed.

2) Select **TPC StorageSubsystem** from the list and click **Change Device Driver**. Do not select the **Use Logical Operation** check box.

For each storage pool object, do the following:

a. In the left panel, expand **Inventory → Manage Inventory → Storage Pools** and click a storage pool name.

b. Select the **Workflows** tab and verify that the following volume workflows are associated with the storage pool:

> TPC_SP_CreateStorageVolume
> TPC_SP_CreateStorageVolumeWithName
> TPC_SP_GetStorageVolumes
> TPC_SP_RemoveStorageVolume

c. If the workflows are not associated with the storage pool, follow these steps:

1) In the **Workflows** tab, click **Edit → Assign Device Driver**. A list of device drivers is displayed.

2) Select **TPC StoragePool** from the list and click **Change Device Driver**. Do not select the **Use Logical Operation** check box.

For each Fabric do the following:

a. Expand **Inventory → Manage Inventory → Storage Area Networks → TPC_SAN** and click the fabric name.

b. Select the **Workflows** tab and verify that the following workflows are associated with the fabric.

- TPC_Add_Zone_Members
- TPC_Create_Zone
- TPC_Remove_Zone
- TPC_Remove_Zone_Members

c. If the fabric workflows are not associated with the fabric, follow these steps:

1) In the **Workflows** tab, click **Edit → Assign Device Driver**. A list of device drivers is displayed.

2) Select **TPC SANFabric** from the list and click **Change Device Driver**. Do not select the **Use Logical Operation** check box.

Chapter 3. Automating storage provisioning with IBM Tivoli Storage Productivity Center workflows

Storage provisioning workflows are grouped into the following three types:
- Setup and DCM synchronization workflows
- Fabric workflows
- Disk workflows

Storage workflows, and hence the LDOs, can be invoked from the GUI to perform the following tasks:

For Fabric (SANFabric.*xxx* LDOs):
- Create a zone
- Add zone members
- Remove a zone
- Remove zone members

For Storage Subsystems (StorageSubsystem.*xxx* LDOs):
- Create a storage volume
- LUN mapping
- Remove a storage volume
- LUN unmapping

For Storage Allocation Pools (StoragePool.*xxx* LDOs):
- Create a storage volume
- Remove a storage volume

Setup and DCM synchronization workflows

The setup and DCM synchronization workflows TPC_Configure and TPC_Initialize are unique in that they are not associated with LDOs. These are high level workflows designed to set up storage provisioning workflows. They are run after installation of the TPC automation package. For more information on running TPC_Configure and TPC_Initialize, see "Configuring and initializing workflows" on page 6.

The setup and DCM synchronization workflows perform the following functions:

Setup and DCM Synchronization Workflows	Descriptions
TPC_Configure (HostName, Port, Username, Password)	This workflow is used to configure a Tivoli Provisioning Manager install to point to a specific Tivoli Storage Productivity Center install for the purposes of discovery and storage provisioning actions. Run this workflow before any other storage workflows. See "Configuring and initializing workflows" on page 6 for details about running the configuration workflow.

Setup and DCM Synchronization Workflows	Descriptions
TPC_Initialize	The initialization workflow initializes the storage-specific sections of the Tivoli Provisioning Manager DCM. Note that all SAN discoveries, probes and scans (such as CIMOM discovery, subsystem probe, outband discovery, and so forth) on the Tivoli Storage Productivity Center server configured during TPC_Configure should be completed before the initialization workflow is run.
	See "Configuring and initializing workflows" on page 6 for details about running the initialization workflow. Run TPC_Initialize immediately after running a device discovery, scan, and probe on the machine where Tivoli Storage Productivity Center is installed. This workflow should be run right after the discovery and before running any other workflows. It can also be run at any time to synchronize Tivoli Provisioning Manager's DCM with the "real" view of the SAN as seen by Tivoli Storage Productivity Center.

Where variables are:

HostName
>   Host name of the machine where IBM Tivoli Storage Productivity Center is installed. This can be either an IP address or a resolvable host name. See Chapter 2, "Installing and configuring Tivoli Storage Productivity Center storage workflows," on page 3 for more information.

Port   Port number of the machine where IBM Tivoli Storage Productivity Center Device Server is installed (default is 9550). See Chapter 2, "Installing and configuring Tivoli Storage Productivity Center storage workflows," on page 3 for more information.

Username
>   User ID with administrative privileges on the machine where IBM Tivoli Storage Productivity Center is installed. This should be created on the Tivoli Storage Productivity Center server as part of Tivoli Storage Productivity Center workflows installation. The recommendation is to create a new user called TPCUser (see Chapter 2, "Installing and configuring Tivoli Storage Productivity Center storage workflows," on page 3).

Password
>   Administrative password set during installation on the machine where IBM Tivoli Storage Productivity Center is installed (see Chapter 2, "Installing and configuring Tivoli Storage Productivity Center storage workflows," on page 3).

Setup and DCM synchronization workflows do not use or implement any logical device operations. For further details, see the README for the IBMTPC.tcdriver automation package.

The configuration workflow takes as input the host, port, user name and password for the machine where Tivoli Storage Productivity Center is installed. These are stored in an encrypted configuration properties file and used by other Java helpers to authenticate with the functions.

The initialization workflow populates the storage-specific sections of the Tivoli Provisioning Manager Data Center Model.

The following SAN entities are discovered by the DCM synchronization and initialization workflow and populated in the Tivoli Provisioning Manager DCM:

Servers
- Newly discovered servers are put in TPC_Server_Pool. Existing servers also managed by Tivoli Storage Productivity Center are shown by the "DISCOVERED_BY" property, which has value "TPC."
- Server ports (associated to default HBA)
- Server port connections to fabrics
- Other server properties (such as server IP interface and IP address)

Storage subsystems
- Storage pools
- Storage volumes
- Subsystem fibre adapter ports (associated with default FA)
- Subsystem fabric connections

SAN fabrics
- Switch
- Discovers all ports of discovered switches, as well as their WWPNs.
- Fabric WWN
- Zones and active zoneset
- Fabric connections

Note: If the storage environment is manipulated outside Tivoli Provisioning Manager, it is possible that the DCM will go out of synchronization with the real view of the SAN. We strongly recommend that you operate exclusively through the Tivoli Provisioning Manager console to avoid this situation. You can run TPC_Initialize to resynchronize the DCM, however user-defined relationships (such as file systems defined on volumes provisioned by Tivoli Storage Productivity Center workflows) may be lost during initialization.

Using storage provisioning workflows

Using the Tivoli Provisioning Manager console, you can complete the following tasks:

SAN Fabric	What to do
CreateZone	• Expand **Inventory → Manage Inventory → Storage Area Networks → TPC_SAN** and find your fabric. • In the right pane, click on the Zones tab. • Click **Edit → Add Zone**. • In the input parameter window, input a zone name and select the appropriate information for the first zone member of the zone. • Select **Use Logical Device Operation** and click **Save**. Note that it is not possible to create zones without initial members since such zones are invalid on some switches.

SAN Fabric	What to do
AddZoneMembers	1. Expand **Inventory → Manage Inventory → Storage Area Networks → TPC_SAN** and find your fabric. 2. In the right pane, click the Zones tab. 3. Click **Edit Zone → Add Zone Member**. 4. In the input parameter window, enter the necessary information. Check **Use logical operation**. 5. Click **Run**.
RemoveZone	1. Expand **Inventory → Manage Inventory → Storage Area Networks → TPC_SAN** and find your fabric. 2. In the right pane, click the Zones tab. 3. Click **Edit Zone → Delete Zone Using Workflow**. 4. In the input parameter window, enter the necessary information. 5. Click **Run**.
RemoveZoneMembers	This workflow deletes zone members one at a time. 1. Expand **Inventory → Manage Inventory → Storage Area Networks → TPC_SAN** and find your fabric. 2. In the right pane, click the Zones tab. 3. Click **Edit Zone Member → Delete Zone Member Using Workflow**. 4. In the input parameter window, enter the necessary information. 5. Click **Run**.

Storage subsystem	What to do
CreateStorageVolume	1. Expand **Inventory → Manage Inventory → Storage Subsystems** and click on the storage subsystem. 2. Click **Edit → Add Storage Volume**. 3. In the input parameter window, enter the necessary information. Check **Use Logical Operation**. 4. Click **Run**. This will pick a storage pool in the given subsystem matching the RAID level required. If such a storage pool does not exist, the user is informed. Note that the storage pool specified by the user is not used. **Note:** The Tivoli Provisioning Manager UI prompts for **Volume Name** and **Volume ID**. Enter the same information in both fields. For example, to create a volume labeled **mystorage**, enter **mystorage** in both text boxes.
LunMapping	1. Expand **Inventory → Manage Inventory → Storage Subsystems** and click on the storage subsystem. 2. For the storage volume, go to the icon in the far right column. Click the icon and choose **Associate to HBA Port**. 3. In the input parameter window, enter the necessary information. Check **Use logical operation**. 4. Click **Run**.

Storage subsystem	What to do
RemoveStorageVolume	1. Expand **Inventory → Manage Inventory → Storage Subsystems** and click on the storage subsystem. 2. For the storage volume, go to the icon in the far right column. Click the icon and choose **Remove Storage Volume Using Workflow**. 3. In the input parameter window, enter the necessary information. 4. Click **Run**.
LunUnmapping	1. Expand **Inventory → Manage Inventory → Storage subsystems** and click on the storage subsystem. 2. Go to the Fibre Channel Port column for the given volume. Click on the associated host port. 3. Click **Remove Fibre Channel Port Association Using Workflow**. 4. In the input parameter window, enter the necessary information. 5. Click **Run**.
GetStorageVolumes	1. Get storage subsystem and storage capabilities requirement IDs. 2. Go to **Automation → Logical Device Operations → Storage Subsystem**. 3. Click the **StorageSubsystem.GetStorageVolume** LDO. 4. Click **Execute → Run**. 5. In the input parameter window, enter the necessary information. 6. Click **Run**.

Storage Allocation Pool	What to do

CreateStorageVolume	**Note:** Invoking **Manage Inventory → Storage Pools**, clicking on a pool, and, in the right pane, selecting **Edit → Add Storage Volume** does **not** invoke this LDO.
	
	Create storage capabilities:
	• Expand **Manage Inventory → Storage Template → Create New Template**.
	• Select **Edit This Template → Add Volume Container Settings**.
	  – For volume container settings, add logical volume settings. Specify RAID and expected volume size.
	  – For logical volume settings, hover over the Capabilities column to get the storage capabilities ID.
	• Note the pool ID by hovering over it.
	
	Create storage volume:
	1. Expand **Automation → Logical Device Operations → Storage Pools**.
	2. Click the **StoragePool.CreateStorageVolume** LDO.
	3. Click **Execute → Run**.

Storage Allocation Pool	What to do
RemoveStorageVolume	**Note:** Invoking **Manage Inventory → Storage Pools**, clicking on a pool, and, in the right pane, selecting **Edit → Add Storage Volume** does **not** invoke this LDO. 1. Go to **Automation → Logical Device Operations → Storage Pool**. 2. Click on the **StoragePool.RemoveStorageVolumes** LDO. 3. Click **Execute → Run**.
GetStorageVolumes	1. Get storage pool and storage capabilities requirements IDs. 2. Go to **Automation → Logical Device Operations → Storage Pool**. 3. Click on the **StoragePool.GetStorageVolumes** LDO. 4. Click **Execute → Run**.

Fabric device support

The fabric workflows can operate against all the fabric devices and environments supported by the IBM Tivoli Storage Productivity Center.

For a current listing of supported fabric devices, go to the following Web site:
`http://www-1.ibm.com/support/docview.wss?rs=1134&uid=swg21230797`

Disk device support

For a current list of supported disk devices, go to the following Web site:
`http://www-1.ibm.com/support/docview.wss?rs=597&context=SYCRL4`
`&context=SSMMUP&dc-500&uid=ssg1S1002800&loc=en_US&cs=utf-8&lang=en`

Chapter 4. IBM Tivoli Storage Productivity Center workflows as building blocks

This chapter provides listings of workflows and sub-workflows by type. It is of interest primarily to developers who will be writing their own workflows based on the Tivoli Storage Productivity Center workflows. See the *Developing automation packages* guide provided by Tivoli Provisioning Manager and the Redpaper REDP 3900-00 "An Introduction to Storage Provisioning with Tivoli Provisioning Manager and Tivoli Storage Productivity Center" for more information on developing workflows.

Tivoli Storage Productivity Center storage provisioning workflows provide building-block workflows that help automate SAN discovery and basic storage provisioning tasks. High level storage provisioning workflows are created from other workflows. Workflows themselves are composed of low-level workflows, Java helpers, and simple commands. You do not call low-level workflows and Java helpers directly when you are developing workflows.

Note: Sometimes the terms *workflow* and *LDO* seem synonymous. There *is* a difference. An LDO is a wrapper mechanism through which you execute the correct workflow for the device you are working with. The workflow implements this LDO and extends the LDO's functionality or provides specific functionality. When the LDO is invoked, it does some generic actions, invokes the appropriate workflow (based on the device driver associated with the entity on which the LDO is invoked), and then does some post-workflow actions. One of the post actions is committing the changes to DCM. All operations, such as CreateVolume and RemoveZoneMember, should only be invoked through the LDO wrapper mechanism. If they are not invoked via an LDO, Tivoli Provisioning Manager does not know to update the records showing that a workflow ran and what the results were.

Storage provisioning workflows are grouped into the following three types:
- Setup and DCM synchronization workflows
- Fabric workflows
- Disk workflows

Setup and DCM synchronization workflows

In addition to the workflow information covered in "Setup and DCM synchronization workflows," setup and DCM synchronization workflows include the following functions:

Integration Workflows	Descriptions
TPC_Initialize	Previously, the TPC_Initialize workflow only updated current information and added new information to the database. In this release, however, the TPC_Initialize workflow is a high-level workflow that calls two more specific workflows in sequence: the TPC_Clear_DCM workflow and the TPC_Update_DCM workflow.

Integration Workflows	Descriptions
TPC_Clear_DCM	This workflow removes all discovered objects related to IBM Tivoli Storage Productivity Center from the Tivoli Provisioning Manager database. User-created variables and objects that might contain user-created variables are not removed. This workflow should not be invoked directly.
TPC_Update_DCM	This workflow updates, as necessary, the objects discovered by IBM Tivoli Storage Productivity Center in the Tivoli Provisioning Manager database and adds any new objects. This workflow should not be invoked directly.
TPC_Update_StorageVolume _Assignments (StorageSubsystemID, PoolID)	This workflow gets the assignments for all volumes in a given storage subsystem. This workflow can be run after TPC_Initialize has been run. The workflow for storage volume assignments can be slow depending on the number of volumes that are assigned. Other storage logical device operations can be run while this workflow is running. This workflow should not be invoked directly.

Where variables are:

StorageSubsystemID
> The Tivoli Storage Productivity Center ID of a storage subsystem.

PoolID
> The Tivoli Storage Productivity Center ID of a pool.

The setup and DCM synchronization workflows do not use or implement any logical device operations. For further details, see the README for the IBMTPC.tcdriver automation package.

The configuration workflow takes as input the host, port, user name and password for the machine where Tivoli Storage Productivity Center is installed. These are stored in an encrypted configuration properties file and used by other Java helpers to authenticate with the functions.

The initialization workflow populates the storage-specific sections of the Tivoli Provisioning Manager Data Center Model. The initialization workflow discovers SAN fabric objects only if they contain both initiator and target ports. That is, only if both servers and storage are connected to the fabric, with the servers being monitored by fabric functions and storage being monitored by disk. This is done to ensure that these SAN fabrics are usable by higher level workflows that need access to both servers and storage.

A number of associated sub-workflows are invoked by the initialization, update, and clear workflows and listed below.

Attention: Do not invoke these sub-workflows directly.
- TPC_Clear_Fabrics
- TPC_Clear_Servers
- TPC_Clear_StorageSubsystems
- TPC_Clear_Switches
- TPC_Clear_Subsystems

- TPC_CreateStoragePool
- TPC_CreateSan
- TPC_Update_Servers
- TPC_Update_ServerInterface
- TPC_Update_ServerPorts
- TPC_Update_StorageSubsystems
- TPC_Update_StorageSubsystemInterface
- TPC_Update_StorageSubsystemPorts
- TPC_Update_StoragePool
- TPC_Update_StorageVolumes
- TPC_Update_StorageVolume_Assignments
- TPC_Update_Fabrics
- TPC_Update_Switches
- TPC_Update_Zones

Fabric workflows

SANFabric objects are created in DCM when the initialization workflow (present in the Integration Automation Package) is run. The following logical device operations are defined for SANFabric objects.

Fabric Workflows

(and parameters)	Implement these Fabric logical device operations
TPC_Fabric_CreateZone	SANFabric.CreateZone
(SANFabricID, ZoneName, SANPortIDs)	Create a zone with a given zone name, and create new zone members in it.
TPC_Fabric_AddZoneMembers	SANFabric.AddZoneMembers
(SANFabricID, ZoneID, SANPortIDs)	Add new zone members to an existing zone. The zone has to be created using TPC_Fabric_CreateZone beforehand.
TPC_Fabric_RemoveZone	SANFabric.RemoveZone
(SANFabricID, ZoneID)	Remove a zone and all zone members in it.
TPC_Fabric_RemoveZoneMembers	SANFabric.RemoveZoneMembers
(SANFabricID, ZoneID, SANPortIDs)	Remove zone members from the zone. If the last zone member is removed, the DCM object for the zone will also be removed.

Where variables are:

SANFabricID

> The DCM ID of the SAN Fabric. Obtained by moving the cursor over a SAN Fabric object.

SANPortIDs

> An array of SANPort IDs. These can be host port IDs or subsystem port IDs. Obtained by moving the cursor over the HBA ports on server pages or over fibre-adapter ports on subsystem pages.

ZoneName

> The name to be given to the new zone.

ZoneID

> The DCM ID of the zone. Obtained as output of a CreateZone operation or by moving the cursor over a zone on the Zones tab of a SAN Fabric.

The Fabric workflows invoke the following associated sub-workflows:

Attention: Do not invoke these sub-workflows directly.

- TPC_Valid_PortIDs_List
- TPC_PortIDs_To_WWN_List

For further details, see the README for the IBMTPC.tcdriver automation package.

Note: Do not invoke workflows directly. Run the logical device operations, which will invoke the correct workflow based on the SANFabric ID.

Disk workflows

Disk Workflows

(and parameters)	Implement these Volume logical devices operations
TPC_SS_GetStorageVolumes	StorageSubsystem.GetStorageVolumes
(StorageSubsystemID, StorageCapabilitiesRequirementIDs)	Get a list of available storage volumes with the specified storage requirements. One volume is returned for each input storage capability setting.
TPC_SS_AttachVolHostWWPN	StorageSubsystem.LunMapping
(StorageSubsystemID, StorageVolumeIDs, HBAPortID, LUN)	Map a host port to a storage volume. This workflow does both mapping and masking.
TPC_SS_DetachVolHostWWPN	StorageSubsystem.LunUnmapping
(StorageSubsystemID, StorageVolumeIDs, HBAPortID)	Unmap a storage volume from a host port. This workflow does both unmapping and unmasking.
TPC_SS_CreateStorageVolume	StorageSubsystem.CreateStorageVolume
(StorageSubsystemID, StorageCapabilitiesRequirementID)	Create a new storage volume on the storage subsystem.
TPC_SS_CreateStorageVolume WithName	StorageSubsystem.CreateStorageVolumeWithName
StorageSubsystemID, StorageCapabilitiesRequirementID)	Create a new storage volume on the storage subsystem using the desired volume name.
TPC_SS_RemoveStorageVolume	StorageSubsystem.RemoveStorageVolume
(StoragePoolID, StorageCapabilitiesRequirementIDs)	Remove the storage volume on the storage subsystem.
TPC_SP_GetStorageVolumes	StoragePool.GetStorageVolumes
(StorageSubsystemID, StorageVolumeID)	Get a list of available storage volumes in a storage pool with the listed storage requirements. One volume is returned for each input storage capability setting.

Disk Workflows

(and parameters)	Implement these Volume logical devices operations
TPC_SP_CreateStorageVolume	StoragePool.CreateStorageVolume
(StoragePoolID, StorageCapabilitiesRequirementID)	Create a new storage volume (using the given storage capability setting) in the storage subsystem that is linked to this storage pool.
TPC_SP_CreateStorageVolume WithName	StoragePool.CreateStorageVolumeWithName
(StoragePoolID, StorageCapabilitiesRequirementID, StorageVolumeName)	Create a new storage volume (using the given storage capability setting) in the storage subsystem that is linked to this storage pool, using the desired volume name.
TPC_SP_RemoveStorageVolume	StoragePool.RemoveStorageVolume
(StoragePoolID, StorageVolumeID)	Remove a storage volume from the storage subsystem that is linked to this storage pool.

Where variables are:

StorageSubsystemID
> ID of a storage subsystem. Obtained by moving the cursor over a storage subsystem object.

StoragePoolID
> ID of a storage pool. Obtained by moving the cursor over a storage pool object.

StorageCapabilitiesRequirementIDs
> For Get workflows: An array of storage capabilities IDs. Obtained from the Storage Needs page.

> For Create workflows: The storage capabilities ID. Obtained from the Storage Needs tab.

StorageVolumeID
> The ID of StorageVolume. Obtained as output of CreateStorageVolume operation or by moving the cursor over a volume on any storage subsystem or storage pool page.

VolumeID
> A device-specific, unique ID for a volume. Optional when input.

SANPortID
> The ID of a SANPort. Only a host port ID. Obtained by moving the cursor over HBA ports on server pages.

LUN The 1 to 4 digit number of the desired LUN in hexadecimal notation. (optional).

AssignedLUN
> An assigned LUN.

For further details, see the README for the IBMTPC.tcdriver automation package.

Note: Do not invoke workflows directly. Run the logical device operations, which will invoke the correct workflow based on the storage subsystem ID or storage pool ID.

Disk states

The disk states change depending on the operations performed. The following table displays the various states.

Original State	TPM LogicalDeviceOperation	New State
—	CreateStorageVolume	Available
Available	GetStorageVolume	Reserved
Available, Reserved (not assigned to a port), or Assigned (assigned to a port)	LunMapping	Assigned
Assigned	LunUnmapping	Assigned (still maps to some port) or Available (does not map to any port)
Assigned, Available, Reserved	RemoveStorageVolume	—

Chapter 5. Workflow scenario

This chapter provides a detailed scenario that walks you through the process of adding storage to a server and setting up a zone with the IBM Tivoli Provisioning Manager graphical user interface (GUI), building upon the storage workflows provided by Tivoli Storage Productivity Center.

Adding storage to a server and setting up a zone

This section describes how to map a storage volume to a host bus adapter (HBA) and add it to a zone by using the Tivoli Provisioning Manager GUI to execute logical device operations in sequence. The operations are creating a storage volume, creating a zone, mapping the volume to a server, and adding the volume to a zone. All these operations invoke functionality on the Tivoli Storage Productivity Center server to do storage provisioning tasks.

1. Create a storage volume (see CreateStorageVolume).
2. Create a zone (see CreateZone).
3. Expand **Inventory → Manage Inventory → Storage Subsystems** and click the name of the subsystem.
4. Storage volumes are shown in the left pane. Go to the storage volume created in Step 1. Click the options menu icon to the far right of the storage volume row and click **Associate to HBA Port**.
5. In the Input Parameter Workflow window, enter the following information. (See Figure 1 on page 22.)
   StorageSubsystemID: Select the HBA for this server
   Port number: Select the port number on this HBA.
   Logical Unit Number: Input a valid LUN number to assign to the volume. Note that this is not considered by TPC workflows since various storage devices have their own ways of assigning LUN IDs. This means this value is ignored, although it must be filled in.

   Check the **Use Logical Operation** box.
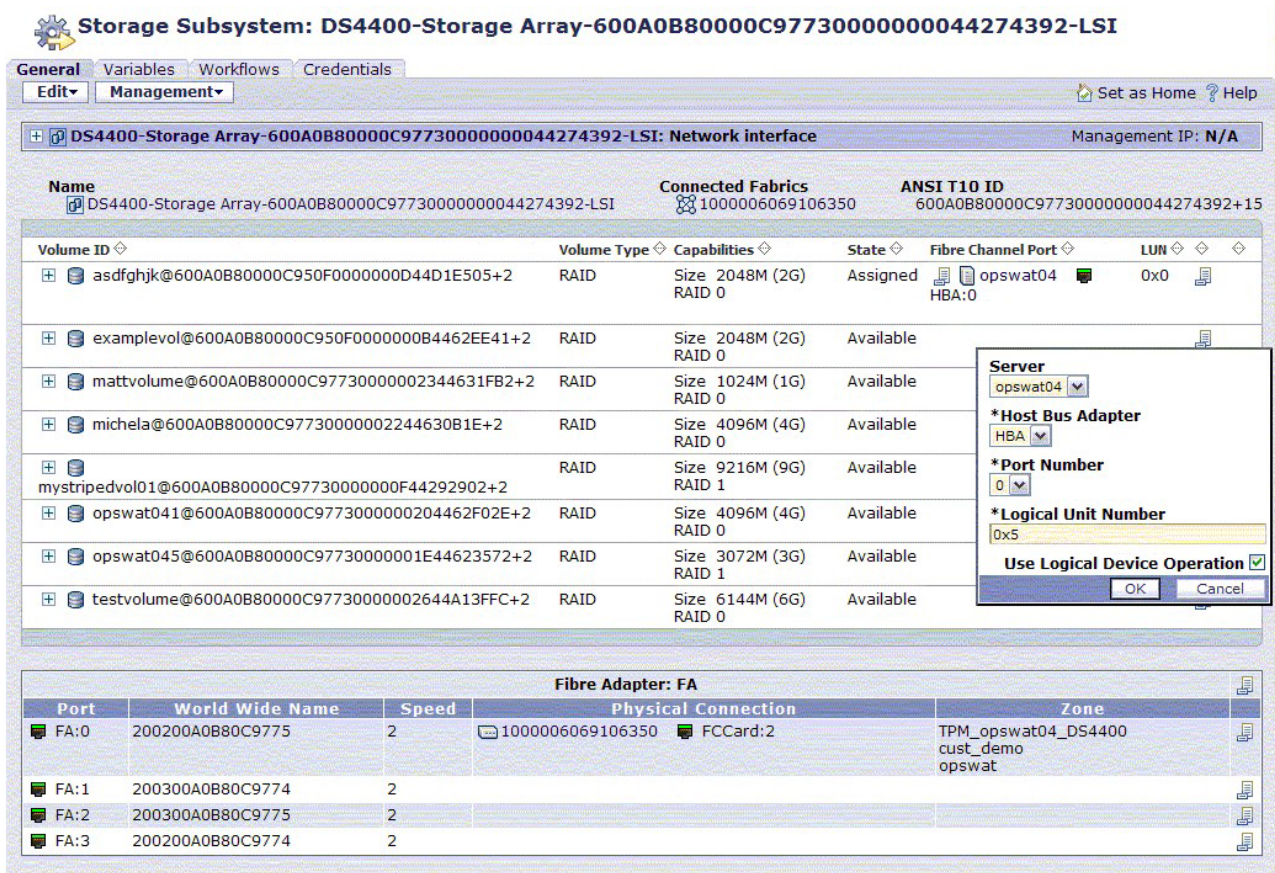
Figure 1. Providing information for logical device operation

Click **OK**.

6. After the LDO is complete, get the assigned LUN number from the workflow output. Click the arrow on the far left of the workflow row to expand. The LUN number will be listed in the output column.

7. Verify that the **LunMapping** LDO has completed successfully. (See Figure 2 on page 23.)

   a. Expand **Inventory → Manage Inventory → Storage Subsystems** and click the name of the subsystem.

   b. In the **General** tab, verify that the LUN number matches the LUN number from the logical device operation output. The listing is in hexadecimal.

Storage Subsystem: DS4400-Storage Array-600A0B80000C97730000000044274392-LSI

General Variables Workflows Credentials

Edit▾ | Management▾

Set as Home Help

⊞ 🔲 DS4400-Storage Array-600A0B80000C97730000000044274392-LSI: Network interface   Management IP: **N/A**

Name	Connected Fabrics	ANSI T10 ID
🔲 DS4400-Storage Array-600A0B80000C97730000000044274392-LSI	⊠ 1000006069106350	600A0B80000C97730000000044274392+15

Volume ID ◇	Volume Type ◇	Capabilities ◇	State ◇	Fibre Channel Port ◇	LUN ◇ ◇ ◇
⊞ 🖬 asdfghjk@600A0B80000C950F0000000D44D1E505+2	RAID	Size 2048M (2G) RAID 0	Assigned	📄 🔲 opswat04 🖳 HBA:0	0x0 📄
⊞ 🖬 examplevol@600A0B80000C950F0000000B4462EE41+2	RAID	Size 2048M (2G) RAID 0	Assigned	📄 🔲 opswat04 🖳 HBA:0	0x5 📄
⊞ 🖬 mattvolume@600A0B80000C97730000002344631FB2+2	RAID	Size 1024M (1G) RAID 0	Available		📄
⊞ 🖬 michela@600A0B80000C97730000002244630B1E+2	RAID	Size 4096M (4G) RAID 0	Available		📄
⊞ 🖬 mystripedvol01@600A0B80000C97730000000F44292902+2	RAID	Size 9216M (9G) RAID 1	Available		📄
⊞ 🖬 opswat041@600A0B80000C9773000000204462F02E+2	RAID	Size 4096M (4G) RAID 0	Available		📄
⊞ 🖬 opswat045@600A0B80000C97730000001E44623572+2	RAID	Size 3072M (3G) RAID 1	Available		📄
⊞ 🖬 testvolume@600A0B80000C97730000002644A13FFC+2	RAID	Size 6144M (6G) RAID 0	Available		📄

Fibre Adapter: FA

Port	World Wide Name	Speed	Physical Connection	Zone	
🖳 FA:0	200200A0B80C9775	2	▭ 1000006069106350 🔲 FCCard:2	TPM_opswat04_DS4400 cust_demo opswat	📄
🖳 FA:1	200300A0B80C9774	2			📄
🖳 FA:2	200300A0B80C9775	2			📄
🖳 FA:3	200200A0B80C9774	2			📄

Figure 2. Checking the LUN entry

8. Add a member to a zone:

   a. Expand **Inventory → Manage Inventory → Storage Area Networks → TPC_SAN** and click on the name of the fabric. Click on the Zones tab.

   b. Click the options menu icon to the far right of the zone row and click **Add Zone Member**.

   c. In the Input Parameter for Workflow window, type the following information. (See Figure 3 on page 24.)

      Connected System: System representing the first zone member to add to the newly created zone.

      Connected Adapter: Adapter on this system that has the port to add as a zone member.

      Connected Port: Port on the system to add as the first zone member to this new zone.
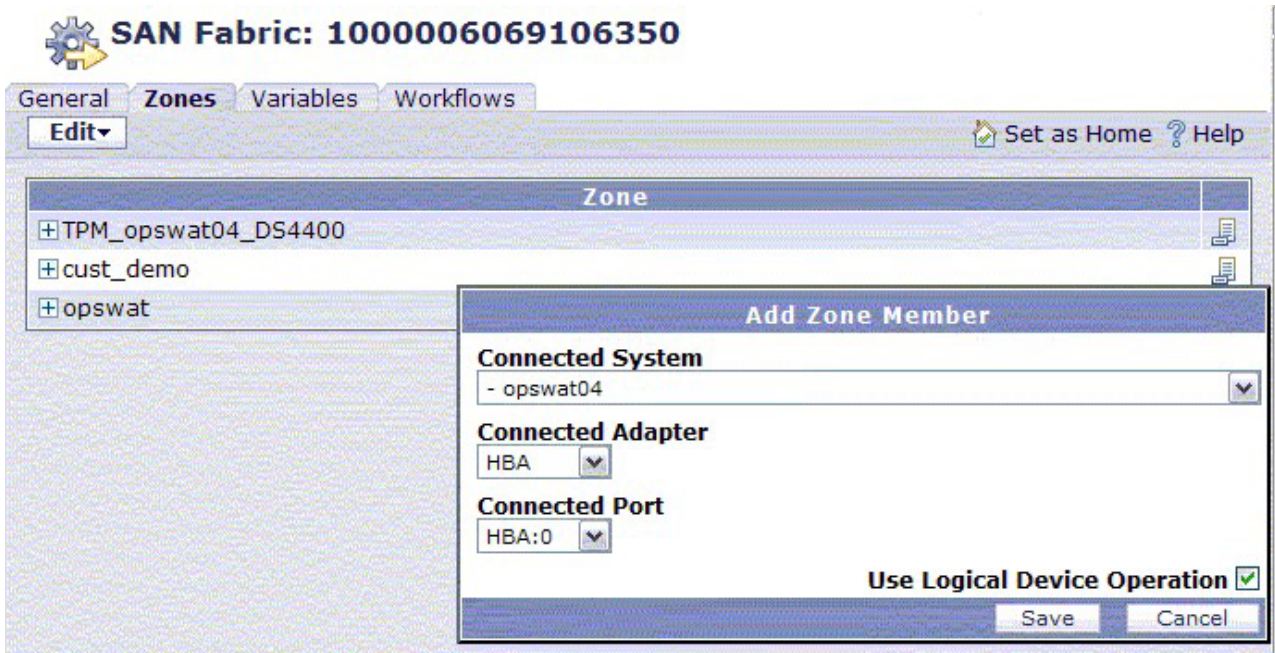
   Check the **Use logical operation** box.

Figure 3. Running the logical device operation

      d. Click **Save**.

Chapter 6. Troubleshooting

For general information about automation packages, how they work, and troubleshooting information, see *Developing automation packages* at the following Web site: `http://publib.boulder.ibm.com/infocenter/tivihelp/v13r1/topic/com.ibm.tivoli.tpm.wkf.doc/workflows/cwkf_wkfovw.html`

For general problem determination, troubleshooting, and error messages, go to the following Web site: `http://publib.boulder.ibm.com/infocenter/tivihelp/v13r1/topic/com.ibm.tivoli.tpm.doc/pubs/TPM51ProblemDeterminationGuide.pdf`

To troubleshoot many of the Tivoli Storage Productivity Center workflows you will need the logs on the Tivoli Storage Productivity Center server. For information about Tivoli Storage Productivity Center log files, see the following publications Web site: `http://publib.boulder.ibm.com/infocenter/tivihelp/v4r1/index.jsp?topic=/com.ibm.itpc.doc/tpcpdg31.htm`

Expand **Problem Determination Guide** for information on how to enable logging. IBM will need these logs for most Tivoli Storage Productivity Center workflows troubleshooting.

Some Tivoli Storage Productivity Center workflows troubleshooting will also require CIMOM logs and agent logs. Refer to the respective documentation for instructions on how to enable such logging.

Log files for workflow troubleshooting

For errors during the install of the tcdrivers, refer to the following log files in `%TIO_LOGS%/tcdrivermanager`:

trace.log
> This log contains entries for all errors encountered. The entries are marked **FATAL** and prefixed with **TPC Invocation error**. There also is a stack trace which is similar to what is shown in the **Error Detail** section of the GUI.

console.log
> This log contains all the information in `trace.log` as well as other information necessary for debugging. For each call made to the enablement layer function, there is an entry in the `console.log`.

objectDump.xml
> For objects that were not loaded into the database.

For errors that occur while running the workflows, refer to the console.log and trace.log files in `%TIO_LOGS%/deploymentengine`.

By default, debug messages are not copied to the log files. To get more log file information, change the setting on `%TC_HOME%/config/log4j.prop` to:

- log4j.appender.errorfile.threshold=debug
- log4j.appender.consolefile.threshold=debug

For Java helper errors, refer to `%TIO_LOGS%\deploymentengine\tpcWorkflowPlugins.log`

When a problem occurs, check the log files in the following areas:

- Tivoli Storage Productivity Center Device server logs in `<TPC install location>/device/log`
- CIMOM logs in documented locations on CIMOM machines
- Agent logs in documented locations on agent machines
- Tivoli Provisioning Manager logs on the Tivoli Provisioning Manager server
- Tivoli Storage Productivity Center Java helper logs on the Tivoli Provisioning Manager machine

Troubleshooting workflow problems

Some general guidelines include the following:

- For SAN modifications, ensure that appropriate discoveries, probes, and scans are run with the Tivoli Storage Productivity Center GUI against the Tivoli Storage Productivity Center server. Also ensure that TPC_Initialize is run at this point to resynchronize the Tivoli Provisioning Manager DCM with the Tivoli Storage Productivity Center view of the SAN.
- Ensure that the Tivoli Storage Productivity Center server (common agent service, Data server, and Device server) is up.
- Ensure that agents and CIMOMs are up.
- Ensure that switches and subsystems are accessible from the Tivoli Storage Productivity Center server.
- Ensure that there are no firewalls blocking access to and from the Tivoli Storage Productivity Center and Tivoli Provisioning Manager servers.
- Some errors are seen because of running Tivoli Storage Productivity Center provisioning workflows instead of the corresponding LDOs. Remember that, for all tasks except TPC_Initialize and TPC_Configure, you must run Tivoli Provisioning Manager LDOs (see http://www.ibm.com/software/tivoli/products/prov-mgr/).

The indicators of a problem can be one of the following:

- Failed workflows
- Error messages in the logs or GUI
- Inconsistencies or unexpected data at various levels: Tivoli Provisioning Manager, Tivoli Storage Productivity Center, or the CIMOMs.

Depending on the error code, trace through the logs: Tivoli Provisioning Manager, Tivoli Storage Productivity Center, and auxiliary (CIMOM, agents, and so forth).

Problem descriptions and solutions

For error messages or error codes, refer to the *IBM Tivoli Storage Productivity Center Problem Determination Guide*.

These are error situations you may encounter when working with storage workflows. The symptom and recovery actions are provided here.

Problem

The workflow fails with error message COPCOM140E.

Solution

WebSphere(R) cannot be started properly on Tivoli Provisioning Manager because of bad transactions. This situation occurs very infrequently. To resolve this problem, follow this procedure:

1. Stop Tivoli Provisioning Manager through Windows® Services.
2. Stop WebSphere TPM through Windows Services.
3. Delete all files and folders located in the following directory:

   `<WAS_home>\logs\server1\*`

   Note: If you encounter an error message informing you that the file is in use, reboot your machine. Then follow steps 1, 2, and 3 again.
4. Delete all files and folders in the following directory:

   `<WAS_home>\tranlog\*`
5. Delete all files and folders in the following directory:

   `<WAS_home>\lOM\*`
6. Check the `SystemOut` log to make sure there are no error messages listed in the log.

   Note: The `SystemOut` log is located in the following directory:

   `<WAS_home>\logs\server1`
7. Start WebSphere TPM through Windows Services.
8. Check the `SystemOut` log again to make sure there are no error messages listed in the log.
9. Start Tivoli Provisioning Manager through Windows Services.
10. Log in to Tivoli Provisioning Manager.
11. Check the `SystemOut` log again to make sure there are no error messages listed in the log.
12. Check the Tivoli Provisioning Manager logs for any error messages:

    `deploymentengine\consolellog`
    `policyengine.log`
13. If there are no error messages, then you can run your workflows.

_____

Problem

   Cannot get volume information when running the Initialize workflow.

Solution

   A user ID of **TPCUser** should have been created with administrator authority on the Tivoli Storage Productivity Center machine. This user ID should be used when running the TPC_Configure workflow.

_____

Problem

   Cannot get volume assignments for the SAN Volume Controller using the TPC_GetStorageVolume_Assignments workflow.

Solution

   Use the SAN Volume Controller CIMOM supported by Tivoli Storage Productivity Center.

_____

Problem

   Received a ″500 Internal error″ message on the console log during the running of the TPC_Initialize workflow.

Solution

   Ensure that the appropriate WebSphere application version is used during

Tivoli Provisioning Manager install. (See the installation instructions, step 2 on page 5.) Refer to the Tivoli Provisioning Manager Installation Guide for your operating system.

Problem

The DCM is not being updated after running the workflows.

Solution

Run the corresponding LDO and not the workflow. For example, run the StorageSubsystem.createStorageVolume LDO and not the TPC_SS_CreateStorageVolume workflow. All DCM updates are done by the LDOs.

Problem

The workflow or LDO fails with error message COPDEX002E. WebSphere cannot be started properly on Tivoli Provisioning Manager because of bad transactions. This error also occurs when the log size has not been configured correctly while installing the Tivoli Provisioning Manager fix pack.

Solution

First, follow these steps to recover from the problem:

1. Stop Tivoli Provisioning Manager through Windows Services.
2. Stop WebSphere TPM through Windows Services.
3. Delete all files and folders located in the following directory:

   `<WAS_home>\logs\server1\*`

   If you encounter an error message informing you that the file is in use, reboot your machine. Then follow steps 1, 2, and 3 again.
4. Delete all files and folders in the following directory:

   `<WAS_home>\tranlog\*`
5. Delete all files and folders in the following directory:

   `<WAS_home>\10M\*`
6. Check the SystemOut log to make sure there are no error messages listed in the log.

   The SystemOut log is located in the following directory:

   `<WAS_home>\logs\server1`
7. Start WebSphere TPM through Windows Services.
8. Check the SystemOut log again to make sure there are no error messages listed in the log.
9. Start Tivoli Provisioning Manager through Windows Services.
10. Log in to Tivoli Provisioning Manager.
11. Check the SystemOut log again to make sure there are no error messages listed in the log.
12. Check the Tivoli Provisioning Manager logs for any error messages.

    ```
    deploymentengine\consolellog
    policyengine.log
    ```

To configure the transaction log size in the WebSphere Application Server, follow these steps:

1. Start the WebSphere Application Server. Log onto the Administrative console from your browser by entering:

   `http://<your_hostname>:9090/admin`

   Replace the variable `<your_hostname>` with the host name of the application server.
2. Click **Servers ➝ Application Servers ➝ Server1 ➝ Transaction Service**.
3. Select the **Configuration** tab to display the transaction-related configuration properties.
4. Change the **Transaction Log directory** field to **;10M**.

   Note: Ensure that there is a semicolon before the number 10M.
5. Click **OK**.
6. Click **Apply ➝ Save**.
7. Stop and then restart the application server.

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