AUTHORIZED DOCUMENTATION

User Guide

Novell® PlateSpin Forge®

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About This Guide

This text provides information about using PlateSpin Forge3.

- Chapter 1, “Product Overview,” on page 7
- Chapter 2, “Getting Started with PlateSpin Forge,” on page 9
- Chapter 3, “Workload Protection,” on page 19
- “Glossary” on page 55

Audience

This guide is intended for IT staff, such as data center administrators and operators, who use PlateSpin Forge in their ongoing workload protection projects.

Feedback

We want to hear your comments and suggestions about this manual and the other documentation included with this product. Please use the User Comments feature at the bottom of each page of the online documentation, or submit your comments through the Novell Documentation Feedback site (http://www.novell.com/documentation/feedback.html).

Additional Documentation

This text is part of the PlateSpin Forge documentation set.

For a complete list of publications supporting this release, visit the PlateSpin Forge 3 Online Documentation Web Site (http://www.novell.com/documentation/platespin_forge_3).

Documentation Updates

For the most recent version of this text, visit the product’s Online Documentation Web Site (see Additional Documentation).

Additional Resources

We encourage you to use the following additional resources on the Web:

- Novell User Forum (http://forums.novell.com): A Web-based community with a variety of discussion topics.
- Novell Knowledge Base (http://www.novell.com/support): A collection of in-depth technical articles.

Technical Support

- Telephone (North America): +1-877-528-3774 (1 87 PlateSpin)
- Telephone (global): +1-416-203-4799
- E-mail: support@platespin.com

You can also visit the PlateSpin Technical Support Web site (http://www.platespin.com/support).

Product Overview

1

- Section 1.1, “About PlateSpin Forge,” on page 7
- Section 1.2, “Supported Configurations,” on page 7
- Section 1.3, “RPO, RTO, and TTO Specifications,” on page 8

1.1 About PlateSpin Forge

PlateSpin Forge is a consolidated recovery hardware appliance that protects physical and virtual workloads (operating systems, middleware, and data) by using embedded virtualization technology. If there is a production server outage or disaster, workloads can be rapidly powered on within the PlateSpin Forge recovery environment and continue to run as normal until the production environment is restored.

PlateSpin Forge enables you to:

- Simultaneously protect multiple workloads (10 to 25, depending on the model)
- Test the failover workload without interfering with your production environment
- Quickly recover workloads upon failure
- Take advantage of existing external storage solutions, such as SANs

With internal, prepackaged storage, Forge has a total storage capacity of 3.5 terabytes, although the capacity is almost unlimited when external storage configurations are used by adding iSCSI or Fibre Channel cards.

1.2 Supported Configurations

- Section 1.2.1, “Supported Workloads,” on page 7

1.2.1 Supported Workloads

PlateSpin Forge supports both Windows and Linux workloads.

Table 1-1 *Supported Windows Workloads*

Operating System	Remarks
Windows 7	
Windwos Server 2008 R2	Including domain controller (DC) systems and Small Business Server (SBS) editions
Windows Server 2008	Including domain controller (DC) systems and Small Business Server (SBS) editions
Windows Vista	Business, Enterprise, and Ultimate editions; SP1 and later
Windwos Server 2003	Including domain controller (DC) systems and Small Business Server (SBS) editions

Operating System	Remarks
Windows XP Professional	
Windows Server 2000	
Windows clusters	Supported only to targets on VMware ESX 3.0.2 and later). See “Protecting Windows Clusters” on page 30.

Supported international versions (Windows): French, German, Japanese, Chinese Traditional, and Chinese Simplified

Table 1-2 *Supported Linux Workloads*

Operating System	Remarks
SUSE Linux Enterprise Server (SLES) 10, 11	
Red Hat Enterprise Linux (RHEL) 4, 5	

Supported international versions (Linux): All international versions of these Linux systems are supported.

1.3 RPO, RTO, and TTO Specifications

- **Recovery Point Objective (RPO):** Describes the acceptable amount of data loss measured in time. The RPO is determined by the time between incremental replications of a protected workload and is affected by current utilization levels of PlateSpin Forge, the rate and scope of changes on the workload, and your network speed.
- **Recovery Time Objective (RTO):** Describes the time required for a failover operation (bringing a workload replica online to temporarily replace a protected production workload).

  The RTO in the process of failing a workload over to its virtual replica is affected by the time it takes to configure and execute the failover operation (10 to 45 minutes). See “Failover” on page 24.
- **Test Time Objective (TTO):** Describes the time required for testing disaster recovery with some confidence of service restoration.

  Use the *Test Failover* feature to run through different scenarios and generate benchmark data.

Among factors that have an impact on RPO, RTO, and TTO is the number of required concurrent failover operations; a single failed-over workload has more memory and CPU resources than multiple failed-over workloads, which share the resources of their underlying infrastructure.

You should get average failover times for workloads in your environment by doing test failovers at various times and use them as benchmark data in your overall data recovery plans. See “Workload and Workload Protection Reports” on page 17.

Getting Started with PlateSpin Forge 2

This section provides information about the essential features of PlateSpin Forge.

- Section 2.1, “Working with the PlateSpin Forge User Interface,” on page 9
- Section 2.2, “Using Workload Protection Features through the PlateSpin Forge Web Services API,” on page 14
- Section 2.3, “Managing Multiple Instances of PlateSpin Forge,” on page 14
- Section 2.4, “Workload and Workload Protection Reports,” on page 17

2.1 Working with the PlateSpin Forge User Interface

- Section 2.1.1, “Launching the PlateSpin Forge Web Client,” on page 9
- Section 2.1.2, “Elements of the PlateSpin Forge Web Client,” on page 10
- Section 2.1.3, “Workloads and Workload Commands,” on page 12

2.1.1 Launching the PlateSpin Forge Web Client

Most of your interaction with PlateSpin Forge takes place through the browser-based PlateSpin Forge Web Client.

The supported browsers are:

- Microsoft Internet Explorer 7, 8
- Mozilla Firefox 3.6

NOTE: JavaScript (Active Scripting) must be enabled in your browser:

- **Internet Explorer:** *Click Tools > Internet Options > Security > Internet zone > Custom level*, then select the *Enable* option for the Active Scripting feature.
- **Firefox:** Click *Tools > Options > Content*, then select the *Enable JavaScript* option.

To use the PlateSpin Forge Web Client and integrated help in one of the supported languages, see “Language Setup for International Versions of PlateSpin Forge” in your *Application Configuration Guide*.

To launch the PlateSpin Forge Web Client:

1. Open a Web browser and go to:

   `http://`<*hostname* | *IP_address*>`/Forge`

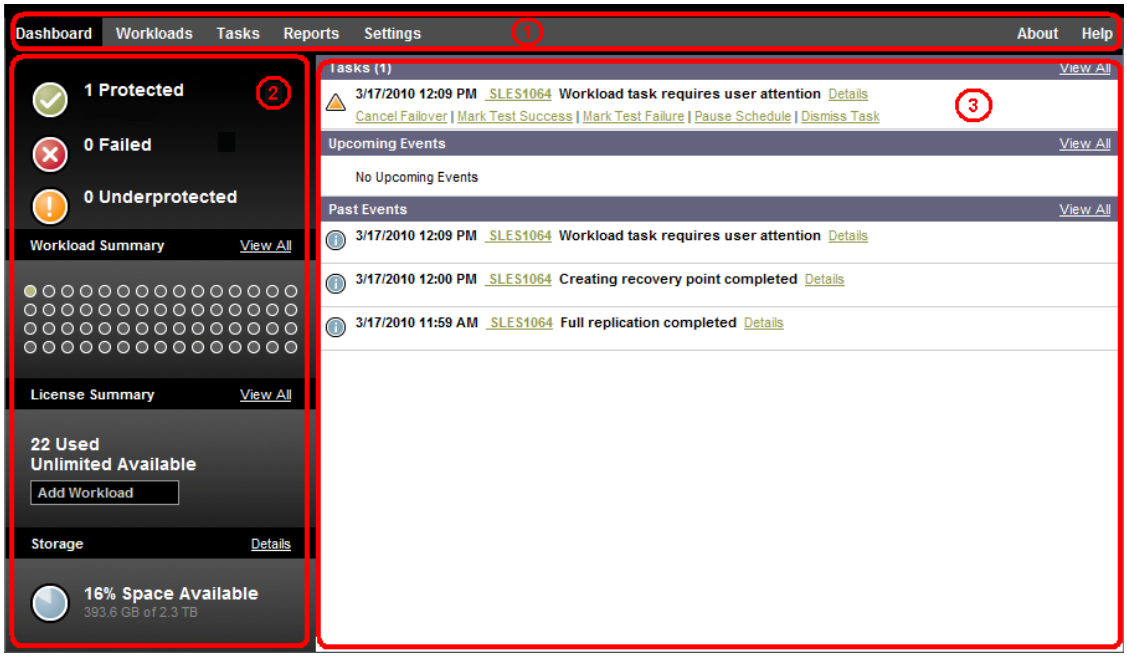
   Replace <*hostname* | *IP_address*> with the hostname or the IP address of your Forge Management VM.

   If SSL is enabled, use `https` in the URL.

2.1.2 Elements of the PlateSpin Forge Web Client

The default interface of the PlateSpin Forge Web Client is the Dashboard page, which contains elements for navigating to different functional areas of the interface and carrying out workload protection and recovery operations.

Figure 2-1 *The Default Dashboard Page of the PlateSpin Forge Web Client*



The Dashboard page consists of the following elements:

1. **Navigation bar:** Found on most pages of the PlateSpin Forge Web Client.
2. **Visual Summary panel:** Provides a high-level view at the overall state of the PlateSpin Forge workload inventory,
3. **Tasks and Events panel:** Provides information about events and tasks requiring user attention.
4. **Latest News panel:** Provides information on product and related updates through RSS. To subscribe to the PlateSpin Forge news feed, click *RSS*.

The following topics provide more details:

- “Navigation Bar” on page 11
- “Visual Summary Panel” on page 11
- “Tasks and Events Panel” on page 12

Navigation Bar

The Navigation bar provides the following links:

- **Dashboard:** Displays the default Dashboard page.
- **Workloads:** Displays the Workloads page. See “Workloads and Workload Commands” on page 12.
- **Tasks:** Displays the Tasks page, which lists items requiring user intervention.
- **Reports:** Displays the Reports page. See “Workload and Workload Protection Reports” on page 17.
- **Settings:** Displays the Settings page, which provides access to the following configuration options:
  - **Protection Tiers:** See “Protection Tiers” on page 38.
  - **Permissions:** See “Setting Up User Authorization and Authentication” in your *Application Configuration Guide*.
  - **Email/SMTP:** See “Setting Up E-Mail Notifications of Events” in your *Application Configuration Guide*.
  - **Licenses/License Designations:** See “Product Licensing” in your *Application Configuration Guide*.

Visual Summary Panel

The Visual Summary panel provides a high-level view of all licensed workloads and the amount of available storage on the appliance.

Inventoried workloads are represented by three categories:

- **Protected:** Indicates the number of workloads under active protection.
- **Failed:** Indicates the number of protected workloads that the system has rendered as failed according to that workload’s protection tier.
- **Underprotected:** Indicates the number of protected workloads that require user attention.

The area in the center of the left panel represents a graphical summary of the Workloads page. It uses the following dot icons to represent workloads in different states:

Table 2-1 *Dot Icon Workload Representation*

●	*Unprotected*	●	*Underprotected*
○	*Unprotected – Error*	●	*Failed*
●	*Protected*	●	*Expired*
●	*Unused*		

The icons are shown in alphabetical order according to workload name. Mouse over a dot icon to display the workload name, or click it to display its Workload Details page.

Storage provides information about storage space available to PlateSpin Forge.

Tasks and Events Panel

The Tasks and Events panel shows the most recent *Tasks*, the most recent *Past Events*, and the next *Upcoming Events*.

Events are logged whenever something relevant to the system or to the workload occurs. For example, an event could be the addition of a new protected workload, the replication of a workload starting or failing, or the detection of the failure of a protected workload. Some events generate automatic notifications by e-mail if SMTP is configured. See "Setting Up E-Mail Notifications of Events" in your *Application Configuration Guide*.

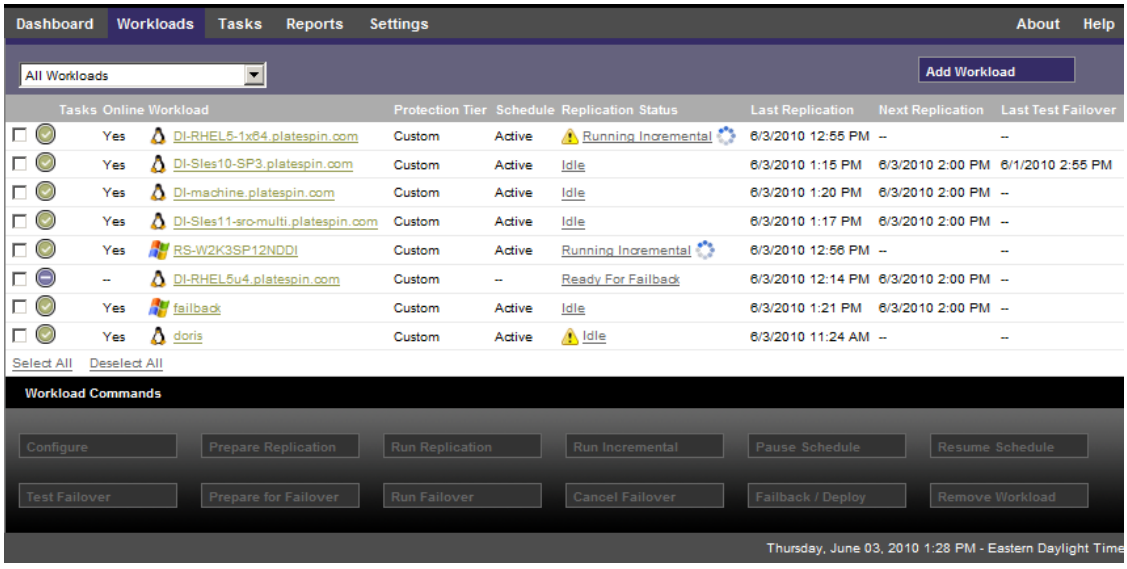
Tasks are special commands that are tied to events that require user intervention. For example, upon completion of a Test Failover command, the system generates an event associated with two tasks: `Mark Test as Success` and `Mark Test as Failure`. Clicking either task results in the Test Failover operation being cancelled and a corresponding event being written in the history. Another example is the `FullReplicationFailed` event, which is shown coupled with a `StartFull` task. You can view a complete list of current tasks on the Tasks tab.

In the Tasks and Events panel on the dashboard, each category shows a maximum of three entries. To see all tasks or to see past and upcoming events, click *View All* in the appropriate section.

2.1.3 Workloads and Workload Commands

The Workloads page displays a table with a row for each inventoried workload. Click a workload name to display a Workload Details page for viewing or editing configurations relevant to the workload and its state.

Figure 2-2 *The Workloads Page*

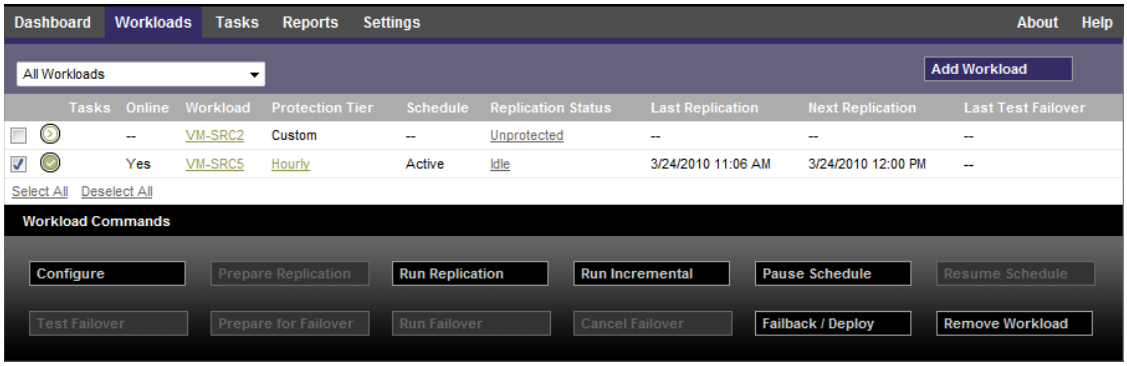


NOTE: All time stamps reflect the time zone of the Forge Management VM. This might be different from the time zone of the protected workload or the time zone of the host on which you are running the PlateSpin Forge Web Client. A display of the server date and time appears at the bottom right of the client window.

Workload Protection and Recovery Commands

Commands reflect the workflow of workload protection and recovery. To perform a command to a workload, select the corresponding check box at the left. Applicable commands depend on the current state of a workload.

Figure 2-3 *Workload Commands*



The following is a summary of workload commands along with their functional descriptions.

Table 2-2 *Workload Protection and Recovery Commands*

Workload Command	Description
Configure	Starts the workload protection configuration with parameters applicable to an inventoried workload.
Prepare Replication	Installs required data transfer software on the source and creates a failover VM in preparation of workload replication.
Run Replication	Starts replicating the source workload and establishes the workload protection contract according to specified parameters.
Run Incremental	Performs an individual transfer of changed data from the source to the target outside the workload protection schedule.
Pause Schedule	Suspends the protection and pauses data transfers from the protected workload.
Resume Schedule	Resumes the protection according to saved protection settings.
Test Failover	Brings the recovery workload online in an isolated environment within the container for testing purposes.
Prepare for Failover	Boots the recovery workload in preparation for a failover operation.
Run Failover	Boots and configures the recovery workload, which takes over the business services of a failed workload.
Cancel Failover	Aborts the failover process.
Failback / Deploy	Following a failover operation, fails the recovery workload back to its original infrastructure or to a new infrastructure (virtual or physical).
Remove Workload	Removes a workload from the inventory.

2.2 Using Workload Protection Features through the PlateSpin Forge Web Services API

You can use workload protection functionality programmatically, using the `protection.webservices` API from within your applications. You can use any programming or scripting language that supports Web services.

`http://`<*hostname* | *IP_address*>`/protection.webservices`

Replace <*hostname* | *IP_address*> with the hostname or the IP address of your Forge Management VM.

To script common workload protection operations, use the referenced samples written in Python as guidance. A Microsoft Silverlight application, along with its source code, is also provided for reference purposes.

2.3 Managing Multiple Instances of PlateSpin Forge

PlateSpin Forge includes a Web-based client application, the PlateSpin ForgeManagement Console, that provides centralized access to multiple instances of PlateSpin Forge.

In a data center with more than one instance of PlateSpin Forge, you can designate one of the instances as the manager and run the management console from there. Other instances are added under the Manager, providing a single point of control and interaction.

- Section 2.3.1, “Using the PlateSpin Forge Management Console,” on page 14
- Section 2.3.2, “About PlateSpin Forge Management Console Cards,” on page 15
- Section 2.3.3, “Adding Instances of PlateSpin Forge to the Management Console,” on page 16
- Section 2.3.4, “Managing Cards on the Management Console,” on page 16

2.3.1 Using the PlateSpin Forge Management Console

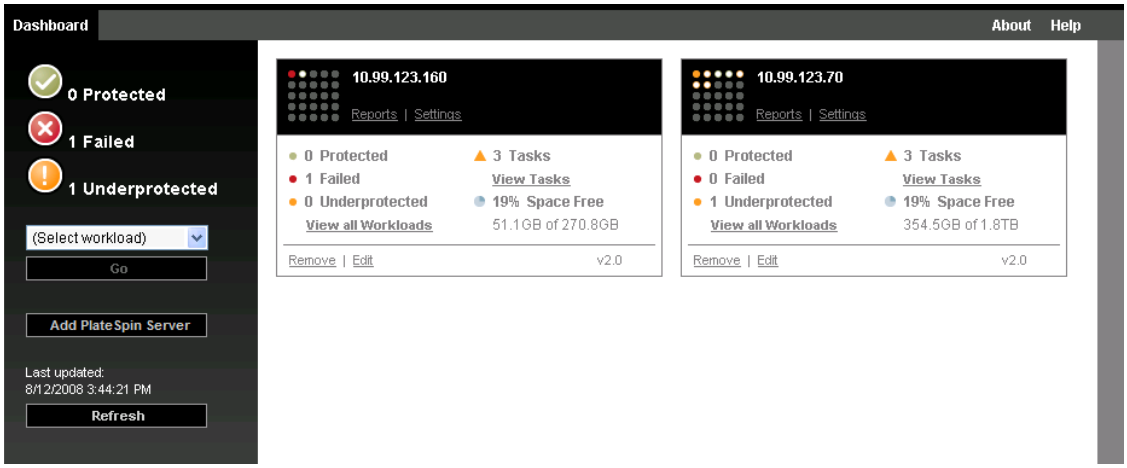
1. Open a Web browser on a machine that has access to your PlateSpin Forge instances and navigate to the following URL:

   `http://`<*IP_address* | *hostname*>`/console`

   Replace <*IP_address* | *hostname*> with either the IP address or the hostname of the Forge Management VM that is designated as the Manager.
2. Log in with your username and password.

   The console’s default Dashboard page is displayed.

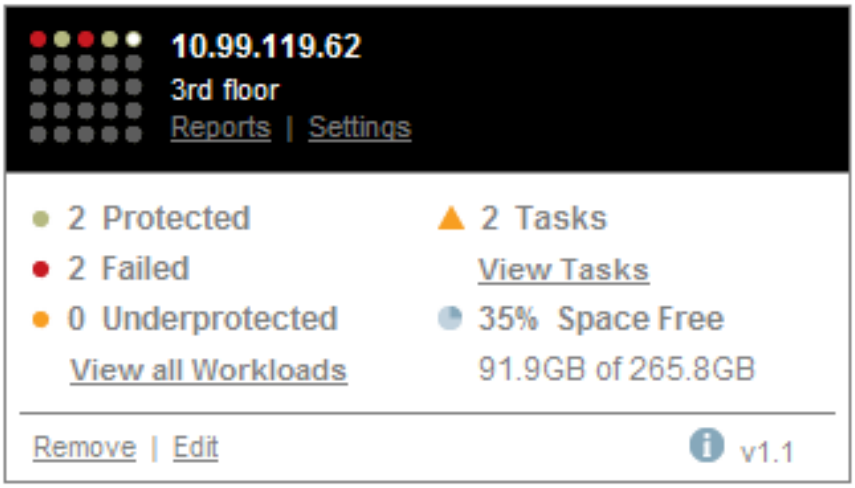
Figure 2-4 *The Management Console's Default Dashboard Page*



2.3.2 About PlateSpin Forge Management Console Cards

Individual instances of PlateSpin Forge, when added to the Management Console, are represented by cards.

Figure 2-5 *PlateSpin Forge Instance Card*



A card displays basic information about the specific instance of PlateSpin Forge, such as:

- IP address/hostname
- Location
- Version number
- Workload count
- Workload status
- Storage capacity
- Remaining free space

Hyperlinks on each card allow you to navigate to that particular instance's Workloads, Reports, Settings, and Tasks pages. There are also hyperlinks that allow you to edit a card's configuration or remove a card from the display.

2.3.3 Adding Instances of PlateSpin Forge to the Management Console

Adding a PlateSpin Forge instance to the Management Console results in a new card on the Management Console's dashboard.

NOTE: When you log in to the Management Console on a PlateSpin Forge instance, that instance is not automatically added to the console. It must be manually added to the console.

To add a PlateSpin Forge instance to the console:

1. On the console's main dashboard, click *Add*.

   The *Add/Edit* page is displayed.
2. Specify the URL of the Forge Management VM. Both HTTP and HTTPS protocols are supported.
3. (Optional) Enable the *Use Management Console Credentials* check box to use the same credentials as those used by the console. When it is selected, the console automatically populates the *Domain\Username* field.
4. In the *Domain\Username* field, type a domain name and a username valid for the PlateSpin Forge instance that you are adding. In the *Password* field, type the corresponding password.
5. (Optional) Specify a descriptive or identifying *Display Name* (15 characters max), a *Location* (20 characters max), and any *Notes* you might require (400 characters max).
6. Click *Add/Save*.

   A new card is added to the dashboard.

2.3.4 Managing Cards on the Management Console

You can modify the details of a PlateSpin Forge card on the Management Console.

1. Click the *Edit* hyperlink on the card that you want to edit.

   The console's *Add/Edit* page is displayed.
2. Make any desired changes, then click *Add/Save*.

   The updated console dashboard is displayed.

To remove a PlateSpin Forge card from the Management Console:

1. Click the *Remove* hyperlink on the card you want to remove.

   A confirmation prompt is displayed.
2. Click *OK*.

   The individual appliance card is removed from the dashboard.

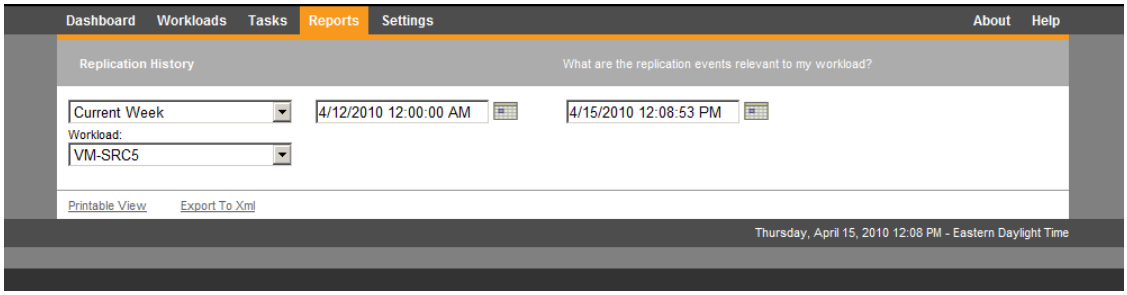
2.4 Workload and Workload Protection Reports

PlateSpin Forge enables you to generate reports that provide analytical insight into your workload protection schedules over time.

The following report types are supported:

- **Workload Protection:** Reports replication events for all workloads over a selectable time window.
- **Replication History:** Reports replication type, size, time, and transfer speed per selectable workload over a selectable time window.
- **Replication Window:** Reports the dynamics of full and incremental replications that can be summarized by *Average*, *Most Recent*, *Sum*, and *Peak* perspectives.
- **Current Protection Status:** Reports *Target RPO*, *Actual RPO*, *Actual TTO*, *Actual RTO*, *Last Test Failover*, *Last Replication*, and *Test Age* statistics.
- **Events:** Reports system events for all workloads over a selectable time window.
- **Scheduled Events:** Reports only upcoming workload protection events.

Figure 2-6 *Options for a Replication History Report*



To generate a report:

1. In your PlateSpin Forge Web Client, click *Reports*.

   A list of the report types is displayed.
2. Click the name of the required report type.

Workload Protection 3

PlateSpin Forge creates a replica of your production workload and regularly updates that replica based on changes that the protected workload undergoes over time.

The replica, or the *failover workload*, is a virtual machine in the VM container of PlateSpin Forge and takes over the business function of your production workload in case of a disruption at the production site.

- Section 3.1, “Basic Workflow for Workload Protection and Recovery,” on page 19
- Section 3.2, “Adding a Workload for Protection,” on page 20
- Section 3.3, “Configuring Protection Details and Preparing the Replication,” on page 21
- Section 3.4, “Starting the Workload Protection,” on page 23
- Section 3.5, “Failover,” on page 24
- Section 3.6, “Failback,” on page 26
- Section 3.7, “Protecting Windows Clusters,” on page 30

3.1 Basic Workflow for Workload Protection and Recovery

PlateSpin Forge defines the following workflow of workload protection and recovery:

1. Preparatory step:
   - **1a** Make sure that PlateSpin Forge supports your workload. See “Supported Configurations” on page 7.
   - **1b** Make sure that your workloads meet access and network prerequisites. See “Access and Communication Requirements across your Protection Network” in your *Application Configuration Guide*.
   - **1c** (Linux only)
     - (Conditional) If you plan to protect a supported Linux workload that has a non-standard, customized, or newer kernel, rebuild the PlateSpin `blkwatch` module, which is required for block-level data replication. See KB Article 7005873 (http://www.novell.com/support/viewContent.do?externalId=7005873).
     - (Recommended) Prepare LVM snapshots for block-level data transfer. See KB Article 7005872 (http://www.novell.com/support/viewContent.do?externalId=7005872).
     - (Optional) Determine and prepare any custom scripts that you want to execute on your source workload upon each replication. See “Automatically Executing Custom Scripts upon Every Replication (Linux)” on page 41.
   - **1d** (Optional) Define a replication blackout window if required. See *Parameters for Imposing a Replication Blackout Window* in your *Application Configuration Guide*.
2. Add a workload. See “Adding a Workload for Protection” on page 20.
3. Configure protection details and prepare the replication. See “Configuring Protection Details and Preparing the Replication” on page 21.

4 Start the workload protection schedule. See “Starting the Workload Protection” on page 23.

5 (Optional) Manually run an incremental.

6 (Optional) Test the failover functionality. See Testing the Recovery Workload and the Failover Functionality

7 Perform a failover. See “Failover” on page 24

8 Perform a failback. See “Failback” on page 26.

9 (Optional) Reprotect a workload after failback.

Except for Steps 1, 8, and 9, these are represented by workload commands on the Workloads page. See “Workloads and Workload Commands” on page 12.

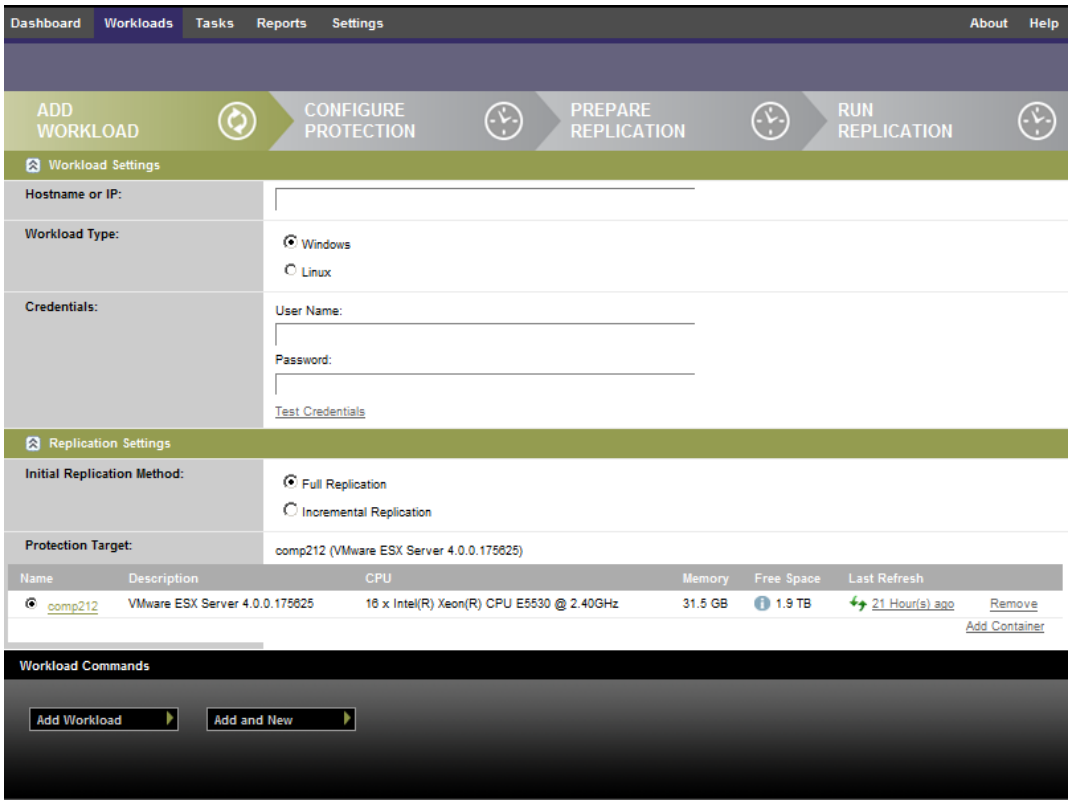
A *Reprotect* command becomes available following a successful Failback operation.

3.2 Adding a Workload for Protection

1 Follow the required preparatory steps. See Step 1 in “Basic Workflow for Workload Protection and Recovery” on page 19.

2 On the Dashboard or Workloads page, click *Add Workload*.

The PlateSpin Forge Web Client displays the Add Workload page.



3 Specify the required workload details:

- **Workload Settings:** Specify your workload's hostname or IP address, the operating system, and admin-level credentials. Use the required credential format (see "Guidelines for Workload Credentials" on page 37. To make sure that PlateSpin Forge can access the workload, click *Test Credentials*.
- **Replication Settings:** Select the required replication settings. See "Initial Replication Method (Full and Incremental)" on page 39.

4 Click *Add Workload*.

PlateSpin Forge reloads the Workloads page and displays a process indicator for the workload being added  . Wait for the process to complete. Upon completion, a *Workload Added* event is shown on the Dashboard.

3.3 Configuring Protection Details and Preparing the Replication

Protection details control the workload protection and recovery settings and behavior over the entire life cycle of a workload under protection. At each phase of the protection and recovery workflow (see "Basic Workflow for Workload Protection and Recovery" on page 19), relevant settings are read from the protection details.

To configure your workload's protection details:

1 Add a workload. See "Adding a Workload for Protection" on page 20.

2 On the Workloads page, select the required workload and click *Configure*.

The PlateSpin Forge Web Client displays the workload's Protection Details page.

3 Configure the protection details in each set of settings as dictated by your business continuity needs. See "Workload Protection Details" on page 22.

4 Correct any validation errors.

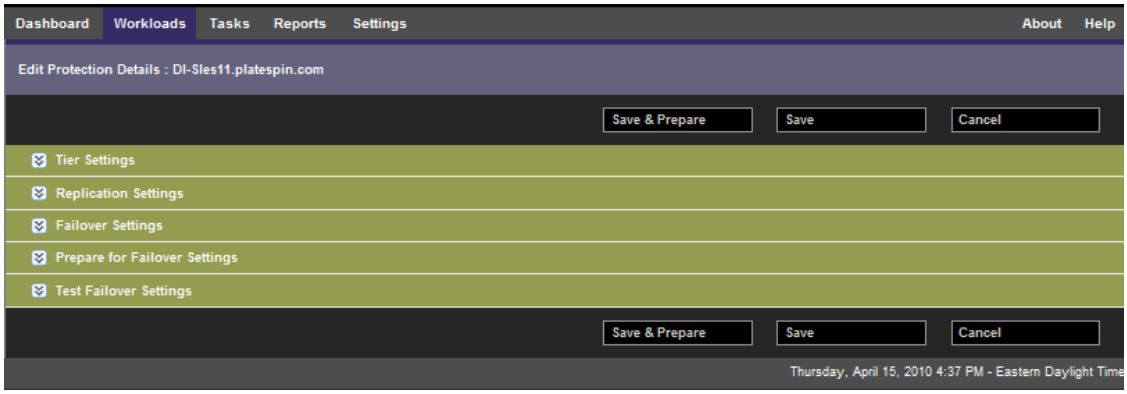
5 Click *Save*.

Alternatively, click *Save & Prepare*. This saves the settings and simultaneously executes the *Prepare Replication* command (installing data transfer drivers on the source workload if required and creating the initial VM replica of your workload).

Wait for the process to complete. Upon completion, a *Workload configuration completed* event is shown on the Dashboard.

3.3.1 Workload Protection Details

Workload protection details are represented by five sets of parameters:



You can expand or collapse each parameter set by clicking the icon at the left.

The following are the details of the five parameter sets:

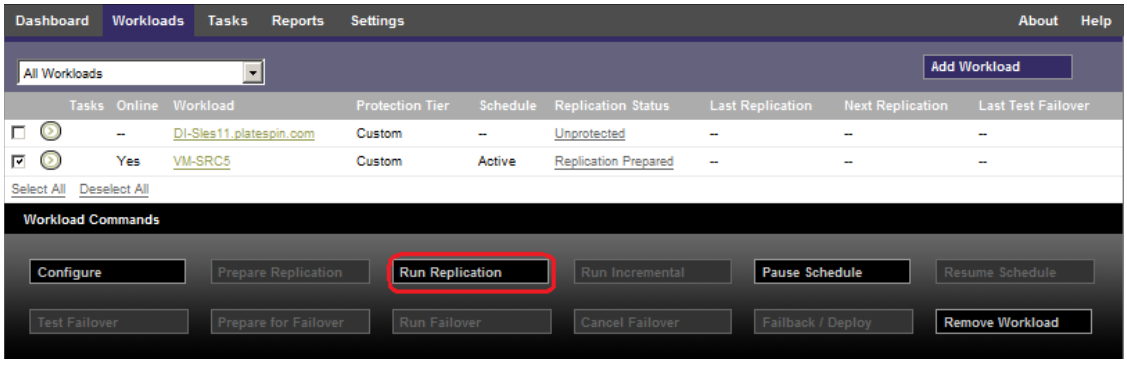
Table 3-1 *Workload Protection Details*

Parameter Set (Settings)	Details
Tier	Indicates the Protection Tier that the current protection contract follows. See "Protection Tiers" on page 38.
Replication	**Transfer Method:** (Windows) Enables you to select a data transfer mechanism and security through encryption. See "Transfer Methods and Data Transfer Security" on page 38. **Source Credentials:** Required for accessing the workload. See "Guidelines for Workload Credentials" on page 37. **Number of CPUs:** Enables you to specify the required number of vCPUs assigned to the recovery workload. **Replication Network:** Enables you to separate replication traffic based on virtual networks defined on your appliance host. See "Networking" on page 42. **Recovery Point Datastore:** Enables you to select a datastore associated with your appliance host for storing Recovery Points. See "Recovery Points" on page 39. **Protected Volumes:** Use these options to select volumes for protection and to assign their replicas to specific datastores on your appliance host. For Linux, you can also select logical volumes and volume groups for protection. See "Volumes" on page 41. **Services/Daemons to stop:** Enables you to select Windows services or Linux Daemons that are automatically stopped during the replication. See "Service and Daemon Control" on page 40.

Parameter Set (Settings)	Details
Failover	**VM Memory:** Enables you to specify the amount of memory allocated to the failover VM. **Hostname and Domain/Workgroup affiliation:** Use these options to control the identity and domain/workgroup affiliation of the failover workload when it is live. For domain affiliation, domain admin credentials are required. **Network Connections:** Use these options to control the LAN settings of the failover workload. See “Networking” on page 42. **Service States to Change:** Enables you to control the startup state of specific application services (Windows) or daemons (Linux). See “Service and Daemon Control” on page 40.
Prepare for Failover	Enables you to control the temporary network settings of the failover workload during the optional Prepare for Failover operation. See “Networking” on page 42.
Test Failover	**VM Memory:** Enables you to assign the required RAM to the temporary workload. **Hostname:** Enables you to assign a hostname to the temporary workload. **Domain/Workgroup:** Enables you to affiliate the temporary workload with a domain or a workgroup. For domain affiliation, domain admin credentials are required. **Network Connections:** Controls the LAN settings of the temporary workload. See “Networking” on page 42. **Service States to Change:** Enables you to control the startup state of specific application services (Windows) or daemons (Linux). See “Service and Daemon Control” on page 40.

3.4 Starting the Workload Protection

Workload protection is started by the *Run Replication* command:



You can execute the Run Replication command after:

- Adding a workload.
- Configuring the workload’s protection details.
- Preparing the initial replication.

When you are ready to proceed:

1. On the Workloads page, select the required workload, then click *Run Replication*.
2. Click *Execute*.

   PlateSpin Forge starts the execution and displays a process indicator for the *Copy data* step  .

3.5 Failover

Failover is when the business function of a failed workload is taken over by a recovery workload within a PlateSpin Forge VM container.

- Section 3.5.1, “Failure Detection,” on page 24
- Section 3.5.2, “Performing a Failover,” on page 25
- Section 3.5.3, “Testing the Recovery Workload and the Failover Functionality,” on page 26

3.5.1 Failure Detection

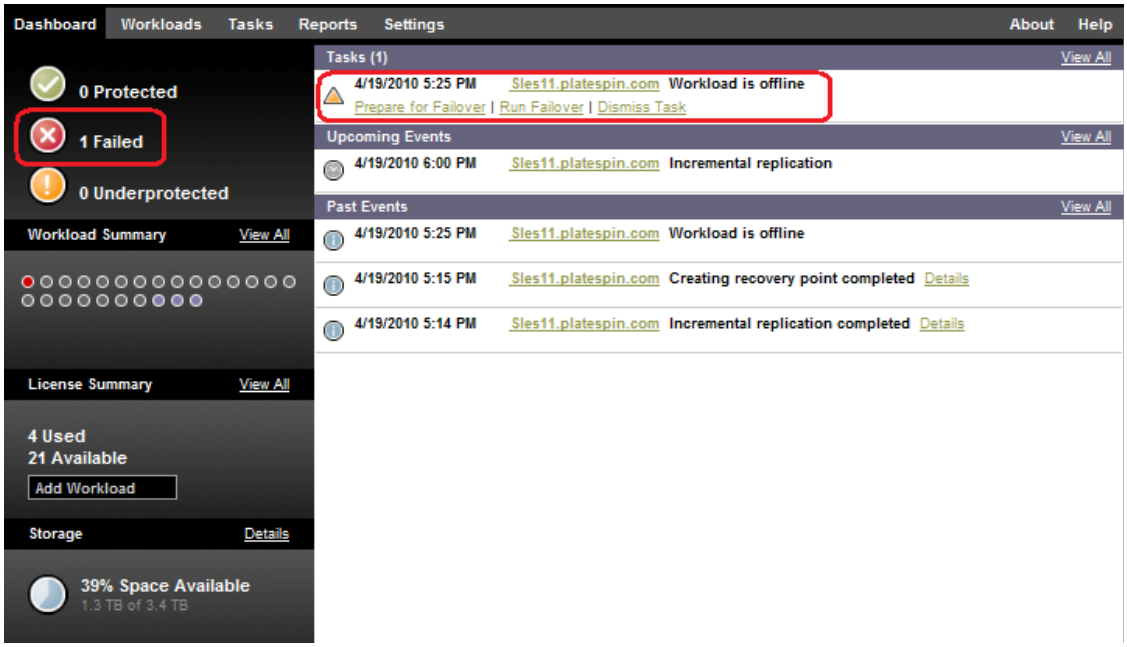
If an attempt to detect a workload fails for a predefined number of times, PlateSpin Forge generates a *Workload is offline* event. Criteria that determine and log a workload failure are part of a workload protection contract’s Tier settings (see the Tier row in “Workload Protection Details” on page 22).

If notifications are configured along with SMTP settings, PlateSpin Forge simultaneously sends a notification e-mail to the specified recipients. See *Setting Up E-Mail Notifications of Events* in your *Application Configuration Guide*.

If a workload failure is detected while the status of the replication is *Idle*, you can proceed to the *Run Failover* command. If a workload fails while an incremental is underway, the job stalls. In this case, abort the command, and then proceed to the *Run Failover* command. See “Performing a Failover” on page 25.

The following figure shows the PlateSpin Forge Web Client’s Dashboard page upon detecting a workload failure. Note the applicable tasks in the Tasks and Events pane:

Figure 3-1 *The Dashboard Page upon Workload Failure Detection*



3.5.2 Performing a Failover

Failover settings, including the recovery workload's network identity and LAN settings, are saved together with the workload's protection details at configuration time. See the Failover row in "Workload Protection Details" on page 22.

You can use the following methods to perform a failover:

- Selecting the required workload on the Workloads page and clicking *Run Failover*. You can use the optional *Prepare for Failover* command for applying your saved failover settings to the recovery workload and booting it in advance of a full failover. Consider a separate *Prepare for Failover* operation to make sure that your production workload has indeed failed. This saves time when running a full *Failover* command.
- Clicking the appropriate command hyperlink of the *Workload is offline* event in the Tasks and Events pane. See Figure 3-1.
- Manually booting the recovery workload by using the VMware Infrastructure Client (VIC). When using this method, use the VIC's Snapshot Manager to select a snapshot (a recovery point).

  See "Managing Forge Snapshots on the Appliance Host" in your *Appliance Setup and Maintenance Guide*.

  NOTE: When performing a failover manually, the system applies failover settings as saved upon the workload's replication.

Use one of these methods to start the failover process and select a recovery point to apply to the recovery workload (see "Recovery Points" on page 39). Click *Execute* and monitor the progress. Upon completion, the replication status of the workload should indicate *Live*.

For testing the recovery workload or testing the failover process as part of a planned disaster recovery exercise, see “Testing the Recovery Workload and the Failover Functionality” on page 26.

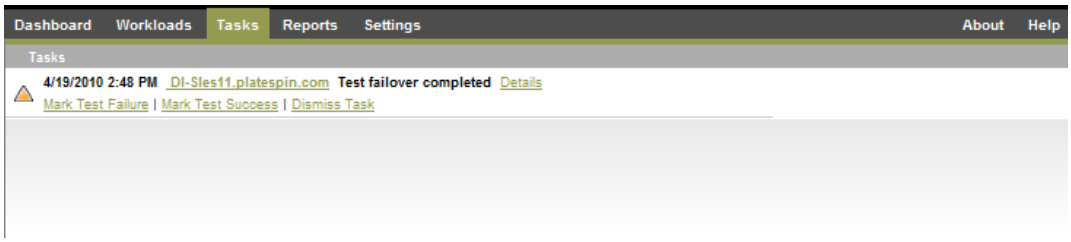
3.5.3 Testing the Recovery Workload and the Failover Functionality

PlateSpin Forge provides you with the capability to test the failover functionality and the integrity of the recovery workload. This is done by using the *Test Failover* command, which boots the recovery workload in a restricted network environment for testing.

When you execute the command, PlateSpin Forge applies the Test Failover Settings, as saved in the workload protection details, to the recovery workload (see the Test Failover row in “Workload Protection Details” on page 22.

1. Define an appropriate time window for testing and make sure that there are no replications underway. The replication status of the workload must be *Idle*.
2. On the Workloads page, select the required workload, click *Test Failover*, select a recovery point (see “Recovery Points” on page 39), and the click *Execute*.

   Upon completion, PlateSpin Forge generates a corresponding event and a task with a set of applicable commands:



3. Verify the integrity and business functionality of the recovery workload. Use the VMware vSphere Client to access the recovery workload in the appliance host.

   See “Downloading the VMware Infrastructure Client (VIC)” in your *Appliance Setup and Maintenance Guide*.
4. Mark the test as a failure or a success. Use the corresponding commands in the task (*Mark Test Failure*, *Mark Test Success*). The selected action is saved in the history of events associated with the workload. *Dismiss Task* discards the task and the event.

   Upon completion of the *Mark Test Failure* or *Mark Test Success* tasks, PlateSpin Forge discards temporary settings that were applied to the recovery workload, and the protection contract returns to its pre-test state.

3.6 Failback

A Failback operation is the next logical step after a failover; it transfers the failover workload to its original infrastructure or, if required, a new one.

Failback methods differ according to the target infrastructure type and the degree of automation of the failback process:

- **Automated Failback to a Virtual Machine:** Supported for VMware ESX platforms.
- **Semi-Automated Failback to a Physical Machine:** Supported for all physical machines.

- **Semi-Automated Failback to a Virtual Machine:** Supported for Xen on SLES and Microsoft Hyper-V platforms.

The following topics provide more information:

- Section 3.6.1, “Automated Failback to a Virtual Machine,” on page 27
- Section 3.6.2, “Semi-Automated Failback to a Physical Machine,” on page 29
- Section 3.6.3, “Semi-Automated Failback to a Virtual Machine,” on page 30

3.6.1 Automated Failback to a Virtual Machine

Use these steps to do an automated failback of a failover workload to a target VMware container.

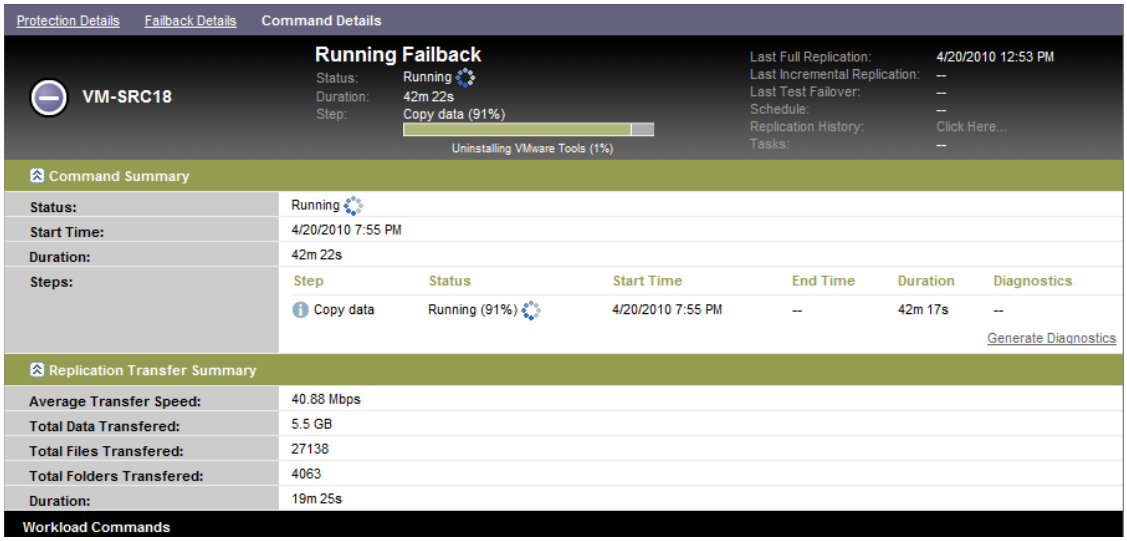
The following VMware containers are supported as automated failback targets: VMware ESX 3i, 3.5.x, 4, 4i, 4.1.

1. Following a failover, select the workload on the Workloads page and click *Failback / Deploy*.
2. Specify the following sets of parameters:
   - **Workload Settings:** Specify the recovery workload’s hostname or IP address and provide admin-level credentials. Use the required credential format (see “Guidelines for Workload Credentials” on page 37.
   - **Failback Target Settings:** Specify the the following parameters:
     - ***Replication Method*:** Select the scope of data replication. If you select *Incremental*, you must prepare a target. See “Initial Replication Method (Full and Incremental)” on page 39.
     - ***Target Type*:** Select *Virtual Target*. If you don’t yet have a failback container, click *Add Container* and inventory a supported VM host using root-level credentials.
3. Click *Save and Prepare* and monitor the progress on the Command Details screen.

   Upon successful completion, PlateSpin Forge loads the Ready for Failback screen, prompting you to specify the details of the failback operation.
4. Configure the failback details. See “Failback Details (Workload to VM)” on page 28.
5. Click *Save and Failback* and monitor the progress on the Command Details page. See Figure 3-2.

   PlateSpin Forge executes the command. If you selected the Reprotect after Failback in the Post-Failback parameter set, a *Reprotect* command is shown in the PlateSpin Forge Web Client.

Figure 3-2 *Failback Command Details*



Failback Details (Workload to VM)

Failback details are represented by three sets of parameters that you configure when you are performing a workload failback operation to a virtual machine.

Table 3-2 *Failback Details (VM)*

Parameter Set (Settings)	Details
Failback	**Transfer Method:** (Windows) Enables you to select a data transfer mechanism and security through encryption. See "Transfer Methods and Data Transfer Security" on page 38. **Failback Network:** Enables you to direct failback traffic over a dedicated network based on virtual networks defined on your appliance host. See "Networking" on page 42. **VM Datastore:** Enables you to select a datastore associated with your failback container for the target workload. **Volumes to Copy:** Enables you to select the volumes for re-creating on the target and assigning to a specific datastore. **Services/Daemons to stop:** Enables you to select Windows services or Linux daemons that are automatically stopped during the failback. See "Service and Daemon Control" on page 40.

Parameter Set (Settings)	Details
Workload	***Number of CPUs:*** Enables you to specify the required number of vCPUs assigned to the target workload. **VM Memory:** Enables you to assign the required RAM to the target workload . **Hostname, Domain/Workgroup:** Use these options to control the identity and domain/workgroup affiliation of the target workload. For domain affiliation, domain admin credentials are required. **Network Connections:** Use these options to specify the network mapping of the target workload based on the virtual networks of the underlying VM container. **Service States to Change:** Enables you to control the startup state of specific application services (Windows) or daemons (Linux). See "Service and Daemon Control" on page 40.
Post-Failback	**Reprotect Workload:** Use this option if you plan to re-create the protection contract for the target workload after deployment. This maintains a continuous event history for the workload and auto-assigns/designates a workload license. ◆ ***Reprotect after Failback:*** Select this option if you intend to re-create a protection contract for the target workload. ◆ ***No reprotect*:** Select this option if you don't intend to re-create a protection contract for the target workload.

3.6.2 Semi-Automated Failback to a Physical Machine

Use these steps to fail a workload back to a physical machine after a failover. The physical machine might be either the original infrastructure or a new one.

1. Register the required physical machine with your PlateSpin Forge Server. See "Registering Physical Machines with PlateSpin Forge for Failback" on page 43.
2. (Optional: Windows platforms) Run the PS Analyzer tool to determine whether any drivers are missing. See "Analyzing Workloads with PlateSpin Analyzer" on page 31.
3. If the PS Analyzer reports missing or incompatible drivers, upload the required drivers to the PlateSpin Forge device driver database. See "Managing Device Drivers" on page 32.
4. Following a failover, select the workload on the Workloads page and click *Failback / Deploy*.
5. Specify the following sets of parameters:
   - **Workload Settings:** Specify the recovery workload's hostname or IP address and provide admin-level credentials. Use the required credential format (see "Guidelines for Workload Credentials" on page 37.
   - **Failback Target Settings:** Specify the following parameters:
     - ***Replication Method:*** Select the scope of data replication. See "Initial Replication Method (Full and Incremental)" on page 39.
     - ***Target Type:*** Select the *Physical Target* option and then select the physical machine you registered in Step 1.
6. Click *Save and Prepare* and monitor the progress on the Command Details screen.

   Upon successful completion, PlateSpin Forge loads the Ready for Failback screen, prompting you to specify the details of the failback operation.

7 Configure the failback details, then click *Save and Failback*.

Monitor the progress on the Command Details screen.

3.6.3 Semi-Automated Failback to a Virtual Machine

This failback type follows a process similar to the Semi-Automated Failback to a Physical Machine for a VM target other than a natively-supported VMware container. During this process, you direct the system to regard a VM target as a physical machine.

A semi-automated failback to a VM is supported for the following target VM platforms:

- Xen on SLES 10, 11
- Microsoft Hyper-V

3.7 Protecting Windows Clusters

PlateSpin Forge supports the protection of a Microsoft Windows cluster's business services. The supported clustering technologies are:

- Windows 2003 Server-based Windows Cluster Server (*Single-Quorum Device Cluster* model)
- Windows 2008 Server-based Microsoft Failover Cluster (*Node and Disk Majority* and *No Majority: Disk Only* models)

Protection of a cluster is achieved through incremental replications of changes on the active node streamed to a virtual single-node cluster, which you can use while troubleshooting the source infrastructure.

The scope of support for cluster migrations in the current release is subject to the following conditions:

- When performing an *Add Workload* operation, you must identify the active node—the node that currently owns the quorum resource of the cluster—identified by the cluster's IP address (*virtual IP address*). Specifying the IP address of an individual node results in that node being inventoried as a regular, cluster-unaware Windows workload.
- A cluster's quorum resource must be collocated with the cluster's resource group (service) being protected.

If a node failover occurs between incremental replications of a protected cluster, PlateSpin Forge generates a protection event. If the new active node's profile is similar to the failed active node, the protection schedule continues, otherwise the command fails.

To protect a Windows cluster, follow the normal workload protection workflow (see "Basic Workflow for Workload Protection and Recovery" on page 19).

On Failback, PlateSpin Forge provides validation that helps you ensure that shared volume layouts are preserved on the target. Make sure you map the volumes correctly.

Auxiliary Tools for Working with Physical Machines

4

Your PlateSpin Forge distribution includes tools for use when working with physical machines as failback targets.

- Section 4.1, “Analyzing Workloads with PlateSpin Analyzer,” on page 31
- Section 4.2, “Managing Device Drivers,” on page 32

4.1 Analyzing Workloads with PlateSpin Analyzer

Before running a workload failback or operation to a physical machine, use the PlateSpin Analyzer to identify potential driver problems and correct them beforehand.

NOTE: PlateSpin Analyzer currently supports only Windows workloads.

1. On your Forge Management VM, start the `Analyzer.Client.exe` program, located in the following directory:

   `Program Files\PlateSpin Forge Server\PlateSpin Analyzer`
2. Make sure that the network selection is *Default*, then select the required machine in the *All Machines* drop-down list.
3. (Optional) To reduce the analysis time, limit the scope of machines to a specific language.
4. Click *Analyze*.

   Depending on the number of inventoried workloads you select, the analysis might take a few seconds to several minutes.

Analyzed servers are listed in the left pane. Select a server to view test results in the right pane. Test results can be any combination of the following:

Table 4-1 *Status Messages in PlateSpin Analyzer Test Results*

Result	Description
Passed	The machine passed the PlateSpin Analyzer tests.
Warning	One or more tests returned warnings for the machine, indicating potential migration issues. Click the hostname to see the details.
Failed	One or more tests failed for this machine. Click the hostname to see the details and obtain more information.

The *Summary* tab provides a listing of the number of machines analyzed and not checked, as well as those that passed the test, failed the test, or were assigned a warning status.

The *Test Results* tab provides the following information:

Table 4-2 *PlateSpin Analyzer Test Results Tab*

Section	Details
System Test	Validates that the machine fulfills minimum hardware and operating system requirements.
Hardware Support	Checks the workload for hardware compatibility.
Target Hardware Support	Checks hardware compatibility for use as a target physical machine.
Software Test	Checks for applications that must be shut down for Live Transfer, and databases that should be shut down during Live Transfer to guarantee transactional integrity.
Incompatible Application Test	Verifies that applications known to interfere with the migration process are not installed on the system. These applications are stored in the Incompatible Application Database. To add, delete or edit entries in this database, select *Incompatible Application* from the *Tools* menu.

The *Properties* tab provides detailed information about a selected machine.

4.2 Managing Device Drivers

PlateSpin Forge ships with a library of device drivers and automatically installs the appropriate ones on target workloads. To determine if the required drivers are available, use the PlateSpin Analyzer utility. See "Analyzing Workloads with PlateSpin Analyzer" on page 31.

If PlateSpin Analyzer encounters missing or incompatible drivers, or if you require specific drivers for a target infrastructure, you might need to add (upload) drivers to the PlateSpin Forge driver database.

- Section 4.2.1, "Packaging Device Drivers for Windows Systems," on page 32
- Section 4.2.2, "Packaging Device Drivers for Linux Systems," on page 33
- Section 4.2.3, "Uploading Drivers to the PlateSpin Forge Device Driver Database," on page 33

4.2.1 Packaging Device Drivers for Windows Systems

To package your Windows device drivers for uploading to the PlateSpin Forge driver database:

1. Prepare all interdependent driver files (`*.sys`, `*.inf`, `*.dll`, etc.) for your target infrastructure and device. If you have obtained manufacturer-specific drivers as a `.zip` archive or an executable, extract them first.
2. Save the driver files in separate folders, with a discrete folder per device.

The drivers are now ready for upload. See "Uploading Drivers to the PlateSpin Forge Device Driver Database" on page 33.

NOTE: For problem-free operation of your protection job and the target workload, upload only digitally signed drivers for:

- All 64-bit Windows systems
- 32-bit versions of Windows Vista and Windows Server 2008, and Windows 7 systems

4.2.2 Packaging Device Drivers for Linux Systems

To package your Linux device drivers for uploading to the PlateSpin Forge driver database, you can use a custom utility included in your Linux Take Control ISO boot image. See Table 5-2, "ISO Boot Images for Target Physical Machines," on page 43.

1. On a Linux workstation, create a directory for your device driver files. All the drivers in the directory must be for the same kernel and architecture.
2. Download and mount the boot image, and from its `/tools` subdirectory, copy and extract the `ackageModules.tar.gz` archive into a another working directory.
3. Enter the working directory and execute the following command:

   `./PackageModules.sh –d` <*path_to_driver_dir*> `-o` <*package name*>

   Replace <*path_to_driver_dir*> with the actual path to the directory where you saved you driver files, and <*package name*> with the actual package name, using the following format:

   Drivername-driverversion-dist-kernelversion-arch`.pkg`

   For example, `bnx2x-1.48.107-RHEL4-2.6.9-11.EL-i686.pkg`

The package is now ready for upload. See "Uploading Drivers to the PlateSpin Forge Device Driver Database" on page 33.

4.2.3 Uploading Drivers to the PlateSpin Forge Device Driver Database

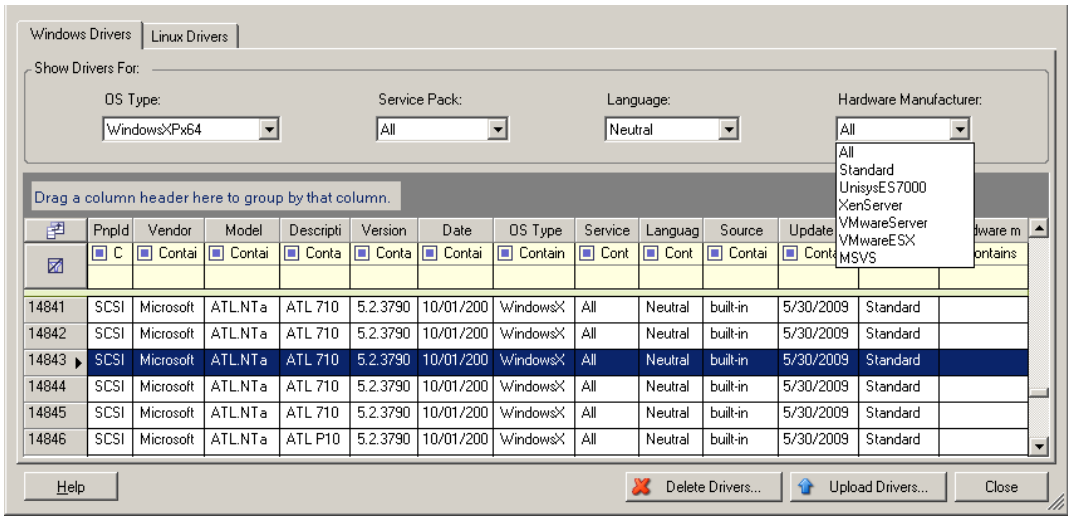
Use the PlateSpin Driver Manager to upload device drivers to the driver database.

NOTE: On upload, PlateSpin Forge does not validate drivers against selected operating system types or their bit specifications; make sure that you only upload drivers that are appropriate for your target infrastructure.

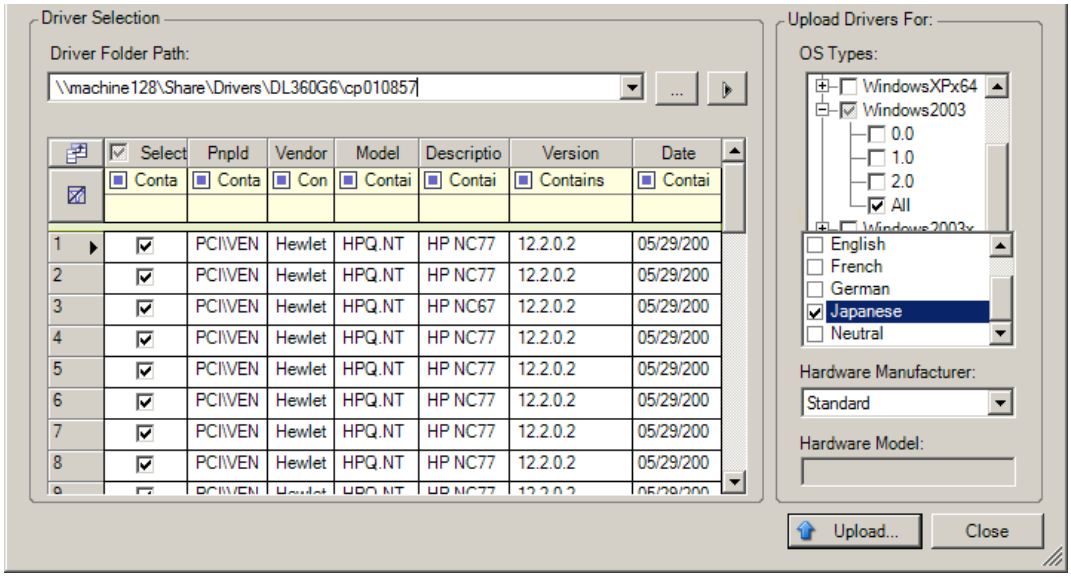
- "Device Driver Upload Procedure (Windows)" on page 33
- "Device Driver Upload Procedure (Linux)" on page 34

Device Driver Upload Procedure (Windows)

1. Obtain and prepare the required device drivers. See Packaging Device Drivers for Windows Systems.
2. On your Forge Management VM, under `Program Files\PlateSpin Forge Server\DriverManager`, start the `DriverManager.exe` program and select the *Windows Drivers* tab.



3 Click *Upload Drivers*, browse to the folder that contains the required driver files, and select applicable OS type, language, and hardware manufacturer options.



Select *Standard* as the *Hardware Manufacturer* option, unless your drivers are designed specifically for any of the target environments listed.

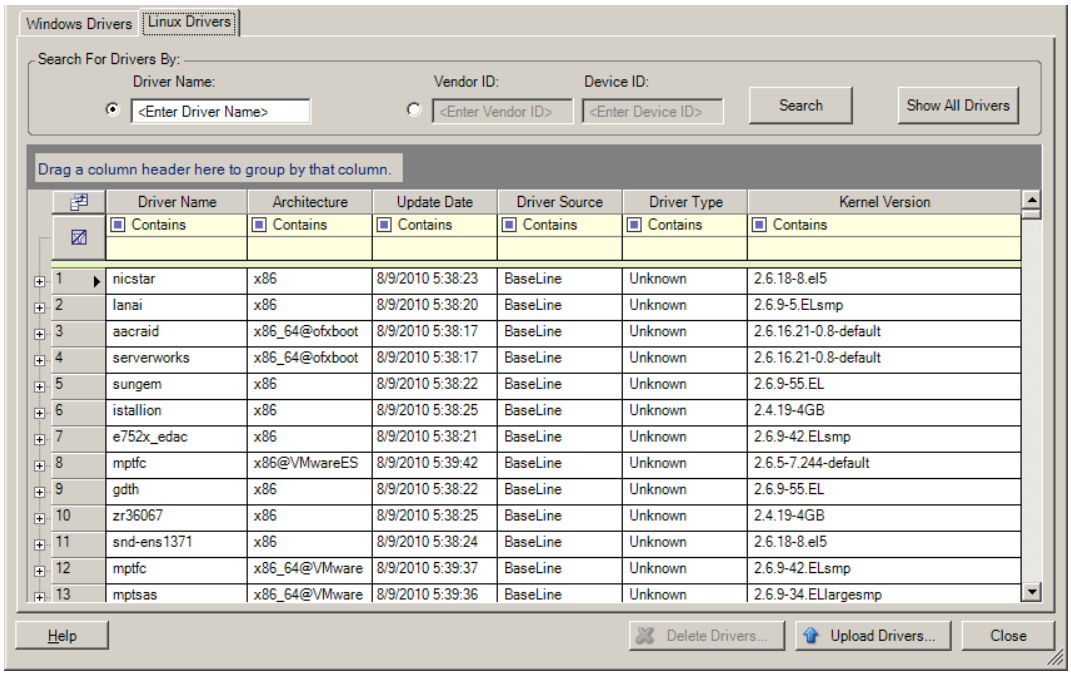
4 Click *Upload* and confirm your selections when prompted.

The system uploads the selected drivers to the driver database.

Device Driver Upload Procedure (Linux)

1 Obtain and prepare the required device drivers. See Packaging Device Drivers for Linux Systems.

2 Click *Tools* > *Manage Device Drivers* and select the *Linux Drivers* tab:



3 Click *Upload Drivers*, browse to the folder that contains the required driver package (`*.pkg`), and click *Upload All Drivers*.

The system uploads the selected drivers to the driver database.

Essentials of Workload Protection Details

5

This section provides information about the different functional areas of a workload protection contract.

- Section 5.1, “Guidelines for Workload Credentials,” on page 37
- Section 5.2, “Transfer Methods and Data Transfer Security,” on page 38
- Section 5.3, “Protection Tiers,” on page 38
- Section 5.4, “Recovery Points,” on page 39
- Section 5.5, “Initial Replication Method (Full and Incremental),” on page 39
- Section 5.6, “Service and Daemon Control,” on page 40
- Section 5.7, “Automatically Executing Custom Scripts upon Every Replication (Linux),” on page 41
- Section 5.8, “Volumes,” on page 41
- Section 5.9, “Networking,” on page 42
- Section 5.10, “Registering Physical Machines with PlateSpin Forge for Failback,” on page 43

5.1 Guidelines for Workload Credentials

PlateSpin Forge must have admin-level access to workloads Throughout the workload protection and recovery workflow, PlateSpin Forge prompts you to specify credentials that must be provided in a specific format.

Table 5-1 *Workload Credentials*

To Discover	Credentials	Remarks
All Windows workloads	Local or domain admin credentials.	For the username, use this format: ◆ For domain member machines: *authority\principal* ◆ For workgroup member machines: *hostname\principal*
Windows Clusters	Domain admin credentials	Use the cluster’s virtual IP address. If you use the IP address of an individual Windows cluster node, that node is discovered as a regular (cluster-unaware) Windows workload.
All Linux workloads	Root-level username and password	Non-root accounts must be properly configured to use `sudo`. See KB Article 7920711 (http://www.novell.com/support/viewContent.do?externalId=7920711).

To Discover	Credentials	Remarks
VMware ESX 4.1	ESX account with admin role.	If the ESX Server 4.1 is configured for Windows domain authentication, you can also use your Windows domain credentials.

5.2 Transfer Methods and Data Transfer Security

A transfer method describes the way data is replicated from a source to a target. PlateSpin Forge provides different data transfer capabilities, which depend on the protected workload's operating system:

- **Block-level:** Data is replicated at a volume's block level. For this transfer method, PlateSpin Forge uses a driver to monitor changes on the source workload.
  - **Windows systems:** For Windows systems, PlateSpin Forge uses a block-based component that leverages the Microsoft Volume Snapshot Service (VSS) with applications and services that support VSS. The automatic installation of the block-based component requires a reboot of the source workload. When you are configuring workload protection details, you can select the timing of the component's installation. Similarly, when removing a workload, uninstallation of the block-based component requires a reboot.
  - **Linux systems:** For the block-level transfer of Linux systems, PlateSpin Forge uses a block-based component driver that can leverage LVM snapshots (recommended). See KB Article 7005872 (http://www.novell.com/support/viewContent.do?externalId=7005872).

    The Linux block-based component included in your PlateSpin Forge distribution is precompiled for the standard, non-debug kernels of the supported Linux distributions. If you have a non-standard, customized, or newer kernel, you can rebuild the block-based component for your specific kernel. See KB Article 7005873 (http://www.novell.com/support/viewContent.do?externalId=7005873).

    Deployment or removal of the component is transparent, has no continuity impact, and requires no intervention.
- **File-level:** Data is replicated on a file-by-file basis (Windows only). Supported with or without VSS.

To make the transfer of workload data more secure, PlateSpin Forge enables you to encrypt data replication. When encryption is enabled, over-the-network data transfer from the source to the target is encrypted by using AES (Advanced Encryption Standard) or 3DES if FIPS-compliant encryption is enabled.

NOTE: Data encryption has a performance impact and might significantly slow down the data transfer.

5.3 Protection Tiers

A Protection Tier is a customizable collection of workload protection parameters that define the frequency of replications and criteria for the system to consider a workload as failed; it is an integral part of every workload protection contract.During the configuration stage of a workload protection contract, you can select one of several built-in Protection Tiers and customize its attributes as required by that specific protection contract.

You can also create custom protection tiers in advance:

1. In your PlateSpin Forge Web Client, click *Settings* > *Protection Tiers* > *Create Protection Tier*.
2. Specify the parameters for the new Protection Tier:

Name	Type the name you want to use for the tier.
Workload Failure	Specify the number of workload detection attempts before it is considered failed.
Workload Detection Every	Specify the time interval (in seconds) between workload detection attempts.
Recovery Points to Keep	Specify the number of recovery points to keep for workloads that use this Protection Tier. See "Recovery Points" on page 39. A `0` value disables this feature.
Incremental Recurrence	Specify the frequency of incremental replications and the incremental recurrence pattern. You can type directly in the *Start of recurrence* field, or click the calendar icon to select a date. Select *None* as the Recurrence Pattern to never use incremental replication.
Full Recurrence	Specify the frequency of full replications and the full recurrence pattern.

5.4 Recovery Points

A recovery point is a point-in-time snapshot of a workload . It allows a replicated workload to be restored to a specific state.

For each protected workload, you can keep up to 32 recovery points.

Recovery points that accumulate over time might cause your PlateSpin Forge storage to run out of space.

To remove recovery points from your appliance, see "Managing Forge Snapshots on the Appliance Host" in your *Appliance Setup and Maintenance Guide*.

5.5 Initial Replication Method (Full and Incremental)

In workload protection and failback operations, the Initial Replication parameter determines the scope of data transferred from a source to a target.

- **Full:** A full volume transfer takes place from a production workload to its replica (the recovery workload), or from a failover workload to its original virtual or physical infrastructure.
- **Incremental:** Only differences are transferred from a selected operation's source to its target, provided that they have a similar operating system and volume profile.
  - During protection: The production workload is compared with an existing VM in the appliance host. The existing VM might be:
    - A previously-protected workload's recovery VM (when a *Remove Workload* command's *Delete VM* option is deselected).

- A VM that is manually imported into the appliance host, such as a workload VM physically moved, on portable media, from the production site to a remote recovery site (for VMware ESX 3.5 and later only).

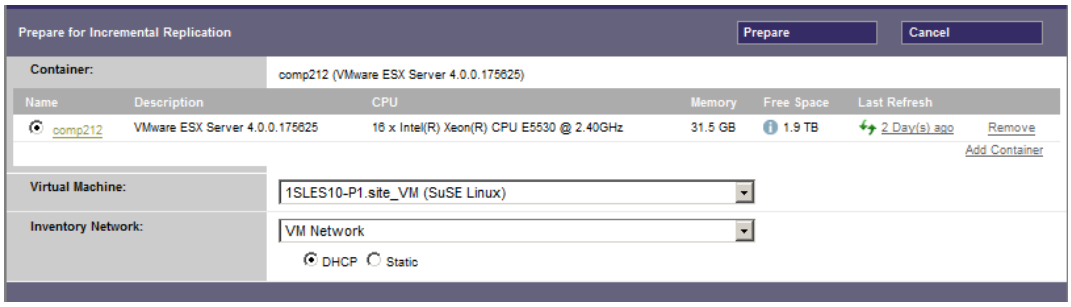
  See "Manually Importing VMs into the Appliance Host's Datastore" in your *Appliance Setup and Maintenance* guide.

- During failback to a virtual machine - the failover workload is compared with an existing VM in a failback container.
- During failback to a physical machine - the failover workload is compared with a workload on the target physical machine, if the physical machine is registered with PlateSpin Forge (see "Semi-Automated Failback to a Physical Machine" on page 29).

During workload protection and failback to a VM host, selecting *Incremental* as the initial replication method requires that you browse, locate, and prepare the target VM for synchronization with the selected operation's source.

1. Proceed with the required workload command, such as *Add Workload* or *Failback.*
2. For the *Initial Replication Method* option, select *Incremental Replication*.
3. Click *Prepare Workload*.

   The PlateSpin Forge Web Client displays the Prepare for Incremental Replication page.



4. Select the required container, the virtual machine, and the inventory network to use for communicating with the VM.
5. Click *Prepare*.

   Wait for the process to complete and for the user interface to return to the original command, then select the prepared workload.

5.6 Service and Daemon Control

PlateSpin Forge enables you to control services and daemons:

- **Source service/daemon control:** During data transfer, you can automatically stop Windows services or Linux daemons that are running on your source workload. This ensures that the source workload is transferred to the recovery workload in a more consistent state than if you leave them running.

  For example, for Windows workloads, consider stopping antivirus software services or services of third-party VSS-aware backup software.

For additional control of Linux sources during replication, consider the capability to run custom scripts on your Linux workloads during each replication. See “Automatically Executing Custom Scripts upon Every Replication (Linux)” on page 41.

- **Target startup sate/run level control:** You can select the startup state (Windows) or the run level (Linux) of services/daemons on the target workload. When you perform a Failover or Test Failover operation, you can specify which services or daemons you want to be running or stopped when the failover workload has gone live.

  Common services that you might want to assign a `disabled` startup state are vendor-specific services that are tied to their underlying physical infrastructure and are not required in a virtual machine.

5.7 Automatically Executing Custom Scripts upon Every Replication (Linux)

For Linux systems, PlateSpin Forge provides you with the capability to automatically execute custom scripts: `freeze` (executed at the beginning of a replication) and `thaw` (executed at the end of a replication).

You might want to consider using this capability to complement the automated daemon control feature provided through the user interface (see “Source service/daemon control:” on page 40. For example, you might want to use this feature to temporarily freeze certain daemons instead of shutting them down during replications.

To implement the feature, do the following before setting up your Linux workload protection:

1. Create the following files:
   - `platespin.freeze.sh` - a shell script to execute at the beginning of the replication
   - `platespin.thaw.sh` - a shell script to execute at the end of the replication
   - `platespin.conf` - a text file defining any required arguments, along with a timeout value.

     The required syntax for the contents of the `platespin.conf` file is:

     ```
     [ServiceControl]
     FreezeArguments=<arguments>
     ThawArguments=<arguments>
     TimeOut=<timeout>
     ```

     Replace <*arguments*> with the required command arguments, separated by a space, and <*timeout*> with a timeout value in seconds. If unspecified, the default timeout is used (60 seconds).
2. Save the scripts, along with the `.conf` file, on your Linux source workload, in the following directory:

   `/etc/platespin`

5.8 Volumes

Upon adding a workload for protection, PlateSpin Forge inventories your source workload’s storage media and automatically sets up options in the PlateSpin Forge Web Client for you to specify the volumes you require for protection.

PlateSpin Forge supports several types of storage, including Windows dynamic disks, LVM, RAID, and SAN.

For Linux workloads, PlateSpin Forge provides the following additional features:

- Non-volume storage that is associated with the source workload is recreated and assigned to the recovery workload.
- The layout of volume groups and logical volumes is preserved so that you can re-create it during failback.

The following figure shows the Replication Settings parameter set for a Linux workload with multiple volumes and two logical volumes in a volume group.

Figure 5-1 *Volumes, Logical Volumes, and Volume Groups of a Protected Linux Workload*

5.9 Networking

PlateSpin Forge enables you to control your recovery workload's network identity and LAN settings to prevent replication traffic from interfering with your main LAN or WAN traffic.

You can specify distinct networking settings in your workload protection details for use at different stages of the workload protection and recovery workflow:

- **Replication:** (Replication parameter set) For separating regular replication traffic from your production traffic.
- **Failover:** (Failover parameter set) For the recovery workload to become part of your production network when it goes live.
- **Prepare for Failover:** (Prepare for Failover network parameter) For network settings during the optional Prepare for Failover stage.
- **Test Failover:** (Test Failover parameter set) For network settings to apply to the recovery workload during a Test Failover stage.

5.10 Registering Physical Machines with PlateSpin Forge for Failback

If the required target infrastructure for a failback operation is a physical machine, you must register it with PlateSpin Forge.

The registration of a physical machine is carried out by booting the target physical machine with the appropriate PlateSpin boot (ISO) image.

Download the ISO image from the Novell Downloads (http://download.novell.com). Use the image appropriate for your target infrastructure:

Table 5-2 *ISO Boot Images for Target Physical Machines*

Filename	Remarks
`winperamdisk.iso`	Windows systems with 384 MB RAM or more
`winpe.iso`	Windows systems with 256 to 384 MB RAM
`bootofxx2p.iso`	All Linux systems
`winpe_cisco.iso`	Windows systems on Cisco hardware
`winpe_dell.iso`	Windows systems on Dell hardware
`winpe_fujitsu.iso`	Windows systems on Fujitsu hardware

After downloading the required file, unzip and save the extracted ISO file.

- Section 5.10.1, “Registering Target Physical Machines,” on page 43

5.10.1 Registering Target Physical Machines

1. Burn the appropriate image on a CD or save it to media, from which your target can boot.
2. Ensure that the network switch port connected to the target is set to *Auto Full Duplex*.

   Because the Windows version of the boot CD image supports only *Auto Negotiate Full Duplex*, this ensures that there are no conflicts in the duplex settings.

3. Use the boot CD to boot the target physical machine, then wait for the command prompt window to open.
4. (Linux only) For 64-bit systems, at the initial boot prompt, type the following:
   - `ps64` (for systems with up to 512 MB RAM)
   - `ps64_512m` (for systems with more than 512 MB RAM)

   Press Enter.
5. When prompted, enter the following URL:

   `http://`<*hostname* | *IP_address*>`/platespinforge`

   Replace <*hostname* | *IP_address*> with the hostname or the IP address of your Forge Management VM.
6. Provide your admin-level credentials for the Forge Management VM, specifying an authority. For the user account, use this format:

   *domain**username* or *hostname**username*

   Available network cards are detected and displayed by their MAC addresses.
7. If DHCP is available on the NIC to be used, press Enter to continue. If DHCP is not available, select the required NIC to configure with a static IP address.
8. Enter a hostname for the physical machine or press the Enter key to accept the default values.
9. Enter *Yes* if you have enabled SSL; otherwise, enter *No*.

After a few moments, the physical machine should be available in the failback settings of the PlateSpin Forge Web Client.

Injecting Drivers into a PlateSpin Boot Image (Linux)

You can use a custom utility to package and inject additional Linux device drivers into the PlateSpin boot image (`bootofxx2p`) before burning it on a CD:

1. Obtain or compile the required `*.ko` driver filess.

   IMPORTANT: Make sure the drivers are valid for the kernel included with the ISO file (`2.6.16.21-0.8-default`) and are appropriate for the target architecture.

   ---
2. Mount the image in any Linux machine (`root` credentials required). Use the following command syntax:

   `mount –o loop` <*path-to-ISO*> <*mount_point*>
3. Copy the `rebuildiso.sh` script, located in the `/tools` subdirectory of the mounted ISO file, into a temporary working directory. When you have finished, unmount the ISO file (execute the command `unmount` <*mount_point*>).
4. Create another working directory for the required driver files and save them in that directory.
5. In the directory where you saved the `rebuildiso.sh` script, run the following command as `root`:

   `./rebuildiso.sh –i` <*ISO_file*> `-d` <*driver_dir*> `-m i586|x86_64`

   On completion, the ISO file is updated with the additional drivers.

Troubleshooting

6

- Section 6.1, “Troubleshooting Workload Inventory (Windows),” on page 45
- Section 6.2, “Troubleshooting Workload Inventory (Linux),” on page 49
- Section 6.3, “Troubleshooting Problems during the Prepare Replication Command (Windows),” on page 49
- Section 6.4, “Troubleshooting Workload Replication,” on page 50
- Section 6.5, “Generating and Viewing Diagnostic Reports,” on page 51
- Section 6.6, “Post-Protection Workload Cleanup,” on page 52

6.1 Troubleshooting Workload Inventory (Windows)

The following are common problems that you might need to troubleshoot during the workload inventory.

Problems or Messages	Solutions
`The domain in the credentials is invalid or blank`	This error occurs when the Credential Format is incorrect. Try the discovery by using a local admin account with the credential format `hostname\LocalAdmin` Or try the discovery by using a domain admin account with the credential format `domain\DomainAdmin`
`Unable to connect to Windows server...Access is denied`	A non-admin account was used when trying to add a workload. Use an admin account or add the user to the administrators group and try again. This message might also indicate WMI connectivity failure. For each of the following possible resolutions, attempt the solution and then perform the “WMI Connectivity Test” on page 47 again. If the test succeeds, try adding the workload again. ◆ “Troubleshooting DCOM Connectivity” on page 47 ◆ “Troubleshooting RPC Service Connectivity” on page 47
`Unable to connect to Windows server...The network path was not found`	Network connectivity failure. Perform the “Performing Connectivity Tests” on page 46. If it fails, ensure that PlateSpin Forge and the workload are on the same network. Reconfigure the network and try again.

Problems or Messages	Solutions
`"Discover Server Details {hostname}" Failed Progress: 0% Status: NotStarted`	This error can occur for several reasons and each has a unique solution: ◆ For environments using a local proxy with authentication, bypass the proxy or add the proper permissions. See KB Article 7920339 (http://www.novell.com/support/viewContent.do?externalId=7920339) for more details. ◆ If local or domain policies restrict required permissions, follow the steps outlined in Knowledge Base article KB Article 7920862 (http://www.novell.com/support/viewContent.do?externalId=7920862).

Workload Discovery fails with error message
`Could not find file output.xml`
or
`Network path not found`
or (upon attempting to discover a Windows cluster)
`Inventory failed to discover. Inventory result returned nothing.`
	There are several possible reasons for the "Could not find file `output.xml`" error:
	◆ Anti-virus software on the source could be interfering with the discovery. Disable the anti-virus software to determine whether or not it is the cause of the problem. See "Disabling Anti-Virus Software" on page 48.
	◆ File and Printer Sharing for Microsoft Networks might not be enabled. Enable it under the Network Interface Card properties.
	◆ The C$ and/or Admin$ shares on the source might not be accessible. Ensure that PlateSpin Forge can access those shares. See "Enabling File/Share Permissions and Access" on page 48.
	◆ Change the flag `ForceMachineDiscoveryUsingService` to `true` in the `web.config` file in the `\Program Files\PlateSpin Portability Suite Server\Web` folder.
	◆ The Server or the Workstation service might not be running. If this is the case, enable them and set the startup mode to `automatic`.
	◆ The Windows remote registry service is disabled. Start the service and set the startup type to automatic.

6.1.1 Performing Connectivity Tests

- "Network Connectivity Test" on page 46
- "WMI Connectivity Test" on page 47
- "Troubleshooting DCOM Connectivity" on page 47
- "Troubleshooting RPC Service Connectivity" on page 47

Network Connectivity Test

Perform this basic network connectivity test to determine whether PlateSpin Forge is able to communicate with the workload that you are trying to protect.

1 Go to your Forge Management VM.

See "Downloading the VMware Infrastructure Client (VIC)" in your *Appliance Setup and Maintenance Guide*.

2 Open a command prompt and ping your workload:

```
ping workload_ip
```

WMI Connectivity Test

1 Go to your Forge Management VM.

See "Downloading the VMware Infrastructure Client (VIC)" in your *Appliance Setup and Maintenance Guide*.

2 Click *Start* > *Run*, type `Wbemtest` and press `Enter`.

3 Click *Connect*.

4 In the *Namespace*, type the name of the workload you are trying to discover with `\root\cimv2` appended to it. For example, if the hostname is `win2k`, type:

```
\\win2k\root\cimv2
```

5 Enter the appropriate credentials, using either the `hostname\LocalAdmin` or `domain\DomainAdmin` format.

6 Click *Connect* to test the WMI connection. If an error message is returned, a WMI connection cannot be established between PlateSpin Forge and your workload.

Troubleshooting DCOM Connectivity

1 Log into the workload that you want to protect.

2 Click *Start* > *Run*.

3 Type `dcomcnfg` and press Enter.

4 Check connectivity:

- On a Windows NT/2000 server machine, the DCOM Configuration dialog is displayed. Click the *Default Properties* tab and ensure that *Enable Distributed COM on this computer* is selected.
- For Windows Server 2003, the Component Services window is displayed. In the *Computers* folder of the console tree of the Component Services administrative tool, right-click the computer that you want to check for DCOM connectivity, then click *Properties*. Click the *Default Properties* tab and ensure that *Enable Distributed COM on this computer* is selected.

5 If DCOM was not enabled, enable it and either reboot the server or restart the Windows Management Instrumentation Service. Then try adding the workload again.

Troubleshooting RPC Service Connectivity

There are three potential blockages for the RPC service:

- The Windows Service
- A Windows firewall
- A Hardware firewall

For the Windows Service, ensure that the RPC service is running on the workload. To access the services panel, run `services.msc` from a command prompt. For a Windows firewall, add an RPC exception.For hardware firewalls, you can try the following strategies:

- Putting PlateSpin Forge and the workload on the same side of the firewall
- Opening up specific ports between PlateSpin Forge and the workload (See "Access and Communication Requirements across your Protection Network" in your *Application Configuration Guide*).

6.1.2 Disabling Anti-Virus Software

Anti-virus software might occasionally block some of the PlateSpin Forge functionality related to WMI and Remote Registry.In order to ensure that workload inventory is successful, it might be necessary to first disable the anti-virus service on a workload.In addition, anti-virus software might occasionally lock access to certain files, allowing access only to certain processes or executables. This might occasionally obstruct file-based data replication. In this case, when you configure the workload protection, you can select services to disable, such as services installed and used by anti-virus software. These services are only disabled for the duration of the file transfer, and are restarted when the process completes. This is not necessary during block-level data replication.

6.1.3 Enabling File/Share Permissions and Access

To successfully protect a workload, PlateSpin Forge needs to successfully deploy and install the OFX Controller and, if you require block-level replication, a dedicated block-based component. Upon deployment of these components to a workload, as well as during the Add Workload process, PlateSpin Forge uses the workload's administrative shares. PlateSpin Forge needs administrative access to the shares, using either a local administrator account or a domain admin account for this to work.

To ensure that the Administrative shares are enabled:

1. Right-click `My Computer` on the desktop and select `Manage`.
2. Expand *System Tools* > *Shared Folders* > *Shares*
3. In the `Shared Folders` directory, you should see C$ and Admin$, among other shares.

After confirming that the shares are enabled, ensure that they are accessible from within the Forge Management VM:

1. Go to your Forge Management VM.

   See "Downloading the VMware Infrastructure Client (VIC)" in your *Appliance Setup and Maintenance Guide*.
2. Click *Start* > *Run*, type \\<*server_host*>\C$, then click *OK*.
3. If prompted, use the same credentials as those you will use to add the workload to the PlateSpin Forge workload inventory.

   The directory is opened and you should be able to browse and modify its contents.
4. Repeat the process for all shares with the exception of the IPC$ share.

   Windows uses the IPC$ share for credential validation and authentication purposes. It is not mapped to a folder or file on the workload, so the test will always fail; however, the share should still be visible.

PlateSpin Forge does not modify the existing content of the volume; however, it creates its own directory, to which it requires access and permissions.

6.2 Troubleshooting Workload Inventory (Linux)

Problems or Messages	Solutions
`Unable to connect neither to the SSH server running on <IP_address> nor to VMware Virtual Infrastructure web-services at <ip_address>/sdk`	This message has a number of possible causes: ◆ The workload is unreachable. ◆ The workload does not have SSH running. ◆ The firewall is on and the required ports have not been opened. ◆ The workload's specific operating system is not supported. For network and access requirements for workload, see "Access and Communication Requirements across your Protection Network" in your *Application Configuration Guide*.
`Access denied`	Authentication problem: either invalid username or password. For information on proper workload access credentials, see "Guidelines for Workload Credentials" on page 37.

6.3 Troubleshooting Problems during the Prepare Replication Command (Windows)

Problems or Messages	Solutions
Authentication error when verifying the controller connection while setting up the controller on the source.	The account used to add a workload needs to be allowed by this policy. See "Group Policy and User Rights" on page 49.

6.3.1 Group Policy and User Rights

Refresh the policy immediately by using `gpudate /force` (for Windows 2003/XP) or `secedit /refreshpolicy machine_policy /enforce` (for Windows 2000). Because of the way that PlateSpin Forge interacts with the source workload's operating system, it requires the administrator account used to add a workload have certain user rights on the source machine. In most instances, these settings are defaults of group policy; however, if the environment has been locked down, the following user rights assignments might have been removed:

- Bypass Traverse Checking
- Replace Process Level Token
- Act as part of the Operating System

In order to verify that these Group Policy settings have been set, you can run `gpresult /v` from the command line on the source machine, or alternatively `RSOP.msc`. If the policy has not been set, or has been disabled, it can be enabled through either the Local Security Policy of the machine or through any of the Domain Group Policies being applied to the machine.

6.4 Troubleshooting Workload Replication

Problems or Messages	Solutions
Workload issue requires user intervention Recoverable error during replication either during *Scheduling Taking Snapshot of Virtual Machine* or *Scheduling Reverting Virtual Machine to Snapshot before Starting*.	This problem occurs when the server is under load and the process is taking longer than expected. The solution is to wait until the replication is complete.
All workloads go into recoverable errors because you are out of disk space.	Verify the free space. If more space is required, remove a workload.
Slow network speeds under 1 MB.	Confirm that the source machine's Network Interface Card's duplex setting is on and the switch it is connected to has a matching setting. That is, if the switch is set to auto, the source can't be set to 100 MB.
Slow network speeds over 1 MB.	Measure the latency by running the following from the source workload: `ping ip –t` (replace *ip* with the IP address of your Forge Management VM). Allow it to run for 50 iterations and the average indicates the latency. Also see *Parameters for Optimizing Transfers over WAN Connections* in your *Application Configuration Guide*.

`The file transfer cannot begin - port 3725 is already in use`
 	
or
 	
`3725 unable to connect`
	Ensure that the port is open and listening:
	
	Run `netstat -ano` on the workload.
	
	Check the firewall.
	
	Retry the replication.

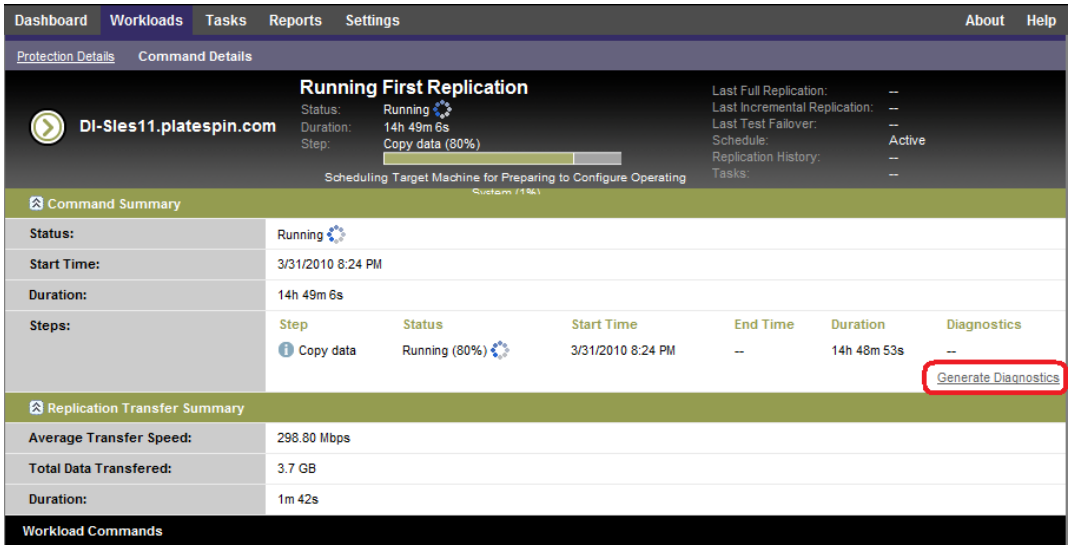
`Controller connection not established` Replication fails at the *Take Control of Virtual Machine* step.	This error occurs when the replication networking information is invalid. Either the DHCP server is not available or the replication virtual network is not routable to the Forge Management VM. Change the replication IP to a static IP or enable the DHCP server. Ensure that the virtual network selected for replication is routable to the Forge Management VM.

Problems or Messages	Solutions
Replication job does not start (stuck at 0%)	This error can occur for different reasons and each has a unique solution: • For environments using a local proxy with authentication, bypass the proxy or add proper permissions to resolve this problem. See Knowledge Base article KB Article 20339 (http://www.novell.com/support/viewContent.do?externalId=7920339) for more details. • If local or domain policies restrict required permissions, to resolve this problem follow the steps outlined in KB Article 7920862 (http://www.novell.com/support/viewContent.do?externalId=7920862). This is a common issue when Forge Management VM is affiliated with a domain and the domain policies are applied with restrictions. See “Group Policy and User Rights” on page 49.

6.5 Generating and Viewing Diagnostic Reports

After you execute a command, you can generate detailed diagnostic reports about the command’s details.

1 Click *Command Details*, then click the *Generate Diagnostics* link.



After a few moments, the page refreshes and displays a *View* link above the *Generated Diagnostics* link.

2 Click *View*.

A new page opens with comprehensive diagnostic information about the current command.

3 Save the diagnostics page and have it ready when seeking technical support.

6.6 Post-Protection Workload Cleanup

Use these steps to clean up your source workload from all PlateSpin software components when required, such as following an unsuccessful or problematic protection.

6.6.1 Cleaning Up Windows Workloads

Component	Removal Instructions
Third-party Block-based Transfer Component (discontinued)	1. Use the Windows Add/Remove Programs applet (run `appwiz.cpl`) and remove the component. Depending on the source, you might have either of the following versions: ◆ SteelEye Data Replication for Windows v6 Update2 ◆ SteelEye DataKeeper For Windows v7 2. Reboot the machine.
File-based Transfer Component	At root level for each volume under protection, remove all files named `PlateSpinCatalog*.dat`
Workload Inventory software	In the workload's `Windows` directory: ◆ Remove all files named `machinediscovery*` ◆ Remove the subdirectory named `platespin`.
Controller software	1. Open a command prompt and change the current directory to: ◆ `\Program Files\platespin*` (32-bit systems) ◆ `\Program Files (x86)\platespin` (64-bit systems) 2. Run the following command: `ofxcontroller.exe /uninstall` 3. Remove the `platespin*` directory

6.6.2 Cleaning Up Linux Workloads

Component	Removal Instructions

Controller software	◆ In the source workload's file system, under `/boot`, remove the `ofx` directory with its contents.
	◆ Kill the OFX controller process if running:
	`pkill -9 ofxcontrollerd`
	◆ remove the OFX controller rpm package:
	`rpm -e ofxcontrollerd`

Component	Removal Instructions
Block-level data transfer software	In the source workload's file system: ◆ Under `/lib/modules/`*`kernel_version`*, remove the `platespin` directory with its contents ◆ Under `/etc`, remove the `blkwatch.conf` file
LVM snapshots	1. In the Jobs view, generate a Job Report for the failed job, then note the name of the snapshot. 2. Remove the snapshot device by using the following command: `lvremove` *snapshot_name*
Bitmap files	For each volume under protection, at the root of the volume, remove the corresponding `.blocks_bitmap` file.
Tools	On the source workload, under `/sbin`, remove the following files: ◆ `bmaputil` ◆ `blkconfig`

Glossary

appliance host
See container.

container
The VM host that contains the recovery workload (a protected workload's bootable virtual replica).

Event
A PlateSpin Forge Server message that contains information about important steps throughout the workload protection lifecycle.

Failback
The restoration of the business function of a failed workload in its original environment when the business function of a temporary recovery workload within PlateSpin Forge is no longer required.

Failover
The taking over of the business function of a failed workload by a recovery workload within a PlateSpin Forge VM container.

incremental
1. (noun) An individual scheduled or manual transfer of differences between a protected workload and its replica (the recovery workload).

2. (adjective) Describes the scope of *replication (1)*, in which the initial replica of a workload is created differentially (based on differences between the workload and its prepared counterpart).

management VM
The management virtual machine containing the PlateSpin Forge software.

Prepare for Failover
A PlateSpin Forge operation that boots the recovery workload in preparation of a full Failover operation.

protection tier
A customizable collection of workload protection parameters that define the frequency of replications and criteria for the system to consider a workload as failed.

recovery point
A point-in-time snapshot, allowing a replicated workload to be restored to a previous state.

recovery point objective (RPO)
Tolerable data loss measured in time and defined by a configurable interval between incremental replications of a protected workload .

recovery time objective (RTO)
A measure of a workload's tolerable downtime defined by the time a failover operation takes to complete.

recovery workload
A protected workload's bootable virtual replica.

replication
1. The creation of an initial base copy of a workload (*initial replication*). 2. Any transfer of changed data from a protected workload to its replica in the container.

replication schedule
The schedule that is set up to control the frequency and scope of replications.

Reprotect
A PlateSpin Forge command that reestablishes a protection contract for a workload following the Failover and Failback operations.

source
A workload or its infrastructure that is the starting point of a PlateSpin Forge operation. For example, upon initial protection of a workload, the source is your production workload. In a failback operation, it is the recovery workload in the container.

See also target.

target
A workload or its infrastructure that is the outcome of a PlateSpin Forge command. For example, upon initial protection of a workload, the target is the recovery workload in the container. In a failback operation, it is either your production workload's original infrastructure or any supported container that has been inventoried by PlateSpin Forge.

See also source.

Test Failover
A PlateSpin Forge operation that boots a recovery workload in an isolated networking environment for testing the functionality of the failover and verifying the integrity of the recovery workload.

test time objective (TTO)
A measure of the ease with which a disaster recovery plan can be tested. It is similar to RTO, but includes the time needed for a user to test the recovery workload.

workload
The basic object of protection in a data store. An operating system, along with its middleware and data, decoupled from the underlying physical or virtual infrastructure.