# Installation and Configuration Guide

## NetIQ Sentinel 7.1

June 2013

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# Contents

# About this Book and the Library

The *Installation and Configuration Guide* provides an introduction to NetIQ Sentinel and explains how to install and configure Sentinel.

## Intended Audience

This guide is intended for Sentinel administrators and consultants.

## Other Information in the Library

The library provides the following information resources:

**Administration Guide**

Provides administration information and tasks required to manage a Sentinel deployment.

**User Guide**

Provides conceptual information about Sentinel. This book also provides an overview of the user interfaces and step-by-step guidance for many tasks.

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# I Understanding Sentinel

This section provides detailed information about what Sentinel is and how Sentinel provides an event management solution for your organization.

- Chapter 1, “What is Sentinel?,” on page 15
- Chapter 2, “How Sentinel Works,” on page 19

# 1 What is Sentinel?

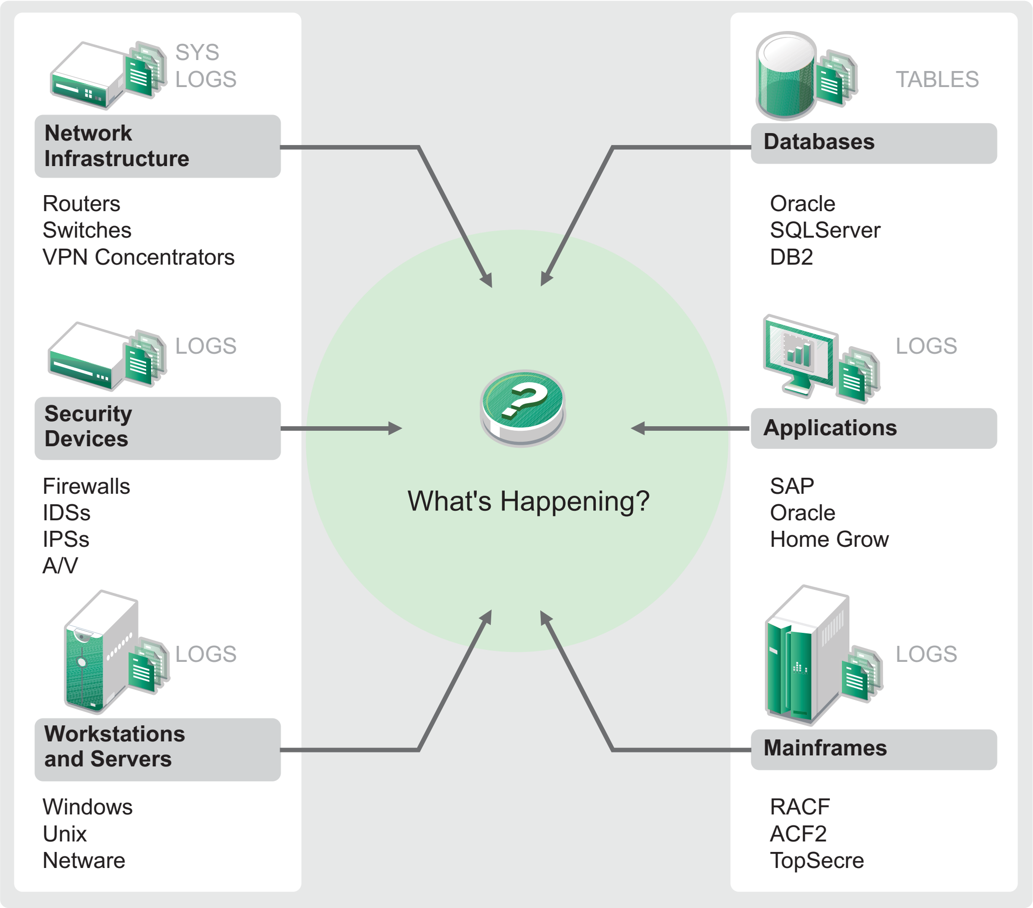
Sentinel is a security information and event management (SIEM) solution as well as a compliance monitoring solution. Sentinel automatically monitors the most complex IT environments and provides the security required to protect your IT environment.

- Section 1.1, "Challenges of Securing an IT Environment," on page 15
- Section 1.2, "The Solution That Sentinel Provides," on page 16

## 1.1 Challenges of Securing an IT Environment

Securing your IT environment is a challenge due to the complexity of your environment. There are many different applications, databases, mainframes, workstations, and servers that all have logs of events. You also have the security devices and network infrastructure devices that all contain logs of what is happening in your IT environment.

**Figure 1-1** *What Happens in Your Environment*



The challenges arise because of the following facts:

- There are many devices in your IT environment.
- The logs are in different formats.
- The logs are stored in silos.
- The amount of information generated in the logs.
- You can’t determine who did what without manually analyzing all of the logs.

To make the information useful, you must be able to perform the following:

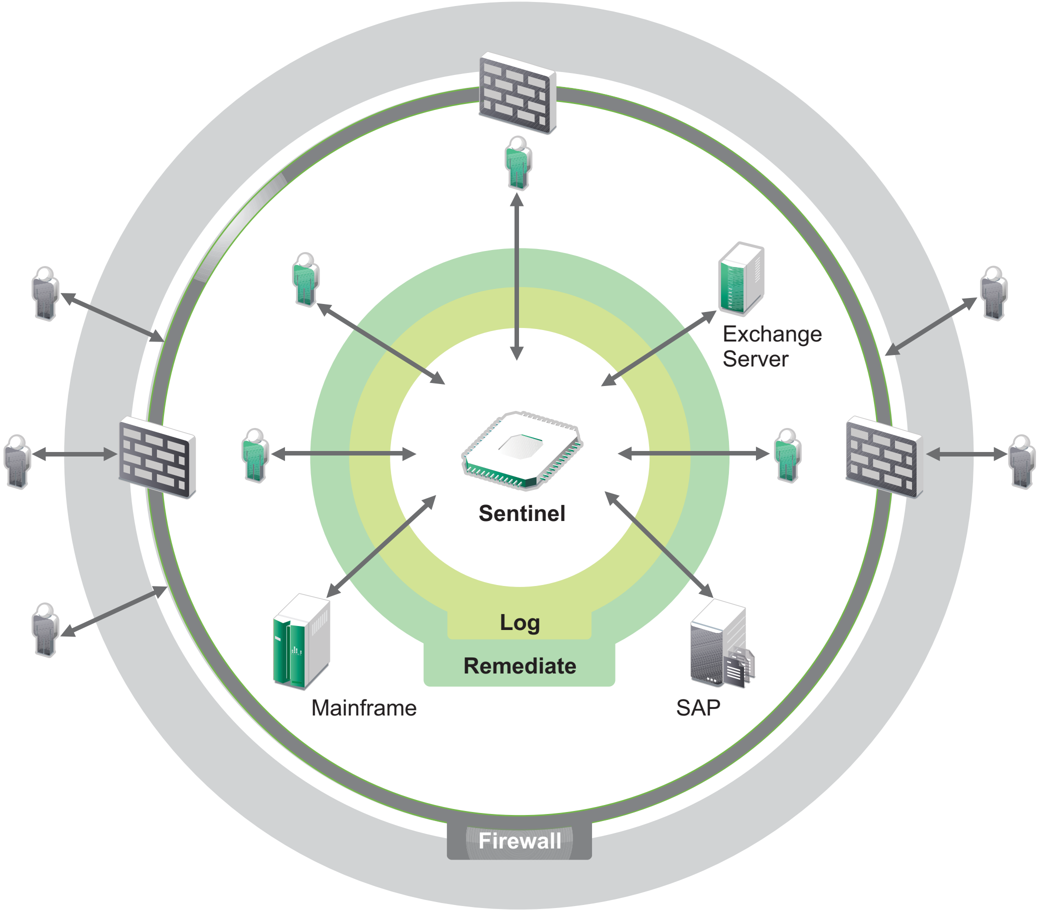
- Collect the data.
- Consolidate the data.
- Normalize disparate data into events that you can easily compare.
- Map events to standard regulations.
- Analyze the data.
- Compare events across multiple systems to determine if there are security issues.
- Send notifications when the data is outside of the norms.
- Take action on notifications to comply with business policies.
- Generate reports to prove compliance.

After you understand the challenges of securing your IT environment, you need to determine how to secure the enterprise for and from users without treating them like malicious users, or burdening them to the point where it is impossible to be productive. Sentinel provides the solution.

## 1.2 The Solution That Sentinel Provides

Sentinel acts as the central nervous system to the enterprise security. It pulls in data from across your entire infrastructure—applications, databases, servers, storage, and security devices. It analyzes and correlates the data, and makes the data actionable, either automatically or manually.

*Figure 1-2 The Solution That Sentinel Provides*



The result is that you know what is happening in your IT environment at any given point, and you have the ability to tie the actions taken on resources to the people taking those actions. This allows you to determine user behavior and effectively monitor control. No matter if that person is an insider or not, you can tie together all the actions they take so that unauthorized activities become clear before they do damage.

Sentinel does this in a cost-effective way by:

- Providing a single solution to address IT controls across multiple regulations.
- Closing the knowledge gap between what should happen and what is actually happening in your networked environment.
- Demonstrating to auditors and regulators that your organization documents, monitors, and reports on security controls.
- Providing out-of-the-box compliance monitoring and reporting programs.
- Gaining the visibility and control required to continually assess the success of your organization's compliance and security programs.

Sentinel automates log collection, analysis, and the reporting processes to ensure that IT controls are effective in supporting threat detection and audit requirements. Sentinel provides automated monitoring of security events, compliance events, and IT controls allowing you to take immediate action if there is a security breach or non-compliant event occurring. Sentinel also allows you to easily gather summary information about your environment so you can communicate your overall security posture to key stakeholders.

# 2 How Sentinel Works

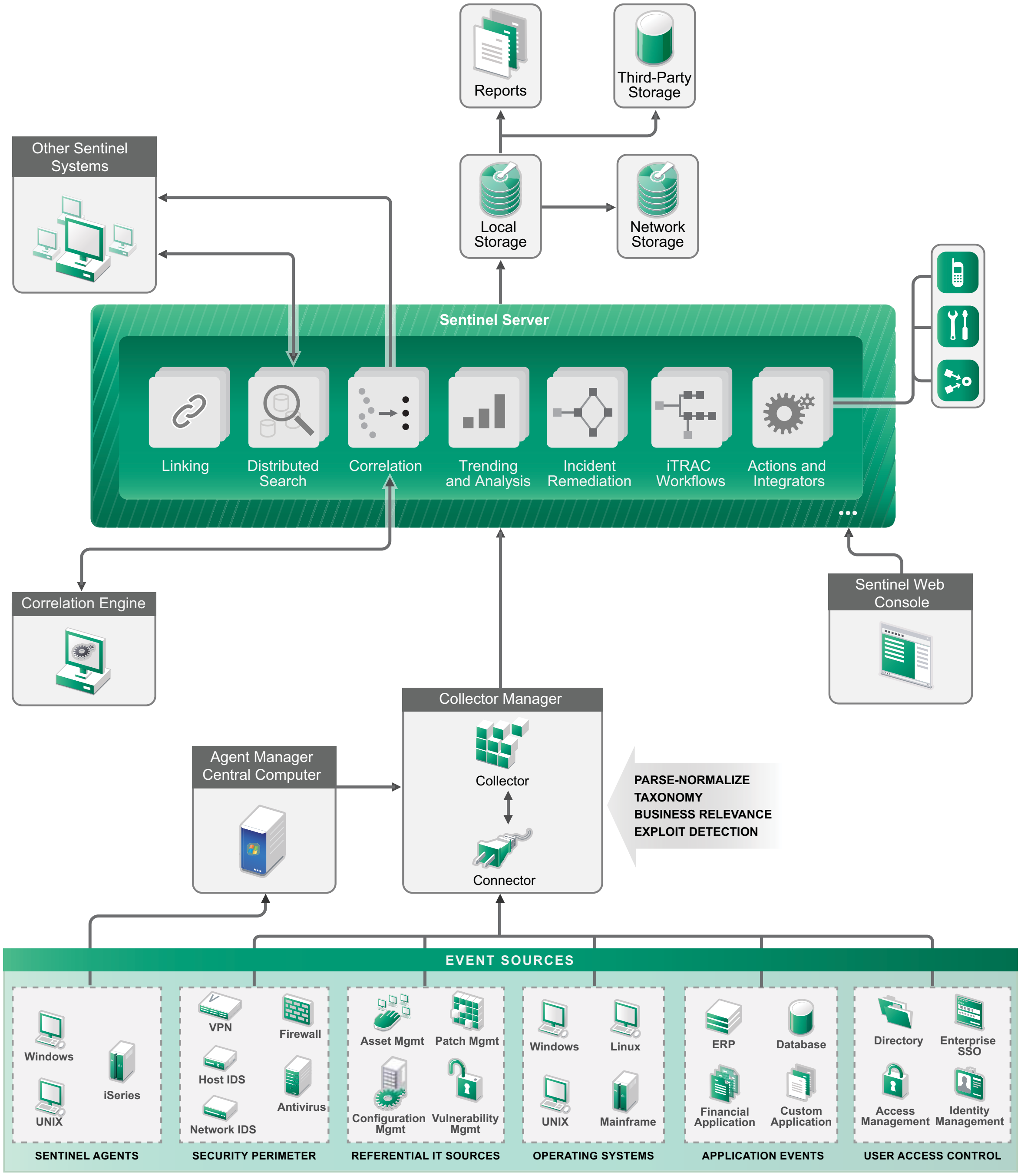
Sentinel continuously manages security information and events throughout your IT environment to provide a complete monitoring solution.

Sentinel does the following:

- Gathers logs, events, and security information from all of the different event sources in your IT environment.
- Normalizes the collected logs, events, and security information into a common format.
- Stores events in a file-based data store with flexible, customizable data retention policies.
- Provides the ability to hierarchically link multiple Sentinel systems, including Sentinel Log Manager.
- Allows you to search for events not only on your local Sentinel server, but also on other Sentinel servers distributed across the globe.
- Performs a statistical analysis that allows you define a baseline and then compares it to what is occurring to determine if there are unseen problems.
- Correlates a set of similar or comparable events in a given period to determine a pattern.
- Organizes events into incidents for efficient response management and tracking.
- Provides reports based on real time and historical events.

The following figure illustrates how Sentinel works:

***Figure 2-1*** *Sentinel Architecture*



The following sections describe Sentinel components in detail:

- Section 2.1, “Event Sources,” on page 21
- Section 2.2, “Sentinel Event,” on page 21
- Section 2.3, “Collector Manager,” on page 22
- Section 2.4, “Agent Manager,” on page 23
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- Section 2.7, "Incident Remediation," on page 24
- Section 2.8, "iTrac Workflows," on page 24
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- Section 2.10, "Reports," on page 25
- Section 2.11, "Event Analysis," on page 25
- Section 2.12, "Sentinel Data Routing and Storage," on page 26

## 2.1 Event Sources

Sentinel gathers security information and events from many different sources in your IT environment. These sources are called event sources. The event sources can be many different items on your network.

**Security Perimeter:** Security devices including hardware and software used to create a security perimeter for your environment, such as firewalls, IDS, and VPNs.

**Operating Systems:** Events from the different operating systems running in the network.

**Referential IT Sources:** The software used to maintain and track assets, patches, configuration, and vulnerability.

**Application Events:** Events generated from the applications installed in the network.

**User Access Control:** Events generated from applications or devices that allow users access to company resources.

## 2.2 Sentinel Event

Sentinel receives information from devices, normalizes this information into a structure called an event, categorizes the event, and then sends the event for processing. By adding category information (taxonomy) to events, events are easier to compare across systems that report events differently. For example, authentication failures. Events are processed by the real time display, correlation engine, dashboards, and the back end server.

An event comprises more than 200 fields. Event fields are of different types and of different purposes. There are some predefined fields such as severity, criticality, destination IP and destination port. There are two sets of configurable fields: Reserved fields are for Sentinel internal use to allow future expansion and Customer fields are for customer extensions.

Fields can be re-purposed by renaming them. The source for a field can either be external, which means that it is set explicitly by the device or the corresponding Collector, or referential. The value of a referential field is computed as a function of one or more other fields using the mapping service. For example, a field can be defined to be the building code for the building containing the asset mentioned as the destination IP of an event. For example, a field can be computed by the mapping service using a customer defined map using the destination IP from the event.

- Section 2.2.1, "Mapping Service," on page 22
- Section 2.2.2, "Streaming Maps," on page 22
- Section 2.2.3, "Exploit Detection (Mapping Service)," on page 22

### 2.2.1 Mapping Service

The Mapping Service allows a sophisticated mechanism to propagate business relevance data throughout the system. This data can enrich events with referential information that will provide context that enables analysts to make better decisions, write more useful reports, and write well-thought out correlation rules.

You can enrich your event data by using maps to add additional information such as host and identity details to the incoming events from your source devices. This additional information can be used for advanced correlation and reporting. The system supports several built-in maps as well as custom user-defined maps

Maps that are defined in Sentinel are stored in two ways:

- Built-in maps are stored in the database, updated using APIs in Collector code, and automatically exported to the Mapping service.
- Custom maps are stored as CSV files and can be updated on the file system or via the Map Data Configuration UI, then loaded by the Mapping service.

In both cases, the CSV files are kept on the central Sentinel server but changes to the maps are distributed to each Collector Manager and applied locally. This distributed processing ensures that mapping activity does not overload the main server.

### 2.2.2 Streaming Maps

The Map Service employs a dynamic update model and streams the maps from one point to another, avoiding the buildup of large static maps in dynamic memory. The value of this streaming capability is particularly relevant in a mission-critical real-time system such as Sentinel where there needs to be a steady, predictive and agile movement of data independent of any transient load on the system.

### 2.2.3 Exploit Detection (Mapping Service)

Sentinel provides the ability to cross-reference event data signatures with Vulnerability Scanner data. Users are notified automatically and immediately when an attack is attempting to exploit a vulnerable system. This is accomplished through:

- Advisor Feed
- Intrusion detection
- Vulnerability scanning
- Firewalls

Advisor provides a cross-reference between event data signatures and vulnerability scanner data. Advisor feed contains information about vulnerabilities and threats as well as a normalization of event signatures and vulnerability plug-ins. For more information on Advisor, see “Configuring Advisor”in the *NetIQ Sentinel 7.1 Administration Guide*.

## 2.3 Collector Manager

The Collector Manager manages data collection, monitors system status messages, and performs event filtering as needed. The main functions of the Collector Manager include the following:

- Transforming events.
- Adding business relevance to events through the mapping service.

- Performing global filtering on events.
- Routing events.
- Determining real-time, vulnerability, asset, or non-real-time data.
- Sending health message to the Sentinel server.

### 2.3.1 Collectors

The Collectors normalize and collect the information from the Connectors. Collectors are written in JavaScript and they define the logic for the following:

- Receiving raw data from the Connectors.
- Parsing and normalizing the data.
- Applying repeatable logic to the data.
- Translating device-specific data into Sentinel specific data.
- Formatting the events.
- Passing the normalized, parsed, and formatted data to the Collector Manager.
- Device-specific filtering of events.

### 2.3.2 Connectors

The Connectors provide connections from the event sources to the Sentinel system. Connectors use industry-standard protocols to get events such as syslog, JDBC to read from database tables, WMI to read from Windows Event Logs, and so on. Connectors provide:

- Transportation of raw event data from the events sources to the Collector.
- Connection specific filtering.
- Connection error handling.

## 2.4 Agent Manager

Agent Manager provides host-based data collection that complements agentless data collection by allowing you to:

- Access logs not available from the network.
- Operate in tightly-controlled network environments.
- Improve security posture by limiting attack surface on critical servers.
- Provide enhanced reliability of data collection during times of network interruption

Agent Manager allows you to deploy agents, manage agent configuration, and act as a collection point for events flowing into Sentinel. For more information about Agent Manager, see the Agent Manager documentation.

## 2.5 Correlation

A single event may seem trivial, but in combination with other events, it might warn you of a potential problem. Sentinel helps you correlate such events by using the rules you create and deploy in the Correlation engine, and take appropriate action to mitigate any problems.

Correlation adds intelligence to security event management by automating analysis of the incoming event stream to find patterns of interest. Correlation allows you to define rules that identify critical threats and complex attack patterns so that you can prioritize events and initiate effective incident management and response. For more information, see "Correlating Event Data" in the *NetIQ Sentinel 7.1 User Guide*.

To monitor events according to the Correlation rules, you must deploy the rules in the Correlation Engine. When an event occurs that satisfies the rule criteria, the Correlation Engine generates a correlation event describing the pattern. For more information, see "Correlation Engine" in the *NetIQ Sentinel 7.1 User Guide*.

## 2.6 Security Intelligence

The correlation capability in Sentinel provides the ability to look for known patterns of activity, whether it be for security, compliance, or other reasons. The Security Intelligence capability looks for activity that is out of the ordinary, which may be malicious, but does not match any known pattern.

The Security Intelligence feature in Sentinel focuses on statistical analysis of time series data to enable analysts to identify and analyze deviations (anomalies) either by an automated statistical engine or by visual representation of the statistical data for manual interpretation. For more information, see "Analyzing Trends in Data" in the *NetIQ Sentinel 7.1 User Guide*.

## 2.7 Incident Remediation

Sentinel provides an automated incident response management system that enables you to document and formalize the process of tracking, escalating, and responding to incidents and policy violations, and provides two-way integration with trouble-ticketing systems. Sentinel enables you to react promptly and resolve incidents efficiently. For more information, see "Configuring Incidents"in the *NetIQ Sentinel 7.1 User Guide*.

## 2.8 iTrac Workflows

iTRAC workflows are designed to provide a simple, flexible solution for automating and tracking an enterprise's incident response processes. iTRAC leverages Sentinel's internal incident system to track security or system problems from identification (through correlation rules or manual identification) through resolution.

Workflows can be built using manual and automated steps. Advanced features such as branching, time-based escalation, and local variables are supported. Integration with external scripts and plug-ins allows for flexible interaction with third-party systems. Comprehensive reporting allows administrators to understand and fine-tune the incident response processes. For more information, see "Configuring iTRAC Workflows"in the *NetIQ Sentinel 7.1 User Guide*.

## 2.9 Actions and Integrators

Actions either manually or automatically execute some type of action, such as sending an email, in Sentinel. Actions can be triggered by routing rules, by manually executing an event or incident operation, and by correlation rules. Sentinel provides a list of preconfigured Actions. You can use the default Actions and reconfigure them as necessary, or you can add new Actions. For more information, see “Configuring Actions” in the *NetIQ Sentinel 7.1 Administration Guide*.

An Action can execute on its own, or it can make use of an Integrator instance configured from an Integrator plug-in. Integrator plug-ins extend the features and functionality of Sentinel remediation actions. Integrators provide the ability to connect to an external system, such as an LDAP, SMTP, or SOAP server, to execute an action. For more information, see “Configuring Integrators”in the *NetIQ Sentinel 7.1 Administration Guide*.

## 2.10 Reports

Sentinel provides the ability to run reports on the data gathered. Sentinel is prepackaged with a variety of customizable reports. Some reports are flexible, which allow you to specify the columns to be displayed in the results.

You can run, schedule, and e-mail PDF reports. You can also run any report as a search and then interact with the results as you would do with a search, such as refining the search or performing an action on the results. You can also run reports on Sentinel servers distributed across different geographic locations. For more information, see “Reporting” in the *NetIQ Sentinel 7.1 User Guide*.

## 2.11 Event Analysis

Sentinel provides a powerful set of tools to help you easily find and analyze critical event data. The system is tuned and optimized for maximal efficiency in any particular type of analysis, and methods to easily transition from one type of analysis to another are provided for seamless transitions.

Investigating events in Sentinel often starts with the near real-time Active Views. Although more advanced tools are available, Active Views display filtered event streams along with summary charts that can be used for simple, rough analysis of event trends, event data, and identification of specific events. Over time, you build up tuned filters for specific classes of data, such as output from correlation. You can use Active Views as a dashboard showing an overall operational and security posture.

You can then use the interactive search to perform more detailed analysis of events. This allows you to quickly and easily search for and find data related to a specific query, such as activity by a specific user or on a particular system. By clicking on the event data or using the left-hand refinement pane, you can quickly zero in on specific events of interest.

When analyzing hundreds of events, the reporting capabilities of Sentinel provide custom control over event layout and can display larger volumes of data. Sentinel makes this transition easier by allowing you to transfer the interactive searches built up in the Search interface into a reporting template, which instantly creates a report that displays the same data but in a format better suited for a larger number of events.

Sentinel includes many templates for this purpose. Some templates are tuned to display particular types of information, such as authentication data or user creation, and some are general-purpose templates that allow you to customize groups and columns on the report interactively.

Over time, you will develop commonly-used filters and reports that make your workflows easier. Sentinel fully supports storing this information and distributing it with people in your organization. For more information, see the *NetIQ Sentinel 7.1 User Guide*.

## 2.12 Sentinel Data Routing and Storage

Sentinel provides multiple options to route, store, and extract the data collected. By default, Sentinel receives two separate but related data streams from the Collector Managers: the parsed event data and the raw data. The raw data is immediately stored in protected partitions to provide a secure evidence chain. The parsed event data is routed according to rules you define and can be filtered out, sent to storage, sent to the real-time analytics, and routed to external systems. All event data sent to storage is further matched to user-defined retention policies that determine the partition the data is placed in, and also define the grooming policy under which the event data is retained and then eventually deleted.

Sentinel's data storage is based on a three-tier structure:

- **Online storage**
    - **Primary or local storage:** Optimized for quick writes and fast retrieval. The most recently-collected event data (and the most frequently searched) is stored here.
    - **Secondary or network storage:** Optimized to reduce space usage while still supporting fast retrieval. Sentinel automatically migrates data partitions to secondary storage.

**NOTE:** Using a secondary storage is optional. Data retention policies, searches, and reports operate on event data partitions regardless of whether they are actually residing on primary or secondary storage or both.

- **Offline storage or archival storage:**

  Once partitions are closed, you can back up the closed partitions to an offline storage such as cheap mass storage, Amazon Glacier, and so on. If necessary, you can temporarily re-import offline partitions for long-term forensic analysis.

You can also configure Sentinel to extract the event data and event data summaries to an external database by using data synchronization policies. For more information, see "Configuring Data Storage" in the *NetIQ Sentinel 7.1 Administration Guide*.

# II

# Planning Your Sentinel Installation

This section guides you through planning considerations before installing Sentinel. If you want to install a configuration that is not identified in the sections that follow, or if you have any questions, contact NetIQ Technical Support.

# 3 Implementation Checklist

Use the following checklist to complete planning, installing, and configuring Sentinel:

| ☐ | Tasks | See |
|---|---|---|
| ☐ | Review the product architecture information to learn about Sentinel components. | Part I, "Understanding Sentinel," on page 13. |
| ☐ | Review the Sentinel licensing to determine whether you need to install the trial version or the enterprise version of Sentinel. | Chapter 4, "Understanding License Information," on page 31. |
| ☐ | Assess your environment to determine the hardware configuration. Ensure that the computers on which you install Sentinel and its components meet the specified requirements. | Chapter 5, "Meeting System Requirements," on page 33. |
| ☐ | By default, Sentinel comes with a Collector Manager and a Correlation Engine. Review the Collector Manager and Correlation Engine events per second (EPS) and determine if you need to install additional Collector Managers and Correlation Engines to improve performance and load balancing. | Section 9.1, "Advantages of Additional Collector Managers," on page 64 and Section 9.2, "Advantages of Additional Correlation Engines," on page 64. |
| ☐ | Install Sentinel. | Part III, "Installing Sentinel," on page 61. |
| ☐ | Ensure that you configure the time on the Sentinel server. | Chapter 16, "Configuring Time," on page 97. |
| ☐ | When you install Sentinel, the Sentinel plug-ins available at the time of the Sentinel release are installed by default. Configure the out-of-the-box plug-ins for data collection and reporting purposes. | Chapter 17, "Configuring Out-of-the-Box Plug-Ins," on page 101. |
| ☐ | Install additional Collectors and Connectors as needed in your environment. | Chapter 13, "Installing Additional Collectors and Connectors," on page 89. |
| ☐ | Install additional Collector Managers and Correlation Engines as needed in your environment. | Section 11.6, "Installing Additional Collector Managers and Correlation Engines," on page 74. |

# 4 Understanding License Information

Sentinel has several licenses that you can use. By default, Sentinel comes with the trial license.

## 4.1 Trial License

The Sentinel default licensing allows you to use all the enterprise features of Sentinel for the evaluation period of 90 days. A system running with the trial license displays an indicator on the Web Interface indicating that the temporary license key is being used. It also displays the number of days left before the functionality expires and indicates how to upgrade to a full license.

**NOTE:** The expiration date of the system is based on the oldest data in the system. If you restore old events into your system, the expiration date will be adjusted accordingly.

After the 90-day trial period, most functionality is disabled, but you are still able to log in and update the system to use an enterprise license key.

After you upgrade to an enterprise license, all functionality is restored. To prevent any interruption in functionality, you must upgrade the system with an enterprise license before the expiration date.

## 4.2 Enterprise Licenses

When you purchase Sentinel, you receive a license key through the customer portal. Depending on what you purchase, your license key enables certain features, data collection rates, and event sources. There may be additional license terms that are not enforced by the license key, so please read your license agreement carefully.

To make changes to your licensing, please contact your account manager. To add the license key to the system, see in the *NetIQ Sentinel 7.1 Administration Guide*.

# 5 Meeting System Requirements

This chapter provides information about the hardware, operating system, and browser requirements for Sentinel.

## 5.1 Supported Operating Systems and Platforms

NetIQ supports Sentinel on the operating systems described in this section. NetIQ also supports Sentinel on systems with minor updates to these operating systems, such as security patches or hotfixes. However, NetIQ does not support running Sentinel on systems with major updates to these operating systems until NetIQ tests and certifies those updates.

NetIQ supports the Sentinel server, Collector Manager, and Correlation Engine on the following operating systems and platforms:

| Category | Requirement |
|---|---|
| Operating System | Sentinel is supported on the following operating systems:<br>◆ SUSE Linux Enterprise Server (SLES) 11 SP2 64-bit *<br>◆ Red Hat Enterprise Linux for Servers (RHEL) 6 64-bit<br>* Sentinel is not supported on the Open Enterprise Server installs of SLES.<br>**IMPORTANT:** For traditional installations, ensure that Internet Protocol version 6 (IPv6) is enabled in your operating system. If IPv6 is not enabled, major components will fail to operate.<br>For appliance installations, IPv6 is enabled by default. |
| Virtual Platform | NetIQ provides appliances that install a SLES 11 SP2 64-bit server and Sentinel on the following virtual platforms:<br>◆ VMWare ESX 4.0 and 5.0<br>◆ Xen 4.0 |

| Category | Requirement |
|---|---|
| DVD ISO | NetIQ provides a DVD ISO file that installs SLES 11 SP2 64-bit and Sentinel on:<br>◆ Hyper-V Server 2008 R2<br>◆ Hardware without an operating system installed |
| File System | **Traditional Installations:**<br>◆ **On SLES systems:** Sentinel supports ext3 and XFS file systems.<br>◆ **On RHEL systems:** Sentinel supports ext4 and XFS file systems.<br>**Appliance Installations:**<br>Sentinel uses the ext3 file system.<br>For more information on file systems, see Overview of File Systems in Linux (http://www.novell.com/documentation/sles11/stor_admin/data/filesystems.html) in the *SLES 11 SP2 Storage Administration Guide*. |

## 5.2 Supported Database Platforms

Sentinel includes an embedded file-based storage system and the PostgreSQL database, which is all that is necessary to run Sentinel. However, if you use the optional data synchronization feature to copy data to a data warehouse, Sentinel supports using PostgreSQL, Oracle version 11g R2, or Microsoft SQL Server 2008 R2 as the data warehouse.

## 5.3 Supported Browsers

The Sentinel Web interface is optimized for viewing at 1280 x 1024 or higher resolution in the following supported browsers:

**NOTE:** To load the Sentinel client applications properly, you must install the Java Webstart on your system.

| Platform | Browser |
|---|---|
| Windows 7 | ◆ Firefox version 5 to version 18<br>◆ Internet Explorer 8, 9, and10.*<br>For information about Internet Explorer 8, see “Prerequisites for Internet Explorer” on page 34. |
| SLES 11 SP2 and RHEL 6 | ◆ Firefox version 5 to version 18 |

### 5.3.1 Prerequisites for Internet Explorer

If the Internet Security Level is set to High, a blank page appears after logging in to Sentinel and the file download pop-up might be blocked by the browser. To work around this issue, you need to first set the security level to Medium-high and then change to Custom level as follows:

1. Navigate to *Tools* > *Internet Options* > *Security tab* and set the security level to *Medium-high*.

2. Make sure that the *Tools* > *Compatibility View* option is not selected.
3. Navigate to *Tools* > *Internet Options* > *Security tab*> *Custom Level*, then scroll down to the *Downloads* section and select *Enable* under the *Automatic prompting for file downloads* option.

## 5.4 System Sizing Information

A Sentinel implementation can vary based on the needs of your environment, so you should consult NetIQ Consulting Services or any of the NetIQ Sentinel partners prior to finalizing the Sentinel architecture.

This section provides sizing information based on the testing performed at NetIQ with the hardware avialable to us at the time of testing. It is likely that larger, more powerful, hardware configurations exist that can handle a greater load.

All-in-one configurations put all of the processing load on the Sentinel server rather than distributing it out to remote Collector Managers and Correlation Engines. While an all-in-one configuration can work well for simple scenarios where only a small set of features are used in limited ways, they do not scale well when a large number of features are used or are used in an extensive manner. For example, if you use more than the out-of-the-box correlation rules, this puts a greater load on the system and can result in other features on the same server suffering due to the increased resource utilization of the Correlation Engine.

- Distributing the load to remote Collector Managers is required when more than a small number of Collectors are used.
- Distributing the load to remote Correlation Engines is required when you use more than the out-of-the-box correlation rules.
- Distributing the load is a good idea when you plan to grow the number of features you use or how extensively you use them.

The ability of the CPU to perform hyperthreading has been shown to have a significant positive impact on the load the system can handle. Therefore, when deciding on a CPU to purchase, be sure to note whether hyperthreading was enabled in the reference test below and ensure the CPU you choose has as good or better hyperthreading capabilities.

| **Category** | **Description** | **Demo All-in-One**<br>**not intended for production** | **Medium All-in-One** | **Medium Agent-based Data Collection** | **Large All-in-One** | **Large Distributed Agent-less Data Collection** | **Extra Large** |
|---|---|---|---|---|---|---|---|
| Retained EPS Capability | The events per second rate processed by real-time components and retained in storage by the system. | 100 EPS | 2500 EPS | 2500 EPS | 9000 EPS | 11000 EPS | 11000+ EPS |

| Category | Description | Demo All-in-One<br>not intended for production | Medium All-in-One | Medium Agent-based Data Collection | Large All-in-One | Large Distributed Agent-less Data Collection | Extra Large |
|---|---|---|---|---|---|---|---|
| Operational EPS Capability | The total events per second rate received by the system from event sources. This includes data dropped by the system's intelligent filtering capability before being stored and is the number used for the purposes of EPS-based license compliance. | 100 EPS | 2500+ EPS | 2500+ EPS | 9000 EPS | 16000 EPS | 16000+ EPS |
| **Sentinel Server Hardware** | | | | | | | |
| CPU | | Intel Xeon CPU E5420 @ 2.50GHz (4 CPU cores), no hyper-threading | Two Intel Xeon CPU E5450 @ 3.00GHz (4 cores per CPU; 8 cores total), no hyper-threading | Two AMD Opteron 2431 @ 2.40 GHz (6 cores per CPU; 12 cores total) | Two Intel(R) Xeon(R) CPU E5-2680 0 @ 2.70GHz (8 core) CPUs (16 cores total), with hyper-threading | | Contact NetIQ Services |
| Local Storage | Locally cached data for higher search performance. | 500 GB 7.2k RPM drive | 5 x 300 GB SAS 15k RPM (Hardware RAID 0) | 3 x 146 GB SAS 10K RPM (RAID 0, stripe size 128k) | 5 TB, 8 x 600 GB SAS 15k RPM (Hardware RAID 0, stripe size 128k) | | |
| Networked Storage | Includes a copy of the data in local storage. | Not Used | Not Used | Not Used | Not Used | | |
| Memory | | 4 GB | 24 GB | 16 GB | 64 GB | | |
| **Remote Collector Manager # 1 Hardware** | | | | | | | |
| CPU | | Not Applicable (Local Embedded CM Only) | | | | Two Intel(R) Xeon(R) CPU E5-2680 0 @ 2.70GHz (8 core) CPUs (16 cores total), with hyper-threading | Contact NetIQ Services |

| **Category** | **Description** | **Demo All-in-One**<br>**not intended for production** | **Medium All-in-One** | **Medium Agent-based Data Collection** | **Large All-in-One** | **Large Distributed Agent-less Data Collection** | **Extra Large** |
|---|---|---|---|---|---|---|---|
| Storage | | | | | | 20 GB free space | Contact NetIQ Services |
| Memory | | | | | | 24 GB | |
| **Remote Collector Manager # 2 Hardware** | | | | | | | |
| CPU | | Not Applicable (Local Embedded CM Only) | | | | 8 Core Intel(R) Xeon(R) CPU X5570 @ 2.93GHz (virtual machine) | Contact NetIQ Services |
| Storage | | | | | | 50 GB | |
| Memory | | | | | | 8 GB | |
| **Agent Manager Hardware** | | | | | | | |
| CPU | | Not Applicable (Agent-less collection only) | | Two Intel Xeon 5140 @ 2.33 GHz (2 cores per CPU; 4 cores total) | Not Applicable (Agent-less collection only) | | Contact NetIQ Services |
| Storage | | | | 2 x 300 GB SAS 10K RPM (RAID 0, stripe size 128k) | | | |
| Memory | | | | 16 GB | | | |
| **Remote Correlation Engine Hardware** | | | | | | | |
| CPU | | Not Applicable (Local Embedded CE Only) | | | | | Contact NetIQ Services |
| Storage | | | | | | | |
| Memory | | | | | | | |

| Category | Description | Demo All-in-One<br>not intended for production | Medium All-in-One | Medium Agent-based Data Collection | Large All-in-One | Large Distributed Agent-less Data Collection | Extra Large |
|---|---|---|---|---|---|---|---|
| **Data Collection** | | | | | | | |
| Collector Manager (CM) Distribution | The number of event sources and events per second load placed on each collector manager.<br>The filtered percentage indicates how many normalized events were filtered out immediately after collection, without being stored or passed to analytic engines. Note that the non-normalized raw log data that the normalized events are based off of is not affected by filtering and is always stored.<br>The Local Embedded CM is located on the Sentinel Server machine. | **Local Embedded CM**<br>Event Sources: 101<br>EPS: 100<br>Filtered: 0% | **Local Embedded CM**<br>Event Sources: 2500<br>EPS: 2500<br>Filtered: 0% | **Local Embedded CM**<br>Event Sources: 5000<br>EPS: 2500<br>Filtered: 0% | **Local Embedded CM**<br>Event Sources: 500<br>EPS: 9000<br>Filtered: 0% | **Local Embedded CM**<br>Not Used<br>**Remote CM #1**<br>Event Sources: 110<br>EPS: 9500<br>Filtered: 21%<br>Raw Data Disabled<br>**Remote CM #2**<br>Event Sources: 20<br>EPS: 6500<br>Filtered: 54%<br>Raw Data Disabled | Contact NetIQ Services |

| Category | Description | Demo All-in-One<br>not intended for production | Medium All-in-One | Medium Agent-based Data Collection | Large All-in-One | Large Distributed Agent-less Data Collection | Extra Large |
|---|---|---|---|---|---|---|---|
| Collectors Used | | **IBM AIX 6.1r3**<br>Sources: 100<br>EPS: 99<br>**NetIQ Universal Event 2011.1r1**<br>Sources: 1<br>EPS: 1 | Each collector had its own syslog server.<br>**Oracle Solaris 6.1r3**<br>Sources: 1000<br>EPS: 1000<br>**IBM AIX 6.1r3**<br>Sources: 1000<br>EPS: 1000<br>**Sourcefire Snort 2011.1r1**<br>Sources: 500<br>EPS:500 | Custom Testing Collector (no parsing)<br>**Agent Manager Connector Server 1**<br>Sources: 5000<br>EPS: 2500 | Each of the following Collectors had its own syslog server, parsing at the following EPS rates:<br>**Oracle Solaris 6.1r3**<br>EPS: 2000<br>**Sourcefire Snort 2011.1r1**<br>EPS: 1500<br>**NetIQ Universal Event 2011.1r1**<br>EPS: 2000<br>**Juniper Netscreen Series 2011.1r1**<br>EPS: 1500<br>**IBM AIX 6.1r3: 2000**<br>EPS: 2000 | Each of the following Collectors had its own syslog server, parsing at the following EPS rates:<br>**Oracle Solaris 6.1r3**<br>RCM #1: 2000<br>RCM #2: 2000<br>**Sourcefire Snort 2011.1r1**<br>RCM #1: 2000<br>RCM #2: 1000<br>**NetIQ Universal Event 2011.1r1**<br>RCM #1: 2000<br>RCM #2: 0<br>**Juniper Netscreen Series 2011.1r1**<br>RCM #1: 2000<br>RCM #2: 1500 | Contact NetIQ Services |

| Category | Description | Demo All-in-One<br>not intended for production | Medium All-in-One | Medium Agent-based Data Collection | Large All-in-One | Large Distributed Agent-less Data Collection | Extra Large |
|---|---|---|---|---|---|---|---|
| | | | | | | **IBM AIX 6.1r3**<br>RCM #1: 1500<br>RCM #2: 0<br>**IBM iSeries 2011.1r3**<br>RCM #1: 0<br>RCM #2: 2000 | Contact NetIQ Services |
| Total | | Event Source: 101<br>EPS: 100<br>Filtered: 0% | Event Source: 2500<br>EPS: 2500<br>Filtered: 0% | Event Source: 5000<br>EPS: 2500<br>Filtered: 0% | Event Source: 500<br>EPS: 9000<br>Filtered: 0% | Event Source: 130<br>Operational EPS: 16000<br>Retained EPS: 11000<br>Filtered: 25% | |
| **Data Storage** | | | | | | | |
| How far into the past will users search for data on a regular basis? | Amount of locally cached data for higher search performance. | 7 Days | | | | | Contact NetIQ Services |
| What percentage of searches will be over data older than the number of days above? | Impacts the amount of input/output operations per second (IOPS) for local or network storage | 10% | | | | | |
| How far into the past must data be retained? | Impacts how much disk space is needed to retain all of the data. If network storage is enabled, this impacts the size of network storage needed. Otherwise, it impacts the size of local storage needed. | 14 Days | | | | | |

| **Category** | **Description** | **Demo All-in-One**<br>**not intended for production** | **Medium All-in-One** | **Medium Agent-based Data Collection** | **Large All-in-One** | **Large Distributed Agent-less Data Collection** | **Extra Large** |
|---|---|---|---|---|---|---|---|
| Will a network storage device be available and connected? | Impacts whether all data will be stored locally or if network storage is available for lower-cost long term online storage. Data in network storage remains online. | No | | | | | Contact NetIQ Services |
| How many reports will be optimized using summaries and other data synchronization policies? | Impacts the number of data synchronization policies which impacts size and IOPS of local storage. | 5 (Out-of-the-box) | | | 4 (Out-of-the-box except the Source Summary RDD, which falls behind) | | |
| **User Activity** | | | | | | | |
| How many users will be active at the same time, on average? | Impacts the amount of IOPS for local and network storage and other items. | 1 | | | | | Contact NetIQ Services |
| How many searches will an active user be performing at the same time, on average? | Impacts the amount of IOPS for local and network storage. | 1 search or report (but not both at the same time)<br>20k events per report<br>100M events per search | | Not tested with search or reporting load | 1<br>80M events per search | 1<br>20M events per search | |
| How many reports will an active user be running at the same time, on average? | Impacts the amount of IOPS for local and network storage. | 1 search or report (but not both at the same time)<br>20k events per report<br>100M events per search | | Not tested with search or reporting load | 1<br>1k events per report | 1<br>60k events, 5k pages, per report | |
| **Analytics** | | | | | | | |
| What percentage of the event data is relevant to correlation rules? | Amount of data the correlation engine will process. | 100% (out of the box)<br>(3 correlations per second) | | 100% (out of the box)<br>(0 correlations per second) | 0% | 0%<br>(some data arrives too late for real-time correlation) | Contact NetIQ Services |

| Category | Description | Demo All-in-One<br>not intended for production | Medium All-in-One | Medium Agent-based Data Collection | Large All-in-One | Large Distributed Agent-less Data Collection | Extra Large |
|---|---|---|---|---|---|---|---|
| How many simple correlation rules (filter/trigger only) will be used? | Impacts the CPU utilization of the correlation engine. | 84 (out of the box) | | | 0 | | Contact NetIQ Services |
| How many complex correlation rules will be used? | Impacts the CPU and memory utilization of the correlation engine. | 0 (out of the box) | | | | | |
| Correlation Engine (CE) Distribution | | Local Embedded CE (all rules) | | | | | |
| How many sets of data will anomaly detection be performed on? | The number of Security Intelligence dashboards, which impacts the CPU, local storage size, and memory utilization. | 1<br>(1% of event stream each) | | 0 | | | |
| **High Availability** | | | | | | | |
| Notes | Notable functionality disabled or warnings of what happens when exceeding the system load described above. | | | | Raw Data Disabled<br>Correlation and Security Intelligence Not Used<br>Reports on 30k+ events cause instability | Raw Data Disabled<br>Correlation and Security Intelligence Not Used<br>Reports on larger than stated number of events will cause instability<br>Increasing Retained EPS will eventually cause instability in this system configuration | Contact NetIQ Services |

## 5.5 Planning Partitions for Data Storage

When you install Sentinel, you must mount the disk partition for local storage in the same location where Sentinel is installed, by default, the `/var/opt/novell` directory.

The entire directory structure under the `/var/opt/novell/sentinel` directory must reside on a single disk partition to ensure proper disk usage calculations. Otherwise, the automatic data management capabilities might delete event data prematurely. For more information about the Sentinel directory structure, see Chapter 15, "Sentinel Directory Structure," on page 93.

As a best practice, ensure that this data directory is located are stored on a separate disk partition than the executables, configuration, and operating system files. The benefits of storing variable data separately include easier backup of sets of files and simpler recovery in case of corruption, and provides additional robustness if a disk partition fills up. It also improves the overall performance of systems where smaller file systems are more efficient. For more information, see "Disk Partitioning".

### 5.5.1 Using Partitions in Traditional Installations

On traditional installations, you can modify the disk partition layout of the operating system prior to installing Sentinel. The administrator should create and mount the desired partitions to the appropriate directories, based on the directory structure detailed in Section 15, "Sentinel Directory Structure," on page 93. When you run the installer, Sentinel is installed into the pre-created directories resulting in an installation that spans multiple partitions.

**NOTE:**

- You can use the `--location` option while running the installer to specify a different top-level location than the default directories to store the file. The value that you pass to the `--location` option is prepended to the directory paths. For example, if you specify `--location=/foo`, the data directory will be `/foo/var/opt/novell/sentinel/data` and the config directory will be `/foo/etc/opt/novell/sentinel/config`.
- You must not use filesystem links (for example, soft links) for the `--location` option.

### 5.5.2 Using Partitions in an Appliance Installation

Using the DVD ISO appliance format, you can configure the partitioning of the appliance filesystem during installation. For example, you can create a separate partition for the `/var/opt/novell/sentinel` mount point to put all data on a separate partition. However, for other appliance formats, you can configure the partitioning only after installation. You can add partitions and move a directory to the new partition by using the SuSE YaST system configuration tool. For information about creating partitions after the installation, see Section 12.4.2, "Creating Partitions," on page 85.

## 5.6 Connector and Collector System Requirements

Each Connector and Collector has its own set of system requirements and supported platforms. See the Connector and Collector documentation on the Sentinel Plug-ins Web page (http://support.novell.com/products/sentinel/secure/sentinelplugins.html).

## 5.7 Virtual Environment

Sentinel is extensively tested and fully supported on a VMware ESX server. When you set up a virtual environment, the virtual machines must have 2 or more CPUs. To achieve comparable performance results to the physical-machine testing results on ESX or in any other virtual environment, the virtual environment should provide the same memory, CPUs, disk space, and I/O as the physical machine recommendations.

For information on physical machine recommendations, see Chapter 5, "Meeting System Requirements," on page 33.

# 6 Deployment Considerations for Operating Sentinel in FIPS140-2 Mode

Sentinel can optionally be configured to use Mozilla Network Security Services (NSS), which is a FIPS 140-2 validated cryptographic provider, for its internal encryption and other functions. The purpose of doing so is to ensure that Sentinel is 'FIPS 140-2 Inside' and is compliant with United States federal purchasing policies and standards.

Enabling Sentinel FIPS 140-2 mode causes communication between the Sentinel Server, Sentinel remote Collector Managers, Sentinel remote Correlation Engines, the Sentinel Web UI, the Sentinel Control Center, and the Sentinel Advisor service to use FIPS 140-2 validated cryptography.

## 6.1 FIPS Implementation in Sentinel

Sentinel uses the Mozilla NSS libraries that are provided by the operating system. Red Hat Enterprise Linux (RHEL) and SUSE Linux Enterprise Server (SLES) have different set of NSS packages.

The NSS cryptographic module provided by RHEL 6.2 is FIPS 140-2 validated. The NSS cryptographic module provided by SLES 11 SP2 are not yet officially FIPS 140-2 validated, but work is in progress to get the SUSE module FIPS 140-2 validated. Once the validation is available, no necessary changes to Sentinel are anticipated to provide 'FIPS 140-2 Inside' on the SUSE platform.

For more information about RHEL 6.2 FIPS 140-2 certification, see *Validated FIPS 140-1 and FIPS 140-2 Cryptographic Modules*.

### 6.1.1 RHEL NSS Packages

Sentinel requires the following 64-bit NSS packages to support FIPS 140-2 mode:

- nspr-4.9-1.el6.x86_64
- nss-sysinit-3.13.3-6.el6.x86_64
- nss-util-3.13.3-2.el6.x86_64
- nss-softokn-freebl-3.12.9-11.el6.x86_64
- nss-softokn-3.12.9-11.el6.x86_64
- nss-3.13.3-6.el6.x86_64
- nss-tools-3.13.3-6.el6.x86_64

If any of these packages are not installed, you must install them before enabling FIPS 140-2 mode in Sentinel.

### 6.1.2 SLES NSS Packages

Sentinel requires the following 64-bit NSS packages to support FIPS 140-2 mode:

- libfreebl3-3.13.1-0.2.1
- mozilla-nspr-4.8.9-1.2.2.1
- mozilla-nss-3.13.1-0.2.1
- mozilla-nss-tools-3.13.1-0.2.1

If any of these packages are not installed, you must install them before enabling FIPS 140-2 mode in Sentinel.

## 6.2 FIPS-Enabled Components in Sentinel

The following Sentinel components provide FIPS 140-2 support:

- All Sentinel platform components are updated to support FIPS 140-2 mode.
- The following Sentinel plug-ins that support cryptography are updated to support FIPS 140-2 mode:
  - Agent Manager Connector 2011.1r1 and later
  - Database (JDBC) Connector 2011.1r2 and later
  - File Connector 2011.1r1 and later - Only if the file event source type is local or NFS.
  - LDAP Integrator 2011.1r1 and later
  - Sentinel Link Connector 2011.1r3 and later
  - Sentinel Link Integrator 2011.1r2 and later
  - SMTP Integrator 2011.1r1 and later
  - Syslog Connector 2011.1r2 and later
  - Windows Event (WMI) Connector 2011.1r2 and later

  For more information about configuring these Sentinel plug-ins to run in FIPS 140-2 mode, see "Configuring Sentinel Plug-Ins to Run in FIPS 140-2 Mode" on page 107.

The following Sentinel Connectors that support optional cryptography are not yet updated to support FIPS 140-2 mode at the time of release of this document. However, you can continue to collect events using these Connectors. For instructions on using these Connectors with Sentinel in FIPS 140-2 mode, see "Using Non-FIPS Enabled Connectors with Sentinel in FIPS 140-2 Mode" on page 113.

- Check Point (LEA) Connector 2011.1r2
- Cisco SDEE Connector 2011.1r1
- File Connector 2011.1r1 - The CIFS and SCP functionalities involve cryptography and will not work in FIPS 140-2 mode.
- NetIQ Audit Connector 2011.1r1
- SNMP Connector 2011.1r1

The following Sentinel Integrators that support SSL are not updated to support FIPS 140-2 mode at the time of release of this document. However, you may continue to use unencrypted connections when these Integrators are used with Sentinel in FIPS 140-2 mode.

- Remedy Integrator 2011.1r1 or later
- SOAP Integrator 2011.1r1 or later

Any other Sentinel plug-ins that are not listed above do not use cryptography and are not affected by enabling FIPS 140-2 mode in Sentinel. You do not need to perform any additional steps to use them with Sentinel in FIPS 140-2 mode.

For more information about the Sentinel plug-ins, see Sentinel Plug-ins Web site. If you would like to request that one of the plug-ins that has not yet been updated be made available with FIPS support, please submit a request using Bugzilla.

## 6.3 Implementation Checklist

The following table provides an overview of the tasks required to configure Sentinel for operation in FIPS 140-2 mode.

| Tasks | For more information, see… |
|---|---|
| Plan the deployment. | Section 6.4, "Deployment Scenarios," on page 49. |
| Determine whether you need to enable FIPS 140-2 mode during the Sentinel installation or you want to enable it in future.<br>To enable Sentinel in FIPS 140-2 mode during the installation, you need to select the Custom or Silent installation method during the installation process. | Section 11.2.2, "Custom Installation," on page 69.<br>Section 11.3, "Performing a Silent Installation," on page 70<br>Chapter 18, "Enabling FIPS 140-2 Mode in an Existing Sentinel Installation," on page 103 |
| Configure Sentinel Plug-ins to run in FIPS 140-2 Mode. | Section 19.5, "Configuring Sentinel Plug-Ins to Run in FIPS 140-2 Mode," on page 107. |
| Import certificates into the Sentinel FIPS Keystore. | Section 19.6, "Importing Certificates into FIPS Keystore Database," on page 113 |

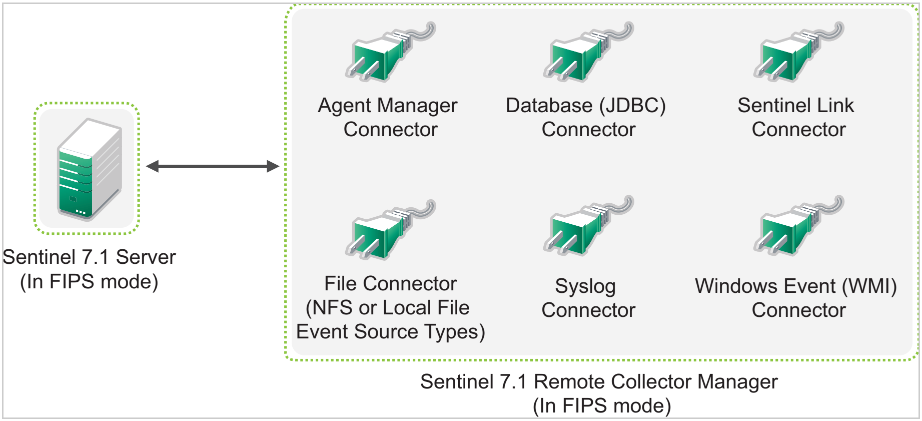
**NOTE:** NetIQ highly recommends taking a backup of your Sentinel systems before beginning the conversion to FIPS mode. If for some reason the server must be reverted to non-FIPS mode, the only supported method for doing so involves restoring from a backup. For more information on reverting to non-FIPS mode, see "Reverting Sentinel to Non-FIPS Mode" on page 114.

## 6.4 Deployment Scenarios

This section provides information about the deployment scenarios for Sentinel in FIPS 140-2 mode.

### 6.4.1 Scenario 1: Data Collection in Full FIPS 140-2 Mode

In this scenario, data collection is done only through the Connectors that support FIPS 140-2 mode. We assume that this environment involves a Sentinel server and data is collected through a remote Collector Manager. You may have one or more remote Collector Managers.


Sentinel 7.1 Server
(In FIPS mode)
Agent Manager Connector
Database (JDBC) Connector
Sentinel Link Connector
File Connector (NFS or Local File Event Source Types)
Syslog Connector
Windows Event (WMI) Connector
Sentinel 7.1 Remote Collector Manager
(In FIPS mode)

You must perform the following procedure only if your environment involves data collection from event sources using Connectors that support FIPS 140-2 mode.

1. You must have a Sentinel 7.1 server in FIPS 140-2 mode.

   **NOTE:** If your Sentinel server (freshly installed or upgraded) is in non-FIPS mode, you must enable FIPS on Sentinel server. For more information, see "Enabling Sentinel Server to Run in FIPS 140-2 Mode" on page 103.

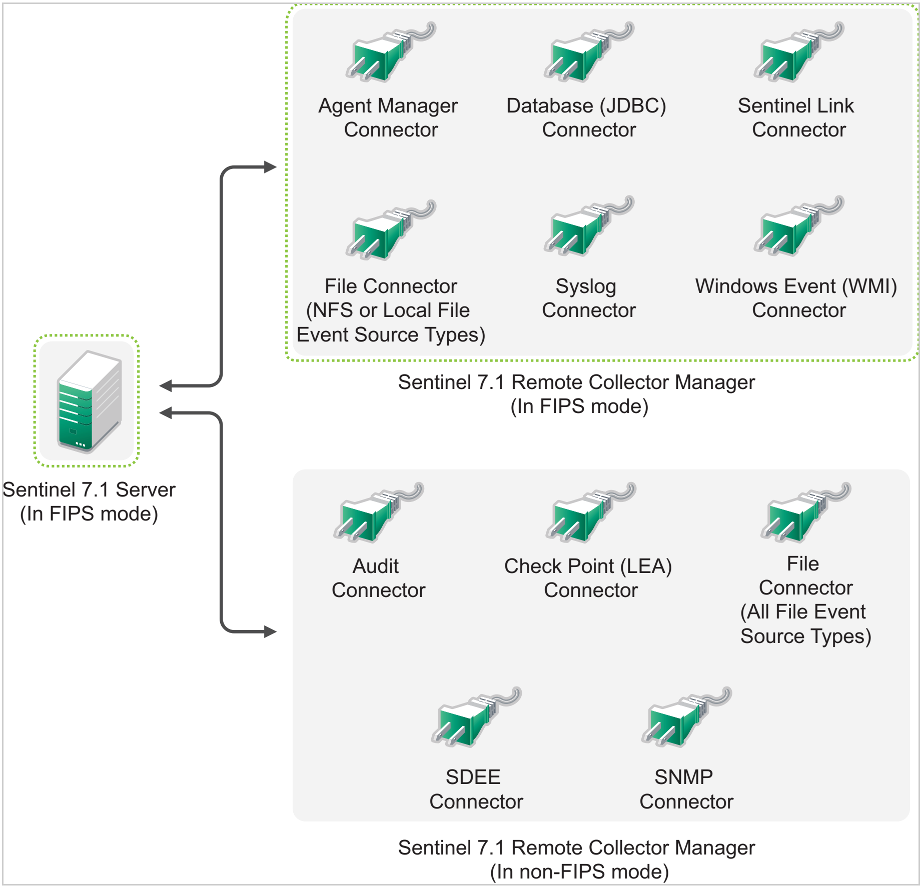
2. You must have a Sentinel 7.1 remote Collector Manager is running in FIPS 140-2 mode.

   **NOTE:** If your remote Collector Manager (freshly installed or upgraded) is running in non-FIPS mode, you must enable FIPS on the remote Collector Manager. For more information, see "Enabling FIPS 140-2 Mode on Remote Collector Managers and Correlation Engines" on page 103.

3. Ensure that FIPS server and remote Collector Managers communicates with each other.
4. Convert Remote Correlation Engines if any to run in FIPS mode. For more information, see "Enabling FIPS 140-2 Mode on Remote Collector Managers and Correlation Engines" on page 103.
5. Configure the Sentinel plug-ins to run in FIPS 140-2 mode. For more information, see "Configuring Sentinel Plug-Ins to Run in FIPS 140-2 Mode" on page 107.

## 6.4.2 Scenario 2: Data Collection in Partial FIPS 140-2 Mode

In this scenario, data collection is done using Connectors that support FIPS 140-2 mode and Connectors that do not support FIPS 140-2 mode. We assume that this environment involves a Sentinel server and data is collected through a remote Collector Manager. You may have one or more remote Collector Managers.


Agent Manager Connector
Database (JDBC) Connector
Sentinel Link Connector
File Connector (NFS or Local File Event Source Types)
Syslog Connector
Windows Event (WMI) Connector
Sentinel 7.1 Remote Collector Manager (In FIPS mode)
Sentinel 7.1 Server (In FIPS mode)
Audit Connector
Check Point (LEA) Connector
File Connector (All File Event Source Types)
SDEE Connector
SNMP Connector
Sentinel 7.1 Remote Collector Manager (In non-FIPS mode)

To handle data collection using Connectors that support and those that do not support the FIPS 140-2 mode, it is recommended that you have two remote Collector Managers - one running in FIPS 140-2 mode for FIPS supported Connectors, and another running in non-FIPS (normal) mode for Connectors that do not support the FIPS 140-2 mode.

You must perform the following procedure if your environment involves data collection from event sources using Connectors that support FIPS 140-2 mode and Connectors that do not support FIPS 140-2 mode yet.

1. You must have a Sentinel 7.1 server in FIPS 140-2 mode.

   **NOTE:** If your Sentinel server (freshly installed or upgraded) is in non-FIPS mode, you must enable FIPS on Sentinel server. For more information, see "Enabling Sentinel Server to Run in FIPS 140-2 Mode" on page 103.

2. Ensure that one remote Collector Manager is running in FIPS 140-2 mode, and another remote Collector Manager continues to run non-FIPS mode.

   **2a** If you do not have a FIPS 140-2 mode enabled remote Collector Manager, you must enable FIPS mode on the remote Collector Manager. For more information, see "Enabling FIPS 140-2 Mode on Remote Collector Managers and Correlation Engines" on page 103.

   **2b** Update the server certificate on the non-FIPS remote Collector Manager. For more information, see "Updating Server Certificates in Remote Collector Managers and Correlation Engines" on page 107.

3. Ensure that the two remote Collector Managers communicates with FIPS 140-2 enabled Sentinel server.

4 Convert Remote Correlation Engines if any to run in FIPS mode. For more information, see "Enabling FIPS 140-2 Mode on Remote Collector Managers and Correlation Engines" on page 103.

5 Configure the Sentinel plug-ins to run in FIPS 140-2 mode. For more information, see "Configuring Sentinel Plug-Ins to Run in FIPS 140-2 Mode" on page 107.

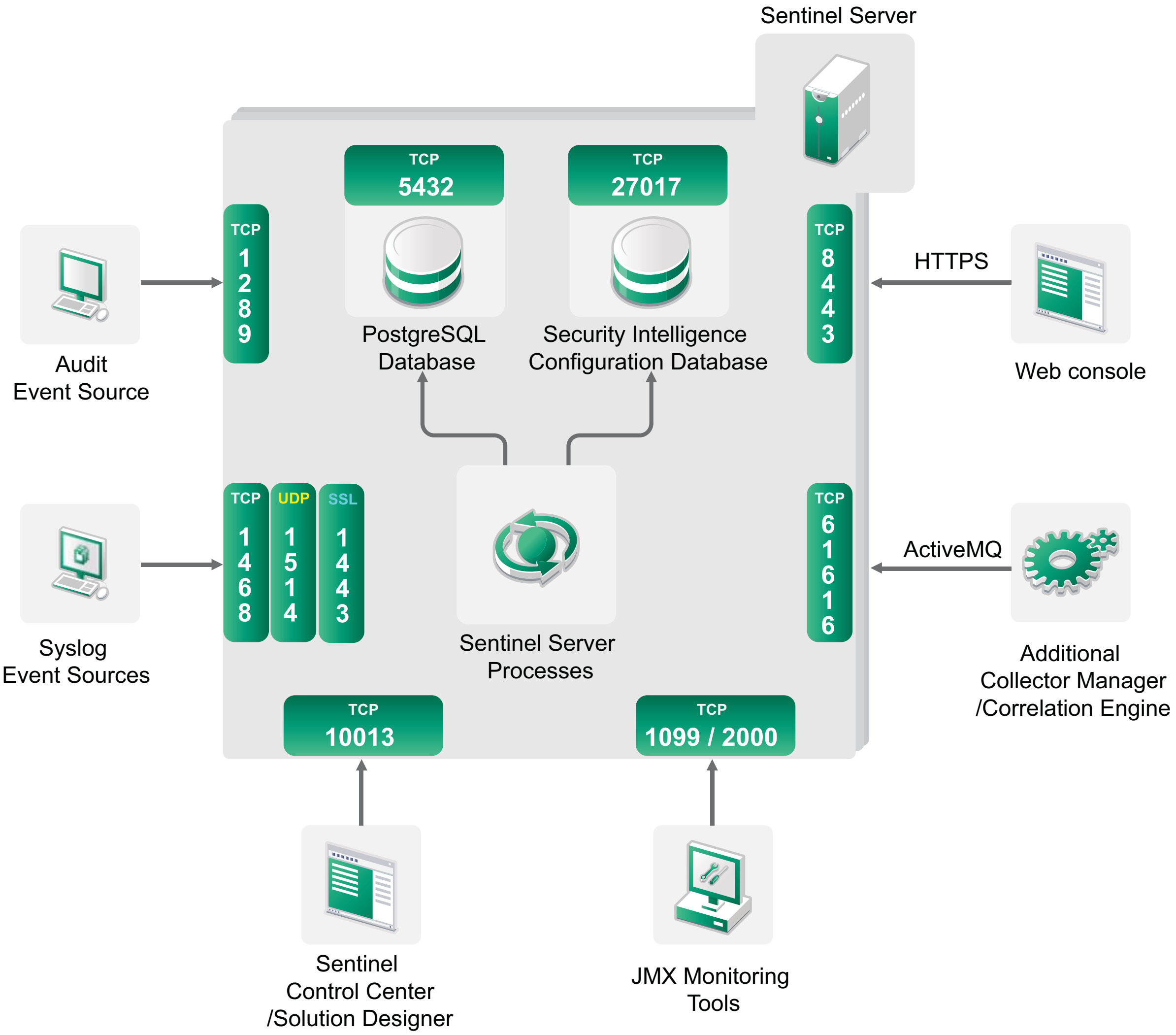
   5a Deploy Connectors that support FIPS 140-2 mode in the remote Collector Manager running in FIPS mode.

   5b Deploy the Connectors that do not support FIPS 140-2 mode in the non-FIPS remote Collector Manager.

# 7 Ports Used

Sentinel uses different ports for external communication with other components. For the appliance installation, the ports are opened on the firewall by default. However, for the traditional installation, you must configure the operating system on which you are installing Sentinel to open the ports on the firewall. The following figure illustrates the ports used in Sentinel:

***Figure 7-1*** *Ports Used in Sentinel*



- Section 7.1, "Sentinel Server Ports," on page 54
- Section 7.2, "Collector Manager Ports," on page 56
- Section 7.3, "Correlation Engine Ports," on page 57

## 7.1 Sentinel Server Ports

The Sentinel server uses the following ports for internal and external communication.

### 7.1.1 Local Ports

Sentinel uses the following ports for internal communication with database and other internal processes:

| Ports | Description |
|---|---|
| TCP 27017 | Used for the Security Intelligence configuration database. |
| TCP 28017 | Used for the Web interface for Security Intelligence database. |
| TCP 32000 | Used for internal communication between the wrapper process and the server process. |

### 7.1.2 Network Ports

For Sentinel to work properly, ensure that the following ports are open on the firewall:

| Ports | Direction | Required/ Optional | Description |
|---|---|---|---|
| TCP 5432 | Inbound | Optional. By default, this port listens only on loopback interface. | Used for the PostgreSQL database. You do not need to open this port by default. However, you must open this port when you develop reports by using the Sentinel SDK. For more information, see the Sentinel Plug-in SDK. |
| TCP 1099 and 2000 | Inbound | Optional | Used together by monitoring tools to connect to Sentinel server process using Java Management Extensions (JMX). |
| TCP 1289 | Inbound | Optional | Used for Audit connections. |
| UDP 1514 | Inbound | Optional | Used for syslog messages. |
| TCP 8443 | Inbound | Required | Used for HTTPS communication. |
| TCP 1443 | Inbound | Optional | Used for SSL encrypted syslog messages. |
| TCP 61616 | Inbound | Optional | Used for incoming connections from Collector Managers and Correlation Engines. |
| TCP 10013 | Inbound | Required | Used by the Sentinel Control Center and Solution Designer. |
| TCP 1468 | Inbound | Optional | Used for syslog messages. |
| TCP 10014 | Inbound | Optional | Used by the remote Collector Managers to connect to the server through the SSL proxy. However, this is uncommon. By default, remote Collector Managers use the SSL port 61616 to connect to the server. |
| TCP 443 | Outbound | Optional | ff Advisor is used, the port initiates a connection to the Advisor service over the Internet to the Advisor Updates URL (https://secure-www.novell.com/sentinel/download/advisor/). |

| Ports | Direction | Required/ Optional | Description |
|---|---|---|---|
| TCP 8443 | Outbound | Optional | If distributed search is used, the port initiates a connection to other Sentinel systems to perform the distributed search. |
| TCP 389 or 636 | Outbound | Optional | If LDAP authentication is used, the port initiates a connection to the LDAP server. |
| TCP/UDP 111 and TCP/UDP 2049 | Outbound | Optional | If network storage is configured to use NFS. |
| TCP 137, 138, 139, 445 | Outbound | Optional | If network storage is configured to use CIFS. |
| TCP JDBC (database dependent) | Outbound | Optional | If data synchronization is used, the port initiates a connection to the target database using JDBC. The port that is used is dependent on the target database. |
| TCP 25 | Outbound | Optional | Initiates a connection to the email server. |
| TCP 1290 | Outbound | Optional | When Sentinel forwards events to another Sentinel system, this port initiates a Sentinel Link connection to that system. |
| UDP 162 | Outbound | Optional | When Sentinel forwards events to the system receiving SNMP traps, the port sends a packet to the receiver. |
| UDP 514 or TCP 1468 | Outbound | Optional | This port is used when Sentinel forwards events to the system receiving Syslog messages. If the port is UDP, it sends a packet to the receiver. If the port is TCP, it initiates a connection to the receiver. |

### 7.1.3 Sentinel Server Appliance Specific Ports

In addition to the above ports, the following ports are open for appliance.

| Ports | Direction | Required/ Optional | Description |
|---|---|---|---|
| TCP 22 | Inbound | Required | Used for secure shell access to the Sentinel appliance. |
| TCP 54984 | Inbound | Required | Used by the Sentinel Appliance Management Console (WebYaST). Also used by the Sentinel appliance for the update service. |
| TCP 289 | Inbound | Optional | Forwarded to 1289 for Audit connections. |
| UDP 443 | Inbound | Optional | Forwarded to 8443 for HTTPS communication. |
| UDP 514 | Inbound | Optional | Forwarded to 1514 for syslog messages. |
| TCP 1290 | Inbound | Optional | Sentinel Link port that is allowed to connect through the SuSE Firewall. |
| UDP and TCP 40000 - 41000 | Inbound | Optional | Ports that can be used when configuring data collection servers, such as syslog. Sentinel does not listen on these ports by default. |
| TCP 443 or 80 | Outbound | Required | Initiates a connect to the NetIQ appliance software update repository on the Internet or a Subscription Management Tool service in your network. |

| Ports | Direction | Required/ Optional | Description |
|---|---|---|---|
| TCP 80 | Outbound | Optional | Initiates a connection to the Subscription Management Tool. |

## 7.2 Collector Manager Ports

The Collector Manager uses the following ports to communicate with other components.

### 7.2.1 Network Ports

For Sentinel Collector Manager to work properly, ensure that the following ports are open on the firewall:

| Ports | Direction | Required/ Optional | Description |
|---|---|---|---|
| TCP 1289 | Inbound | Optional | Used for Audit connections. |
| UDP 1514 | Inbound | Optional | Used for syslog messages. |
| TCP 1443 | Inbound | Optional | Used for SSL encrypted syslog messages. |
| TCP 1468 | Inbound | Optional | Used for syslog messages. |
| TCP 1099 and 2000 | Inbound | Optional | Used together by monitoring tools to connect to Sentinel server process using Java Management Extensions (JMX). |
| TCP 61616 | Outbound | Required | Initiates a connection to the Sentinel server. |

### 7.2.2 Collector Manager Appliance Specific Ports

In addition to the above ports, the following ports are open for the Sentinel Collector Manager appliance.

| Ports | Direction | Required/ Optional | Description |
|---|---|---|---|
| TCP 22 | Inbound | Required | Used for secure shell access to the Sentinel appliance. |
| TCP 54984 | Inbound | Required | Used by the Sentinel Appliance Management Console (WebYaST). Also used by the Sentinel appliance for the update service. |
| TCP 289 | Inbound | Optional | Forwarded to 1289 for Audit connections. |
| UDP 514 | Inbound | Optional | Forwarded to 1514 for syslog messages. |
| TCP 1290 | Inbound | Optional | This is the Sentinel Link port that is allowed to connect through the SuSE Firewall. |
| UDP and TCP 40000 - 41000 | Inbound | Optional | Ports that can be used when configuring data collection servers, such as syslog. Sentinel does not listen on these ports by default. |

| Ports | Direction | Required/ Optional | Description |
|---|---|---|---|
| TCP 443 | Outbound | Required | Initiates a connection to the NetIQ appliance software update repository on the Internet or a Subscription Management Tool service in your network. |
| TCP 80 | Outbound | Optional | Initiates a connection to the Subscription Management Tool. |

## 7.3 Correlation Engine Ports

The Correlation Engine uses the following ports to communicate with other components.

### 7.3.1 Network Ports

For Sentinel Correlation Engine to work properly, ensure that the following ports are open on the firewall:

| Ports | Direction | Required/Optional | Description |
|---|---|---|---|
| TCP 1099 and 2000 | Inbound | Optional | Used together by monitoring tools to connect to Sentinel server process using Java Management Extensions (JMX). |
| TCP 61616 | Outbound | Required | Initiates a connection to the Sentinel server. |

### 7.3.2 Correlation Engine Appliance Specific Ports

In addition to the above ports, the following ports are open on Sentinel Correlation Engine appliance.

| Ports | Direction | Required/ Optional | Description |
|---|---|---|---|
| TCP 22 | Inbound | Required | Used for secure shell access to the Sentinel appliance. |
| TCP 54984 | Inbound | Required | Used by the Sentinel Appliance Management Console (WebYaST). Also used by the Sentinel appliance for the update service. |
| TCP 443 | Outbound | Required | Initiates a connection to the NetIQ appliance software update repository on the Internet or a Subscription Management Tool service in your network. |
| TCP 80 | Outbound | Optional | Initiates a connection to the Subscription Management Tool. |

# 8 Installation Options

You can perform a traditional installation of Sentinel or install the appliance. This chapter provides information about the two installation options.

## 8.1 Traditional Installation

The traditional installation installs Sentinel on an existing SUSE Linux Enterprise Server (SLES) 11 or Red Hat Enterprise Linux (RHEL) 6 operating system, by using the application installer. You can install Sentinel in the following ways:

- **Interactive:** The installation proceeds with user inputs. During installation, you can record the installation options (user inputs or default values) to a file, which you can use later for silent installation.You can either perform a standard installation or a custom installation.

| Standard Installation | Custom Installation |
|---|---|
| Uses the default values for the configuration. User input is required only for the password. | Prompts you to specify the values for the configuration setup. You can either select the default values or specify the necessary values. |
| Installs with default 90-day evaluation key. | Allows you to install with the 90-day license key or with a valid license key. |
| Allows you to specify the admin password and uses the admin password as the default password for both dbauser and appuser. | Allows you to specify the admin password. For dbauser and appuser, you can either specify new password or use admin password. |
| Installs the default ports for all the components. | Allows you to specify ports for different components. |
| Installs Sentinel in non-FIPS mode. | Allows you to install Sentinel in FIPS 140-2 mode. |
| Authenticates users with the internal database. | Provides the option set up LDAP authentication for Sentinel in addition to the database authentication. When you configure Sentinel for LDAP authentication, users can log in to the server by using their Novell eDirectory or Microsoft Active Directory credentials. |

  For more information on interactive installation, see Section 11.2, “Performing Interactive Installation,” on page 68.

- **Silent:** If you want to install multiple Sentinel servers in your deployment, you can record the installation options during the standard or custom installation in a configuration file and then use the file to run an unattended installation. For more information on silent installation, see Section 11.3, “Performing a Silent Installation,” on page 70.

## 8.2 Appliance Installation

The appliance installation installs both the SLES 11 SP2 64-bit operating system and Sentinel.

The Sentinel appliance is available in the following formats:

- A VMware appliance image
- A Xen appliance image
- A hardware appliance Live DVD image that is directly deployable to a hardware server

For more information on appliance installation, see Chapter 12, “Appliance Installation,” on page 77.

# III

# Installing Sentinel

This section provides information about installing Sentinel and additional components.

# 9 Installation Overview

The Sentinel installation installs the following components in the Sentinel server:

- **Sentinel server process:** This is the primary component of Sentinel. The Sentinel server process processes requests from other components of Sentinel and enables seamless functionality of the system.The Sentinel server process handles requests, such as filtering data, processing search queries, and managing administrative tasks that include user authentication and authorization.
- **Web server:** Sentinel uses Jetty as its Web server to allow secure connection to the Sentinel Web interface.
- **PostgreSQL database:** Sentinel has a built-in database that stores Sentinel configuration information, asset and vulnerability data, identity information, incident and workflow status, and so on.
- **MongoDB database:** Stores the Security Intelligence data.
- **Collector Manager:** Collector Manager provides a flexible data collection point for Sentinel. The Sentinel installer installs a Collector Manager by default during installation.
- **Correlation Engine:** Correlation Engine processes events from the real-time event stream to determine whether they should trigger any of the correlation rules.
- **Advisor:** Advisor, powered by Security Nexus, is an optional data subscription service that provides device-level correlation between real-time events, from intrusion detection and prevention systems, and from enterprise vulnerability scan results. For more information about Advisor, see “Configuring Advisor”in the *NetIQ Sentinel 7.1 Administration Guide*.
- **Sentinel plug-ins:** Sentinel supports a variety of plug-ins to expand and enhance system functionality. Some of these plug-ins are preinstalled. You can download additional plug-ins and updates from the Sentinel Plug-ins Web site. Sentinel plug-ins include the following:
  - Collectors
  - Connectors
  - Correlation rules and actions
  - Reports
  - iTRAC workflows
  - Solution packs

Sentinel has a highly scalable architecture, and if high event rates are expected, you can distribute components across several machines to achieve the best performance for the system. Independent scaling of components provides cost-effective scalability and performance.

## 9.1 Advantages of Additional Collector Managers

You can install additional Collector Managers at suitable locations in your network. These remote Collector Managers run Connectors and Collectors, and forward the collected data to the Sentinel server for storage and processing. For information on installing additional Collector Managers, see Section 11.6, "Installing Additional Collector Managers and Correlation Engines," on page 74.

Installing more than one Collector Manager in a distributed network provides several advantages:

- **Improved system performance:** Additional Collector Managers can parse and process event data in a distributed environment, which increases the system performance.
- **Additional data security and decreased network bandwidth requirements:** If the Collector Managers are co-located with event sources, then filtering, encryption, and data compression can be performed at the source.
- **File caching:** Additional Collector Managers can cache large amounts of data while the server is temporarily busy archiving events or processing a spike in events. This feature is an advantage for protocols such as syslog, which do not natively support event caching.

**NOTE:** You cannot install more than one Collector Manager on a single system. You can install additional Collector Managers on remote systems, and then connect them to the Sentinel server.

## 9.2 Advantages of Additional Correlation Engines

You can deploy multiple Correlation Engines, each on its own server, without the need to replicate configurations or add databases. For environments with large numbers of Correlation rules or extremely high event rates, it can be advantageous to install more than one Correlation engine and redeploy some rules to the new Correlation engine. Multiple Correlation engines provide the ability to scale as the Sentinel system incorporates additional data sources or as event rates increase. For information on installing additional Correlation Engines, see Section 11.6, "Installing Additional Collector Managers and Correlation Engines," on page 74.

**NOTE:** You cannot install more than one Correlation Engine on a single system. You can install additional Correlation Engines on remote systems, and then connect them to the Sentinel server.

# 10 Installation Checklist

Ensure that you have completed the following tasks before you start the installation:

- ☐ Verify that your hardware and software meet the system requirements listed in Chapter 5, “Meeting System Requirements,” on page 33.
- ☐ If there was a previous installation of Sentinel, ensure that there are no files or system settings remaining from a previous installation. For more information, see Appendix C, “Uninstalling,” on page 145.
- ☐ If you plan to install the licensed version, obtain your license key from the Novell Customer Care Center.
- ☐ Ensure that the ports listed in Chapter 7, “Ports Used,” on page 53 are opened in the firewall.
- ☐ For the Sentinel installer to work properly, the system must be able to return the hostname or a valid IP address. To do this, add the hostname to the `/etc/hosts` file to the line containing the IP address, then enter `hostname -f` to make sure that the hostname is displayed properly.
- ☐ Synchronize time by using the Network Time Protocol (NTP).
- ☐ **On RHEL systems:** For optimal performance, the memory settings must be set appropriately for the PostgreSQL database. The SHMMAX parameter must be greater than or equal to 1073741824.

  To set the appropriate value, append the following information in the `/etc/sysctl.conf` file:

  ```
  # for Sentinel Postgresql
  kernel.shmmax=1073741824
  ```

- ☐ **For traditional installations:**
  - ☐ Ensure that IPv6 is enabled in your operating system. If IPv6 is not enabled, major components will fail to operate.
  - ☐ The operating system for the Sentinel server must include at least the Base Server components of the SLES server or the RHEL 6 server. Sentinel requires the 64-bit versions of the following RPMs:
    - bash
    - bc
    - coreutils
    - gettext
    - glibc
    - grep
    - libgcc
    - libstdc
    - lsof
    - net-tools

- openssl
- python-libs
- sed
- zlib

# 11 Traditional Installation

This chapter provides information about the various ways to install Sentinel.

- Section 11.1, "Understanding Installation Options," on page 67
- Section 11.2, "Performing Interactive Installation," on page 68
- Section 11.3, "Performing a Silent Installation," on page 70
- Section 11.4, "Installing Sentinel as a Non-root User," on page 71
- Section 11.5, "Modifying the Configuration after Installation," on page 73
- Section 11.6, "Installing Additional Collector Managers and Correlation Engines," on page 74

## 11.1 Understanding Installation Options

`./install-sentinel --help` displays the following options:

| Options | Value | Description |
|---|---|---|
| --location | Directory | Specifies a directory other than the root (/) to install Sentinel. |
| -m, --manifest | File name | Specifies a product manifest file to use instead of the default manifest file. |
| --no-configure | | Specifies to not configure the product after installation. |
| -n, --no-start | | Specifies to not start or restart Sentinel after installation or configuration. |
| -r, --recordunattended | Filename | Specifies a file to record the parameters that can be used for unattended installation. |
| -u, --unattended | Filename | Uses the parameters from the specified file in order to install Sentinel on unattended systems. |
| -h, --help | | Displays the options that can be used while installing Sentinel. |
| -l, --log-file | Filename | Records log messages to a file. |
| --no-banner | | Suppresses the display of banner message. |
| -q, --quiet | | Displays fewer messages. |
| -v, --verbose | | Displays all messages during installation. |

## 11.2 Performing Interactive Installation

This section provides information about standard and custom installation.

- Section 11.2.1, "Standard Installation," on page 68
- Section 11.2.2, "Custom Installation," on page 69

### 11.2.1 Standard Installation

Use the following steps to perform a standard installation:

**1** Download the Sentinel installation file from the Novell Downloads Web page (http://download.novell.com/index.jsp):

  **1a** In the *Product or Technology* field, browse to and select *SIEM-Sentinel*.

  **1b** Click *Search*.

  **1c** Click the button in the *Download* column for *Sentinel 7.1 Evaluation*.

  **1d** Click *proceed to download*, then specify your customer name and password.

  **1e** Click *download* for the installation version for your platform.

**2** Specify at the command line the following command to extract the installation file.

```
tar zxvf <install_filename>
```

Replace <*install_filename*> with the actual name of the install file.

**3** Change to the directory where you extracted the installer:

```
cd <directory_name>
```

**4** Specify the following command to install Sentinel:

```
./install-sentinel
```

or

If you want to install Sentinel on more than one system, you can record your installation options in a file. You can use this file for an unattended Sentinel installation on other systems. To record your installation options, specify the following command:

```
./install-sentinel -r <response_filename>
```

**5** Specify the number for the language you want to use for the installation, then press Enter.

The end user license agreement is displayed in the selected language.

**6** Press the Spacebar to read through the license agreement.

**7** Enter `yes` or `y` to accept the license and continue with the installation.

The installation might take a few seconds to load the installation packages and prompt for the configuration type.

**8** When prompted, specify `1` to proceed with the standard configuration.

Installation proceeds with the 90-day evaluation license key included with the installer. This license key activates the full set of product features for a 90-day trial period. At any time during or after the trial period, you can replace the evaluation license with a license key you have purchased.

**9** Specify the password for the administrator user `admin`.

**10** Confirm the password again.

This password is used by `admin`, `dbauser`, and `appuser`.

The Sentinel installation finishes and the server starts. It might take few minutes for all services to start after installation because the system performs a one-time initialization. Wait until the installation finishes before you log in to the server.

To access the Sentinel Web interface, specify the following URL in your Web browser:

```
https://<IP_Address_Sentinel_server>:8443.
```

The <*IP_Address_Sentinel_server*> is the IP address or DNS name of the Sentinel server and 8443 is the default port for the Sentinel server.

## 11.2.2 Custom Installation

If you are installing Sentinel with a custom configuration, you can specify the license key, change the password for different users, and specify values for different ports that are used to interact with the internal components.

**1** Download the Sentinel installation file from the Novell Downloads Web page:

  **1a** In the *Product or Technology* field, browse to and select *SIEM-Sentinel*.

  **1b** Click *Search*.

  **1c** Click the button in the *Download* column for *Sentinel 7.1 Evaluation*.

  **1d** Click *proceed to download*, then specify your customer name and password.

  **1e** Click *download* for the installation version for your platform.

**2** Specify at the command line the following command to extract the installation file.

```
tar zxvf <install_filename>
```

Replace <*install_filename*> with the actual name of the install file.

**3** Specify the following command in the root of the extracted directory to install Sentinel:

```
./install-sentinel
```

or

If you want to use this custom configuration to install Sentinel on more than one system, you can record your installation options in a file. You can use this file for an unattended Sentinel installation on other systems. To record your installation options, specify the following command:

```
./install-sentinel -r <response_filename>
```

**4** Specify the number for the language you want to use for the installation, then press Enter.

The end user license agreement is displayed in the selected language.

**5** Press the Spacebar to read through the license agreement.

**6** Enter `yes` or `y` to accept the license agreement and continue with the installation.

The installation might take a few seconds to load the installation packages and prompt for the configuration type.

**7** Specify `2` to perform a custom configuration of Sentinel.

**8** Enter `1` to use the default 90-day evaluation license key

or

Enter `2` to enter a purchased license key for Sentinel.

9. Specify the password for the administrator user `admin` and confirm the password again.
10. Specify the password for the database user `dbauser` and confirm the password again.

    The `dbauser` account is the identity used by Sentinel to interact with the database. The password you enter here can be used to perform database maintenance tasks, including resetting the admin password if the admin password is forgotten or lost.
11. Specify the password for the application user `appuser` and confirm the password again.
12. Change the port assignments for the Sentinel services by entering the desired number, then specifying the new port number.
13. After you have changed the ports, specify 7 for done.
14. Enter `1` to authenticate users using only the internal database.

    or

    If you have configured an LDAP directory in your domain, enter `2` to authenticate users by using LDAP directory authentication.

    The default value is `1`.
15. ***If you want to enable Sentinel in FIPS 140-2 mode***, press `y`.

    **15a** Specify a strong password for the keystore database and confirm the password again.

    ---

    **NOTE:** The password must be at least seven characters long. The password must contain at least three of the following character classes: Digits, ASCII lowercase letters, ASCII uppercase letters, ASCII non-alphanumeric characters, and non-ASCII characters.

    If an ASCII uppercase letter is the first character or a digit is the last character, they are not counted.

    ---

    **15b** If you want to insert external certificates into the keystore database to establish trust, press `y` and specify the path for the certificate file. Otherwise, press `n`

    **15c** Complete the FIPS 140-2 mode configuration by following the tasks mentioned in Chapter 19, "Operating Sentinel in FIPS 140-2 Mode," on page 105.

The Sentinel installation finishes and the server starts. It might take few minutes for all services to start after installation because the system performs a one-time initialization. Wait until the installation finishes before you log in to the server.

To access the Sentinel Web interface, specify the following URL in your Web browser:

```
https://<IP_Address_Sentinel_server>:8443.
```

The <*IP_Address_Sentinel_server*> is the IP address or DNS name of the Sentinel server and 8443 is the default port for the Sentinel server.

## 11.3 Performing a Silent Installation

The silent or unattended installation is useful if you need to install more than one Sentinel server in your deployment. In such a scenario, you can record the installation parameters during the interactive installation and then run the recorded file on other servers. You can record the installation parameters while installing Sentinel with the standard configuration or a custom configuration.

To perform silent installation, ensure that you have recorded the installation parameters to a file. For information on creating the response file, see Section 11.2.1, "Standard Installation," on page 68 or Section 11.2.2, "Custom Installation," on page 69.

To enable Sentinel in FIPS 140-2 mode, ensure that the response file includes the following parameters:

- ENABLE_FIPS_MODE
- NSS_DB_PASSWORD

To perform a silent installation, use the following steps:

1. Download the installation files from the Novell Downloads Web page.
2. Log in as `root` to the server where you want to install Sentinel.
3. Specify the following command to extract the install files from the tar file:

   ```
   tar -zxvf <install_filename>
   ```

   Replace <*install_filename*> with the actual name of the install file.
4. Specify the following command to install Sentinel in silent mode:

   ```
   ./install-sentinel -u <response_file>
   ```

   The installation proceeds with the values stored in the response file.
5. **If you chose to enable FIPS 140-2 mode,** complete the FIPS 140-2 mode configuration by following the tasks mentioned in Chapter 19, "Operating Sentinel in FIPS 140-2 Mode," on page 105.

The Sentinel installation finishes and the server starts. It might take few minutes for all services to start after installation because the system performs a one-time initialization. Wait until the installation finishes before you log in to the server.

## 11.4 Installing Sentinel as a Non-root User

If your organizational policy does not allow you to run the full installation of Sentinel as `root`, you can install Sentinel as another user. In this installation, a few steps are performed as a `root` user, then you proceed to install Sentinel as another user created by the `root` user. Finally, the `root` user completes the installation.

1. Download the installation files from the Novell Downloads Web page
2. Specify the following command at the command line to extract the install files from the tar file:

   ```
   tar -zxvf <install_filename>
   ```

   Replace <*install_filename*> with the actual name of the install file.
3. Log in as `root` to the server where you want to install Sentinel as `root`.
4. Specify the following command:

   ```
   ./bin/root_install_prepare
   ```

   A list of commands to be executed with root privileges is displayed. If you want the non-root user to install Sentinel in non-default location, specify the --location option along with the command. For example:

   ```
   ./bin/root_install_prepare --location=/foo
   ```

   The value that you pass to the `--location` option `foo` is prepended to the directory paths.

   This also creates a `novell` group and a `novell` user, if they do not already exist.
5. Accept the command list.

The displayed commands are executed.

6. Specify the following command to change to the newly created non-root `novell` user: `novell`:

   ```
   su novell
   ```

7. (Conditional) To do an interactive installation:

   **7a** Specify the following command:

   ```
   ./install-sentinel
   ```

   To install Sentinel in non-default location, specify the --location option along with the command. For example:.

   ```
   ./install-sentinel --location=/foo
   ```

   **7b** Continue with Step 9.

8. (Conditional) To do a silent installation:

   **8a** Specify the following command:

   ```
   ./install-sentinel -u <response_file>
   ```

   The installation proceeds with the values stored in the response file.

   **8b** Continue with Step 12.

9. Specify the number for the language you want to use for the installation.

   The end user license agreement is displayed in the selected language.

10. Read the end user license and enter `yes` or `y` to accept the license and continue with the installation.

    The installation starts installing all RPM packages. This installation might take a few seconds to complete.

11. You are prompted to specify the mode of installation.

    - If you select to proceed with the standard configuration, continue with Step 8 through Step 10 in Section 11.2.1, “Standard Installation,” on page 68.
    - If you select to proceed with the custom configuration, continue with Step 7 through Step 14 in Section 11.2.2, “Custom Installation,” on page 69.

12. Log in as a `root` user and specify the following command to finish installation:

    ```
    ./bin/root_install_finish
    ```

    The Sentinel installation finishes and the server starts. It might take few minutes for all services to start after installation because the system performs a one-time initialization. Wait until the installation finishes before you log in to the server.

To access the Sentinel Web interface, specify the following URL in your Web browser:

```
https://<IP_Address_Sentinel_server>:8443.
```

The <*IP_Address_Sentinel_server*> is the IP address or DNS name of the Sentinel server and 8443 is the default port for the Sentinel server.

## 11.5 Modifying the Configuration after Installation

After installing Sentinel, if you want to enter the valid license key, change the password or modify any of the assigned ports, you can run the `configure.sh` script to modify them. The script is found in the `/opt/novell/sentinel/setup` folder.

1. Specify the following command at the command line to run the `configure.sh` script:

   ```
   ./configure.sh
   ```

2. Specify `1` to perform a standard configuration or specify `2` to perform a custom configuration of Sentinel.
3. Press the Spacebar to read through the license agreement.
4. Enter `yes` or `y` to accept the license agreement and continue with the installation.

   The installation might take a few seconds to load the installation packages.

5. Enter `1` to use the default 90-day evaluation license key

   or

   Enter `2` to enter a purchased license key for Sentinel.

6. Decide whether you want to keep the existing password for the `admin` administrator user.
   - If you want to keep the existing password, enter `1`, then continue with Step 7.
   - If you want to change the existing password, enter `2`, specify the new password, confirm the password, then continue with Step 7.
7. Decide whether you want to keep the existing password for the `dbauser` database user.
   - If you want to keep the existing password, enter `1`, then continue with Step 8.
   - If you want to change the existing password, enter `2`, specify the new password, confirm the password, then continue with Step 8.

   The `dbauser` account is the identity used by Sentinel to interact with the database. The password you enter here can be used to perform database maintenance tasks, including resetting the admin password if the admin password is forgotten or lost.

8. Decide whether you want to keep the existing password for the `appuser` application user.
   - If you want to keep the existing password, enter `1`, then continue with Step 9.
   - If you want to change the existing password, enter `2`, specify the new password, confirm the password, then continue with Step 9.
9. Change the port assignments for the Sentinel services by entering the desired number, then specifying the new port number.
10. After you have changed the ports, specify 7 for done.
11. Enter `1` to authenticate users using only the internal database.

    or

    If you have configured an LDAP directory in your domain, enter `2` to authenticate users by using LDAP directory authentication.

    The default value is `1`.

## 11.6 Installing Additional Collector Managers and Correlation Engines

By default, Sentinel installs a Collector Manager and a Correlation Engine. Depending on your environment, you might need additional Collector Managers and Correlation Engines. For information about the advantages of additional Collector Managers and Correlation Engines, see Section 9.1, "Advantages of Additional Collector Managers," on page 64 and Section 9.2, "Advantages of Additional Correlation Engines," on page 64.

---

**IMPORTANT:** You must install the additional Collector Manager or the Correlation Engine on separate systems. The remote Collector Manager or the remote Correlation Engine must not be on the same system where the Sentinel server is installed.

---

- Section 11.6.1, "Installation Checklist," on page 74
- Section 11.6.2, "Installing Additional Collector Managers and Correlation Engines," on page 74
- Section 11.6.3, "Adding a Custom User for the Collector Manager or Correlation Engine," on page 75

### 11.6.1 Installation Checklist

Ensure that you have completed the following tasks before starting the installation.

☐ Make sure that your hardware and software meet the minimum requirements. For more information, see Chapter 5, "Meeting System Requirements," on page 33.

☐ Synchronize time by using the Network Time Protocol (NTP).

☐ A Collector Manager requires network connectivity to the message bus port (61616) on the Sentinel server. Before you start installing the Collector Manager, make sure that all firewall and network settings are allowed to communicate over this port.

### 11.6.2 Installing Additional Collector Managers and Correlation Engines

1 Launch the Sentinel Web interface by specifying the following URL in your Web browser:

```
https://<IP_Address_Sentinel_server>:8443.
```

The <*IP_Address_Sentinel_server*> is the IP address or DNS name of the Sentinel server and 8443 is the default port for the Sentinel server.

Log in with the username and password specified during the installation of the Sentinel server.

2 In the toolbar, click *Downloads*.

3 Under the Collector Manager heading, click *Download Installer*.

4 Click *Save File* to save the installer to the desired location.

5 Specify the following command to extract the installation file.

```
tar zxvf <install_filename>
```

Replace <*install_filename*> with the actual name of the install file.

6 Change to the directory where you extracted the installer.

7 Specify the following command to install the Collector Manager or the Correlation Engine:

**For Collector Manager:**

```
./install-cm
```

**For Correlation Engine:**

```
./install-ce
```

The install script first checks for the available memory and disk space. If the available memory is less than 1.5 GB, the script automatically terminates the installation.

8. Specify the number for the language you want to use for the installation.

   The end user license agreement is displayed in the selected language.
9. Press the Spacebar to read through the license agreement.
10. Enter `yes` or `y` to accept the license agreement and continue with the installation.

    The installation might take a few seconds before prompting for the configuration type.
11. When prompted, specify 1 to proceed with the standard configuration.
12. Enter default Communication Server Hostname or IP Address of the machine on which Sentinel is installed.
13. Specify the username and password for the Collector Manager or the Correlation Engine.

    The username and password are stored in the `/<install_dir>/etc/opt/novell/sentinel/config/activemqusers.properties` file located in the Sentinel server.
14. Accept the certificate permanently when prompted.
15. Enter `yes` or `y` to enable FIPS 140-2 mode in sentinel and continue with the FIPS configuration.
16. Continue with the installation as prompted until installation is complete.

### 11.6.3 Adding a Custom User for the Collector Manager or Correlation Engine

Sentinel recommends that you use the default usernames for the remote Collector Manager and Correlation Engine. However, if you have installed multiple remote Collector Managers and you want to identify them separately, you can create new users:

1. Log in to the server as the user who has access to the installation files for Sentinel.
2. Open the `activemqgroups.properties` file.

   This file is located in the `/<install_dir>/etc/opt/novell/sentinel/config/` directory.
3. Add the new usernames separated by comma as follows:

   **For Collector Manager, add the new users in the cm section. For example:**

   ```
   cm=collectormanager,cmuser1,cmuser2,...
   ```

   **For Correlation Engine, add the new users in the admins section. For example:**

   ```
   admins=system,correlationengine,ceuser1,ceuser2,...
   ```
4. Save and close the file.
5. Open the `activemqusers.properties` file.

   This file is located in the `/<install_dir>/etc/opt/novell/sentinel/config/` directory.
6. Add the password for the user you created in Step 3.

   The password can be any random string. For example:

   **For Collector Manager users:**

```
system=c7f34372ecd20d831cceb29e754e5ac9
collectormanager=1c51ae56
cmuser1=1b51de55
cmuser2=1a51ce57
```

**For Correlation Engine users:**

```
system=c7f34372ecd20d831cceb29e754e5ac9
correlationengine=68790d7a
ceuser1=69700c6d
ceuser2=70701b5c
```

7 Save and close the file.

8 Restart the Sentinel server.

# 12 Appliance Installation

The Sentinel appliance is a ready-to-run software appliance built on SUSE Studio. The appliance combines a hardened SUSE Linux Enterprise Server (SLES) 11 SP 2 operating system and the Sentinel software integrated update service to provide an easy and seamless user experience that allows customers to leverage existing investments. The software appliance can be installed on the hardware or in a virtual environment.

- Section 12.1, "Installing the VMware Appliance," on page 77
- Section 12.2, "Installing the Xen Appliance," on page 80
- Section 12.3, "Installing the ISO Appliance," on page 82
- Section 12.4, "Post-Installation Configuration for the Appliance," on page 85
- Section 12.5, "Stopping and Starting the Server by Using WebYaST," on page 87

## 12.1 Installing the VMware Appliance

This section provides information about installing Sentinel, Collector Manager, and Correlation Engine on a VMware ESX server.

- Section 12.1.1, "Installing Sentinel," on page 77
- Section 12.1.2, "Installing Additional Collector Managers and Correlation Engines," on page 78
- Section 12.1.3, "Installing VMware Tools," on page 79

### 12.1.1 Installing Sentinel

Use the following steps to install Sentinel on a VMware ESX server:

1. Download the VMware appliance installation file from the Novell Download Web site.

   The correct file for the VMware appliance has `vmx` in the filename. For example, `sentinel_server_7.1.0.0.x86_64.vmx.tar.gz`
2. Establish an ESX datastore to which the appliance image can be installed.
3. Log in as Administrator to the server where you want to install the appliance.
4. Specify the following command to extract the compressed appliance image from the machine where the VM Converter is installed:

   ```
   tar zxvf <install_file>
   ```

   Replace *<install_file>* with the actual filename.
5. To import the VMware image to the ESX server, use the VMware Converter and follow the on-screen instructions in the installation wizard.
6. Log in to the ESX server machine.
7. Select the imported VMware image of the appliance and click the *Power On* icon.

8 Select the language of your choice, then click *Next*.

9 Select the keyboard layout, then click *Next*.

10 Read and accept the SUSE Linux Enterprise Server (SLES) 11 SP2 Software License Agreement.

11 Read and accept the NetIQ Sentinel End User License Agreement.

12 On the Hostname and Domain Name page, specify the hostname and domain name, then ensure that the *Assign Hostname to Loopback IP* option is selected.

13 Click *Next*. The hostname configurations are saved.

14 Do one of the following:

- To use the current network connection settings, select *Use Following Configuration* on the Network Configuration II page, then click *Next*.
- To change the network connection settings, select *Change*, make the desired changes, then click *Next*.

The network connection settings are saved.

15 Set the time and date, then click *Next*.

To change the NTP configuration after installation, use YaST from the appliance command line. You can use WebYast to change the time and date, but not the NTP configuration.

If the time appears out of sync immediately after the install, run the following command to restart NTP:

```
rcntp restart
```

16 Set the `root` password, then click *Next*.

The installation checks for the available memory and disk space. If the available memory is less than 2.5 GB, the installation will not let you proceed and the *Next* button is greyed out.

If the available memory is more than 2.5 GB but less than 6.7 GB, the installation displays a message that you have less memory than is recommended. When this message is displayed, click *Next* to continue with the installation.

17 Set Sentinel admin password, then click *Next*.

It might take few minutes for all services to start after installation because the system performs a one-time initialization. Wait until the installation finishes before you log in to the server.

18 Make a note of the appliance IP address that is shown in the console.

19 Proceed with Section 12.4, “Post-Installation Configuration for the Appliance,” on page 85.

### 12.1.2 Installing Additional Collector Managers and Correlation Engines

The procedure to install a Collector Manager or a Correlation Engine is the same except that you need to download the appropriate file from the Novell Download Web site.

1 Download the VMware appliance installation file from the Novell Download Web site (http://download.novell.com/index.jsp).

The correct file for the VMware appliance has `vmx` in the filename. For example, `sentinel_collector_manager_7.1.0.0.x86_64.vmx.tar.gz`

2 Establish an ESX datastore to which the appliance image can be installed.

3 Log in as Administrator to the server where you want to install the appliance.

4 Specify the following command to extract the compressed appliance image from the machine where the VM Converter is installed:

```
tar zxvf <install_file>
```

Replace <*install_file*> with the actual file name.

5. To import the VMware image to the ESX server, use the VMware Converter and follow the on-screen instructions in the installation wizard.
6. Log in to the ESX server machine.
7. Select the imported VMware image of the appliance and click the *Power On* icon.
8. Specify the host name/IP address of the Sentinel server that the Collector Manager should connect to.
9. Specify the Communication Server port number. The default message bus port is `61616`.
10. Specify the JMS User Name, which is the Collector Manager or Correlation Engine username. The default username is collectormanager for Collector Manager and correlationengine for Correlation Engine.
11. Specify the password for the JMS User.

    The username and password are stored in the `/<install_dir>/etc/opt/novell/sentinel/config/activemqusers.properties` file, which is located in the Sentinel server.
12. (Optional) To verify the password, see the following line in the `activemqusers.properties`

    **For Collector Manager:**

    ```
    collectormanager=<password>
    ```

    In this example, `collectormanager` is the username and the corresponding value is the password.

    **For Correlation Engine:**

    ```
    correlationengine=<password>
    ```

    In this example, `correlationengine` is the username and the corresponding value is the password.
13. Click *Next*.
14. Accept the certificate.
15. Click *Next* to complete the installation.

    When the installation is complete, the installer displays a message indicating that this appliance is the Sentinel Collector Manager or the Sentinel Correlation Engine depending on what you chose to install, along with the IP address. It also displays the Sentinel server user interface IP address.

### 12.1.3 Installing VMware Tools

For Sentinel to work effectively on the VMware server, you need to install VMware Tools. VMware Tools is a suite of utilities that enhances the performance of the virtual machine's operating system. It also improves management of the virtual machine. For more information on installing VMware Tools, see VMware Tools for Linux Guests (https://www.vmware.com/support/ws55/doc/ws_newguest_tools_linux.html#wp1127177).

For more information on the VMware documentation, see Workstation User's Manual (http://www.vmware.com/pdf/ws71_manual.pdf).

## 12.2 Installing the Xen Appliance

This section provides information about installing Sentinel, Collector Manager, and a Correlation Engine on a Xen appliance image.

- Section 12.2.1, "Installing Sentinel," on page 80
- Section 12.2.2, "Installing Additional Collector Managers and Correlation Engines," on page 82

### 12.2.1 Installing Sentinel

Use the following steps to install Sentinel on a Xen appliance image:

1. Download the Xen virtual appliance installation file from the Novell Download Web site (http://download.novell.com/index.jsp) to `/var/lib/xen/images`.

   The correct filename for the Xen virtual appliance has `xen` in the filename. For example, `Sentinel_7.1.0.0.x86_64.xen.tar.gz`.

2. Specify the following command to unpack the file:

   ```
   tar -zxvf <install_file>
   ```

   Replace *<install_file>* with the actual name of the installation file.

3. Change to the new installation directory. This directory has the following files:
   - `<file_name>.raw`
   - `<file_name>.xenconfig`

4. Open the `<file_name>.xenconfig` file by using a text editor.

5. Modify the file as follows:
   - Specify the full path to `.raw` file in the `disk` setting.
   - Specify the bridge setting for your network configuration. For example, `"bridge=br0"` or `"bridge=xenbr0"`.
   - Specify values for the `name` and `memory` settings.

     For example:

     ```
     # -*- mode: python; -*-
     name="Sentinel_7.1.0.0.x86_64"
     memory=4096
     ```

   - Comment the following line:

     ```
     vfb=["type=vnc,vncunused=1,vnclisten=0.0.0.0"]
     ```

   - Add the following line:

     ```
     extra = "console=hvc0 xencons=tty"
     ```

   The updated `xenconfig` file must be as follows:

   ```
   # -*- mode: python; -*-
   name=install_file_name
   memory=4096
   disk=["tap:aio:/var/lib/xen/images/install_directory/install_filename]
   vif=[ "bridge=br0" ]
   #vfb=["type=vnc,vncunused=1,vnclisten=0.0.0.0"]
   extra = "console=hvc0 xencons=tty"
   ```

6. After you have modified the `<filename>.xenconfig` file, specify the following command to create the VM:

```
xm create <file_name>.xenconfig
```

7. (Optional) To verify if the VM is created, specify the following command:

   ```
   xm list
   ```

   The VM appears in the list that is generated.

   For example, if you have configured `name="Sentinel_7.1.0.0.x86_64"` in the `.xenconfig` file, then the VM appears with that name.

8. To start the installation, specify the following command:

   ```
   xm console <vm name>
   ```

   Replace <*vm_name*> with the name specified in the name setting of the `.xenconfig` file, which is also the value returned in Step 7. For example:

   ```
   xm console Sentinel_7.1.0.0.x86_64
   ```

   The installation first checks for the available memory and disk space. If the available memory is less than 2.5 GB, the installation is automatically terminated. If the available memory is more than 2.5 GB but less than 6.7 GB, the installation displays a message that you have less memory than is recommended. Enter `y` if you want to continue with the installation, or enter `n` if you do not want to proceed.

9. Select the language of your choice, then click *Next*.
10. Select the keyboard layout, then click *Next*.
11. Read and accept the SUSE Linux Enterprise Server (SLES) 11 SP2 Software License Agreement.
12. Read and accept the NetIQ Sentinel End User License Agreement.
13. On the Hostname and Domain Name page, specify the hostname and domain name, then ensure that the *Assign Hostname to Loopback IP* option is selected.
14. Select *Next*. The hostname configurations are saved.
15. Do one of the following:
    - To use the current network connection settings, select *Use the following configuration* on the *Network Configuration II* page.
    - To change the network connection settings, select *Change*, then make the desired changes.
16. Select *Next*. The network connection settings are saved.
17. Set the time and date, click *Next*, then click *Finish*

    To change the NTP configuration after installation, use YaST from the appliance command line. You can use WebYast to change the time and date, but not the NTP configuration.

    If the time appears out of sync immediately after the install, run the following command to restart NTP:

    ```
    rcntp restart
    ```

18. Set the SUSE Enterprise Server `root` password, then click *Next*.
19. Set Sentinel admin password, then click *Next*.

    The Sentinel installation proceeds and completes. It might take few minutes for all services to start up after installation as the system performs a one time initialization. Wait until the installation finishes before you log in to the server.

    Make a note of the appliance IP address that is shown in the console.

20. Proceed with Section 12.4, "Post-Installation Configuration for the Appliance," on page 85.

### 12.2.2 Installing Additional Collector Managers and Correlation Engines

The procedure to install a Collector Manager or a Correlation Engine is the same except that you need to download the appropriate file from the Novell Download Web site.

1. Complete Step 1 through Step 14 in Section 12.2.1, "Installing Sentinel," on page 80.
2. On the Network Configuration II screen, select *Change* and specify the IP address of the virtual machine where you want to install the additional Collector Manager or Correlation Engine.
3. Specify the subnet mask of the specified IP.
4. Select *Next*. The network connection settings are saved.
5. Set the time and date, then select *Next*.

   To change the NTP configuration after installation, use YaST from the appliance command line. You can use WebYast to change the time and date, but not the NTP configuration.

   If the time appears out of sync immediately after the install, run the following command to restart NTP:

   ```
   rcntp restart
   ```
6. Set the SUSE Enterprise Server `root` password, then select *Next*.
7. Specify the hostname/IP address of the Sentinel server to which the Collector Manager or Correlation Engine should connect to.
8. Specify the communication server port number. The default message bus port is `61616`.
9. Specify the JMS User Name, which is the Collector Manager or Correlation Engine username.
10. Specify the password for the JMS User.

    The username and password are stored in the `/<install_dir>/etc/opt/novell/sentinel/config/activemqusers.properties` file located on the Sentinel server.
11. (Optional) To verify the password, see the following line in the `activemqusers.properties` file:

    **For Collector Manager:**

    ```
    collectormanager=<password>
    ```

    In this example, `collectormanager` is the username and the corresponding value is the password.

    **For Correlation Engine:**

    ```
    correlationengine=<password>
    ```

    In this example, `correlationengine` is the username and the corresponding value is the password.
12. Select *Next* to complete the installation.

    When the installation is complete, it displays a message that this appliance is the Sentinel Collector Manager or the Correlation Engine depending on what you chose to install, along with the IP address.

## 12.3 Installing the ISO Appliance

Before installing the appliance on the hardware, ensure that the appliance ISO disk image is downloaded from the support site, unpacked, and is available on a DVD.

**IMPORTANT:** Installation on hardware using the ISO disk image (bare metal & Hyper-V) requires a minimum memory of 4.5 GB for the installation to complete.

- Section 12.3.1, "Installing Sentinel," on page 83
- Section 12.3.2, "Installing Additional Collector Managers and Correlation Engines," on page 84

### 12.3.1 Installing Sentinel

Use the following steps to install the Sentinel appliance on the hardware:

1. Boot the physical machine from the DVD drive with the DVD.
2. Use the on-screen instructions of the installation wizard.
3. Run the Live DVD appliance image by selecting the top entry in the boot menu.

   The installation first checks for the available memory and disk space. If the available memory is less than 2.5 GB, the installation is automatically terminated. If the available memory is more than 2.5 GB but less than 6.7 GB, the installation displays a message that you have less memory than is recommended. Enter `y` if you want to continue with the installation, or enter `n` if you do not want to proceed.
4. Select the language of your choice, then click *Next*.
5. Select the keyboard layout, then click *Next*.
6. Read and accept the SUSE Enterprise Server Software License Agreement.
7. Read and accept the NetIQ Sentinel End User License Agreement.
8. Select *Next*.
9. On the Hostname and Domain Name page, specify the hostname and domain name, then ensure that the *Assign Hostname to Loopback IP* option is selected.
10. Select *Next*.The hostname configurations are saved.
11. Do one of the following:
    - To use the current network connection settings, select *Use the following configuration* on the Network Configuration II page.
    - To change the network connection settings, select *Change*, then make the desired changes.
12. Select *Next*. The network connection settings are saved.
13. Set the time and date, then click *Next*.

    To change the NTP configuration after installation, use YaST from the appliance command line. You can use WebYast to change the time and date, but not the NTP configuration.

    If the time appears out of sync immediately after the install, run the following command to restart NTP:

    ```
    rcntp restart
    ```
14. Set the `root` password, then click *Next*.
15. Set the Sentinel admin password, then click *Next*.
16. Enter the username and password at the console to log in to the appliance.

    The default value for the username is `root` and the password is the password set in Step 14.
17. Stop the Sentinel server:

    ```
    service sentinel stop
    ```

18 Enter the following command to reset the UI for a clear display in YaST:

```
reset
```

19 To install the appliance on the physical server, ensure that the *Install Sentinel appliance to hard drive (for Live DVD image only)* check box is selected.

This check box is selected by default. If you deselect this check box, the appliance is not installed on the physical server and will run only in the LIVE DVD mode.

It might take few minutes for all services to start up after installation because the system performs a one-time initialization. Wait until the installation finishes before you log in to the server.

20 Make a note of the appliance IP address that is shown in the console.

21 Proceed with Section 12.4, “Post-Installation Configuration for the Appliance,” on page 85.

## 12.3.2 Installing Additional Collector Managers and Correlation Engines

The procedure to install a Collector Manager or a Correlation Engine is same except that you need to download the appropriate file from the Novell Download Web site.

1 Complete Step 1 through Step 14 in Section 12.3.1, “Installing Sentinel,” on page 83.

2 Specify the host name/IP address of the Sentinel server that the Collector Manager should connect to.

3 Specify the communication server port number. The default Message bus port is `61616`.

4 Specify the JMS User Name, which is the Collector Manager or Correlation Engine user name.

5 Specify the password for the JMS User.

6 Click *Next*.

The username and password is stored in the `/<install_dir>/etc/opt/novell/sentinel/config/activemqusers.properties` file located on the Sentinel server.

7 To verify the password, see the following line in the `activemqusers.properties` file:

**For Collector Manager:**

```
collectormanager=<password>
```

In this example, `collectormanager` is the username and the corresponding value is the password.

**For Correlation Engine:**

```
correlationengine=<password>
```

In this example, `correlationengine` is the username and the corresponding value is the password.

8 To install the appliance on the physical server, ensure that the *Install Sentinel appliance to hard drive (for Live DVD image only)* check box is selected.

This check box is selected by default. If you deselect this check box, the appliance will not be installed on the physical server and will run only in the Live DVD mode.

9 Accept the certificate when prompted.

10 Enter `yes` or `y` to enable FIPS 140-2 mode in sentinel and continue with the FIPS configuration.

11. Continue with the installation as prompted until installation is complete.

    When the installation is complete, it displays a message that this appliance is the Sentinel Collector Manager or Correlation Engine depending on what you chose to install, along with the IP address. It also displays the Sentinel server user interface IP address.

## 12.4 Post-Installation Configuration for the Appliance

After you install Sentinel, you need to perform additional configuration for the appliance to work properly.

- Section 12.4.1, "Configuring WebYaST," on page 85
- Section 12.4.2, "Creating Partitions," on page 85
- Section 12.4.3, "Registering for Updates," on page 86
- Section 12.4.4, "Configuring the Appliance with SMT," on page 86

### 12.4.1 Configuring WebYaST

The Sentinel appliance user interface is equipped with WebYaST, which is a Web-based remote console for controlling appliances based on SUSE Linux Enterprise. You can access, configure, and monitor the Sentinel appliances with WebYaST. The following procedure briefly describes the steps to configure WebYaST. For more information on detailed configuration, see the *WebYaST User Guide* (http://www.novell.com/documentation/webyast/).

1. Log in to the Sentinel appliance.
2. Click *Appliance*.
3. Configure the Sentinel Server to receive updates as described in Section 12.4.3, "Registering for Updates," on page 86.
4. Click *Next* to finish the initial setup.

### 12.4.2 Creating Partitions

You can add partitions in the appliance and move a directory to the new partition by using the YaST tool.

Use the following procedure to create a new partition and move the data files from its directory to the newly created partition:

1. Log in to Sentinel as `root`.
2. Run the following command to stop the Sentinel on the appliance:

    ```
    /etc/init.d/sentinel stop
    ```
3. Specify the following command to change to `novell` user:

    ```
    su - novell
    ```
4. Move the contents of the directory at `/var/opt/novell/sentinel` to a temporary location.
5. Change to `root` user.
6. Enter the following command to access the YaST2 Control Center:

    ```
    yast
    ```
7. Select *System* > *Partitioner*.

8. Read the warning and select *Yes* to add the new unused partition.
9. Mount the new partition at `/var/opt/novell/sentinel`.
10. Specify the following command to change to `novell` user:

    ```
    su - novell
    ```

11. Move the contents of the data directory from the temporary location (where it was saved in Step 4) back to `/var/opt/novell/sentinel` in the new partition.
12. Run the following command to restart the Sentinel appliance:

    ```
    /etc/init.d/sentinel start
    ```

## 12.4.3 Registering for Updates

You must register the Sentinel appliance with the appliance update channel to receive patch updates. To register the appliance, you must first obtain your appliance registration code or the appliance activation key from the Novell Customer Care Center.

Use the following steps to register the appliance for updates:

1. Log in to the Sentinel appliance.
2. Click *Appliance* to launch WebYaST.
3. Click *Registration*.
4. Specify the e-mail ID that you want to receive updates, then specify the system name and the appliance registration code.
5. Click *Save*.

## 12.4.4 Configuring the Appliance with SMT

In secured environments where the appliance must run without direct Internet access, you can configure the appliance with the Subscription Management Tool (SMT), which enables you to upgrade the appliance to the latest versions of Sentinel as they are released. SMT is a package proxy system that is integrated with Novell Customer Center and provides key Novell Customer Center capabilities.

- "Prerequisites" on page 86
- "Configuring the Appliance" on page 87
- "Upgrading the Appliance" on page 87

### Prerequisites

- Get the Novell Customer Center credentials for Sentinel to get updates from Novell. For information on getting the credentials, contact Novell Support.
- Ensure that SLES 11 SP2 is installed with the following packages on the machine where you want to install SMT:
    - htmldoc
    - perl-DBIx-Transaction
    - perl-File-Basename-Object
    - perl-DBIx-Migration-Director
    - perl-MIME-Lite

  - perl-Text-ASCIITable
  - yum-metadata-parser
  - createrepo
  - perl-DBI
  - apache2-prefork
  - libapr1
  - perl-Data-ShowTable
  - perl-Net-Daemon
  - perl-Tie-IxHash
  - fltk
  - libapr-util1
  - perl-PlRPC
  - apache2-mod_perl
  - apache2-utils
  - apache2
  - perl-DBD-mysql
- Install SMT and configure the SMT server. For more information, refer to the following sections in the SMT documentation:
  - SMT Installation
  - SMT Server Configuration
  - Mirroring Installation and Update Repositories with SMT
- Install the `wget` utility on the appliance computer.

### Configuring the Appliance

For information on configuring the appliance with SMT, see the Subscription Management Tool (SMT) for SUSE Linux Enterprise 11 documentation.

To enable the appliance repositories, execute the following command:

```
smt-repos -e Sentinel-Server-7.0-Updates sle-11-x86_64

smt-repos -e Sentinel-Collector-Manager-7.0-Updates sle-11-x86_64

smt-repos -e Sentinel-Correlation-Engine-7.0-Updates sle-11-x86_64
```

### Upgrading the Appliance

For information about upgrading the appliance, see Section 21.3, “Upgrading the Appliance by Using SMT,” on page 120.

## 12.5 Stopping and Starting the Server by Using WebYaST

You can start and stop the Sentinel server by using the Web interface as follows:

1. Log in to the Sentinel appliance.
2. Click *Appliance* to launch WebYaST.

3. Click *System Services*.
4. To stop the Sentinel server, click *stop*.
5. To start the Sentinel server, click *start*.

# 13 Installing Additional Collectors and Connectors

By default, all released Collectors and Connectors are installed when you install Sentinel. If you want to install a new Collector or Connector released after the Sentinel release, use the information in the following sections.

- Section 13.1, "Installing a Collector," on page 89
- Section 13.2, "Installing a Connector," on page 89

## 13.1 Installing a Collector

Use the following steps to install a Collector:

1. Download the desired Collector from the Sentinel Plug-ins Web site.
2. Log in to the Sentinel Web interface at https://<*IP address*>:8443, where 8443 is the default port for the Sentinel server.
3. Click *applications* in the toolbar, then click *Applications*.
4. Click *Launch Control Center* to launch the Sentinel Control Center.
5. In the toolbar, click *Event Source Management* > *Live View*, then click *Tools* > *Import plugin*.
6. Browse to and select the Collector file you downloaded in Step 1, then click *Next*.
7. Follow the remaining prompts, then click *Finish*.

To configure the Collector, see the documentation for the specific Collector on the Sentinel Plug-ins Web site.

## 13.2 Installing a Connector

Use the following steps to install a Connector:

1. Download the desired Connector from the Sentinel Plug-ins Web site.
2. Log in to the Sentinel Web interface at https://<*IP address*>:8443, where 8443 is the default port for the Sentinel server.
3. Click *application* in the toolbar, then click *Applications*.
4. Click *Launch Control Center* to launch the Sentinel Control Center.
5. In the toolbar, select *Event Source Management* > *Live View*, then click *Tools* > *Import plugin*.
6. Browse to and select the Connector file you downloaded in Step 1, then click *Next*.
7. Follow the remaining prompts, then click *Finish*.

To configure the Connector, see the documentation for the specific Connector on the Sentinel Plug-ins Web site.

# 14 Verifying the Installation

You can determine whether the installation is successful by performing either of the following:

- Verify the Sentinel version:

  ```
  /etc/init.d/sentinel version
  ```

- Verify whether the Sentinel services are up and running:

  ```
  /etc/init.d/sentinel status
  ```

- Verify whether the Web services are up and running:

  ```
  netstat -an |grep 'LISTEN' |grep <HTTPS_port_number>
  ```

  The default port number is 8443.

- Access the Sentinel Web interface:
  1. Launch a supported Web browser.
  2. Specify the URL of the Sentinel Web interface:

     ```
     https://<IP_Address/DNS_Sentinel_server:8443>
     ```

     IP_Address/DNS_Sentinel_server is the IP address or DNS name of the Sentinel server and 8443 is the default port for the Sentinel server.
  3. Log in with the administrator name and password specified during the installation. The default username is admin.

# 15 Sentinel Directory Structure

By default, the Sentinel directories are in the following locations:

- The data files are in `/var/opt/novell/sentinel/data` and `/var/opt/novell/sentinel/3rdparty` directories.
- Executables and libraries are stored in the following directories:
  - `/opt/novell/sentinel/bin`
  - `/opt/novell/sentinel/setup`
  - `/opt/novell/sentinel/3rdparty`
- Log files are in the directory `/var/opt/novell/sentinel/log`
- Configuration files are in the following directory `/etc/opt/novell/sentinel`
- The process ID (PID) file is in the directory `/var/run/sentinel/server.pid`.

  Using the PID, administrators can identify the parent process of Sentinel server and monitor or terminate the process.

# IV Configuring Sentinel

This section provides information about configuring Sentinel and the out-of-the-box plug-ins.

# 16 Configuring Time

The time of an event is very critical to its processing in Sentinel. It is important for reporting and auditing purposes as well as for real-time processing. This section provides information about understanding time in Sentinel, how to configure time, and handling time zones.

- Section 16.1, "Understanding Time in Sentinel," on page 97
- Section 16.2, "Configuring Time in Sentinel," on page 99
- Section 16.3, "Handling Time Zones," on page 99

## 16.1 Understanding Time in Sentinel

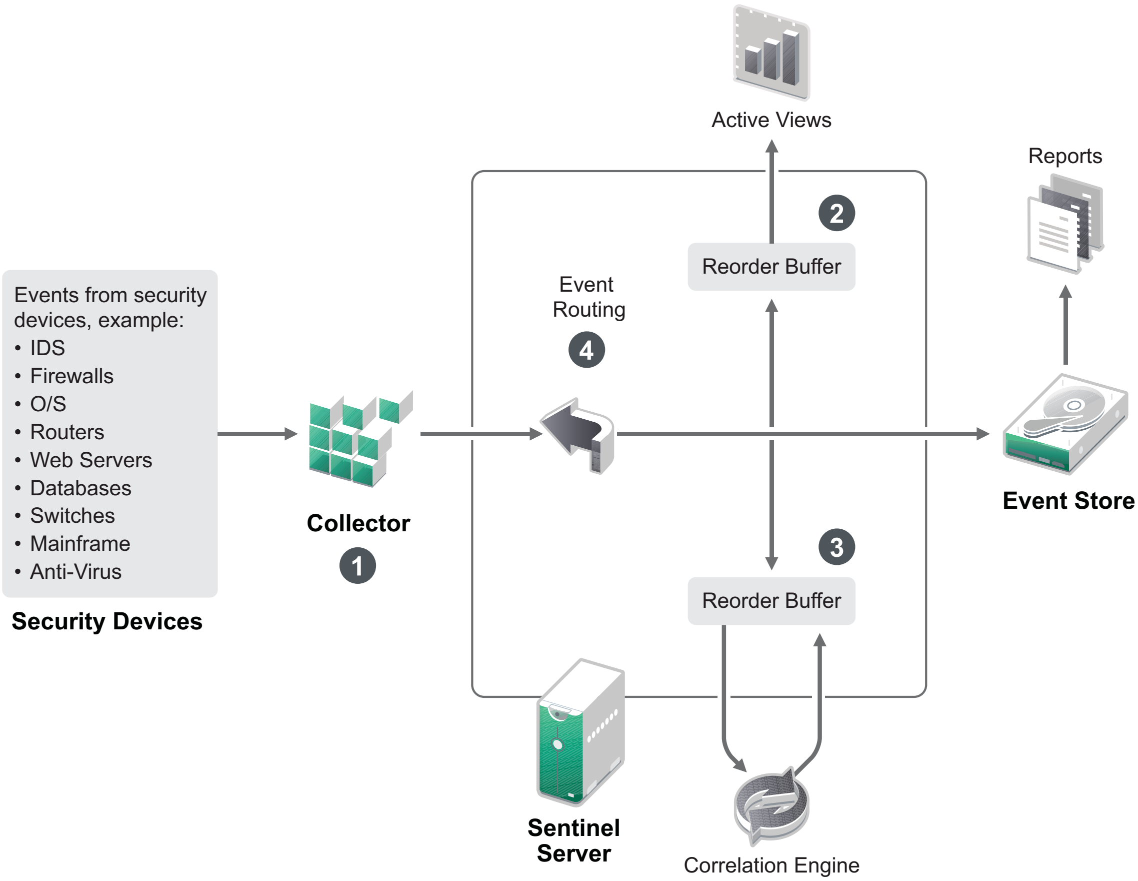
Sentinel is a distributed system that is made up of several processes distributed through out your network. In addition, there can be some delay introduced by the event source. To accommodate this, the Sentinel processes reorder events into a time-ordered stream before processing.

Every event has three time fields:

- **Event Time:** This is the event time used by all analytical engines, searches, reports, and so on.
- **Sentinel Process Time:** The time Sentinel collected the data from the device, which is taken from the Collector Manager system time.
- **Observer Event Time:** The time stamp the device put in the data. The data might not always contain a reliable time stamp and can be quite different than the Sentinel Process Time. For example, when the device delivers data in batches.

The following illustration explains how Sentinel does this:

***Figure 16-1*** *Sentinel Time*



1. By default, the Event Time is set to the Sentinel Process Time. The ideal, however, is for the Event Time to match the Observer Event Time, if it is available and trustworthy. It is best to configure data collection to **Trust Event Source Time** if the device time is available, accurate, and properly parsed by the Collector. The Collector sets the Event Time to match the Observer Event Time.
2. The events that have an Event Time within a 5 minute range from the server time (in the past or future) are processed normally by Active Views. Events that have an Event Time more than 5 minutes in the future do not show in the Active Views, but are inserted into the event store. Events that have an Event Time more than 5 minutes in the future and less than 24 hours in the past still are shown in the charts, but are not shown in the event data for that chart. A drill-down operation is necessary to retrieve those events from the event store.
3. Events are sorted into 30-second intervals so that the Correlation Engine can process them in chronological order. If the Event Time is more than 30 seconds older than the server time, the Correlation Engine does not process the events.
4. If the Event Time is older than 5 minutes relative to the Collector Manager system time, Sentinel directly routes events to the event store, bypassing real-time systems like Correlation, Active Views, and Security Intelligence.

## 16.2 Configuring Time in Sentinel

The Correlation Engine processes time-ordered streams of events and detects patterns within events as well as temporal patterns in the stream. However, sometimes the device generating the event might not include the time in its log messages. To configure time to work correctly with Sentinel, you have two options:

- Configure NTP on the Collector Manager and deselect *Trust Event Source Time* on the event source in the Event Source Manager. Sentinel uses the Collector Manager as the time source for the events.
- Select *Trust Event Source Time* on the event source in Event Source Manager. Sentinel uses the time from the log message as the correct time.

To change this setting on the event source:

1. Log in to Event Source Management.

   For more information, see "Accessing Event Source Management" in the *NetIQ Sentinel 7.1 Administration Guide*.
2. Right-click the event source you want to change the time setting for, then select *Edit*.
3. Select or deselect the *Trust Event Source* option on the bottom of the *General* tab.
4. Click *OK* to save the change.

## 16.3 Handling Time Zones

Handling time zones can become very complex in a distributed environment. For example, you might have an event source in one time zone, the Collector Manager in another, the back-end Sentinel server in another, and the client viewing the data in yet another. When you add concerns such as daylight saving time and the many event sources that don't report what time zone they are set to (such as all syslog sources), there are many possible problems that need to be handled. Sentinel is flexible so that you can properly represent the time when events actually occur, and compare those events to other events from other sources in the same or different time zones.

In general, there are three different scenarios for how event sources report time stamps:

- The event source reports the time in UTC. For example, all standard Windows Event Log events are always reported in UTC.
- The event source reports in local time, but always includes the time zone in the time stamp. For example, any event source that follows RFC3339 in structuring time stamps include the time zone as an offset; other sources report long time zone IDs such as Americas/New York, or short time zone IDs such as EST, which can present problems because of conflicts and inadequate resolutions.
- The event source reports local time, but does not indicate the time zone. Unfortunately, the extremely common syslog format follows this model.

For the first scenario, you can always calculate the absolute UTC time that an event occurred (assuming that a time sync protocol is in use), so you can easily compare the timing of that event to any other event source in the world. However, you cannot automatically determine what the local time was when the event occurred. For this reason, Sentinel allows customers to manually set the time zone of an event source by editing the Event Source node in the Event Source Manager and specifying the appropriate time zone. This information does not affect the calculation of DeviceEventTime or EventTime, but is placed into the ObserverTZ field, and is used to calculate the various ObserverTZ fields, such as ObserverTZHour. These fields are always expressed in local time.

In the second scenario, if the long-form time zone IDs or offsets are used, you can convert to UTC to get the absolute canonical UTC time (stored in DeviceEventTime), but you can also calculate the local time ObserverTZ fields. If a short-form time zone ID is used, there is some potential for conflicts.

The third scenario requires the administrator to manually set the event source time zone for all affected sources so that Sentinel can properly calculate the UTC time. If the time zone is not properly specified by editing the Event Source node in the Event Source Manager, then the DeviceEventTime (and probably the EventTime) can be incorrect; also, the ObserverTZ and associated fields might be incorrect.

In general, the Collector for a given type of event source (such as Microsoft Windows) knows how an event source presents time stamps, and adjusts accordingly. It is always good policy to manually set the time zone for all Event Source nodes in the Event Source Manager, unless you know that the event source reports in local time and always includes the time zone in the time stamp

Processing the event source presentation of the time stamp happens in the Collector and on the Collector Manager. The DeviceEventTime and the EventTime are stored as UTC, and the ObserverTZ fields are stored as strings set to local time for the event source. This information is sent from the Collector Manager to the Sentinel server and stored in the event store. The time zone that the Collector Manager and the Sentinel server are in should not affect this process or the stored data. However, when a client views the event in a Web browser, the UTC EventTime is converted to the local time according to the Web browser, so all events are presented to clients in the local time zone. If the users want to see the local time of the source, they can examine the ObserverTZ fields for details.

# 17 Configuring Out-of-the-Box Plug-Ins

By default, Sentinel comes with several plug-ins. This chapter provides information about how to configure the out-of-the-box plug-ins.

- Section 17.1, "Configuring the Solution Packs," on page 101
- Section 17.2, "Configuring the Collectors, Connectors, Integrators, and Actions," on page 101

## 17.1 Configuring the Solution Packs

Sentinel ships with a wide variety of useful out-of-the-box content that you can use immediately to meet many of your analysis needs. Much of this content comes from the pre-installed Sentinel Core Solution Pack and Solution Pack for ISO 27000 Series. For more information, see "Using Solution Packs" in the *NetIQ Sentinel 7.1 Administration Guide*

Solution Packs allow categorization and grouping of content into controls or policy sets that are treated as a unit. The controls in the Solution Packs are pre-installed to provide you with this out-of-the-box content, but you have to formally implement or test those controls by using the Sentinel Web console.

If a certain amount of rigor is desired to help show that your Sentinel implementation is working as designed, you may use the formal attestation process built into the Solution Packs. This attestation process implements and tests the Solution Pack controls just as you would implement and test controls from any other Solution Pack. As part of this process, the implementer and tester will attest that they have completed their work; these attestations will then become part of an audit trail that can be examined to demonstrate that any particular control was properly deployed.

You can do the attestation process by using the Solution Manager. For more information on implementing and testing the controls, see "Installing and Managing Solution Packs" in the *NetIQ Sentinel 7.1 Administration Guide*.

## 17.2 Configuring the Collectors, Connectors, Integrators, and Actions

For information about configuring the out-of-the-box plug-ins, see the specific plug-in documentation available on the Sentinel Plug-ins Web site.

# 18 Enabling FIPS 140-2 Mode in an Existing Sentinel Installation

This chapter provides information about enabling FIPS 140-2 mode in an existing installation of Sentinel.

---

**NOTE:** These instructions assume that Sentinel is installed at the `/opt/novell/sentinel` directory. The commands must be executed as the `novell` user.

---

- Section 18.1, "Enabling Sentinel Server to Run in FIPS 140-2 Mode," on page 103
- Section 18.2, "Enabling FIPS 140-2 Mode on Remote Collector Managers and Correlation Engines," on page 103

## 18.1 Enabling Sentinel Server to Run in FIPS 140-2 Mode

To enable the Sentinel Server to run in FIPS 140-2 mode:

1. Log in to the Sentinel server.
2. Switch to `novell` user (`su novell).`
3. Browse to the Sentinel bin directory.
4. Run the `convert_to_fips.sh` script and follow the on-screen instructions.
5. Complete the FIPS 140-2 mode configuration by following the tasks mentioned in Chapter 19, "Operating Sentinel in FIPS 140-2 Mode," on page 105.

## 18.2 Enabling FIPS 140-2 Mode on Remote Collector Managers and Correlation Engines

You must enable FIPS 140-2 mode on the remote Collector Manager and Correlation Engine if you want to use FIPS-approved communications with the Sentinel server running in FIPS 140-2 mode.

**To enable a remote Collector Manager or Correlation Engine to run in FIPS 140-2 mode:**

1. Login to the remote Collector Manager or Correlation Engine system.
2. Switch to `novell` user (`su novell).`
3. Browse to the bin directory. The default location is `/opt/novell/sentinel/bin`.
4. Run the `convert_to_fips.sh` script and follow the on-screen instructions.
5. Complete the FIPS 140-2 mode configuration by following the tasks mentioned in Chapter 19, "Operating Sentinel in FIPS 140-2 Mode," on page 105.

# 19 Operating Sentinel in FIPS 140-2 Mode

This chapter provides information about configuring and operating Sentinel in FIPS 140-2 mode.

## 19.1 Configuring the Advisor Service in FIPS 140-2 Mode

The Advisor service uses a secure HTTPS connection to download its feed from the Advisor server. The certificate used by the server for secure communication needs to be added to the Sentinel FIPS keystore database.

To verify successful registration with the Resource Management database:

1. Download the certificate from the Advisor server and save the file as `advisor.cer`.
2. Import the Advisor server certificate into the Sentinel FIPS keystore.

   For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.

## 19.2 Configuring Distributed Search in FIPS 140-2 Mode

This section provides information about configuring distributed search in FIPS 140-2 mode.

**Scenario 1: Both the source and the target Sentinel servers are in FIPS 140-2 mode**

To allow distributed searches across multiple Sentinel servers running in FIPS 140-2 mode, you need to add the certificates used for secure communication to the FIPS keystore.

1. Log in to the distributed search source computer.
2. Browse to the certificate directory:

   ```
   cd <sentinel_install_directory>/config
   ```

3. Copy the source certificate (`sentinel.cer`) to a temporary location on the target computer.
4. Import the source certificate into the target Sentinel FIPS keystore.

For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.

5. Log in to the distributed search target computer.
6. Browse to the certificate directory:

   ```
   cd /etc/opt/novell/sentinel/config
   ```

7. Copy the target certificate (`sentinel.cer`) to a temporary location on the source computer.
8. Import the target system certificate into the source Sentinel FIPS keystore.
9. Restart the Sentinel services on both the source and target computer.

**Scenario 2: The source Sentinel server is in non-FIPS mode and the target Sentinel server is in FIPS 140-2 mode**

You must convert the Web server keystore on the source computer to the certificate format and then export the certificate to the target computer.

1. Log in to the distributed search source computer.
2. Create the Web server keystore in certificate (`.cer)` format:

   ```
   <sentinel_install_directory>/jre/bin/keytool -export -alias webserver -
   keystore <sentinel_install_directory>/config/.webserverkeystore.jks -storepass
   password -file <certificate_name.cer>
   ```

3. Copy the distributed search source certificate (`Sentinel.cer`) to a temporary location on the distributed search target computer.
4. Log in to the distributed search target computer.
5. Import the source certificate into the target Sentinel FIPS keystore.

   For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.
6. Restart Sentinel services on the target computer.

**Scenario 3: The source Sentinel server is in FIPS mode and the target Sentinel server is in non-FIPS mode**

1. Log in to the distributed search target computer.
2. Create the Web server keystore in certificate (.cer) format:

   ```
   <sentinel_install_directory>/jre/bin/keytool -export -alias webserver -
   keystore <sentinel_install_directory>/config/.webserverkeystore.jks -storepass
   password -file <certificate_name.cer>
   ```

3. Copy the certificate to a temporary location on the distributed search source computer.
4. Import the target certificate into the source Sentinel FIPS keystore.

   For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.
5. Restart the Sentinel services on the source computer.

## 19.3 Configuring LDAP Authentication in FIPS 140-2 Mode

**To configure LDAP authentication for Sentinel servers running in FIPS 140-2 mode:**

1. Get the LDAP server certificate from the LDAP administrator, or you can use a command. For example,

```
openssl s_client -connect <LDAP server IP>:636
```

and then copy the text returned (between but not including the BEGIN and END lines) into a file.

2. Import the LDAP server certificate into the Sentinel FIPS keystore.

   For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.

3. Log in to Sentinel Web console as a user in the administrator role and proceed with configuring LDAP authentication.

   For more information, see *Configuring LDAP Authentication* in the *NetIQ Sentinel 7.1 Administration Guide.*

---

**NOTE:** You can also configure LDAP authentication for a Sentinel server running in FIPS 140-2 mode by running the `ldap_auth_config.sh` script in the `/opt/novell/sentinel/setup` directory.

---

## 19.4 Updating Server Certificates in Remote Collector Managers and Correlation Engines

To configure existing remote Collector Managers and Correlation Engines to communicate with a Sentinel server running in FIPS 140-2 Mode, you can either convert the remote system in FIPS 140-2 mode or you can update the Sentinel server certificate to the remote system and leave the Collector Manager or Correlation Engine in non-FIPS mode. Remote Collector Managers in FIPS mode may not work with event sources that do not support FIPS or that require one of the Sentinel Connectors that are not yet FIPS-enabled.

If you do not plan to enable FIPS 140-2 mode on the remote Collector Manager or Correlation Engine, you must copy the latest Sentinel server certificate to the remote system, so that the Collector Manager or Correlation Engine, can communicate with the Sentinel server.

To update the Sentinel server certificate in the remote Collector Manager or Correlation Engine:

1. Log in to the remote Collector Manager or Correlation Engine computer.
2. Switch to `novell` user (`su novell).`
3. Browse to the bin directory. The default location is `/opt/novell/sentinel/bin`.
4. Run the `updateServerCert.sh` script and follow the on-screen instructions.

## 19.5 Configuring Sentinel Plug-Ins to Run in FIPS 140-2 Mode

This section provides information about configuring various Sentinel plug-ins to run in FIPS 140-2 mode.

---

**NOTE:** These instructions assume that Sentinel is installed at the `/opt/novell/sentinel` directory. The commands must be executed as `novell` user.

---

- Section 19.5.1, "Agent Manager Connector," on page 108
- Section 19.5.2, "Database (JDBC) Connector," on page 109
- Section 19.5.3, "Sentinel Link Connector," on page 109
- Section 19.5.4, "Syslog Connector," on page 110

- Section 19.5.5, “Windows Event (WMI) Connector,” on page 111
- Section 19.5.6, “Sentinel Link Integrator,” on page 111
- Section 19.5.7, “LDAP Integrator,” on page 112
- Section 19.5.8, “SMTP Integrator,” on page 113
- Section 19.5.9, “Using Non-FIPS Enabled Connectors with Sentinel in FIPS 140-2 Mode,” on page 113

### 19.5.1 Agent Manager Connector

Follow the below procedure only if you have selected the *Encrypted (HTTPS)* option when configuring the networking settings of the Agent Manager Event Source Server.

**To configure the Agent Manager Connector to run in FIPS 140-2 mode:**

1. Add or edit the Agent Manager Event Source Server. Proceed through the configuration screens until the Security window is displayed. For more information, see the *Agent Manager Connector Guide*.
2. Select one of the options from the *Client Authentication Type* field. The client authentication type determines how strictly the SSL Agent Manager Event Source Server verifies the identity of Agent Manager Event Sources that are attempting to send data.
    - **Open:** Allows all the SSL connections coming from the Agent Manager agents. Does not perform any client certificate validation or authentication.
    - **Strict:** Validates the certificate to be a valid X.509 certificate and also checks that the client certificate is trusted by the Event Source Server. New sources will need to be explicitly added to Sentinel (this prevents rogue sources from sending unauthorized data).

      For the *Strict* option, you must import the certificate of each new Agent Manager client into the Sentinel FIPS keystore. When Sentinel is running in FIPS 140-2 mode, you cannot import the client certificate using the Event Source Management (ESM) interface.

      For more information about importing the certificate, see “Importing Certificates into FIPS Keystore Database” on page 113.

   ---

   **NOTE:** In FIPS 140-2 mode, the Agent Manager Event Source Server uses the Sentinel server key pair; importing the server key pair is not required.

3. If server authentication is enabled in the agents, the agents must additionally be configured to trust the Sentinel server or the remote Collector Manager certificate depending on where the Connector is deployed.

   **Sentinel server certificate location:** `/etc/opt/novell/sentinel/config/sentinel.cer`

   **Remote Collector Manager certificate location:** `/etc/opt/novell/sentinel/config/rcm.cer`

   **NOTE:** When using custom certificates that are digitally signed by a certificate authority (CA), the Agent Manager agent must trust the appropriate certificate file.

## 19.5.2 Database (JDBC) Connector

Follow the below procedure only if you have selected the *SSL* option when configuring the database connection.

**To configure the Database Connector to run in FIPS 140-2 mode:**

1. Before configuring the Connector, download the certificate from the Database server and save it as `database.cert` file into the `/etc/opt/novell/sentinel/config` directory of the Sentinel server.

   For more information, refer to the respective database documentation.
2. Import the certificate into the Sentinel FIPS keystore.

   For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.
3. Proceed with configuring the Connector.

## 19.5.3 Sentinel Link Connector

Follow the below procedure only if you have selected *Encrypted (HTTPS)* option when configuring the networking settings of the Sentinel Link Event Source Server.

**To configure the Sentinel Link Connector to run in FIPS 140-2 mode:**

1. Add or edit the Sentinel Link Event Source Server. Proceed through the configuration screens until the Security window is displayed. For more information, see the *Sentinel Link Connector Guide*.
2. Select one of the options from the *Client Authentication Type* field. The client authentication type determines how strictly the SSL Sentinel Link Event Source Server verifies the identity of Sentinel Link Event Sources (Sentinel Link Integrators) that are attempting to send data.
   - **Open:** Allows all the SSL connections coming from the clients (Sentinel Link Integrators). Does not perform any Integrator certificate validation or authentication.
   - **Strict:** Validates the Integrator certificate to be a valid X.509 certificate and also checks that the Integrator certificate is trusted by the Event Source Server. For more information, refer to the respective database documentation.

     For the *Strict* option:
     - If the Sentinel Link Integrator is in FIPS 140-2 mode, you must copy the `/etc/opt/novell/sentinel/config/sentinel.cer` file from the sender Sentinel machine to the receiver Sentinel machine. Import this certificate into the receiver Sentinel FIPS keystore.

       **NOTE:** When using custom certificates that are digitally signed by a certificate authority (CA), you must import the appropriate custom certificate file.
     - If Sentinel Link Integrator is in non-FIPS mode, you must import the custom Integrator certificate into the receiver Sentinel FIPS keystore.

**NOTE:** If the sender is Sentinel Log Manager (in non-FIPS mode) and the receiver is Sentinel in FIPS 140-2 mode, the server certificate to be imported on the sender is the `/etc/opt/novell/sentinel/config/sentinel.cer` file from the receiver Sentinel machine.

When Sentinel is running in FIPS 140-2 mode, you cannot import the client certificate using the Event Source Management (ESM) interface. For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.

**NOTE:** In FIPS 140-2 mode, the Sentinel Link Event Source server uses the Sentinel server key pair. Importing the server key pair is not required.

### 19.5.4 Syslog Connector

Follow the below procedure only if you have selected the *SSL* protocol when configuring the network settings of the Syslog Event Source Server.

**To configure the Syslog Connector to run in FIPS 140-2 mode:**

1. Add or edit the Syslog Event Source Server. Proceed through the configuration screens until the Networking window is displayed. For more information, see the *Syslog Connector Guide*.
2. Click *Settings*.
3. Select one of the options from the *Client Authentication Type* field. The client authentication type determines how strictly the SSL Syslog Event Source Server verifies the identity of Syslog Event Sources that are attempting to send data.
   - **Open:** Allows all the SSL connections coming from the clients (event sources). Does not perform any client certificate validation or authentication.
   - **Strict:** Validates the certificate to be a valid X.509 certificate and also checks that the client certificate is trusted by the Event Source Server. New sources will have to be explicitly added to Sentinel (this prevents rogue sources from sending data to Sentinel).

     For the *Strict* option, you must import the certificate of the syslog client into the Sentinel FIPS keystore.

     When Sentinel is running in FIPS 140-2 mode, you cannot import the client certificate using the Event Source Management (ESM) interface.

     For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.

   **NOTE:** In FIPS 140-2 mode, the Syslog Event Source Server uses the Sentinel server key pair. Importing the server key pair is not required.
4. If server authentication is enabled in the syslog client, the client must trust the Sentinel server certificate or the remote Collector Manager certificate depending on where the Connector is deployed.

   **The Sentinel server certificate file** is in the `/etc/opt/novell/sentinel/config/sentinel.cer` location.

   **The Remote Collector Manger certificate file** is in `/etc/opt/novell/sentinel/config/rcm.cer` location.

   **NOTE:** When using custom certificates that are digitally signed by a certificate authority (CA), the client must trust the appropriate certificate file.

## 19.5.5 Windows Event (WMI) Connector

**To configure the Windows Event (WMI) Connector to run in FIPS 140-2 mode:**

1. Add or edit the Windows Event Connector. Proceed through the configuration screens until the Security window is displayed. For more information, see the *Windows Event (WMI) Connector Guide*.
2. Click *Settings*.
3. Select one of the options from the *Client Authentication Type* field. The client authentication type determines how strictly the Windows Event Connector verifies the identity of the client Windows Event Collection Services (WECS) that are attempting to send data.
   - **Open:** Allows all the SSL connections coming from the client WECS. Does not perform any client certificate validation or authentication.
   - **Strict:** Validates the certificate to be a valid X.509 certificate and also checks that the client WECS certificate is signed by a CA. New sources will need to be explicitly added (this prevents rogue sources from sending data to Sentinel).

     For the *Strict* option, you must import the certificate of the client WECS into the Sentinel FIPS keystore. When Sentinel is running in FIPS 140-2 mode, you cannot import the client certificate using the Event Source Management (ESM) interface.

     For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.

   **NOTE:** In FIPS 140-2 mode, the Windows Event Source Server uses the Sentinel server key pair. Importing the server key pair is not required.
4. If server authentication is enabled in the Windows client, the client must trust the Sentinel server certificate or the remote Collector Manager certificate depending on where the Connector is deployed.

   **The Sentinel server certificate file** is in the `/etc/opt/novell/sentinel/config/sentinel.cer` location.

   **The remote Collector Manager certificate file** is in the `/etc/opt/novell/sentinel/config/rcm.cer` location.

   **NOTE:** When using custom certificates that are digitally signed by a certificate authority (CA), the client must trust the appropriate certificate file.
5. If you want to automatically synchronize the event sources or populate the list of event sources using an Active Directory connection, you must import the Active Directory server certificate into the Sentinel FIPS keystore.

   For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.

## 19.5.6 Sentinel Link Integrator

Follow the below procedure only if you have selected the *Encrypted (HTTPS)* option when configuring the network settings of the Sentinel Link Integrator.

**To configure the Sentinel Link Integrator to run in FIPS 140-2 mode:**

1 When Sentinel Link Integrator is in FIPS 140-2 mode, server authentication is mandatory. Before configuring the Integrator instance, import the Sentinel Link Server certificate into the Sentinel FIPS keystore:

   - **If Sentinel Link Connector is in FIPS 140-2 mode**:

     If the Connector is deployed in the Sentinel server, you must copy the `/etc/opt/novell/sentinel/config/sentinel.cer` file from the receiver Sentinel machine to the sender Sentinel machine.

     If the Connector is deployed in a remote Collector Manager, you must copy the `/etc/opt/novell/sentinel/config/rcm.cer file` from the receiver remote Collector Manager machine to the receiver Sentinel machine.

     Import this certificate into the sender Sentinel FIPS keystore.

     **NOTE:** When using custom certificates that are digitally signed by a certificate authority (CA), you must import the appropriate custom certificate file.

   - If Sentinel Link Connector is in non-FIPS mode:

     Import the custom Sentinel Link Server certificate into the sender Sentinel FIPS keystore.

     **NOTE:** When the Sentinel Link integrator is in FIPS 140-2 mode and the Sentinel Link Connector is in non-FIPS mode, use the custom server key pair on the connector. Do not use the internal server key pair.

   For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.

2 Proceed with configuring the Integrator instance.

   **NOTE:** In FIPS 140-2 mode, the Sentinel Link Integrator uses the Sentinel server key pair. Importing the Integrator key pair is not required.

## 19.5.7 LDAP Integrator

**To configure the LDAP Integrator to run in FIPS 140-2 mode:**

1 Before configuring the Integrator instance, download the certificate from the LDAP server and save it as `ldap.cert` file into the `/etc/opt/novell/sentinel/config` directory of the Sentinel server.

   For example, use

```
openssl s_client -connect <LDAP server IP>:636
```

   and then copy the text returned (between but not including the BEGIN and END lines) into a file.

2 Import the certificate into the Sentinel FIPS keystore.

   For more information about importing the certificate, see "Importing Certificates into FIPS Keystore Database" on page 113.

3 Proceed with configuring the Integrator instance.

### 19.5.8 SMTP Integrator

The SMTP Integrator supports FIPS 140-2 from version 2011.1r2 and later. No configuration changes are required.

### 19.5.9 Using Non-FIPS Enabled Connectors with Sentinel in FIPS 140-2 Mode

This section provides information about how to use non-FIPS enabled Connectors with a Sentinel server in FIPS 140-2 mode. We recommend this approach if you have sources that do not support FIPS or if you want to collect events from the non-FIPS Connectors in your environment.

**To use non-FIPS connectors with Sentinel in FIPS 140-2 mode:**

1. Install a remote Collector Manager in non-FIPS mode to connect to the Sentinel server in FIPS 140-2 mode.

   For more information, see Section 11.6, "Installing Additional Collector Managers and Correlation Engines," on page 74.
2. Deploy the non-FIPS Connectors specifically to the non-FIPS remote Collector Manager.

---

**NOTE:** There are some known issues when non-FIPS Connectors such as Audit Connector and File Connector are deployed on a non-FIPS remote Collector Manager connected to a Sentinel 7.1 server in FIPS 140-2 mode. For more information about these known issues, see "NetIQ Sentinel 7.0.1 Readme".

---

## 19.6 Importing Certificates into FIPS Keystore Database

You must insert certificates into the Sentinel FIPS keystore database to establish secure (SSL) communications from the components that own those certificates to Sentinel. You cannot upload certificates by using the Sentinel user interface as normal when FIPS 140-2 mode is enabled in Sentinel. You must manually import the certificates into the FIPS keystore database.

For event sources that are using Connectors deployed to a remote Collector Manager, you must import the certificates to the FIPS keystore database of the remote Collector Manager rather than the central Sentinel server.

**To import certificates to the FIPS Keystore Database:**

1. Copy the certificate file to any temporary location on the Sentinel server or remote Collector Manager.
2. Browse to the Sentinel bin directory. The default location is `/opt/novell/sentinel/bin`.
3. Run the following command to import the certificate into the FIPS keystore database, and then follow the on-screen instructions:.

   ```
   ./convert_to_fips.sh -i <certificate file path>
   ```
4. Enter `yes` or `y` when prompted to restart the Sentinel server or remote Collector Manager.

## 19.7 Reverting Sentinel to Non-FIPS Mode

This section provides information about how to revert Sentinel and its components to non-FIPS mode.

- Section 19.7.1, "Reverting Sentinel Server to Non-FIPS mode," on page 114
- Section 19.7.2, "Reverting Remote Collector Managers or Remote Correlation Engines to Non-FIPS mode," on page 114

### 19.7.1 Reverting Sentinel Server to Non-FIPS mode

You can revert a Sentinel server running in FIPS 140-2 mode to non-FIPS mode only if you have taken a backup of your Sentinel server before converting it to run in FIPS 140-2 mode.

---

**NOTE:** When you revert a Sentinel server to non-FIPS mode, you will lose the events, incident data, and configuration changes made to your Sentinel server after converting to run FIPS 140-2 mode. The sentinel system will be restored back to the last restoration point of non-FIPS mode. You should take a backup of the current system before reverting to non-FIPS mode for future use.

---

**To revert your Sentinel server to non-FIPS mode:**

1. Log in to the Sentinel server as the `root` user.
2. Switch to the `novell` user.
3. Browse to the Sentinel bin directory. The default location is `/opt/novell/sentinel/bin`.
4. Run the following command to revert your Sentinel server to non-FIPS mode, and follow the on-screen instructions:

   ```
   ./backup_util.sh -f <backup_file_name.tar.gz> -m 'restore'
   ```

   For example, if `non-fips2013012419111359034887.tar.gz` is the backup file, run the following command:

   ```
   ./backup_util.sh -f non-fips2013012419111359034887.tar.gz -m 'restore'
   ```

5. Restart the Sentinel server.

### 19.7.2 Reverting Remote Collector Managers or Remote Correlation Engines to Non-FIPS mode

You can revert remote Collector Managers or remote Correlation Engines to non-FIPS mode.

**To revert a remote Collector Managers or a remote Correlation Engine to non-FIPS mode:**

1. Login to the remote Collector Manager or remote Correlation Engine system.
2. Switch to `novell` user (`su novell`).
3. Browse to the bin directory. The default location is `/opt/novell/sentinel/bin`.
4. Run the `revert_to_nonfips.sh` script and follow the on-screen instructions.
5. Restart the remote Collector Manager or remote Correlation Engine.

# V

# Upgrading Sentinel

This section provides information about upgrading Sentinel and other components.

# 20 Upgrading the Sentinel Server

---

**IMPORTANT:** Sentinel 7.1 and later require that the operating system must be IPv6 enabled. Ensure that IPv6 is enabled in the operating system before you upgrade your system to Sentinel 7.1 or later. If IPv6 is not enabled, major components will fail to operate.

---

Use the following steps to upgrade the Sentinel server:

1. Make a backup of your configuration, then create an ESM export.

   For more information on backing up data, see "Backing Up and Restoring Data" in the *NetIQ Sentinel 7.1 Administration Guide*.
2. Download the latest installer from the Novell download site.
3. Log in as `root` to the server where you want to upgrade Sentinel.
4. Specify the following command to extract the install files from the tar file:

   ```
   tar xfz <install_filename>
   ```

   Replace <*install_filename*> with the actual name of the install file.
5. Change to the directory where the install file was extracted.
6. Specify the following command to upgrade Sentinel:

   ```
   ./install-sentinel
   ```
7. To proceed with a language of your choice, select the number next to the language.

   The end user license agreement is displayed in the selected language.
8. Read the end user license, enter `yes` or `y` to accept the license, then continue with the installation.
9. The installation script detects that an older version of the product already exists and prompts you to specify if you want to upgrade the product. To continue with the upgrade, press y.

   The installation starts installing all RPM packages. This installation might take a few seconds to complete.
10. Clear your Web browser cache to view the latest Sentinel version.
11. (Conditional) To upgrade Collector Manager systems and Correlation Engine systems, see Chapter 22, "Upgrading the Collector Manager or the Correlation Engine," on page 121.

# 21 Upgrading the Sentinel Appliance

The procedures in this chapter guide you through upgrading the Sentinel appliance as well as Collector Manager and Correlation Engine appliances.

- Section 21.1, “Upgrading Sentinel 7.0.2 and Later Appliances,” on page 119
- Section 21.2, “Upgrading Sentinel 7.0 and 7.0.1 Appliances,” on page 120
- Section 21.3, “Upgrading the Appliance by Using SMT,” on page 120

## 21.1 Upgrading Sentinel 7.0.2 and Later Appliances

1. Log in to the Sentinel appliance as a user in the administrator role.
2. **If you want to upgrade the Sentinel Appliance**, click *Appliance* to launch WebYaST.
3. **If you want to upgrade a Collector Manager or Correlation Engine Appliance**, specify the URL of the Collector Manager or Correlation Engine computer using port 54984 to launch WebYaST.
4. Make a backup of your configuration, then create an ESM export.

   For more information on backing up data, see “Backing Up and Restoring Data” in the *NetIQ Sentinel 7.1 Administration Guide*.
5. (Conditional) If you have not already registered the appliance for automatic updates, register for updates.

   For more information, see Section 12.4.3, “Registering for Updates,” on page 86.

   If the appliance is not registered, Sentinel displays a yellow warning that indicates that the appliance is not registered.
6. To check if there are any updates, click *Updates*.

   The available updates are displayed.
7. Select and apply the updates.

   The updates might take a few minutes to complete. After the update is successful, the WebYaST login page is displayed.

   Before upgrading the appliance, WebYaST automatically stops the Sentinel service. You must manually restart this service after the upgrade is complete.
8. Restart the Sentinel service by using the Web interface.

   For more information, see Section 12.5, “Stopping and Starting the Server by Using WebYaST,” on page 87.
9. Clear your Web browser cache to view the latest Sentinel version.

## 21.2 Upgrading Sentinel 7.0 and 7.0.1 Appliances

Upgrading the Sentinel 7.0 and 7.0.1 appliances fails in WebYaST because the vendor name for the patch has changed from Novell to NetIQ. You need to upgrade the appliance by using the zypper patch.

To upgrade the appliance by using the zypper patch:

1. Back up your configuration, then create an ESM export. For more information, see "Backing Up and Restoring Data" in the *NetIQ Sentinel 7.1 Administration Guide*.
2. Log in to the appliance console as the `root` user.
3. Run the following command:

   ```
   /usr/bin/zypper patch
   ```
4. Enter `1` to accept the vendor change from Novell to NetIQ.
5. Enter `Y` to proceed.
6. Enter `yes` to accept the license agreement.
7. Restart the Sentinel appliance.
8. Clear your Web browser cache to view the latest Sentinel version.

## 21.3 Upgrading the Appliance by Using SMT

In secured environments where the appliance must run without direct internet access, you can configure the appliance with Subscription Management Tool (SMT) that allows you upgrade the appliance to the latest available versions.

1. Ensure that the appliance is configured with SMT.

   For more information, see Section 12.4.4, "Configuring the Appliance with SMT," on page 86.
2. Log in to the appliance console as the `root` user.
3. Refresh the repository for upgrade:

   ```
   zypper ref -s
   ```
4. Check whether the appliance is enabled for upgrade:

   ```
   zypper lr
   ```
5. (Optional) Check the available updates for the appliance:

   ```
   zypper lu
   ```
6. (Optional) Check the packages that include the available updates for the appliance:

   ```
   zypper lp -r SMT-http_<smt_server_fqdn>:<package_name>
   ```
7. Update the appliance:

   ```
   zypper up -t patch -r SMT-http_<smt_server_fqdn>:<package_name>
   ```
8. Restart the appliance.

   ```
   rcsentinel restart
   ```

# 22 Upgrading the Collector Manager or the Correlation Engine

Use the following steps to upgrade the Collector Manager or the Correlation Engine:

1. Make a backup of your configuration and create an ESM export.

   For more information, see "Backing Up and Restoring Data" in the *NetIQ Sentinel 7.1 Administration Guide*.

2. Log in to the Sentinel Web interface as a user in the administrator role.
3. Select *Downloads*.
4. Click *Download Installer* in the Collector Manager Installer section.

   A window is displayed with options to either open or to save the installer file on the local machine.

5. Save the file.
6. Copy the file to a temporary location.
7. Extract the contents of the file.
8. Run the following script:

   **For Collector Manager:**

   ```
   ./install-cm
   ```

   **For Correlation Engine:**

   ```
   ./install-ce
   ```

9. Follow the on-screen instructions to complete the installation.
10. Clear your Web browser cache to view the latest Sentinel version.

# 23 Upgrading Sentinel Plug-Ins

The upgrade installations of Sentinel do not upgrade the plug-ins unless a particular plug-in is not compatible with the latest version of Sentinel.

New and updated Sentinel plug-ins are frequently uploaded to the Sentinel Plug-ins Web site. To get the latest bug fixes, documentation updates, and enhancements for a plug-in, download and install the most recent version of the plug-in. For information about installing a plug-in, see the specific plug-in documentation.

# VI Appendices

# A Configuring Sentinel for High Availability

Many customers seek to install Sentinel into highly-available environments with the goal of ensuring that critical enterprise event data is collected as consistently as possible. Many security and compliance requirements depend on comprehensive data collection to demonstrate adherence to those requirements - a few missed events could prevent detection of a threat or violation and cause unacceptable risk to the organization. NetIQ has tested and certified Sentinel to work in a high availability environment, and it supports disaster recovery architectures.

This appendix describes how to install the product in an Active-Passive High Availability mode, which allows Sentinel to fail over to a redundant cluster node in case of hardware or software failure. It does not cover Active-Active configurations, and does not guarantee any particular uptime target. NetIQ Consulting and NetIQ partners can help you implement Sentinel high availability and disaster recovery.

**NOTE:** NetIQ supports the High Availability configuration only in Sentinel all-in-one installations. It does not directly support distributed installs of Collector Managers or Correlation Engines.

- Section A.1, “Concepts,” on page 127
- Section A.2, “Supportability,” on page 129
- Section A.3, “System Requirements,” on page 129
- Section A.4, “Installation and Configuration,” on page 130
- Section A.5, “Backup and Recovery,” on page 141

## A.1 Concepts

High availability refers to a design methodology that is intended to keep a system available for use as much as is practicable. The intent is to minimize the causes of downtime such as system failures and maintenance, and to minimize the time it will take to detect and recover from downtime events that do occur. In practice, automated means of detecting and recovering from downtime events quickly become necessary as higher levels of availability must be achieved.

- Section A.1.1, “External Systems,” on page 128
- Section A.1.2, “Shared Storage,” on page 128
- Section A.1.3, “Service Monitoring,” on page 128
- Section A.1.4, “Fencing,” on page 129

### A.1.1 External Systems

Sentinel is a complex multi-tier application that depends upon and provides a wide variety of services. Additionally, it integrates with multiple external third-party systems for data collection, data sharing, and incident remediation. Most high availability solutions allow implementors to declare dependencies between the service(s) that should be highly available and dependent services, but this only applies to services running on the cluster itself. Systems external to Sentinel such as event sources must be configured separately to be as available as required by the organization, and must also be configured to properly handle situations where Sentinel is unavailable for some period of time such as a failover event. If access rights are tightly restricted, for example if authenticated sessions are used to send/receive data between the third-party system and Sentinel, then the third-party system must be configured to accept sessions from or initiate sessions to any cluster node (Sentinel should be configured with a virtual IP for this purpose). NetIQ can not guarantee any particular level of high availability between our product and third-party systems out of our control.

### A.1.2 Shared Storage

All high availability clusters require some form of shared storage so that application data can be quickly moved from one cluster node to another in the case of a failure of the originating node. The storage itself should be highly available; this is usually achieved by using Storage Area Network (SAN) technology connected to the cluster nodes using a Fibre Channel network. Other systems use Network Attached Storage (NAS), iSCSI, or other technologies that allow for remote mounting of shared storage. The fundamental requirement of the shared storage is that the cluster can cleanly move the storage from a failed cluster node to a new cluster node.

**NOTE:** For iSCSI, you should use the largest Message Transfer Unit (MTU) supported by your hardware. Larger MTUs benefits the storage performance. Sentinel might experience issues if latency and/or bandwidth to storage is slower than recommended.

There are two basic approaches that Sentinel can use for the shared storage. The first locates all components - application binaries, configuration, and event data - on the shared storage. On failover, the storage is unmounted from the primary node and moved the backup node; which loads the entire application and configuration from the shared storage. The second approach stores the event data on shared storage, but the application binaries and configuration reside on each cluster node. On failover, only the event data is moved to the backup node.

Each approach has benefits and disadvantages, but the second approach allows the Sentinel installation to use standard FHS-compliant install paths, allows for verification of the RPM packaging, and also allows for warm patching and reconfiguration to minimize downtime.

This solution will guide you through an example of the process of installing to a cluster that uses iSCSI shared storage and locates the application binaries/configuration on each cluster node.

### A.1.3 Service Monitoring

A key component of any highly available environment is a reliable, consistent way to monitor the resource(s) that should be highly available, along with any resource(s) that they depend on. The SLE HAE uses a component called a Resource Agent to perform this monitoring - the Resource Agent's job is to provide the status for each resource, plus (when asked) to start or stop that resource.

Resource Agents must provide a reliable status for monitored resources in order to prevent unnecessary downtime. False positives (when a resource is deemed to have failed, but would in fact recover on its own) can cause service migration (and related downtime) when it is not actually necessary, and false negatives (when the Resource Agent reports that a resource is functioning when in fact it is not operating properly) can prevent proper use of the service. On the other hand, external monitoring of a service can be quite difficult - a web service port might respond to a simple ping, for example, but may not provide correct data when a real query is issued. In many cases, self-test functionality must be built into the service itself to provide a truly accurate measurement.

This solution provides a basic OCF Resource Agent for Sentinel that can monitor for major hardware, operating system, or Sentinel system failure. At this time the external monitoring capabilities for Sentinel are based on IP port probes, and there is some potential for false positive and false negative readings. We plan to improve both Sentinel and the Resource Agent over time to improve the accuracy of this component.

### A.1.4 Fencing

Within an HA cluster, critical services are constantly monitored and restarted automatically on other nodes in the case of failure. This automation can introduce problems, however, if some communications problem occurs with the primary node; although the service running on that node appears to be down, it in fact continues to run and write data to the shared storage. In this case, starting a new set of services on a backup node could easily cause data corruption.

Clusters use a variety of techniques collectively called fencing to prevent this from happening, including Split Brain Detection (SBD) and Shoot The Other Node In The Head (STONITH). The primary goal is to prevent data corruption on the shared storage.

## A.2 Supportability

NetIQ supports this solution based on the defined cluster characteristics and expected behavior as defined in this document and as tested in our labs. Other cluster configurations will only be supported if the issues seen in your environment can be replicated in our internal test environments, thus eliminating local differences in implementation as the cause of the issue.

## A.3 System Requirements

When allocating cluster resources to support a highly-available installation, consider the following requirements:

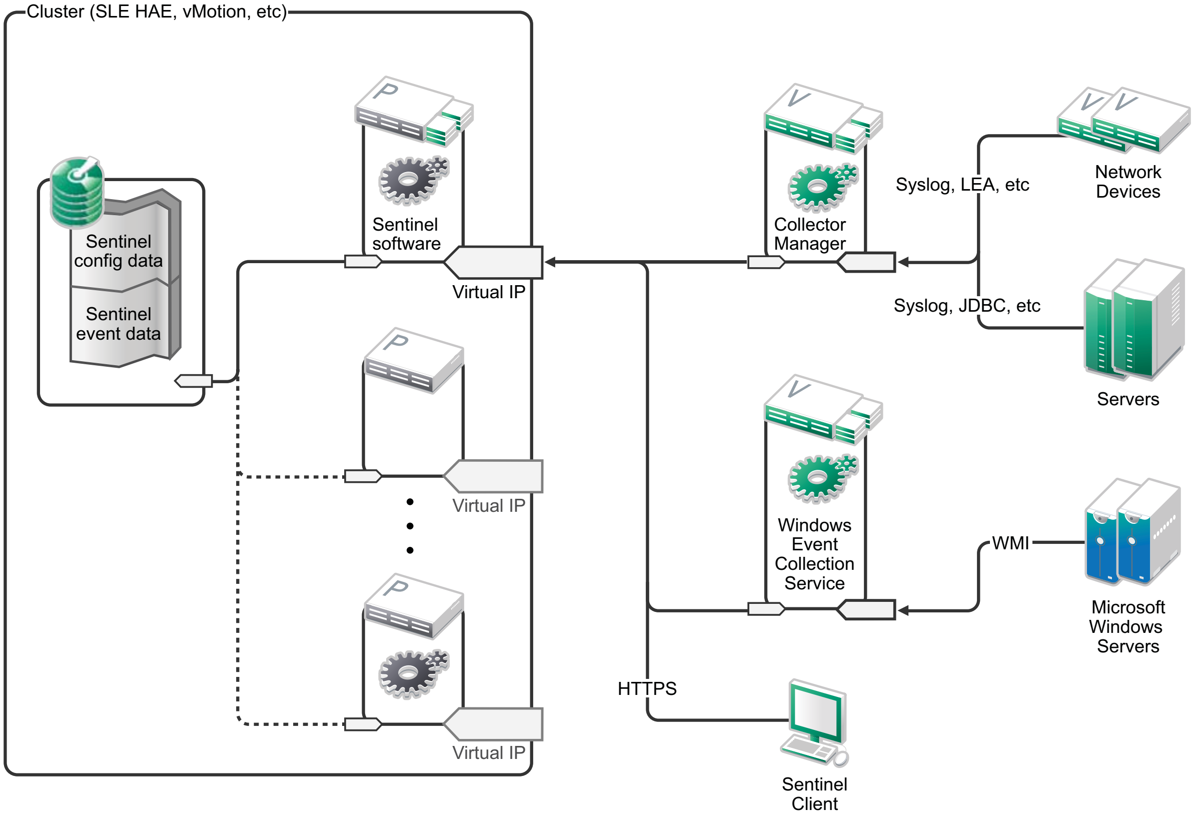
- Each cluster node that hosts the Sentinel services must meet the requirements specified in Chapter 5, “Meeting System Requirements,” on page 33.
- Ensure that sufficient shared storage is available for the Sentinel data and application.
- A virtual IP address for the services that can be migrated from node to node on failover.
- The Sentinel installer (TAR file) with a valid license.
- The SUSE Linux High Availability Extension (ISO image) with a valid license.
- A shared storage device that meets the performance and size characteristics as documented in Chapter 5, “Meeting System Requirements,” on page 33. The exemplary solution will use a standard SUSE Linux VM configured with iSCSI Targets as shared storage.
- Minimum two cluster nodes that meet the resource requirements for running Sentinel in the customer environment. The exemplary solution will use two SUSE Linux VMs.
- A method for the cluster nodes to communicate with the shared storage, such as FibreChannel for a SAN. The exemplary solution will use a dedicated IP address to connect to the iSCSI Target.

- A virtual IP that can be migrated from cluster node to cluster node to serve as the external IP address for Sentinel.
- At least one IP address per cluster node for internal cluster communications. The exemplary solution will use a simple unicast IP address, but multicast is preferred for production environments.

## A.4 Installation and Configuration

This section provides the steps for installing and configuring Sentinel in a High Availability environment. Each step describes the general approach, then refer to a demo setup that documents the details of an exemplary cluster solution. You can use other options or technology other than those listed in this document, subject to the constraints described in Section A.2, "Supportability," on page 129.

The following diagram represents an active-passive High Availability architecture:



- Section A.4.1, "Initial Setup," on page 131
- Section A.4.2, "Shared Storage Setup," on page 132
- Section A.4.3, "Sentinel Installation," on page 134
- Section A.4.4, "Cluster Installation," on page 135
- Section A.4.5, "Cluster Configuration," on page 136
- Section A.4.6, "Resource Configuration," on page 138
- Section A.4.7, "Network Storage Configuration," on page 140

### A.4.1 Initial Setup

Configure the machine hardware, network hardware, storage hardware, operating systems, user accounts, and other basic system resources per the documented requirements for Sentinel and local customer requirements. Test the systems to ensure proper function and stability.

- As a best practice, all cluster nodes should be time-synchronized - use NTP or a similar technology for this purpose.
- The cluster will require reliable hostname resolution. As a best practice, you may wish to enter all internal cluster hostnames into the `/etc/hosts` file to ensure cluster continuity in case of DNS failure. If any cluster node cannot resolve all other nodes ***by name***, the cluster configuration described in this section will fail.
- The CPU, RAM, and disk space characteristics for each cluster node must meet the system requirements defined in Chapter 5, "Meeting System Requirements," on page 33 based on the expected event rate.
- The disk space and I/O characteristics for the storage nodes must meet the system requirements defined in Chapter 5, "Meeting System Requirements," on page 33 based on the expected event rate and data retention policies for local and/or network storage.
- If you want to configure the operating system firewalls to restrict access to Sentinel and the cluster, refer to Chapter 7, "Ports Used," on page 53 for details of which ports must be available depending on your local configuration and the sources that will be sending event data.

**The exemplary solution will use the following configuration:**

- Two SUSE Linux 11 SP2 cluster node VMs
  - The OS install need not install X Windows, but can if GUI configuration is desired. The boot scripts can be set to start without X (runlevel 3), which can then be started only when needed.
  - The nodes will have two NICS: one for external access and one for iSCSI communications.
  - Configure the external NICs with IP addresses that allow for remote access through SSH or similar. For this example, we will use 172.16.0.1 (node01) and 172.16.0.2 (node02).
  - Each node should have sufficient disk for the operating system, Sentinel binaries and configuration data, cluster software, temp space, and so forth. See the SUSE Linux and SLE HAE system requirements, and Sentinel application requirements.
- One SUSE Linux 11 SP2 VM configured with iSCSI Targets for shared storage
  - The OS install need not install X Windows, but can if GUI configuration is desired. The boot scripts can be set to start without X (runlevel 3), which can then be started only when needed.
  - The system will have two NICs: one for external access and one for iSCSI communications.
  - Configure the external NIC with an IP address that allows for remote access via SSH or similar. For this example we will use 172.16.0.3 (storage03).
  - The system should have sufficient space for the operating system, temp space, a large volume for shared storage to hold Sentinel data, and a small amount of space for an SBD partition. See the SUSE Linux system requirements, and Sentinel event data storage requirements. For the exemplary solution we will put all data (local, network, SBD) on a single disk, but for production deployments this could be allocated to different nodes.

**NOTE:** In a production cluster, you can use internal, non-routable IPs on separate NICs (possibly a couple, for redundancy) for internal cluster communications.

## A.4.2 Shared Storage Setup

Set up your shared storage and make sure that you can mount it on each cluster node. If you are using FibreChannel and a SAN, this may involve physical connections and other configuration. The shared storage will be used to hold Sentinel's databases and event data, so must be sized accordingly for the customer environment based on the expected event rate and data retention policies.

A typical implementation might use a fast SAN attached via FibreChannel to all cluster nodes, with a large RAID array to store the local event data. A separate NAS or iSCSI node might be used for the slower network storage. As long as the cluster node can mount the local storage as a normal block device, it can be used by the solution. The network storage can also be mounted as a block device, or could be an NFS or CIFS volume.

---

**NOTE:** You should configure your shared storage and test mounting it on each cluster node, but the actual mount of the storage will be handled by the cluster configuration.

---

**For the exemplary solution, we will use iSCSI Targets hosted by a SUSE Linux VM:**

The exemplary solution will use iSCSI Targets configured on a SUSE Linux VM. The VM is `storage03` as listed in Initial Setup. iSCSI devices can be created using any file or block device, but for simplicity here we will use a file that we create for this purpose.

Connect to `storage03` and start a console session. Use the `dd` command to create a blank file of any desired size for Sentinel local storage:

```
dd if=/dev/zero of=/localdata count=10240000 bs=1024
```

In this case, we create a 10GB file filled with zeros (copied from the `/dev/zero pseudo-device`). See the info or man page for `dd` for details on the command-line options. For example to create different-sized "disks". The iSCSI Target treats this file as if it were a disk; you could of course use an actual disk if you prefer.

Repeat this procedure to create a file for network storage:

```
dd if=/dev/zero of=/networkdata count=10240000 bs=1024
```

For this example we use two files ("disks") of the same size and performance characteristics. For a production deployment, you might put the local storage on a fast SAN and the network storage on a slower iSCSI, NFS, or CIFS volume.

Configure these files as iSCSI Targets:

1. Run YaST from the command line (or use the GUI, if preferred): `/sbin/yast`
2. Select **Network Devices** > **Network Settings**.
3. Ensure that the **Overview** tab is selected.
4. Select the secondary NIC from the displayed list, then tab forward to Edit and press `Enter`.
5. On the **Address** tab, assign a static IP address of 10.0.0.3. This will be the internal iSCSI communications IP.
6. Click **Next**, then click **OK**.
7. On the main screen, select **Network Services** > **iSCSI Target**.
8. If prompted, install the required software (`iscsitarget RPM`) from the SUSE Linux 11 SP2 media.
9. Click **Service**, select the **When Booting** option to ensure that the service starts when the operating system boots.

10. Click **Global**, and then select **No Authentication** because the current OCF Resource Agent for iSCSI does not support authentication.
11. Click **Targets** and then click **Add** to add a new target.

    The iSCSI Target will auto-generate an ID and then present an empty list of LUNs (drives) that are available.
12. Click **Add** to add a new LUN.
13. Leave the LUN number as 0, then browse in the **Path** dialog (under Type=fileio) and select the `/localdata` file that you created. If you have a dedicated disk for storage, specify a block device, such as `/dev/sdc`.
14. Repeat steps 12 and 13, and add LUN 1 and `/networkdata` this time.
15. Leave the other options at their defaults. Click **OK** and then click **Next**.
16. Click **Next** again to select the default authentication options, then **Finish** to exit the configuration. Accept if asked to restart iSCSI.
17. Exit YaST.

The above procedure exposes two iSCSI Targets on the server at IP address 10.0.0.3. At each cluster node, ensure that it can mount the local data shared storage device. You must also format the devices (once):

1. Connect to one of the cluster nodes (node01) and start YaST.
2. Select **Network Devices** > **Network Settings**.
3. Ensure that the **Overview** tab is selected.
4. Select the secondary NIC from the displayed list, then tab forward to Edit and press `Enter`.
5. Click **Address**, assign a static IP address of 10.0.0.1. This will be the internal iSCSI communications IP.
6. Select **Next**, then click **OK**.
7. Click **Network Services** > **iSCSI Initiator**.
8. If prompted, install the required software (open-iscsi RPM) from the SUSE Linux 11 SP2 media.
9. Click **Service**, select **When Booting** to ensure the iSCSI service is started on boot.
10. Click **Discovered Targets**, and select **Discovery**.
11. Specify the iSCSI IP address (10.0.0.3), select **No Authentication**, and then click **Next**.
12. Select the discovered iSCSI Target with the IP address 10.0.0.3 and then select **Log In**.
13. Switch to automatic in the **Startup** drop-down and select **No Authentication**, then click **Next**.
14. Switch to the **Connected Targets** tab to ensure that we are connected to the target.
15. Exit the configuration. This should have mounted the iSCSI Targets as block devices on the cluster node.
16. In the YaST main menu, select **System** > **Partitioner**.
17. In the System View, you should see new hard disks (such as `/dev/sdb` and `/dev/sdc`) in the list - they will have a type of IET-VIRTUAL-DISK. Tab over to the first one in the list (which should be the local storage), select that disk, then press `Enter`.
18. Select **Add** to add a new partition to the empty disk. Format the disk as a primary ext3 partition, but do not mount it. Ensure that the option Do not mount partition is selected.
19. Select **Next**, then **Finish** after reviewing the changes that will be made. Assuming you create a single large partition on this shared iSCSI LUN, you should end up with a `/dev/sdb1` or similar formatted disk (referred to as `/dev/<SHARED1>` below).

20 Go back into the partitioner and repeat the partitioning/formatting process (steps 16-19) for `/dev/sdc` or whichever block device corresponds to the network storage. This should result in a `/dev/sdc1` partition or similar formatted disk (referred to as `/dev/<NETWORK1>` below).

21 Exit YaST.

22 Finally, create a mountpoint and test mounting the local partition as follows (the exact device name may depend on the specific implementation):

```
# mkdir /var/opt/novell
# mount /dev/<SHARED1> /var/opt/novell
```

23 You should be able to create files on the new partition and see them wherever it is mounted.

To unmount:

```
# umount /var/opt/novell
```

Repeat steps 1-15 in the procedure above to ensure that each cluster node can mount the local shared storage. Replace the node IP in step 5, however, with a different IP (e.g. node02 > 10.0.0.2).

## A.4.3 Sentinel Installation

There are two options to install Sentinel: install every part of Sentinel onto the shared storage (using the --location option to redirect the Sentinel install to wherever you have mounted the shared storage) or just put the variable application data on the shared storage.

In this exemplary solution, we will follow the latter approach and install Sentinel to each cluster node that can host it. The first time Sentinel is installed we will do a complete installation including the application binaries, configuration, and all the data stores. Subsequent installations on the other cluster nodes will only install the application, and will assume that the actual Sentinel data will be available some time later (e.g. once the shared storage is mounted).

**Exemplary Solution:**

In this exemplary solution we will install Sentinel to each cluster node, storing only the variable application data on shared storage. This keeps the application binaries and configuration in standard locations, allows us to verify the RPMs, and also allows us to support warm patching in certain scenarios.

**First Node Installation**

1 Connect to one of the cluster nodes (node01) and open a console window.

2 Download the Sentinel installer (a tar.gz file) and store it in `/tmp` on the cluster node.

3 Execute the following commands:

```
mount /dev/<SHARED1> /var/opt/novell

cd /tmp

tar -xvzf sentinel_server*.tar.gz

cd sentinel_server*

./install-sentinel --record-unattended=/tmp/install.props
```

1 Run through the standard install, configuring the product as appropriate. The installer will install the binaries, configuration, databases, and set up usernames/passwords and network ports.

2 Start Sentinel and test the basic functions. You can use the standard external cluster node IP to access the product.

3. Shut down Sentinel and dismount the shared storage:

   ```
   rcsentinel stop
   umount /var/opt/novell
   ```

   This step removes the autostart scripts so that the cluster can manage the product.

   ```
   cd /
   insserv -r sentinel
   ```

**Subsequent Node Installation**

Repeat the installation on other nodes:

The initial Sentinel installer creates a user account for use by the product, which uses the next available user ID at the time of the install. Subsequent installs in unattended mode will attempt to use the same user ID for account creation, but the possibility for conflicts (if the cluster nodes are not identical at the time of the install) does exist. It is highly recommended that you do one of the following:

- Synchronize the user account database across cluster nodes (manually through LDAP or similar), making sure that the sync happens before subsequent installs. In this case the installer will detect the presence of the user account and use the existing one.
- Watch the output of the subsequent unattended installs - a warning will be issued if the user account could not be created with the same user ID.

1. Connect to each additional cluster node (node02) and open a console window.
2. Execute the following:

   ```
   cd /tmp
   scp root@node01:/tmp/sentinel_server*.tar.gz
   scp root@node01:/tmp/install.props
   tar -xvzf sentinel_server*.tar.gz
   ./install-sentinel --no-start --cluster-node --unattended=/tmp/install.props
   cd /
   insserv -r sentinel
   ```

At the end of this process, Sentinel should be installed on all nodes, but it will likely not work correctly on any but the first node until various keys are synchronized, which will happen when we configure the cluster resources.

## A.4.4 Cluster Installation

Install the cluster software on each node, and register each cluster node with the cluster manager. Procedures to do so will vary depending on the cluster implementation, but at the end of the process each cluster node should show up in the cluster management console.

**For our exemplary solution, we will set up SUSE Linux High Availability Extension and overlay that with Sentinel-specific Resource Agents**:

If you do not use the OCF Resource Agent to monitor Sentinel, you will likely have to develop a similar monitoring solution for the local cluster environment. The OCF Resource Agent for Sentinel is a simple shell script that runs a variety of checks to verify if Sentinel is functional. If you wish to develop your own, you should examine the existing Resource Agent for examples (the Resource Agent is stored in the `sentinel-ha.rpm` in the Sentinel download package.)

There are many different ways in which a SLE HAE cluster can be configured, but we will select options that keep it fairly simple. The first step is to install the core SLE HAE software; the process is fully detailed in the SLE HAE Documentation. For information about installing SLES add-ons, see the Deployment Guide.

You must install the SLE HAE on all cluster nodes, node01 and node02 in our example. The add-on will install the core cluster management and communications software, as well as many Resource Agents that are used to monitor cluster resources.

Once the cluster software has been installed, an additional RPM should be installed to provide the additional Sentinel-specific cluster Resource Agents. The RPM can be found in the `novell-Sentinel-ha-7.1*.rpm` stored in the normal Sentinel download, which you unpacked to install the product.

On each cluster node, copy the `novell-Sentinel-ha-7.1*.rpm` into the `/tmp` directory, then:

```
cd /tmp
```

```
rpm -i novell-Sentinel-ha-7.1*.rpm
```

## A.4.5 Cluster Configuration

You must configure the cluster software to register each cluster node as a member of the cluster. As part of this configuration, you can also set up fencing and STONITH resources to ensure cluster consistency.

In our exemplary solution, we basically use the simplest configuration without additional redundancy or other advanced features. We also use a unicast address (instead of the preferred multicast address) because it requires less interaction with network administators, and is sufficient for testing purposes. We also set up a simple SBD-based fencing resource.

**Exemplary Solution:**

The exemplary solution will use private IP addresses for internal cluster communications, and will use unicast to minimize the need to request a multicast address from a network administrator. The solution will also use an iSCSI Target configured on the same SUSE Linux VM that hosts the shared storage to serve as an SBD device for fencing purposes. As before, iSCSI devices can be created using any file or block device, but for simplicity here we will use a file that we create for this purpose.

The following configuration steps are very similar to those in Shared Storage Setup:

**SBD Setup**

Connect to `storage03` and start a console session. Use the **dd** command to create a blank file of any desired size:

```
dd if=/dev/zero of=/sbd count=1024 bs=1024
```

In this case, we create a 1MB file filled with zeros (copied from the `/dev/zero` pseudo-device).

Configure that file as an iSCSI Target:

1. Run YaST from the command line (or use the GUI, if preferred): `/sbin/yast`
2. Select **Network Services** > **iSCSI Target**.

3. Click **Targets** and select the existing target.
4. Select **Edit**. The UI will present a list of LUNs (drives) that are available.
5. Select **Add** to add a new LUN.
6. Leave the LUN number as 2. Browse in the **Path** dialog and select the `/sbd` file that you created.
7. Leave the other options at their defaults, then select **OK** then **Next**, then click **Next** again to select the default authentication options.
8. Click **Finish** to exit the configuration. Restart the services if needed. Exit YaST.

---

**NOTE:** The following steps require that each cluster node be able to resolve the hostname of all other cluster nodes (the file sync service csync2 will fail if this is not the case). If DNS is not set up or available, add entries for each host to the `/etc/hosts` file that list each IP and its hostname (as reported by the hostname command).

---

This procedure should expose an iSCSI Target for the SBD device on the server at IP address 10.0.0.3 (storage03).

**Node Configuration**

Connect to a cluster node (node01) and open a console:

1. Run YaST.
2. Open **Network Services** > **iSCSI Initiator**.
3. Select **Connected Targets**, then the iSCSI Target you configured above.
4. Select the **Log Out** option and log out of the Target.
5. Switch to the **Discovered Targets** tab, select the **Target**, and log back in to refresh the list of devices (leave the automatic startup option and No Authentication).
6. Select **OK** to exit the iSCSI Initiator tool.
7. Open **System** > **Partitioner** and identify the SBD device as the 1MB IET-VIRTUAL-DISK. It will be listed as **/dev/sdd** or similar - note which one.
8. Exit YaST.
9. Execute the command `ls -l /dev/disk/by-id/` and note the device ID that is linked to the device name you located above.
10. Execute the command `sleha-init`.
11. When prompted for the network address to bind to, specify the external NIC IP (172.16.0.1).
12. Accept the default multicast address and port. We will override this later.
13. Enter 'y' to enable SBD, then specify `/dev/disk/by-id/<device id>`, where `<device id>` is the ID you located above (you can use Tab to auto-complete the path).
14. Complete the wizard and make sure no errors are reported.
15. Start YaST.
16. Select **High Availability** > **Cluster** (or just Cluster on some systems).
17. In the box at left, ensure **Communication Channels** is selected.
18. Tab over to the top line of the configuration, and change the udp selection to udpu (this disables multicast and selects unicast).
19. Select to **Add a Member Address** and specify this node (172.16.0.1), then repeat and add the other cluster node(s): 172.16.0.2.
20. Select **Finish** to complete the configuration.

21 Exit YaST.

22 Run the command `/etc/rc.d/openais` restart to restart the cluster services with the new sync protocol.

Connect to each additional cluster node (node02) and open a console:

1. Run the following command: `sleha-join`
2. Enter the IP address of the first cluster node.

In some circumstances the cluster communications do not initialize correctly. If the cluster does not start (the `openais` service fails to start):

- Manually copy `corosync.conf` from node1 to node02, or run `csync2 -x -v` on node 1, or manually set the cluster up on node02 through YaST.
- Run `/etc/rc.d/openais start` on node02

In some cases, the script might fail because the `xinetd` service does not properly add the new `csync2` service. This service is required so that the other node can sync the cluster configuration files down to this node. If you see errors like `csync2 run failed`, you may have this problem. To fix this, execute: `` kill -HUP `cat /var/run/xinetd.init.pid `` and then re-run the `sleha-join` script.

At this point you should be able to run crm_mon on each cluster node and see that the cluster is running properly. Alternatively you can use 'hawk', the web console - the default login credentials are 'hacluster / linux'.

There are two additional parameters we need to tweak for this example; whether these will apply to a customer's production cluster will depend on its configuration:

1. Set the global cluster option `no-quorum-policy` to `ignore`. We do this because we have only a two-node cluster, so any single node failure would break quorum and shut down the entire cluster: `crm configure property no-quorum-policy=ignore`

   **NOTE:** If your cluster has more than two nodes, do not set this option.

2. Set the global cluster option `default-resource-stickiness to 1.` This will encourage the resource manager to leave resources running in place rather than move them around: `crm configure property default-resource-stickiness=1`.

## A.4.6 Resource Configuration

As mentioned in the Cluster Installation, this solution provides an OCF Resource Agent to monitor the core services under SLE HAE, and you can create alternatives if desired. The software also depends on several other resources, for which Resource Agents are provided by default with SLE HAE. If you do not want to use SLE HAE, you need to monitor these additional resources using some other technology:

- A filesystem resource corresponding to the shared storage that the software uses.
- An IP address resource corresponding to the virtual IP by which the services will be accessed.
- The Postgres database software the software uses to store configuration and event metadata.

There are additional resources, such as MongoDB used for Security Intelligence and the ActiveMQ message bus; for now at least these are monitored as part of the core services.

**Exemplary Solution**

The exemplary solution uses simple versions of the required resources, such as the simple Filesystem Resource Agent. You can choose to use more sophisticated cluster resources like cLVM (a logical-volume version of the filesystem) if required.

The exemplary solution provides a `crm` script to aid in cluster configuration. The script pulls relevant configuration variables from the unattended setup file generated as part of the Sentinel installation. If you did not generate the setup file, or you wish to change the configuration of the resources, you can edit the script accordingly.

Connect to the original node on which you installed Sentinel (this must be the node on which you ran the full Sentinel install) and do the following (<SHARED1> is the shared volume you created above):

```
mount /dev/<SHARED1> /var/opt/novell
```

```
cd /usr/lib/ocf/resource.d/novell
```

```
./install-resources.sh
```

There might be issues with the new resources coming up in the cluster; run `/etc/rc.d/openais restart` on node02 if you experience this issue.

The `install-resources.sh` script will prompt you for a couple values, namely the virtual IP that you would like people to use to access Sentinel and the device name of the shared storage, and then will auto-create the required cluster resources. Note that the script requires the shared volume to already be mounted, and also requires the unattended installation file which was created during Sentinel install to be present (`/tmp/install.props`). You do not need to run this script on any but the first installed node; all relevant config files will be automatically synced to the other nodes.

If the customer environment varies from this exemplary solution, you can edit the `resources.cli` file (in the same directory) and modify the primitives definitions from there. For example, the exemplary solution uses a simple Filesystem resource; you may wish to use a more cluster-aware cLVM resource.

After running the shell script, you can issue a crm status command and the output should look like this:

```
crm status
```

```
Last updated: Thu Jul 26 16:34:34 2012
Last change: Thu Jul 26 16:28:52 2012 by hacluster via crmd on node01
Stack: openais
Current DC: node01 - partition with quorum
Version: 1.1.6-b988976485d15cb702c9307df55512d323831a5e
2 Nodes configured, 2 expected votes
5 Resources configured.
```

```
Online: [ node01, node02 ]
stonith-sbd    (stonith:external/sbd):    Started node01
 Resource Group: sentinelgrp
     sentinelip    (ocf::heartbeat:IPaddr2):    Started node01
     sentinelfs    (ocf::heartbeat:Filesystem):    Started node01
     sentineldb    (ocf::novell:pgsql):    Started node01
     sentinelserver    (ocf::novell:sentinel):    Started node01
```

At this point the relevant Sentinel resources should be configured in the cluster. You can examine how they are configured and grouped in the cluster management tool, for example by running crm status.

## A.4.7 Network Storage Configuration

As the final step in this process, configure network storage so that Sentinel can migrate event partitions to less-expensive storage. This is optional, and in fact the network storage need not be made highly-available in the same way that the rest of the system has been - you can use any directory (mounted from a SAN or not), or NFS or CIFS volume.

Click **Storage** in the top menu bar, then select **Configuration**, then select one of the radio buttons under Network storage not configured to set this up.

**Exemplary Solution**

The exemplary solution will use a simple iSCSI Target as a network shared storage location, in much the same configuration as the local storage. In production implementations, these would likely be different storage technologies.

Use the following procedure to configure the network storage for use by Sentinel:

---

**NOTE:** Since we will be using an iSCSI Target for this exemplary solution, the target will be mounted as a directory for use as network storage. Hence we will need to configure the mount as a filesystem resource akin to the way the local storage filesystem is configured. This was not automatically set up as part of the resource installation script since there are other possible variations; we will do the configuration manually here.

---

1. Review the steps above to determine which partition was created for use as network storage (`/dev/<NETWORK1>`, or something like `/dev/sdc1`). If necessary create an empty directory on which the partition can be mounted (such as `/var/opt/netdata`).
2. Set up the network filesystem as a cluster resource: use the web GUI or run the command:

   ```
   crm configure primitive sentinelnetfs ocf:heartbeat:Filesystem params device="/
   dev/<NETWORK1>" directory="<PATH>" fstype="ext3" op monitor interval=60s
   ```

   where `/dev/<NETWORK1>` is the partition that was created in the Shared Storage Setup section above, and <PATH> is any local directory on which it can be mounted.
3. Add the new resource to the group of managed resources:

   ```
    crm resource stop sentinelgrp
    crm configure delete sentinelgrp
    crm configure group sentinelgrp sentinelip sentinelfs sentinelnetfs sentineldb
   sentinelserver
    crm resource start sentinelgrp
   ```

4. You can connect to the node currently hosting the resources (use crm status or Hawk) and make sure that the network storage is properly mounted (use the mount command).
5. Log in to the Sentinel Web interface.
6. Select **Storage**, then select **Configuration**, then select the **SAN (locally mounted**) under Network storage not configured.
7. Type in the path where the network storage is mounted, for example `/var/opt/netdata`.

The exemplary solution uses simple versions of the required resources, such as the simple Filesystem Resource Agent - customers can choose to use more sophisticated cluster resources like cLVM (a logical-volume version of the filesystem) if they wish.

## A.5 Backup and Recovery

The highly available failover cluster described in this document provides a level of redundancy so that if the service fails on one node in the cluster, it will automatically failover and recover on another node in the cluster. When an event like this happens, it's important to bring the node that failed back into an operational state so that the redundancy in the system can be restored and protect in the case of another failure. This section talks about restoring the failed node under a variety of failure conditions.

- Section A.5.1, "Backup," on page 141
- Section A.5.2, "Recovery," on page 141

### A.5.1 Backup

While a highly available failover cluster like the one described in this document provides a layer of redundancy, it is still important to regularly take a traditional backup of the configuration and data, which would not be easy to recover from if lost or corrupted. The section "Backing Up and Restoring Data" in the *NetIQ Sentinel 7.1 Administration Guide* describes how to use Sentinel's built-in tools for creating a backup. These tools should be used on the active node in the cluster because the passive node in the cluster will not have the required access to the shared storage device. Other commercially available backup tools could be used instead and may have different requirements on which node they can be used.

### A.5.2 Recovery

- "Transient Failure" on page 141
- "Node Corruption" on page 141
- "Cluster Data Configuration" on page 141

#### Transient Failure

If the failure was a temporary failure and there is no apparent corruption to the application and operating system software and configuration, then simply clearing the temporary failure, for example rebooting the node, will restore the node to an operational state. The cluster management user interface can be used to fail back the running service back to the original cluster node, if desired.

#### Node Corruption

If the failure caused a corruption in the application or operating system software or configuration that is present on the node's storage system, then the corrupted software will need to be reinstalled. Repeating the steps for adding a node to the cluster described earlier in this document will restore the node to an operational state. The cluster management user interface can be used to failback the running service back to the original cluster node, if desired.

#### Cluster Data Configuration

If data corruption occurs on the shared storage device in a way that the shared storage device can't recover from, this would result in the corruption affecting the entire cluster in a way that cannot be automatically recovered from using the highly available failover cluster described in this document. The section "Backing Up and Restoring Data" in the *NetIQ Sentinel 7.1 Administration Guide* describes how to use Sentinel's built-in tools for restoring from a backup. These tools should be used on the active node in the cluster because the passive node in the cluster will not have the required access to the shared storage device. Other commercially available backup and restore tools could be used instead and may have different requirements on which node they can be used.

# B Troubleshooting the Installation

This section contains some of the issues that might occur during installation, along with the actions to work around the issues.

## B.1 Failed Installation Because of an Incorrect Network Configuration

During the first boot, if the installer finds that the network settings are incorrect, an error message is displayed. If the network is unavailable, installing Sentinel on the appliance fails.

To resolve this issue, properly configure the network settings. To verify the configuration, use the `ifconfig` command to return the valid IP address, and use the `hostname -f` command to return the valid hostname.

## B.2 The UUID Is Not Created for Imaged Collector Managers or Correlation Engine

If you image a Collector Manager server (for example, by using ZENworks Imaging) and restore the images on different machines, Sentinel does not uniquely identify the new instances of the Collector Manager. This happens because of duplicate UUIDs.

You must generate a new UUID by performing the following steps on the newly installed Collector Manager systems:

1. Delete the `host.id` or `sentinel.id` file that is located in the `/var/opt/novell/sentinel/data` folder.
2. Restart the Collector Manager.

   The Collector Manager automatically generates the UUID.

# C Uninstalling

This appendix provides information about uninstalling Sentinel and post-uninstallation tasks.

- Section C.1, "Uninstallation Checklist," on page 145
- Section C.2, "Uninstalling Sentinel," on page 145
- Section C.3, "Post-Uninstallation Tasks," on page 146

## C.1 Uninstallation Checklist

Use the following checklist to uinstall Sentinel:

☐ Uninstall the Sentinel server.

☐ Uninstall the Collector Manager and Correlation Engine, if any.

☐ Perform post-uninstallation tasks to complete the Sentinel uninstallation.

## C.2 Uninstalling Sentinel

An uninstall script is available to help you remove a Sentinel installation. Before performing a new installation, you should perform all of the following steps to ensure there are no files or system settings remaining from a previous installation.

---

**WARNING:** These instructions involve modifying operating system settings and files. If you are not familiar with modifying these system settings and files, please contact your system administrator.

---

### C.2.1 Uninstalling the Sentinel Server

Use the following steps to uninstall the Sentinel server:

1 Log in to the Sentinel server as `root`.

**NOTE:** You cannot uninstall Sentinel server as a non-root user, if the installation is performed as a `root` user. However, a non-root user can uninstall the Sentinel server if the installation was performed by non-root user.

2 Access the following directory:

```
/opt/novell/sentinel/setup/
```

3 Run the following command:

```
./uninstall-sentinel
```

4. When prompted to reconfirm that you want to proceed with the uninstall, press y.

   The script first stops the service and then removes it completely.

### C.2.2 Uninstalling the Collector Manager or Correlation Engine

Use the following steps to uninstall the Collector Manager and Correlation Engine:

1. Log in as `root`.

   ---

   **NOTE:** You can not uninstall Remote Collector Manager or Remote correlation engine as non-root user, if installation is performed as a `root` user. However, non-root user can uninstall, if the installation is done by a non-root user.

   ---

2. Go to the following location:

   ```
   /opt/novell/sentinel/setup
   ```

3. Run the following command:

   ```
   ./uninstall-sentinel
   ```

   The script displays a warning that Collector Manager or Correlation Engine and all associated data will be completely removed.

4. Enter y to remove the Collector Manager or Correlation Engine.

   The script first stops the service and then removes it completely. However, the Collector Manager and Correlation Engine icon is still displayed in inactive state in the Web interface.

5. Perform the following additional steps to manually delete the Collector Manager and Correlation Engine in the Web interface:

   **Collector Manager:**

   1. Access *Event Source Management* > *Live View*.
   2. Right-click the Collector Manager you want to delete, then click *Delete*.

   **Correlation Engine:**

   1. Log in to the Sentinel Web interface as an administrator.
   2. Expand *Correlation*, then select the Correlation Engine that you want to delete.
   3. Click the *Delete* button (garbage can icon).

## C.3 Post-Uninstallation Tasks

Uninstalling the Sentinel server does not remove the Sentinel Administrator User from the operating system. You must manually remove that user.

After you uninstall Sentinel, certain systems settings remain.These settings should be removed before performing a “clean” installation of Sentinel, particularly if the Sentinel uninstallation encountered errors.

To manually clean up the Sentinel system settings:

1. Log in as `root`.
2. Ensure that all Sentinel processes are stopped.
3. Remove the contents of `/opt/novell/sentinel` or wherever the Sentinel software was installed.

4 Make sure no one is logged in as the Sentinel Administrator operating system user (novell by default), then remove the user, the home directory, and the group.

```
userdel -r novell
```

```
groupdel novell
```

5 Restart the operating system.