# Harness built-in automation to configure and manage Red Hat Enterprise Linux

## Executive summary

Red Hat® Enterprise Linux® provides a consistent and repeatable management experience by automating manual tasks, standardizing deployment at scale, and simplifying day-to-day administration with Red Hat Enterprise Linux System Roles.

This paper will discuss the complexity of configuring systems at scale and simplifying security and operations with Red Hat Enterprise Linux System Roles. Context will be given through a discussion of the power automation in today's IT environment. Then an explanation will be given on how Red Hat Enterprise Linux System Roles can assist organizations in implementing automation to accelerate their business.

## The power of automation

Today's businesses need to build IT environments that adapt quickly to rapidly evolving business requirements. Market changes demand applications that can be developed dynamically to ensure that customers' and end users' needs are met to optimize and innovate a business.

The underlying infrastructure that runs such applications must evolve to support such innovations. Organizations must be agile to implement new technology. Automation enables organizations to evolve quickly by reducing the amount of work required to build and maintain the underlying infrastructure that runs these applications.

Automation reduces deployment complexity by streamlining and standardizing the management and configuration of IT infrastructure.

‣ **Streamline –** Automation streamlines the management and configuration of IT infrastructure by reducing the time required to perform complex tasks to prepare hosts for operation. Rather than manually applying multistep settings to hosts, automation will perform them with far less work.

‣ **Standardize –** Automation standardizes the configuration of IT infrastructure by applying settings consistently, across entire environments of application hosts. Standardization can be difficult to enforce without automation since manual intervention is required to apply configurations and to periodically check that configurations have not drifted.

Implementing automation can result in drastically reduced time required to configure and maintain servers and hosts within an organization. Provisioning can be simplified and standardized with dramatically reduced effort. Finally, configuration changes can be implemented or remediated more quickly and on demand to large numbers of hosts.

Red Hat Enterprise Linux System Roles can play an effective part in automating an organization's IT infrastructure, creating the capacity to evolve the business to meet the demands of the market.

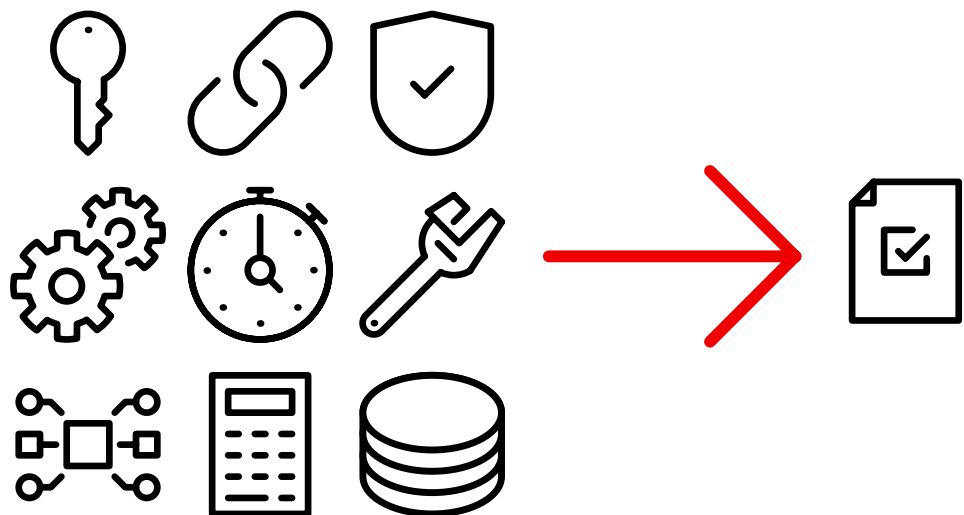## What are Red Hat Enterprise Linux System Roles?

Operating system configuration is a complex task that requires expertise from several areas of computing administration. Typical organizational and security requirements dictate configuration standards that are onerous to implement because there are often many manual steps required to reach the desired configuration.

| System Role(s) | Red Hat Enterprise Linux host | System Role(s) applied |
|---|---|---|
| | | **Desired configuration state** |
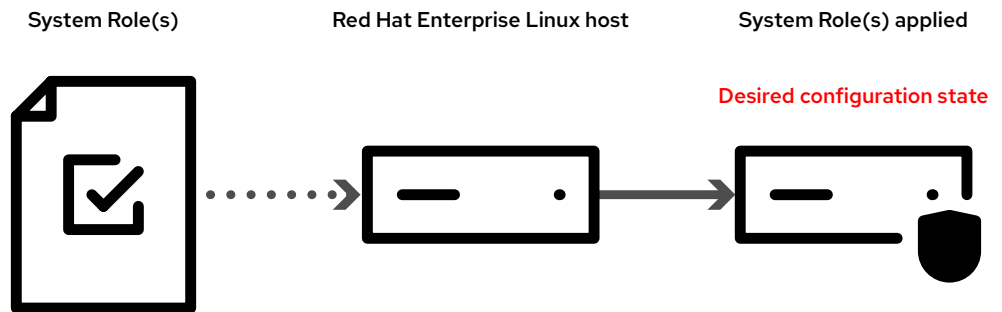


The complexity of configuration increases much faster as the quantity of hosts increases. Not only does the number of manual tasks increase, but the interaction of these hosts can also expose unforeseen second-order problems, often because of incompatibilities through varying versions of software. In other words, an error in the configuration of one host may manifest in another host somewhere else, making it difficult to find and resolve the problem.

Finally, system configuration is an evolutionary process. Changes in technology require configuration changes. New technologies may implement new standards, which can increase complexity and disrupt regular operation.

## The business value of System Roles

Red Hat Enterprise Linux System Roles reduce the effort required to implement complex configurations across all Red Hat Enterprise Linux hosts. They also support the detection of configuration changes and their remediation. Red Hat Enterprise Linux System Roles are authored and supported by Red Hat as part of the open source software ecosystem, using state-of-the-art open source technology. This ensures that an organization can manage its systems and implement changes with minimized risk. System Roles are designed to support Red Hat Enterprise Linux life cycles so that upgrades to newer versions of Red Hat Enterprise Linux will be compatible.

Three key types of System Roles are:

**Security –** Automate security workflows and maintain them over time, at scale, and with minimal resources. Use Red Hat Enterprise Linux System Roles to accelerate and simplify the deployment of many popular security capabilities such as SELinux, system-wide cryptographic policies, session recording, and more. Using System Roles can also help ensure consistency across your environment and help streamline how you meet governance and compliance requirements.

**Configuration –** Save time and streamline deployments by automating manual tasks that ensure a consistent administrative experience and scales across systems. Red Hat Enterprise Linux System Roles bring consistency to configuration management in an organization in on-premise and hybrid cloud environments. AWS, Azure, and GCP platforms are supported, among others. Organizations can also apply Red Hat Enterprise Linux System Roles in existing workflows with Red Hat Satellite or Red Hat Ansible® Automation Platform.

**Workloads –** Easily optimize the most popular workloads at the time of deployment and simplify ongoing administration by automating workload-specific tasks. Supported workloads with their own System Role include:

▸ Microsoft SQL Server – The configuration, installation, tuning, and securing of SQL Server workloads are greatly simplified by implementing configuration options that require deep domain knowledge of the operating system and the application. This includes package dependencies, kernel parameters, settings, and network-related options, among many others. The value to an organization is that application servers can be configured and deployed in less time and with greater consistency, leaving more time to innovate.

▸ SAP – Available as part of the Red Hat Enterprise Linux for SAP Solutions subscription, configure Red Hat Enterprise Linux systems according to the requirements as defined in SAP notes for SAP NetWeaver or SAP HANA®. In addition, these roles can be run in an assert mode to verify correct settings without performing any change. There is no simpler method available to ensure that your SAP systems are running on a correctly configured Linux system.

The complexity of managing IT resources increases as we must do more with the tools we already have. Automation reduces the effort needed to manage our IT resources. Red Hat Enterprise Linux System Roles can significantly reduce that effort and is already included in a Red Hat Enterprise Linux subscription.

## Use cases

The following example is presented to help explain a System Roles solution to a common IT problem.

Before installing any applications, a system may require specific features or services to ensure secure operation, with a high probability of resisting ransomware attacks. We describe such a configuration as a standard operating environment (SOE) that can be applied to all hosts within the organization.

| Service or feature | Description |
| --- | --- |
| SELinux | SELinux is a Linux security module that confines system services, user programs, files, network resources, etc., to prevent adverse interaction that could compromise the security of a host.[1] |
| System-wide cryptographic policy | Enforce cryptographic policies that specify algorithms, encryption strength, library, and software versions, among other items. |
| Network bound disk encryption (NBDE) | NBDE supports automatic unlocking when the authorized network is detected.[2] NBDE prevents unauthorized access to storage devices that have been removed from an authorized network. |
| Session recording | Allows the recording and playback of terminal sessions.[3] |
| Secure shell (SSH) | Secure shell for creating more secure remote terminal sessions. |
| Time synchronization | Time synchronization is critical for ensuring secure, time-limited encryption keys, among other essential features. |
| Performance monitoring | In general, troubleshooting performance problems is a complex task where a lack of resolution could lead to a host becoming unusable. Performance monitoring is a valuable tool for locating performance problems. |
| Certificate management | Manage TLS and SSL certificates. |

Many tasks and steps are required to configure and implement these open source security services in a SOE. Several of these services interact, creating dependencies that must be solved and configured to prevent conflict. Many of these services are not regularly used because they are complicated to implement, depriving the organization of benefitting from recommended security measures.

## How System Roles work

Red Hat Enterprise Linux System Roles automate the management and configuration of Red Hat Enterprise Linux systems in a repeatable process that dramatically reduces the effort required to maintain an open-source IT environment. Multiple System Roles can be applied to a single host for a customized SOE.

Red Hat Enterprise Linux System Roles provides these benefits:

▸ Ensures repeatable configuration and deployment across multiple Red Hat Enterprise Linux 7 and Red Hat Enterprise Linux 8 systems.

▸ Reduces technical burdens and streamlines daily administration with powerful automation.

▸ Minimizes manual tasks and executes them consistently across physical, virtual, private cloud, and public cloud environments.

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1  *"What is SELinux?" Red Hat, 02 Nov. 2021.*

2  *"Network bound disk encryption." FreeIPA, 02 Nov. 2021.*

3  *"Recording sessions." Red Hat, 02 Nov. 2021.*

▸ Scales with the Red Hat Smart Management and Ansible Automation Platform subscriptions.

▸ Included with every Red Hat Enterprise Linux subscription.

▸ Developed and supported by Red Hat, ensuring that recommended practices are implemented, tested, and maintained with each subsequent release of Red Hat Enterprise Linux.

Organizations can use System Roles in concert with Red Hat Satellite or Ansible Automation Platform to augment the deployment and management of systems. System Roles are based on Ansible technology, allowing it to extend configuration operations to many hosts, reuse the same configuration, and enable centralized reporting.

As previously mentioned, the goal is to configure a standard operating environment that contains these services and capabilities:

| Service or feature | Red Hat Enterprise Linux System Roles |
| --- | --- |
| SELinux | Manages SELinux modules, sets policies.[4] |
| Network bound disk encryption (NBDE) | nbde_client[5] – Configures Clevis-client to unlock encrypted volumes from a network Tang server. |
| System-wide cryptographic policy | crypto_policies[6] – Sets a system-wide cryptographic policy to ensure applications and libraries conform to a specified cryptographic standard. |
| Session recording | tlog[7] – Configures terminal session recording with the tlog package. |
| Time synchronization | timesync[8] – Enables time synchronization with NTP or Chrony packages. |
| Secure shell | sshd_server[9] – Configures SSH server. |
| Certificates | certificate[10] – Utilizes the certmonger application to manage certificates. |
| Performance monitoring | metrics[11] – Provides a consistent configuration interface to remotely configure performance analysis services, as well as sets up Grafana on a host. |

Red Hat Enterprise Linux System Roles include roles for each of these items, supporting simplified and automatic configuration. Once the hosts have been configured for the desired standard operating environment, the System Roles can be checked for configuration drift and automatically remediated.

4 *"Configuring SELinux using System Roles."* Red Hat, 02 Nov. 2021.

5 *"Using the nbde_client system role for setting up multiple Clevis clients."* Red Hat, 02 Nov. 2021.

6 *"Automating the implementation of system-wide crypto policies with RHEL System Roles."* Red Hat Blog, 02 Nov. 2021.

7 *"Configuring a system for session recording using the tlog RHEL system roles."* Red Hat, 02 Nov. 2021.

8 *"The timesync System Role."* Red Hat, 02 Nov. 2021.

9 *"Configuring secure communication with the SSH system roles."* Red Hat, 02 Nov. 2021.

10 *"Requesting certificates using RHEL system roles."* Red Hat, 02 Nov. 2021.

11 *"Monitoring performance using RHEL system roles."* Red Hat, 02 Nov. 2021.

# Red Hat Enterprise Linux

Red Hat Enterprise Linux System Roles reduce the task of configuring the SOE to a single job. Without System Roles, each component (NBDE, performance monitoring, SELinux, etc.) would require significantly more time and effort. Additionally, Red Hat Enterprise Linux System Roles make it easy to configure this SOE for multiple hosts simultaneously.

## Summary

Red Hat Enterprise Linux System Roles add value and functionality to your existing Red Hat products by automating complex configurations and applying them across your entire Red Hat Enterprise Linux system environment. Using System Roles saves significant time by reducing configuration tasks while standardizing the configuration. Several Red Hat Enterprise Linux System Roles are available and ready to apply to configure security services, application workloads, and hardware and are already included in standard Red Hat Enterprise Linux subscriptions.

## Get started

For more information, visit:

| Link | Description |
| --- | --- |
| Introduction to Red Hat Enterprise Linux System Roles – blog | Technical introduction and how-to on implementing Red Hat Enterprise Linux System Roles. |
| Red Hat Enterprise Linux System Roles – blog series | A landing page for a complete list of blog entries on Red Hat Enterprise Linux System Roles. |
| Getting Started with Red Hat Enterprise Linux System Roles – documentation | Red Hat documentation on Red Hat Enterprise Linux System Roles. |
| Live lab for trying Red Hat Enterprise Linux System Roles | Live lab environment for trying Red Hat Enterprise Linux System Roles. |
| Full list of Red Hat Enterprise Linux System Roles | Full list of Red Hat Enterprise Linux System Roles. |

## About Red Hat

Red Hat is the world's leading provider of enterprise open source software solutions, using a community-powered approach to deliver reliable and high-performing Linux, hybrid cloud, container, and Kubernetes technologies. Red Hat helps customers develop cloud-native applications, integrate existing and new IT applications, and automate and manage complex environments. A trusted adviser to the Fortune 500, Red Hat provides award-winning support, training, and consulting services that bring the benefits of open innovation to any industry. Red Hat is a connective hub in a global network of enterprises, partners, and communities, helping organizations grow, transform, and prepare for the digital future.

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