Zero touch provisioning and automation

Hands-off deployment powered by Red Hat software platforms

> "Vodafone Idea has automated IT infrastructure and operations end-to-end by adopting Ansible Automation Platform. Adopting Ansible Automation Platform has helped in reducing cost and improving operational efficiency with increased user productivity and faster go-to-market."[1]

Jagbir Singh
Chief Technology Officer,
Vodafone Idea Limited

Lowering operational expenses (OpEx) by automating repetitive, manual, and error-prone processes is essential to service providers remaining competitive and profitable. Achieving this in the context of radio access networks (RANs) is more important than ever. As RANs become more complex and decentralized, service providers need to find innovative ways to significantly lower operational costs.

Conventional methods of network operations create technical debt due to the high levels of human intervention required and introduce human error and limit staff time available for activities that have the biggest impact on service provider revenue. To overcome these challenges, service providers are looking at increasing operational efficiency by reducing manual processes and handoffs between teams to lower OpEx and bring new services to market faster.

Automation is essential for operational and business success

Expanding the level of automation is critical in accelerating time to market for new services, reducing OpEx, and increasing revenue. Automation is also key in managing, changing, and adapting network infrastructure at scale because it accelerates and simplifies deployment and management. This is especially true for RANs.

A key challenge service providers face as they digitally transform their value chains and deploy 5G networks is integrating existing and new automation tools. Existing tools can lack the capabilities to support modern operational approaches—including declarative models like configuration as code (CaC) and infrastructure as code (IaC)—and they may not be capable of using innovations, such as event-driven automation. As a result, service providers of all sizes are looking for ways to extend automation implementations beyond the isolated task-based systems and disparate initiatives that often exist today.

Open RAN and virtualized RAN are going to push the density of the RAN to the point where traditional operations practices will be unable to maintain service levels, OpEx budgetary limits, and other key performance indicators (KPIs). Automated provisioning allows service providers to expeditiously deploy and operate large-scale networks with higher quality of service (QoS) by eliminating a considerable amount of manual intervention.

Business impact of current task-based automation solutions

Task-based automation can create islands of automation that result in reduced inertia, rising OpEx, workflow fragmentation, regulatory compliance issues, and potential damage to a service provider's brand reputation. Unlocking the full value of automation to surmount these barriers relies upon automating workflows across a service provider's business, operational processes, and domains. It will relieve pressure on margins within the highly competitive and capital-intensive telecommunications (telco) marketplace. Successful task-based automation requires a holistic approach with a unified platform and tool suite.

1 *Red Hat success story. "Vodafone Idea Limited automates to improve IT infrastructure," accessed April 2023.*

Red Hat's approach: A unified, intuitive automation platform

Automating the deployment and management of a service provider's network infrastructure and migrating to a GitOps operating model can facilitate the necessary change to tackle these challenges by:

▸ Integrating different automation tools within confined domains and streamlining processes across tools that help bridge workflows.

▸ Establishing consistent governance of processes, products, and technologies.

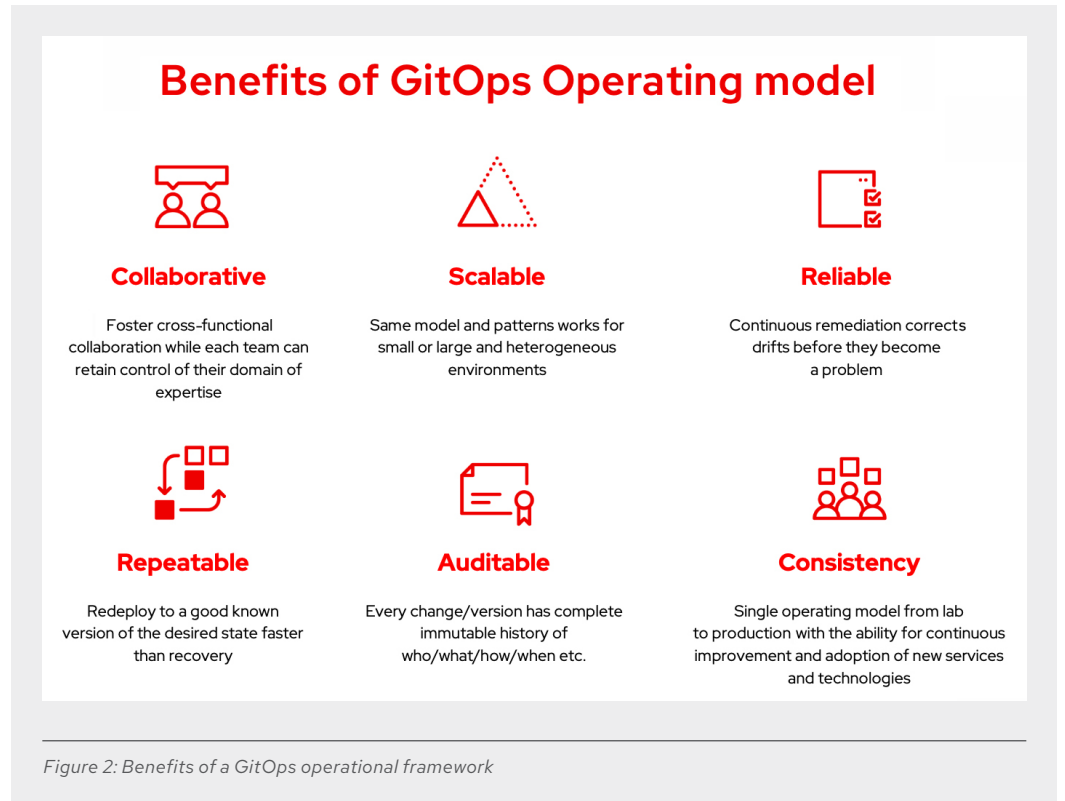**Migrating development and operations (DevOps) to a unified operating model**

GitOps is an operational framework for implementing the continuous deployment part of continuous integration and continuous delivery (CI/CD) for cloud-native applications and is built on DevOps best practices with an emphasis on automating deployment and Day 2 operations.

Figure 1: A GitOps operational framework
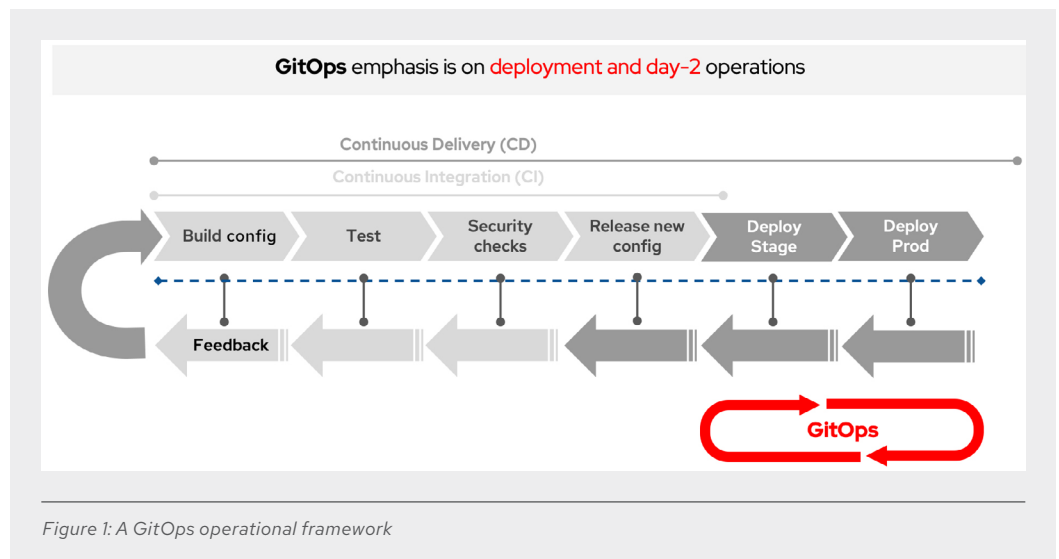
The GitOps framework is based on 4 key principles.

▸ **Declarative.** A system is managed by having its desired state made known, or expressed declaratively.

▸ **Versioned and immutable.** The desired state is stored as an unchanging or immutable versioned artifact and retains complete history.

▸ **Pulled automatically.** A software agent automatically pulls the desired state declaration from a defined repository or single source.

▸ **Continuously reconciled.** The system continuously observes the actual system state and remediates toward the desired state.

With a GitOps framework, service providers can deploy and maintain the RAN faster and more frequently and quickly recover from faults.

Benefits of GitOps Operating model

Collaborative

Foster cross-functional collaboration while each team can retain control of their domain of expertise

Scalable

Same model and patterns works for small or large and heterogeneous environments

Reliable

Continuous remediation corrects drifts before they become a problem

Repeatable

Redeploy to a good known version of the desired state faster than recovery

Auditable

Every change/version has complete immutable history of who/what/how/when etc.

Consistency

Single operating model from lab to production with the ability for continuous improvement and adoption of new services and technologies

Figure 2: Benefits of a GitOps operational framework

Zero touch provisioning

Zero touch provisioning (ZTP) is a modern telecommunications practice that service providers can adopt to increase the level of automation, consistency, and reliability within their network. When used with other automation practices like IaC, development, security and operations (DevSecOps), GitOps, and pipelines, ZTP is suitable for the life cycle management (LCM) of service provider infrastructure that includes the RAN, along with the platform's software components.

ZTP uses a unified and intuitive approach to consistently automate IT operations across a service provider's network infrastructure. Its prime objective is to increase the frequency and reliability of infrastructure and platform deployments. This lets service providers accelerate adoption of new applications and features to meet changing business and operational requirements. ZTP also frees up staff and reduces human errors by eliminating manual configuration efforts, downtime, and travel time to physical sites.

ZTP and other automation practices and methodologies are key in managing change and adapting network infrastructure at scale. ZTP manages policy enforcement to provide a security-focused and stable foundation for end-to-end automation. ZTP allows service providers to deploy and operate large-scale RAN networks and network upgrades in less time by eliminating a considerable amount of manual intervention. ZTP can be performed at scale much more rapidly than manual provisioning—which is key to building a security-focused and compliant network infrastructure.

ZTP gives service providers key capabilities, such as:

▸ **Increased governance** of features based on the needs of IT, DevOps, security, and network operations teams.

▸ **Maximized return on investment (ROI)** through a holistic automation strategy that draws additional value from existing automation investments by integrating them into automated, cross-domain workflows.

▸ **Significant operational benefits** across operational teams that include process efficiencies, accelerated cycle times, cost reduction, better team collaboration, consistent regulatory and security compliance, increased DevOps agility and execution, faster decision-making, improved control, and service transparency.

▸ **Comprehensive life cycle management** that provides more frequent, reliable deployment and upgrades of infrastructure and platforms by checking that software adheres to relevant policies.

Zero touch provisioning for RAN deployment

RANs are complex, geographically distributed, and can typically scale to over a thousand nodes in a region. Hundreds of configuration parameters are required to successfully deploy nodes. Some parameters are common to all nodes, some are applicable to groups of nodes, and others are site-specific. This variability can quickly escalate into an n factorial problem (hundreds of parameters, thousands of nodes, hundreds of files).

Red Hat® platforms give service providers the right size and capabilities to deploy and operate their RAN at scale. Achieving hands-off deployment involves defining IaC, storing all configuration data in a Git repository, and taking advantage of the power, reliability, and consistency contained in a broad, proven set of automation tools from Red Hat.
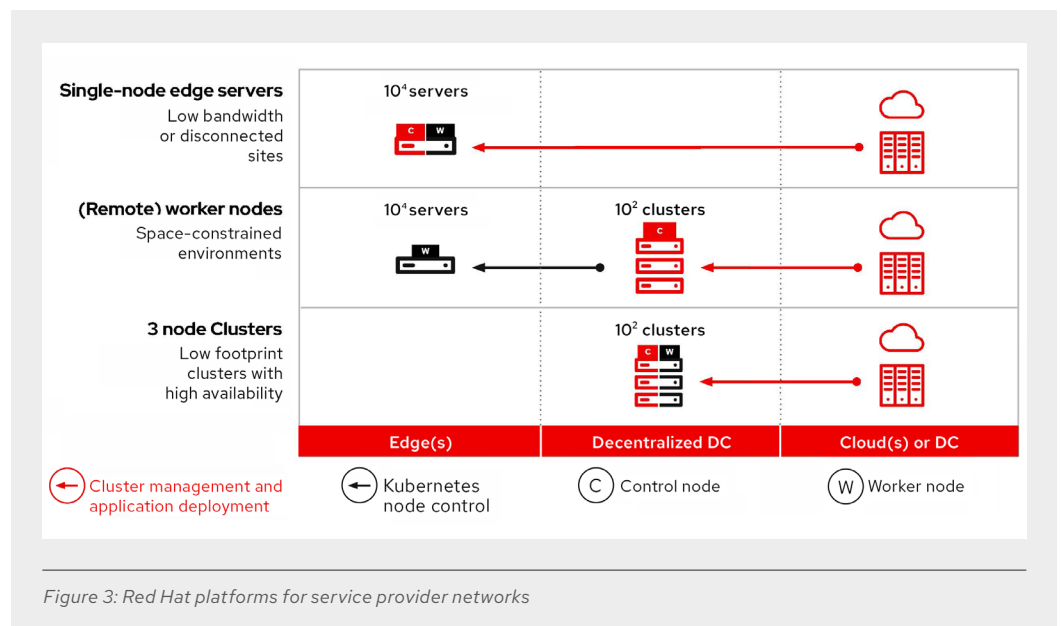

Figure 3: Red Hat platforms for service provider networks

![Red Hat logo](Red Hat)

With a single click, zero touch upgrades are initiated to select common, cluster, or site-specific upgrade policies from the Git repository. Red Hat OpenShift® GitOps then synchronizes the policy to Red Hat Advanced Cluster Management for Kubernetes.

Service provider automation

Red Hat supports the rapid deployment of service provider infrastructure by maximizing cloud technologies to bridge the gap between physical radios and the datacenter. New RAN models defined by the 3rd Generation Partnership Project (3GPP) and the Open RAN Alliance (O-RAN) look to use Kubernetes at the edge, in centralized and decentralized datacenters, and in the cloud. Red Hat OpenShift helps accelerate these new technology deployments with a focus on zero touch provisioning.

Powered by open source, Red Hat software platforms can be deployed at the network edge, loaded with a signed and security-hardened software stack, configured with the appropriate tuning for performance, and implemented with site-specific data applied using cloud-native methodologies and a GitOps framework. All of this is achieved without any human intervention across thousands of nodes.

Red Hat platforms, tools, and capabilities for zero touch provisioning

The full strength of ZTP is made possible by multiple products from Red Hat and their partners.

▸ **Red Hat OpenShift Container Platform** provides simplified workflows to optimize a service provider's operational models and reduce total cost of ownership (TCO). When service providers deploy using Red Hat OpenShift, they get a consistent telco-grade foundation for managing hybrid cloud and multicloud deployments.

▸ **Red Hat OpenShift Pipelines** is a Kubernetes-native CI/CD solution based on Tekton that provides a consistent CI/CD experience through tight integration with Red Hat OpenShift and Red Hat developer tools. Red Hat OpenShift Pipelines reduces operational risk and increases developer productivity using built-in controls for security and policy enforcement across the entire software development cycle with Red Hat Advanced Cluster Security for Kubernetes.

▸ **Red Hat Ansible® Automation Platform** provides the key capabilities service providers need to build, deploy, and manage RAN automation at scale, increase velocity, improve security and compliance, and significantly reduce OpEx. Red Hat Ansible Automation Platform is also supported by a rich ecosystem of technology partners that decreases the complexity of integrating it into a service provider's IT, network, and edge environments, reducing the need to develop custom integrations.

▸ **Red Hat's ecosystem** of supported RAN providers with solutions certified to run on Red Hat OpenShift and Red Hat Advanced Cluster Management provides a flexible and adaptable solution to all of these challenges.

Sidebar:

Organizations using Red Hat OpenShift achieved:

- 20% higher DevOps and development team productivity.

- 29% faster application development cycles.

- Almost 3 times more new features.[2]

Organizations using Red Hat Ansible Automation Platform achieved:

- 29% more efficient network infrastructure management.

- 30% more efficient IT infrastructure management.[3]

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2 *IDC White Paper, sponsored by Red Hat. "The Business Value of Red Hat OpenShift." Document #US48678022, March 2021.*

3 *IDC White Paper, sponsored by Red Hat. "The Business Value of Red Hat Ansible Automation Platform." Document #US47539121, October 2021.*

Why Red Hat

Red Hat provides fully featured, production-grade platforms with dependable release cadences, documentation, training, and committed life cycles. Red Hat gives service providers instant access to a partner ecosystem of more than 5,000 certified hardware vendors, more than 4,500 certified software vendors, and more than 140 certified cloud providers to ensure the platform works in a wide variety of environments.

With Red Hat software platforms, service providers can automate their IT and network infrastructure to optimize their operational model and reduce TCO with confidence now and in the future.

Learn more about how Red Hat can help you automate routine tasks to boost productivity, strengthen security, and reduce delivery times.[4]

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4 *Red Hat telecommunications solutions. accessed April 2023, https://www.redhat.com/en/solutions/telecommunications.*

About Red Hat

Red Hat helps customers standardize across environments, develop cloud-native applications, and integrate, automate, secure, and manage complex environments with award-winning support, training, and consulting services.