Communications Software
and Network Solutions

ribbon

Cloud-Native SBCs for Communications Service Providers

Achieve Cloud Velocity, Elasticity, and Economics

White Paper

Executive Overview

Communications service providers (CSPs) are migrating applications and services to the cloud and using DevOps practices and CI/CD (continuous integration and delivery/deployment) tools to accelerate the pace of innovation and improve business performance. Many are pursuing microservices architectures and introducing container technology to optimize costs and agility. Containers are standardized, lightweight software building blocks that help organizations develop, deploy, and scale cloud-native applications and services more quickly and cost-effectively.

Leading communications vendors now offer cloud-native versions of network elements that are deployed in containers using automated processes, enabling CSPs to take full advantage of cloud speed, elasticity, and cost efficiencies. Cloud-native session border controllers (SBCs), for example, bring all the benefits of modern microservices architectures and containerized applications to the world of real-time IP communications. They help CSPs accelerate service delivery, optimize margins, and streamline operations. CSPs can install, scale, and maintain cloud-native SBCs using the same familiar CI/CD tools and DevOps practices they use to manage other cloud workloads.

This paper provides a brief introduction to microservices architectures, containers, and DevOps, and explains how cloud-native SBCs can help CSPs achieve cloud velocity, elasticity, and economies for real-time communications.

Containers Take Virtualization to the Next Level

Many CSPs have implemented software-based and virtualized network elements over the years to reduce costs, accelerate service agility, and simplify operations. Some of the world's largest service providers have embraced software-defined networking (SDN) and network functions virtualization (NFV) technology, and adopted server virtualization solutions like VMware vSphere to increase service velocity and better align expenses with capacity requirements.

Many CSPs are now preparing for the next stage in the virtualization journey, turning to container orchestration platforms like Kubernetes to improve service velocity, elasticity, and economics even further. Containers are lightweight software building blocks that make it easier to build, implement, and scale cloud-native applications. A container includes an application and all its dependencies—binaries, libraries, configuration files, etc. Unlike a traditional virtual machine (VM), a container does not require a full virtualized guest OS for each app, which helps eliminate overhead, reduce processor and memory requirements, and minimize recurring cloud-compute expenses. (See Figure 1).

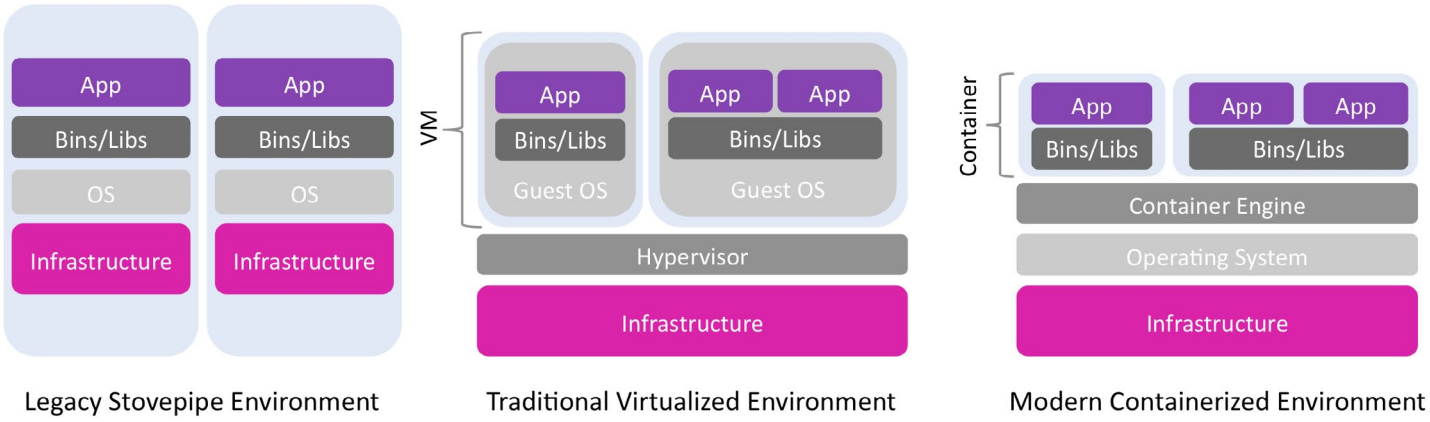

Figure 1. Lightweight Containers Boost Economics, Agility, and Scalability

Containerized apps are self-contained and are simpler to port, maintain, evolve, and scale than traditional virtualized applications. They also offer better performance by avoiding the memory and CPU overhead associated with VM emulation when deployed on bare-metal servers.

Kubernetes – The Cloud-Native Orchestrator

Kubernetes (often abbreviated K8s) is a popular open-source platform for managing containerized workloads, supported by leading private/hybrid cloud platforms like Red Hat OpenShift and leading public cloud providers like AWS, Microsoft Azure, and Google Cloud Platform.

Kubernetes enables operations teams to automatically deploy, scale, update, and remove containers across distributed, heterogeneous implementations. As shown in Figure 2, Kubernetes architectural elements include:

- **Master Node:** A VM or bare-metal server running Kubernetes management/controller software.
- **Worker Node:** A VM or bare-metal server that is managed by Kubernetes and executes containerized workloads.
- **Container:** A lightweight, standalone, executable software package that includes application code and all of its dependencies.
- **Pod:** A collection of one or more co-located containers with shared storage and network resources. (By way of analogy, think of a pod as a peapod, and the containers as the peas.) A pod is the smallest deployable unit of computing in Kubernetes.
- **Cluster:** A virtual pool of worker nodes.

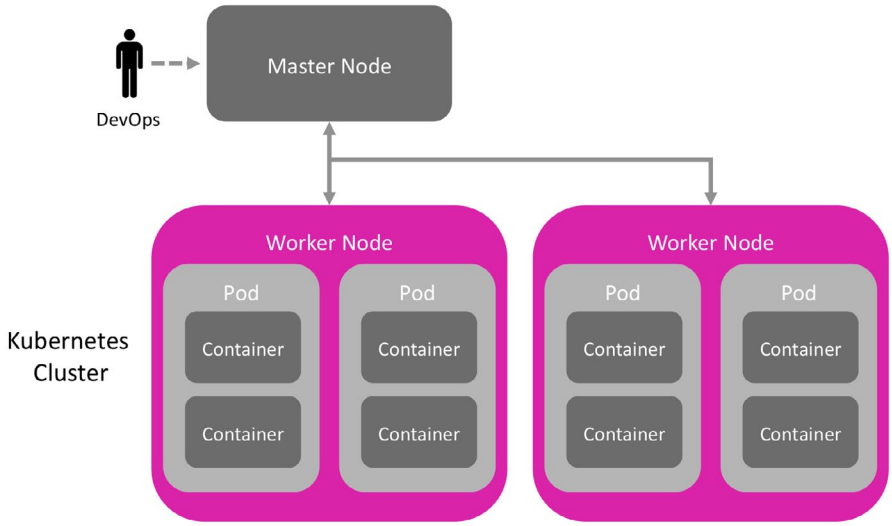

Figure 2. Kubernetes Architectural Elements

Containers are Ideal for Microservices Architectures

Containers are the perfect fit for today's cloud-native applications and microservices architectures. Many CSPs are migrating infrastructure and applications to the cloud. Leading communications vendors are adopting microservices architectures ensure their CSP customers can optimize service agility, scalability, and availability. Unlike with a traditional monolithic application architecture, a microservices approach decomposes a network element or software application into a number of small, discrete processes that perform specific tasks for greater efficiency and economics. Microservices communicate with each other and with external applications via open and well-documented APIs. (See Figure 3).

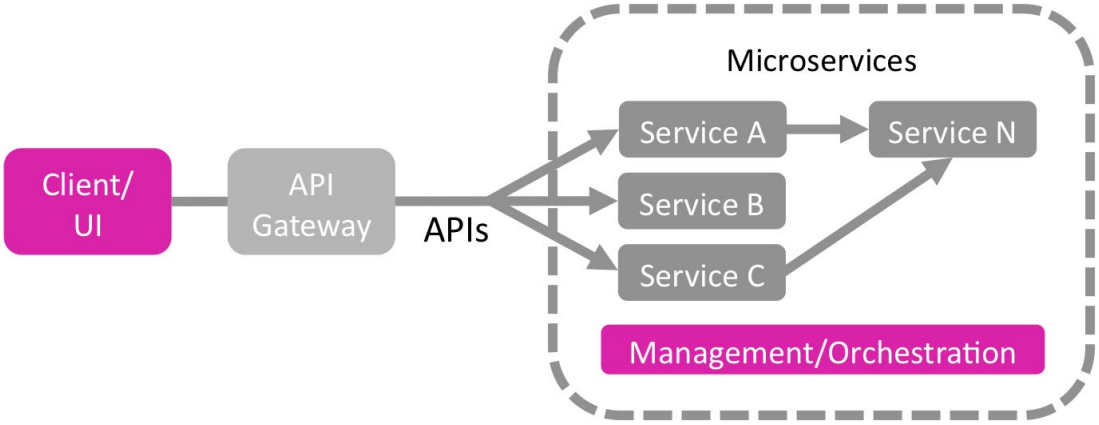

Figure 3. Microservices Architecture for Cloud-Native Apps

Microservices architectures reduce operating expenses by making more efficient use of cloud resources and improve service agility by decoupling functional components. With a microservices approach, CSPs can deploy and spawn functional components independently resulting in greater flexibility, resiliency, and speed. They can spin components up and down on-demand to enable elastic scaling, continuous availability, load-balancing, and non-disruptive software upgrades.

Extending Microservices Benefits to SBCs

Communications vendors can now offer cloud-native versions of network elements like SBCs for ultimate efficiency and ease of deployment. Ideal for CSPs pursing cloud-native strategies, cloud-native SBCs bring advantages to the realm of real-time IP communications. Cloud-native SBCs represent the next phase in the logical evolution of the session border controller. (See Figure 4.)

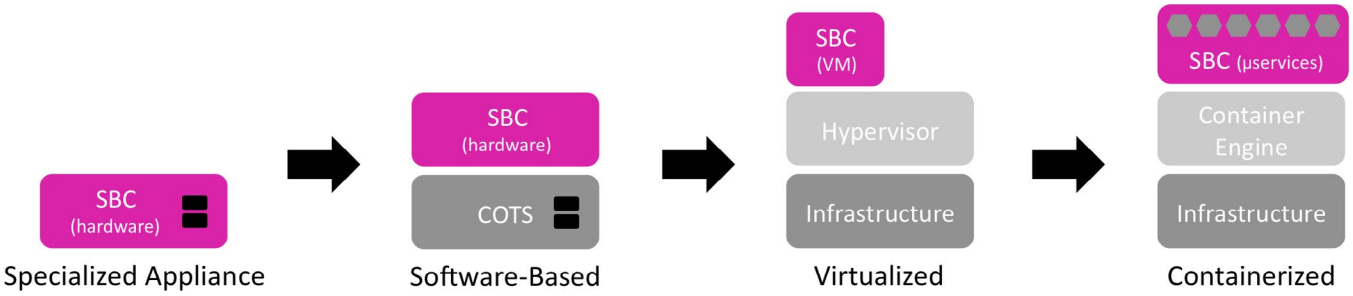

Figure 4. The Evolution of the Session Border Controller

With a containerized approach, the SBC is decomposed into discrete functional components running in distinct Kubernetes pods in a microservices architecture, as shown in Figure 5. CSPs can spin up and tear down SBC worker pods in a Kubernetes environment in real-time to address fluctuating capacity requirements and to ensure continuous availability.

Redundant load balancers distribute traffic across SBC worker pods to optimize performance. And operations, administration and management (OAM) containers provide REST APIs for external management platforms, service orchestration solutions, and automation tools.

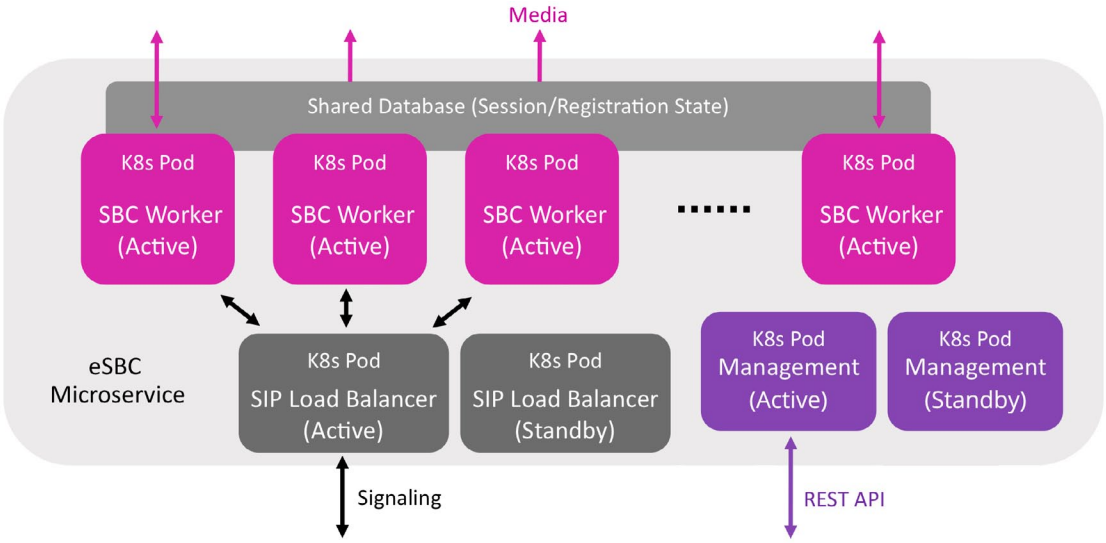

Figure 5. A Containerized, Cloud-Native SBC in a Microservices Architecture

Containerized SBCs are ideal for today's agile development and delivery organizations. Many CSPs are employing DevOps methodologies and using CI/CD tools to accelerate time-to-market for cloud-native applications and services. CSPs can deploy and manage containerized SBCs just like any other cloud-native application using their existing CI/CD tools and practices.

A Brief Introduction to DevOps and CI/CD

DevOps is a set of philosophies and practices that attempts to bridge the traditional gap between application development (Dev) organizations and IT operations (Ops) teams. DevOps combines software development, test, and IT operations processes, improving coordination and collaboration across the application lifecycle. Development and operations teams work hand-and-hand throughout the DevOps continuum, helping maintain alignment, increase velocity, and optimize quality.

By "shifting test left" in the software development lifecycle, DevOps helps development organizations improve product quality and avoid rework and schedule delays. And by automating software builds, releases, and handoffs, DevOps helps IT organizations streamline software installations, patches, and upgrades.

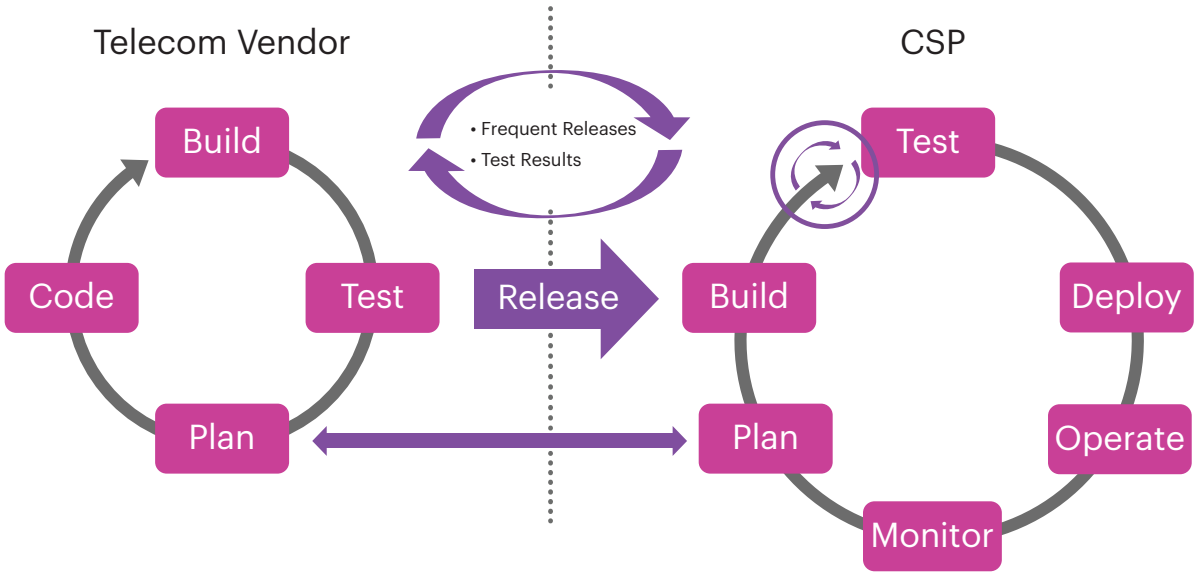

Figure 6. The DevOps Continuum between Vendors and CSPs

In a CSP DevOps use case, the communications vendor takes on the role of Dev (developing, testing, and delivering software) and the CSP takes on the role of Ops (validating, deploying, and operating releases in production).

Communications vendors release generic, platform-agnostic software to their CSP customers. CSPs build and test the software in their own environments prior to deployment. They often identify issues that must be resolved before a release is put into production. CSPs typically work closely with vendors to communicate issues and coordinate plans.

Using agile software development methods, container orchestration solutions, and CI/CD tools, vendors can quickly turn around software updates to address CSP feedback and remedy issues. The DevOps approach helps CSPs accelerate time-to-market for new features, services, and fixes.

Some of the tools used in the Dev/Ops process that are applicable are:

- **Container orchestration tools** (e.g., Kubernetes) for automating containers and microservices.
- **Configuration management tools** (e.g., Ansible, Puppet, Chef) for provisioning infrastructure.
- **CI/CD tools** (e.g., Jenkins, GitLab, CloudBees) for automating lifecycle management.

Cloud-Native SBCs Automate Operations, Optimize Costs, and Increase Agility

Cloud-native SBCs help CSPs simplify operations and improve service agility, scalability, resiliency, and economics.

Easy turn-up and administration

CSPs can deploy and manage cloud-native SBCs using the same familiar tools they use to manage other cloud infrastructure and workloads including container orchestration platforms like Kubernetes and OpenShift; configuration management solutions like Ansible, Terraform, Puppet, and Chef; and CI/CD tools like Jenkins, GitLab, and CloudBees. The approach helps CSPs eliminate the need for special product expertise and training, remove technology adoption barriers, and accelerate time-to-value.

Platform independence

Containers are lightweight, standalone software-packages that can run in any operating environment. CSPs can deploy containerized SBCs on private clouds (using Kubernetes and OpenShift) as well as on public cloud platforms (AWS, Microsoft Azure, Google Cloud Platform) for ultimate flexibility. Containerized SBCs help CSPs increase choice, avoid lock-in, and support hybrid cloud and multi-cloud initiatives.

Microservices scalability, agility, and resiliency

Cloud-native SBCs deliver all the benefits of a microservices architecture, including:

- **Independent scaling** - scale media, signaling, or other functions independently to avoid overprovisioning capacity and to tightly align recurring operating expenses with usage requirements.
- **Autoscaling** - spin-up/spin-down SBC components on-demand for dynamic scaling or burst capacity.
- **Fast restart** – rapidly re-initiate SBC components for fault recovery or software upgrades.
- **Load balancing** – distribute traffic across SBC pods to optimize performance and resiliency.
- **High availability** – implement redundant load balancers and other critical components to ensure continuous service.
- **Canary upgrades/rollbacks** – upgrade SBC components in a staggered fashion to avoid service disruption. or performance degradation. Validate SBC software upgrades on a controlled group before putting them into full production. (See Figure 7).

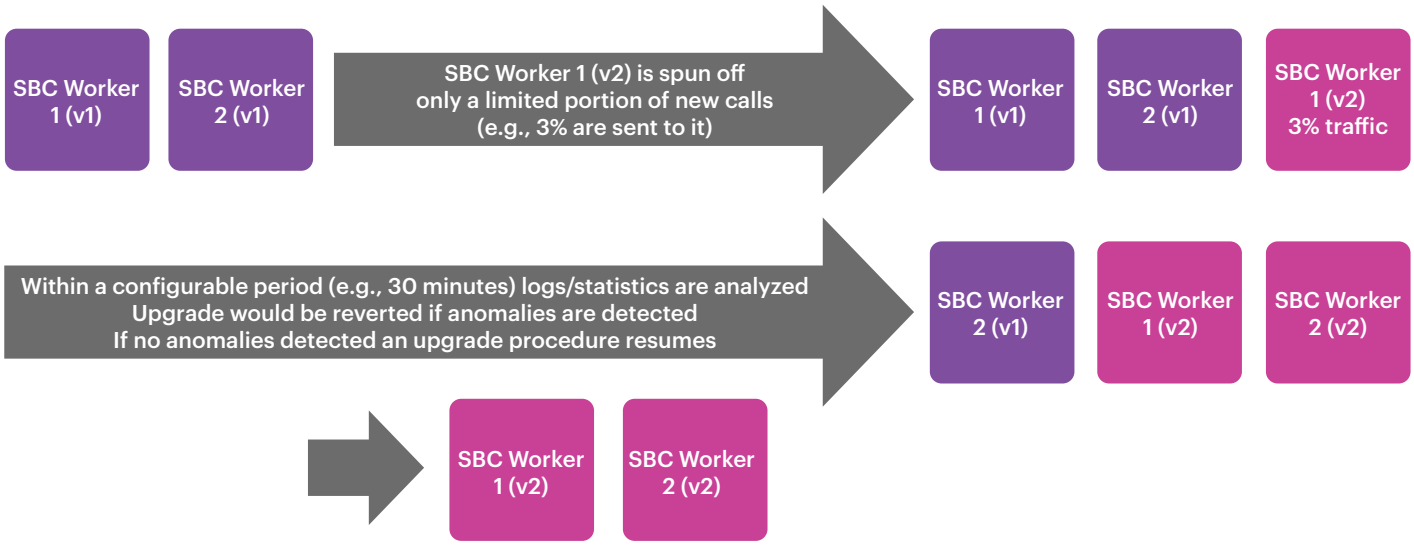

Figure 7. Canary Upgrades: Controlled Upgrade Process Based on Success Criteria

Continuous product improvement and innovation

A microservices architecture makes it fast and easy for SBC vendors to develop and deliver new product features, fixes, and capabilities. Vendors can take full advantage of DevOps methodologies and CI/CD automation tools to streamline development, accelerate time-to-market, and improve software quality.

SBC Use Cases

CSPs use session border controllers to protect and control real-time IP communications network borders. SBCs help CSPs optimize security, service quality, and availability for a wide variety of use cases including network-network interconnection, SIP trunking, unified communications and collaboration (UCC), VoLTE, VoWiFi, and rich communication services (RCS). CSPs can reduce infrastructure cost and complexity, and improve agility by implementing containerized SBCs in the cloud.

Figure 8. Session Border Controllers in a CSP Network

Best-of-breed SBCs provide:

- **Security capabilities** - media/signaling encryption, distributed denial of service (DDoS) prevention, etc.
- **Quality of Service (QoS) controls** – bandwidth management, call admission controls (CAC) etc.
- **Normalization functions** – codec translation, multivendor protocol interworking, DTMF signaling, etc.

Ribbon Cloud-Native SBCs Deliver Cloud Velocity, Elasticity, and Economics

Ribbon is one of the first vendors to offer a containerized session border controller. The product can be deployed on private clouds (using Kubernetes and OpenShift) as well as on public cloud platforms (AWS, GCP, and Azure) and can be managed using existing CI/CD tools and DevOps practices. (See Figure 9).

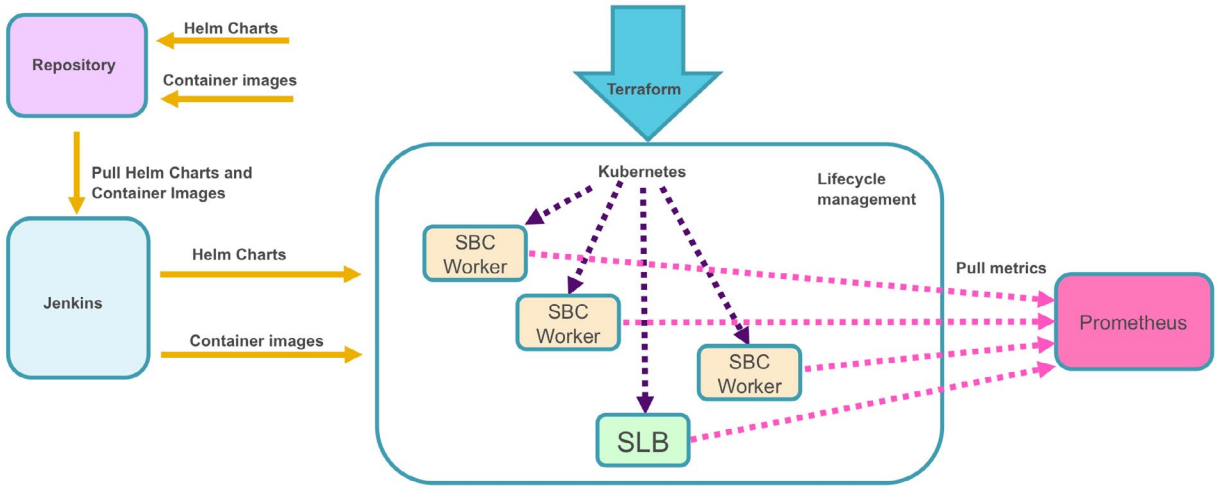

Figure 9. CSPs can Manage Ribbon's Cloud-Native SBC Using Existing CI/CD Tools and DevOps Practices

Ribbon's cloud-native SBC helps CSPs take the next step in their cloud-native journey, while protecting and extending previous investments. With container platforms like OpenShift, CSPs can run cloud-native network functions alongside virtualized network functions to avoid disruptive rip-and-replace migrations.[1]

Ribbon's cloud-native SBC delivers all the benefits of microservices architectures, containers, and DevOps to real-time IP communications, including:

- **Optimal economics and agility** - independent scaling and autoscaling to optimize resource utilization and eliminate overprovisioning; minimize recurring cloud compute costs; and tightly align ongoing operations expenses with dynamic business requirements and capacity demands.
- **Easy deployment and administration** - operations teams can deploy, administer, scale, and maintain Ribbon cloud-native SBCs just like any other containerized workloads, using standard orchestration solutions and management tools.
- **Superior reliability, availability, and serviceability** - redundant components, load balancing functionality, and non-disruptive upgrades provide high availability.

Ribbon's cloud-native SBC provides a rich set of security features, bandwidth and service quality optimization capabilities, and multivendor interworking functions to help safeguard communications, improve user experiences, accelerate time-to-value, and contain OpEx. The product supports a variety of applications including network-network interconnection, SIP trunking, UCC, VoLTE, VoWiFi, and RCS use cases.

Implementing a cloud-native, real-time IP communications solution is a complex undertaking requiring special skills and significant investments. Many vendors lack the knowledge and wherewithal to pull it off. With more than a thousand customers around the globe and 20 years of experience transforming and securing networks, Ribbon has the expertise and financial means to succeed.

[1]OpenShift Virtualization lets you develop, manage, and deploy VMs side-by-side with containers in a single platform.

Summary – Cloud-Native SBCs Boost Business Results

CSPs are moving applications to the cloud and adopting containers and microservices architectures to improve business agility, optimize costs, and streamline operations. Cloud-native SBCs deliver all the benefits of containers and microservices to the world of real-time IP communications.

The next stage in the evolution of the session border controller, containerized SBCs help CSPs reduce TCO, accelerate service delivery, and automate operations. They help CSPs improve margins and closely align upfront investments and ongoing expenses with fluctuating capacity demands and evolving business requirements.

To learn how Ribbon containerized SBCs can help your company achieve cloud speed, elasticity, and economics contact Ribbon today.

About Ribbon

Ribbon Communications (Nasdaq: RBBN) delivers communications software, IP and optical networking solutions to service providers, enterprises and critical infrastructure sectors globally. We engage deeply with our customers, helping them modernize their networks for improved competitive positioning and business outcomes in today's smart, always-on and data-hungry world. Our innovative, end-to-end solutions portfolio delivers unparalleled scale, performance, and agility, including core to edge software-centric solutions, cloud-native offers, leading-edge security and analytics tools, along with IP and optical networking solutions for 5G.