# Multiprotocol solution helps service providers transition to 5G

### 5G deployment goals

Deploying 5G infrastructure will be service providers' most transformative technology transition to date, unlocking opportunities for new application and solution delivery across all industries.

### F5 has a long history of helping wireless carriers deliver their applications

As today's carriers transition to 5G technology, F5 offers a unique solution—including ingress and egress signaling control, security capabilities, and visibility—for supporting containerized infrastructures. The multiprotocol F5 solution integrates 4G protocols with a Kubernetes 5G core. This integration allows service providers transitioning to 5G to reduce risk by maintaining existing 4G services, customers, and billing systems.

### Red Hat OpenShift is the platform for 5G transformation

Red Hat® OpenShift® is a unified, security-focused hybrid cloud application platform for innovation.

Powered by Kubernetes, it provides a foundation for modernizing existing applications, building cloud-native applications, streamlining development, adding intelligence to applications, and integrating third-party services. Red Hat OpenShift runs consistently across telecommunications (telco) service provider cloud and multicloud environments, giving organizations the capabilities needed for a successful transition to a 5G core.

The Red Hat and F5 partnership is deeply rooted in our shared commitment of co-innovation, uniting products and platforms to deliver validated and supported joint solutions that help customers digitally transform their businesses and achieve their desired business outcomes.

Together, Red Hat and F5 solutions help businesses:

- Modernize mobile network infrastructure and network functions architectures.
- Automate the carrier mobile network and streamline operational processes.
- Integrate products and technologies as solutions for telco cloud and multicloud environments.
- Improve business outcomes with increased agility, consistency, and service continuity.

### Solution overview

Moving to a cloud-native 5G core is a significant architectural shift. It is paramount that telco operators maintain forward compatibility from 4G to 5G core applications. F5 delivers this interoperability alongside control, security, and visibility across the entire cloud-native infrastructure.

Each improvement to a telco architecture is a step forward. New 5G architectures improve functionality and increase flexibility through open source innovation. Building the right network infrastructure is a complex and challenging process. Without the right platform and network infrastructure solutions, Telco operators risk falling behind their competition.

The F5 solution for 5G architectures includes two primary components:

- **BIG-IP Next Service Proxy for Kubernetes (BIG-IP SPK):** The gateway for the ingress and egress traffic of the cloud-native platform. It provides load balancing, traffic management, and security, and also enables pre-5G interoperability internally or externally to the platform.
- **Carrier-Grade Aspen Mesh (CGAM):** An Istio-based service mesh for handling traffic within the platform with additional features oriented to service providers including lawful intercept compliance.

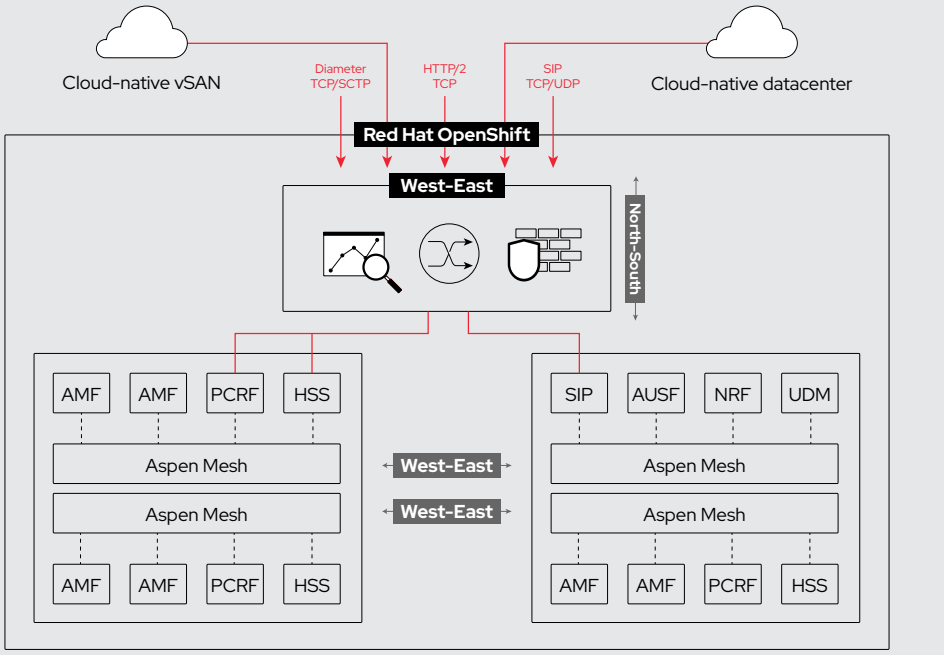


*Figure 1: F5 SPK and Carrier-Grade Aspen Mesh deployment*

The Red Hat OpenShift platform enables traditional 4G and modern 5G telco applications in the same platform:

- Provides an extensive catalog of validated 5G cloud-native network functions (CNFs) from the partner ecosystem.
- Allows 5G and 4G networking functions to co-exist in the same platform. The 4G network functions, implemented as virtual machines, can take advantage of Red Hat OpenShift Virtualization for running virtual machine (VM)-based networking functions (VNFs) in the same platform.

### 5G goals

Deploying 5G infrastructure will be service providers' most transformative technology transition to date, unlocking new opportunities and new application and solution delivery across all industries. Providers' primary goals during this transition include:

- **Fast deployment:** Cloud-native functions and applications can be quickly deployed, independently scaled, and easily upgraded.
- **Greater efficiency:** Cloud-native applications utilize up to 40% fewer resources compared to virtual, machine-based counterparts.
- **Reduced operational cost:** Providers can program and automate operations across far edge, multiaccess edge (MEC), and in the core of the network using Kubernetes orchestration as the common platform.

While Kubernetes was not designed specifically for telco protocols, it was designed for high availability of services. This containerized technology does offer telco operators a wide range of benefits. F5 bridges this gap with a targeted solution that brings critical telco functionalities to Kubernetes.

### Cloud-native architecture for mobile networks

Today's virtualized datacenters are a big improvement from the bare-metal infrastructure of the past, but virtualization is only one step on the journey to decreasing costs and increasing agility. The next major advancement will be the 5G service-based architecture (SBA) and cloud-native network functions (CNFs).

The next-generation 5G SBA is created on the building blocks of previous VM architectures and improves further on these benefits:

- Deploys as containers, allowing for more agile development, deployment, and operations.
- Orchestrates homogeneously with Kubernetes, compared to previous network functions virtualization (NFV) framework solutions, allowing the core to run on nonproprietary infrastructure.
- Allows software vendors and network expansion boards (NEBs) to plug and play network functions.
- Replaces protocols from previous 3GPP standards with web technologies. For example, SCTP and Diameter have been replaced with HTTP/2 and JSON.

Traditional network functions virtualization using VMs can also benefit from cloud-native capabilities when using Red Hat OpenShift Virtualization. With this benefit, VNFs can be natively executed in the Kubernetes platform without requiring additional dedicated infrastructure.

### Solution capabilities: Traffic management, visibility, and interoperability

F5 SPK is used to ingress and egress traffic in and out of the cloud-native platform. F5 SPK's core uses the industry's widely trusted F5 BIG-IP's traffic management microkernel (TMM) used in hardware appliances, chassis, and VM form factors. This allows for a high-performance, dependable product from the start.

F5 SPK provides these differentiating characteristics:

- Fully integrated and validated with Red Hat OpenShift by supporting Red Hat OpenShift's multiple external gateways (MEG) feature and full performance add-on operator integration.
- Bandwidth-guaranteed high throughput with low latency from SR-IOV interfaces not shared with other platform's workloads.
- Elimination of the additional hops and workload distribution imbalances of standard load balancer solutions.
- Telco-specific protocols and functionalities for which native Kubernetes constructs fall short. Some of these protocols and functionalities include, but are not limited to, SCTP, Diameter, SIP, GTP-C, SSL/TLS termination, symmetric upstream BGP ECMP with auto last hop, advanced Layer 7 traffic management, or advanced HTTP/2 message routing. These have been developed and matured over the years in F5 BIG-IP core functionality.
- Pre-5G transitional facilities with dual stack and DNS/NAT46 allow IPv4 applications to access any IPv6 application on demand, without requiring reconfiguration.

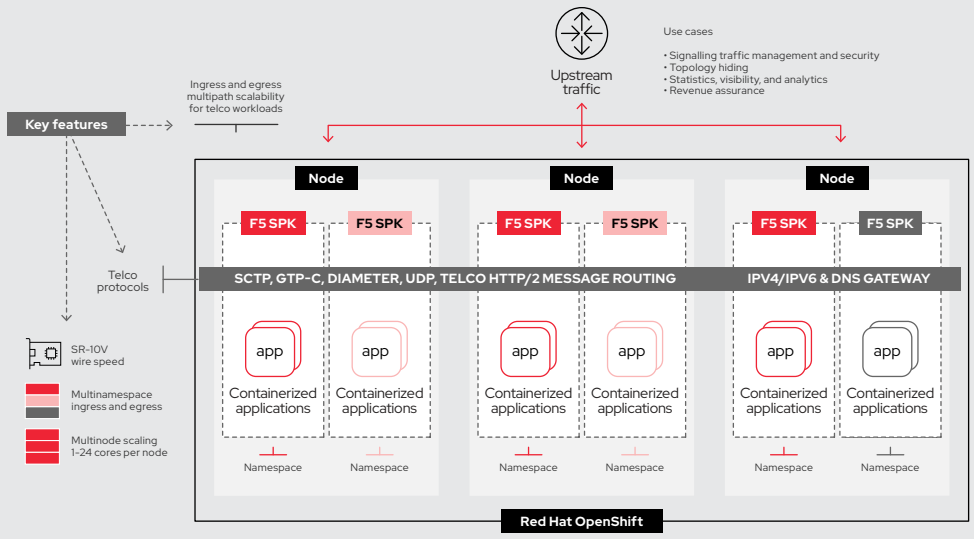


*Figure 2: Detail of F5 BIG-IP Next Service Proxy (SPK) handling ingress and egress traffic*

F5 Carrier Grade Aspen Mesh (CGAM), built on the foundation of Istio, provides comprehensive container security for "east-west" traffic (container to container) within the platform with telco-oriented add-on features.

F5 CGAM solves a common problem facing many providers: a lack of visibility into traffic between the pods. In these cases, decrypting traffic for inspection is one issue, but the bigger issue is that interpod traffic doesn't necessarily cross a switch where standard inspection would take place. With Kubernetes, some traffic will never hit a dedicated switch or tap. When one pod talks to another pod on the same machine, the packets they exchange are virtual—simple bytes in RAM that the system shuffles between pods.

F5 CGAM removes these barriers to visibility with unique packet-tapping capabilities that give service providers full-packet visibility for troubleshooting and meeting lawful intercept requirements.

F5 CGAM additionally provides pre-5G transitional functionalities on top of stock Istio:

- IPv4/IPv6 dual stack support.
- Mutual Transport Layer Security (mTLS) enhancements allow the use of an external, telco-provided certificate authority (GPP-compatible). This provides authentication support with DNS and URI in the certificate's subject alternative names (SANs) allowing interoperability with existing company-wide TLS infrastructure.

Overall, F5 CAGM provides an Red Hat OpenShift-validated, Istio-based service mesh that allows telco providers to operate their networks effectively, with a focus on security, and within regulatory and compliance standards.



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