BROCADE

Solution Brief

Brocade and the Mobile Edge

HIGHLIGHTS

The Brocade® solution for mobile edge computing, powered by the industry-leading Brocade 5600 vRouter, delivers mobile edge virtual infrastructure capabilities to mobile operators for the hosting of Virtual Network Functions (VNFs) and third-party applications at the mobile edge. This approach:

- Delivers virtualization and embedded network infrastructure services, such as IP security (IPsec), including Internet Key Exchange version 2 (IKEv2) termination, a full routing stack, and an embedded network firewall
- Embeds core network services with an optimized data plane that simplifies MEC architecture, provides efficient Virtual Machine to Virtual Machine (VM-VM) communication, and delivers Service Function Chaining (SFC)
- Enables consistent introduction of new network applications in closer proximity to end users
- Delivers Application Programming Interfaces (APIs) for monetization, new service introduction, and service instantiation
- Integrates an optional virtual Evolved Packet Core (vEPC) and Virtual Packet Broker, provided by Brocade
- Offers an open ecosystem of partners that provides complementary, proven solutions to operator performance and monetization challenges

Distribution of Applications and Services to the Network Edge

Originally, the Internet was built as a hierarchical design, consisting of an access, distribution, and core network structure. Clients connected to access networks, including fixed line, cellular, and WiFi, in order to reach content and applications hosted on the Internet. Subscriber traffic transited one or more core network, depending on where the content and applications resided.

Current network designs require change, due to the growth of the Internet, with content and applications being migrated to the network edge. Content Distribution Networks (CDNs), which host images and videos on behalf of Internet destinations and content providers, are an example of this network evolution. CDNs might be provided by operators themselves, third parties, or content providers and aggregators such as Netflix Open Connect, Google Global Cache, and Akamai. These CDNs have increasingly peered directly with access network operators to improve the subscriber experience. Other low-latency application providers, such as Voice over LTE (VoLTE), video conferencing, and voice-based search—and personal assistants such as Apple Siri—have followed suit, building data centers or deploying local servers closer to access networks.

With the growth of the Internet of Things (IoT), new applications and services are expected to benefit from deployment at the network edge. Vertical applications, such as those that enable connected vehicles, and applications that deliver experiences based on real-time interactions with devices, such as augmented reality, are expected to benefit not only from low latency but from the improved bandwidth that is inherent in their closer proximity to subscribers.

Mobile Edge Computing

Historically, the edge of the mobile network was defined by specialized processing and protocols, with services delivered from centralized locations beyond the mobile core. IP traffic between the Radio Access Network (RAN) and the mobile core network, such as the Long Term Evolution (LTE) EPC, is encapsulated using General Packet Radio Services (GPRS) Tunneling Protocol (GTP), and the transport is often encrypted using IPsec with IKEv2 Security Associations (SAs). This has inhibited the ability to insert services and applications close to the mobile access

network and the users themselves. Even when specialized applications were developed to deliver value in this part of the network, operators have been reluctant to insert them, due to the inherent risk of affecting the performance or availability of mobile services.

This centralization has led to both performance and cost challenges for mobile operators as they look to deliver latency-sensitive applications, services, and content to users. By pushing IT and cloud computing capabilities as close to the mobile subscriber as possible, MEC transforms this centralized model into a distributed solution architecture, putting intelligence closer to devices and their users. The result is a low-latency, high-bandwidth environment capable of improving service experience.

Operating on individual servers or in a cloud-based services environment at the edge of the mobile network, MEC provides these benefits:

- MEC addresses both the performance and cost challenges created by a more centralized services edge, including the increased latency caused by locating services back to the center of networks, a lack of visibility into network conditions, decreased security, and higher delivery costs.
- MEC creates a new revenue stream for mobile operators to deliver a distributed Infrastructure-as-a-Service (IaaS) platform for third-party applications that benefit from closer proximity to the RAN.

In December 2014, the European Telecommunications Standards Institute (ETSI) established an Industry Specification Group (ISG) on MEC to develop a standardized, open environment that allows for the efficient and seamless integration of third-party applications across multivendor platforms. The MEC ISG is developing terminology, service scenarios, technical requirements (including use cases and their benefits), and a framework and reference architecture, with future plans to work on platform services, APIs, and interfaces.

MEC will play a key role in future-generation networks, specifically as 5G network technology standards are defined and the continued growth of the IoT/Machine to Machine (M2M) services and other analytics-driven services create increased network congestion and the need for real-time data processing. Technology improvements, including low latency, better flexibility and agility, use of virtualization, network and context awareness, and more can provide the opportunity to increase the Quality of Experience (QoE) of end users and make network operation more cost-effective and competitive. (See Figure 1.)

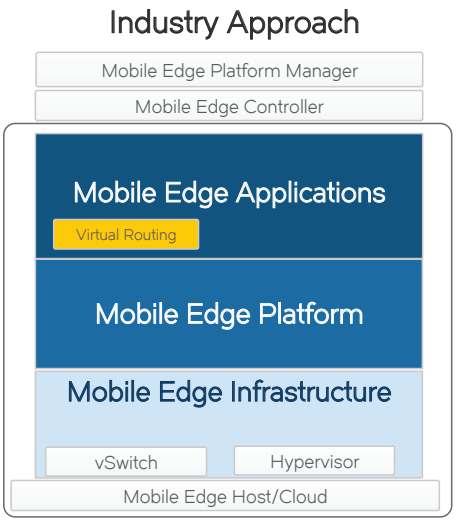

Figure 1: ETSI Architecture Approach to the Mobile Edge Computing Platform.

Brocade Mobile Edge Virtual Infrastructure for MEC

Brocade mobile edge infrastructure capabilities, based on and powered by the Brocade vRouter, provide a complete solution that enables mobile operators to put intelligence closer to devices and their users, reaping performance and cost benefits and enabling both network services and applications at the mobile edge.

The Brocade approach to the MEC infrastructure platform is unique, delivering the capabilities and requirements to MEC platform services and applications. The MEC platform simultaneously integrates in multiple domains—the backhaul network, operator Network Functions Virtualization (NFV), and the cloud:

- MEC is a network element, first and foremost, and it must be capable of coexisting in the mobile operator backhaul network—including networks where operators deploy Security Gateways (SE-GWs) for encrypting the S1-U interface—and participating in network routing.
- MEC is the NFVI for operator services. Thus, it must integrate seamlessly into NFV Management and Orchestration (MANO), to allow operators to migrate specific mobile Access Point Names (APNs) and associated S/Gi-LAN services and service function chains to the MEC infrastructure platform.
- MEC is a distributed IaaS platform, extending the cloud to the edge of the mobile network. It must provide cloud APIs for third-party application providers in a manner that is consistent with APIs from public cloud providers.

Brocade mobile edge virtual infrastructure capabilities include integrated routing, a scale-out data plane, IPsec (that is, IKEv2) termination and origination, and firewall functions in the host OS, as well as an integrated virtualization environment (Kernel-based Virtual Machine [KVM] hypervisor, virtual switch, and direct VM-VM cross-connects). (See Figure 2.)

Brocade mobile edge virtual infrastructure capabilities are controlled by using the Brocade SDN Controller, a fully tested, extensible commercial distribution of the OpenDaylight Controller. A rich set of APIs enable mobile operators to monetize the platform, instantiate new services, and simplify new service introduction, integration, and interoperability.

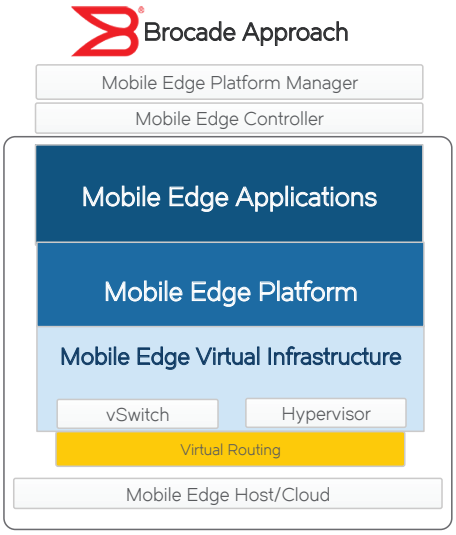

Figure 2: Brocade Approach to the Mobile Edge Computing Platform.

Brocade MEC Platform Services

In addition to these capabilities, Brocade is launching an initial set of MEC platform services that run as VMs and provide an initial set of value-added capabilities. (See Figure 3.) These include the following:

- **Virtual EPC:** Supports instantiation of complete 3rd-Generation Partnership Project (3GPP) virtual System Architecture Evolution Gateway (vSAE-GW) or virtual Packet Data Network Gateway (vP-GW) functionality and the unique portable user plane function from Brocade. This function instantiates only the vSAE-GW/vP-GW user plane, for termination of specific mobile APNs (such as VoLTE, enterprise, IoT, or Mobile Virtual Network Operator [MVNO] APNs) on the MEC platform.
- **Virtual Packet Broker:** Provides visibility into the traffic across both the MEC platform and the mobile backhaul network for northbound analytics systems. This includes correlation of GTP-C/GTP-U/SGi traffic and APN-based or International Mobile Subscriber Identity (IMSI)-based granularity.

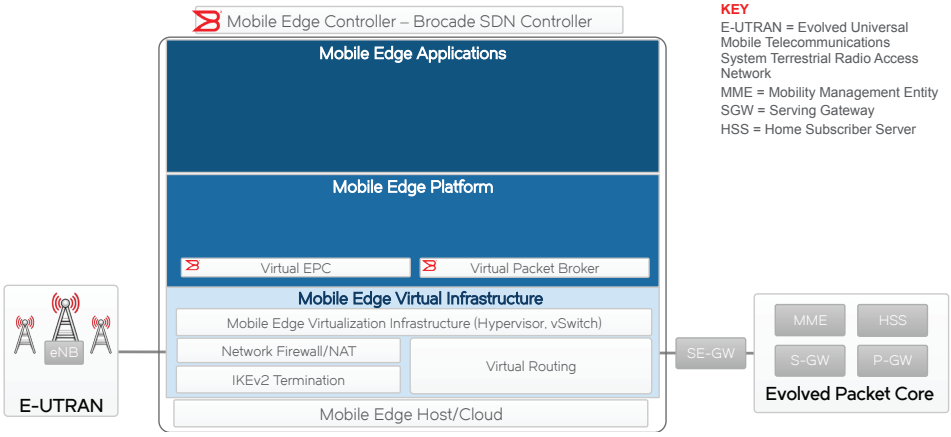

Figure 3: Brocade Mobile Edge Solution.

The Brocade MEC Partner Ecosystem

The ecosystem of Brocade partners is critical, to ensure the delivery of complete and holistic solutions to capture new and innovative ways of service delivery for the mobile edge. The vast ecosystem of Brocade partners provides high-value services. Brocade continues to build this ecosystem of partners to deliver value to mobile operators on the Brocade mobile edge virtual infrastructure platform.

About Brocade

Brocade networking empowers organizations to maximize investments for the New IP by transforming data center networking with open, virtual, and automated solutions. Brocade solutions help organizations achieve their critical business initiatives as they transition to a world where applications and information reside anywhere. Learn more at www.brocade.com.

Corporate Headquarters
San Jose, CA USA
T: +1-408-333-8000
info@brocade.com

European Headquarters
Geneva, Switzerland
T: +41-22-799-56-40
emea-info@brocade.com

Asia Pacific Headquarters
Singapore
T: +65-6538-4700
apac-info@brocade.com

BROCADE