DATA SHEET

Brocade vEPC

Highlights

- Significantly reduces infrastructure deployment costs with a microservice-based modular architecture, allowing throughput, transaction, and session capacity to be added independently
- Optimizes resource usage and increases business agility through on-demand scalability
- Provides granular scalability across various functions, preventing overprovisioning and allowing organizations to grow at market speed
- Leverages a highly optimized architecture with full Evolved Packet Core (EPC) functionality to achieve maximum performance across the control plane and user plane
- Enables linear scaling on a common compute platform (Intel x86), adding resources in the form of Virtual Machines (VMs)
- Provides a flexible, SDN-ready framework by separating the control plane and user plane
- Supports low-latency use cases by placing the user plane at the network edge
- Achieves simpler, more effective monitoring and integration with external services through open APIs

The First Full-Function, Cloud-based Virtual Evolved Packet Core

Brocade® vEPC is a full-function Evolved Packet Core (EPC) solution designed for virtualized environments. Organized in independent slices of the control, user, and management plane, Brocade vEPC is free of the redundant functionalities and inter-node dependencies that increase costs and reduce performance in physical node-based packet cores. Brocade vEPC, running on Intel x86 servers, provides linear-scaling performance to support any size network for cost-effective business growth.

Innovative Architecture

Brocade has transformed the old, physical node-based, vertical architecture into a service-based, horizontal architecture consisting of independent interface, service logic, database, and management modules. This holistic approach to functional virtualization optimizes performance and efficiency—compared to the traditional approach of replicating existing physical nodes as a software asset—and is the fundamental difference between Brocade vEPC and other virtualized products. By leveraging this innovative architecture, Brocade vEPC provides a robust, high-performance, scalable, and fault-tolerant solution capable of supporting diverse use cases (see Figure 1).

Optimized for Processing Transactions and Sessions

The Brocade vEPC framework provides control plane and user plane separation, with each plane functioning and scaling independently and elastically according to the respective load factor. With this framework, Brocade vEPC is optimized for processing control plane transactions and user plane session data.

On-Demand, Granular Scalability

Brocade vEPC components are fully distributed and tiered by function, such as signaling, interface, service logic, and data management. This service-based modular design—combined with the vEPC's stateless nature and "share nothing" design—allows unlimited scalability in each tier. It also offers

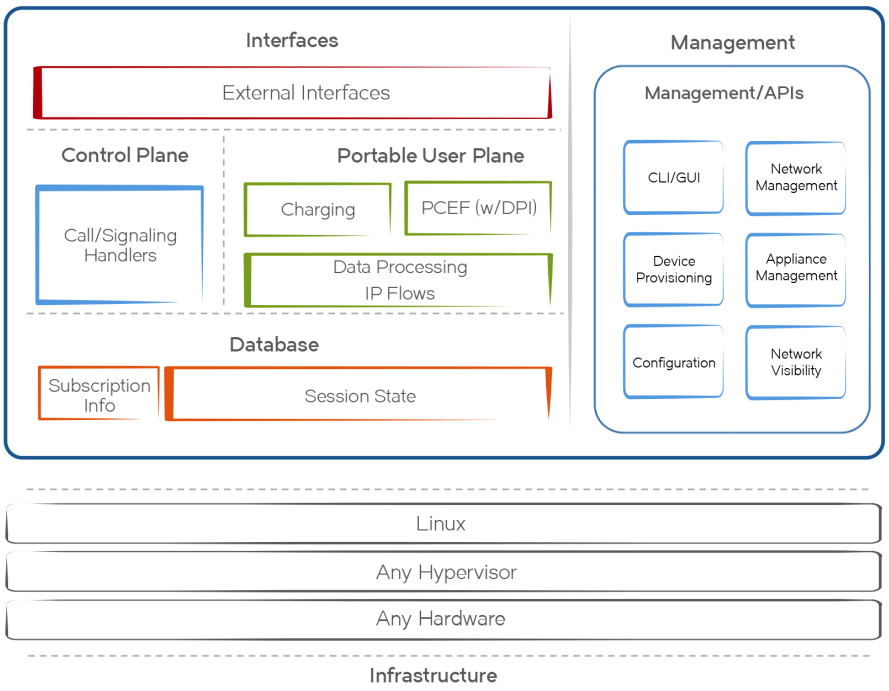

Figure 1: Brocade vEPC logical architecture.

separation of concerns, resulting in high cohesion and low coupling. Each service can scale out and scale in according to the required capacity demand for that specific service. This on-demand, granular scalability eliminates the need for long-range advance budget planning and expensive overprovisioning.

An Open, Highly Flexible Solution

Brocade vEPC leverages proven industry tools, software, and best practices to provide an open and highly flexible solution. Using off-the-shelf hardware and standard operating systems (Linux), Brocade vEPC is designed for maximum interoperability, allowing seamless integration with third-party tools for extended functionality.

Higher Service Velocity

As an open solution, Brocade vEPC can provide higher service velocity than traditional physical node-based architectures, which are far more rigid and complex. Its service-based, modular design, combined with open API support, enables organizations to quickly create and implement new features for maximum business agility. Organizations can add infrastructure to support new users or new services in just days instead of months. The fully virtualized deployment allows organizations to grow their mobile networks at market speed.

Support for Various Deployment Options

The hardware-centric approach of traditional EPC infrastructure has forced service providers to create expensive, large-capacity nodes that are cost-prohibitive to deploy in a distributed manner. Brocade vEPC decouples network function from hardware to provide a service-based, modular design that includes control plane and user plane separation. This approach allows for a distributed deployment that is aligned with security, backhaul, and an organization's business model.

Built-in Load Balancing

Brocade vEPC provides a configuration tool to set the criteria and threshold for instantiating more VMs to run vEPC modules. These criteria include CPU usage, memory usage, the number of queues in the system, and the number of incoming requests. The Brocade vEPC uses intelligent logic in configuring the threshold to prevent the "ping pong" effect of instantiating and removing VMs. Once Brocade vEPC detects that the value(s) for the criteria has passed the threshold, it instantiates particular VMs to support the demand. The added VMs participate in the corresponding cluster without requiring any additional configuration. Internal load balancing within the clusters helps ensure that each VM is optimally loaded based on the capacity it can support.

Streamlined Management and Orchestration

Brocade vEPC provides all aspects of fault, configuration, accounting, performance, and security information to an external orchestrator and/or NMS using various APIs, including REST, SNMP, XML, and CLI. It also can work with multiple industry-leading orchestrators across a range of fields and environments.

Maximum Reliability

Each component of Brocade vEPC is designed for high availability and has no single point of failure. A well-distributed deployment of multiple instances of Virtual Network Function Component (VNFC) VMs at each tier allows clusters to detect a failure and route subsequent requests to available instances. Brocade vEPC can detect and address a failure at the process, network interface, VM, and server level. Each VNFC VM is modeled to support 99.999 percent availability.

High Performance

Brocade vEPC is a software-based, fully virtualized packet core and is not bound to any proprietary hardware. Its capacity and performance depend mainly on the number of cores. It supports linear scalability to meet any capacity and performance requirement, allowing service providers to deploy Brocade vEPC in various use cases (see Table 1).

Table 1: Examples of Brocade vEPC performance with different numbers of physical cores.

		21 cores*	36 cores*	54 cores*
Control Plane Performance	Simultaneous Attached Users (SAUs)	1 million	2 million	3 million
	Number of bearers	1.2 million	2.4 million	3.6 million
	Attaches per second	3,500	7,000	10,500
Data Plane Performance	Throughput† (Gbps)	10	20	30

Notes:
* Physical cores.
† Throughput measured with IMIX traffic.

BROCADE VIRTUAL CORE FOR MOBILE

Brocade Virtual Core for Mobile (VCM) solutions transform mobile networks through a full-function virtualized Evolved Packet Core (EPC) implementation. This approach eliminates the expensive hardware, long upgrade cycles, overprovisioning, and years-in-advance budgeting that traditionally characterize mobile service provider networks. As a result, organizations can experience the benefits of a fully virtualized EPC implementation, or start with a virtual gateway that leverages their existing distributed infrastructure.

The Brocade VCM product family consists of Brocade vEPC, Brocade vPGW, and Brocade vSAE-GW. Key benefits include:

- Lower total cost of ownership
- Greater business agility
- The ability to grow your business—not your network

BROCADE vEPC: KEY FEATURES

- Cloud-friendly design
- Open architecture
- Stateless operation
- High availability in excess of 99.999 percent service uptime
- Intel DPDK support
- 10 Gbps line rate
- Linear scalability of performance
- Hypervisor: VMware ESXi, KVM
- Integration with cloud tools: OpenStack, VMware vCenter, VMware vCloud Director
- Intel x86-based COTS hardware
- Management API support, including REST and XML
- 3GPP interface-compliant

Brocade vEPC Specifications

Features		
Mobility management	• Attach/Detach • Handover (X2, S1) • Paging • Gn/Gp • S6a	• Tracking Area Update • Service Request • Multi-PLMN support • SGs • 3G-LTE Handover
NAS security	• Encryption - EEA0 (NULL) - EEA2 (AES-128)	• Integrity protection - EIA2 (AES-128)
Session management	• Default bearer management • Multiple bearer support	• Dedicated bearer management • GTPv1, v2
Roaming	• Gp	• S8
Networking functions	• VLAN • DSCP to QCI mapping • Routing: Static, OSPFv2, BGPv4 • IP address allocation: Local, HSS, AAA	• Packet filter configuration • IPv4 • Jumbo frame • NTP Synchronization
Lawful intercept	• X1_1 (administration) • X3 (CC)	• X2 (IRI)
Policy and charging	• CDR generation • Partial CDR per volume, time, records • PCRF support: Gx	• GTP support • Online charging: DCCA • Offline charging
RADIUS	• RADIUS authentication • AAA server configuration	• RADIUS accounting
Voice support	• CS Fallback: MO/MT call • VoLTE: MO/MT call	• CS Fallback: MO/MT SMS
DPI	• L3/L4 DPI • Metadata support • Zero rating	• L7 DPI • IM support • X-Header enrichment
OAM aspects	• GUI-based EMS • Follows ITU-T X.733 • Graphical display of VNFC topology • User management	• SNMP, XML, REST • FCAPS • CLI support • Graphical display of resource utilization
3GPP interface support	• S1-MME • SGi • Gy • Gn/Gp • S6a • S1-U	• Gx • Gz • SGs • S11 • S5/S8

Brocade vEPC Specifications *(continued)*

Standards Compliance	
3GPP	• 3GPP TS 23.003: Numbering, addressing and identification • 3GPP TS 23.060: General Packet Radio Service (GPRS); Service description; Stage 2 • 3GPP TS 23.401: General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access • 3GPP TS 24.301: Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3 • 3GPP TS 23.272: Circuit Switched (CS) fallback in Evolved Packet System (EPS); Stage 2 • 3GPP TS 33.102: 3G security; Security architecture • 3GPP TS 33.401: 3GPP System Architecture Evolution (SAE); Security architecture • 3GPP TS 32.251: Telecommunication management; Charging management; Packet Switched (PS) domain charging • 3GPP TS 32.295: Telecommunication management; Charging management; Charging Data Record (CDR) transfer • 3GPP TS 32.298: Telecommunication management; Charging management; Charging Data Record (CDR) parameter description • 3GPP TS 29.212: Policy and Charging Control (PCC); Reference points • 3GPP TS 29.213: Policy and charging control signaling flows and Quality of Service (QoS) parameter mapping • 3GPP TS 23.107: Quality of Service (QoS) concept and architecture • 3GPP TS 23.203: Policy and charging control architecture • 3GPP TS 23.207: End-to-end Quality of Service (QoS) concept and architecture • 3GPP TS 29.061: Interworking between the Public Land Mobile Network (PLMN) supporting packet-based services and Packet Data Networks (PDN) • 3GPP TS 33.107: 3G security; Lawful interception architecture and functions • 3GPP TS 29.060: General Packet Radio Service (GPRS); GPRS Tunneling Protocol (GTP) across the Gn and Gp interface • 3GPP TS 29.274: 3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunneling Protocol for Control plane (GTPv2-C); Stage 3 • 3GPP TS 29.281: General Packet Radio System (GPRS) Tunneling Protocol User Plane (GTPv1-U) • 3GPP TS 29.118: Mobility Management Entity (MME) – Visitor Location Register (VLR) SGs interface specification • 3GPP TS 36.412: Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 signaling transport • 3GPP TS 36.413: Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP) • 3GPP TS 36.414: Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 data transport

Brocade vEPC Specifications *(continued)*

Standards Compliance *(continued)*	
IETF	• IETF RFC 1994: PPP Challenge Handshake Authentication Protocol (CHAP) • IETF RFC 2474: Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers • IETF RFC 2865: Remote Authentication Dial-In User Service (RADIUS) • IETF RFC 2866: RADIUS Accounting • IETF RFC 2867: RADIUS Accounting Modifications for Tunnel Protocol Support • IETF RFC 2868: RADIUS Attributes for Tunnel Protocol Support • IETF RFC 2869: RADIUS Extensions • IETF RFC 2882: Network Access Servers Requirements: Extended RADIUS Practices • IETF RFC 4006: Diameter Credit-Control Application • IETF RFC 4960: Stream Control Transmission Protocol • IETF RFC 6733: Diameter Base Protocol

License Information

Brocade vEPC is offered with simple, disruptive, and value-based perpetual licensing options to meet an organization's specific requirements (see Table 2). Contact Brocade for more information on ordering and licensing.

Table 2: Brocade vEPC software license options.

Software License SKU	Description
BR-vEPC-SITE	Per-instance base RTU license for Brocade vEPC
BR-vEPC-TPUT	Add-on license for incremental throughput
BR-vHSS-TPS	Add-on license for subscriber management function

Brocade Global Services

Brocade Global Services has the expertise to help organizations build scalable, efficient cloud infrastructures. Leveraging 20 years of expertise in storage, networking, and virtualization, Brocade Global Services delivers world-class professional services, technical support, and education services, enabling organizations to maximize their Brocade investments, accelerate new technology deployments, and optimize the performance of networking infrastructures.

Affordable Acquisition Options

Brocade Capital Solutions helps organizations easily address their IT requirements by offering flexible network acquisition and support alternatives. Organizations can select from purchase, lease, Brocade Network Subscription, and Brocade Subscription Plus options to align network acquisition with their unique capital requirements and risk profiles. To learn more, visit www.Brocade.com/Capital.

Maximizing Investments

To help optimize technology investments, Brocade and its partners offer complete solutions that include professional services, technical support, and education. For more information, contact a Brocade sales partner or visit 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

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

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