Brocade vC-SGN

**HIGHLIGHTS**

- Provides a highly optimized packet core to support Cellular IoT (CIoT) LTE traffic for NB-IoT and Cat-M1 devices
- Deploys into a dedicated network slice for seamless integration in an existing network or as part of a combined greenfield EPC deployment, while supporting diverse traffic types
- Provides built-in Service Capability Exposure Function (SCEF) to simplify IoT service enablement
- Performs intelligent metadata insertion and priority handling for service enrichment
- Leverages a highly optimized platform that natively offers the ability to collapse EPC functions to create a C-SGN offering with minimal footprint and inter-nodal overhead
- Efficiently scales the control plane to support very high density CIoT deployments with tens of thousands of eNBs and a high transaction rate
- Delivers CIoT device provisioning and authentication functions, easy-to-use bulk provisioning interfaces, and customized QoS profile templates

**A Virtualized, Dedicated Packet Core for CIoT**

Brocade® Virtual Cellular IoT Serving Gateway Node (vC-SGN) is an innovative collapsed packet core designed for virtualized environments to support Cellular IoT (CIoT) traffic. Running on Intel x86 servers, Brocade vC-SGN includes Service Capability Exposure Function (SCEF) to ensure end-to-end service enablement. Targeted toward operators interested in new revenue opportunities in the emerging NB-IoT ecosystem, Brocade vC-SGN helps ensure high return on investment by keeping the total cost of ownership to a minimum.

**Innovative Architecture**

Brocade vC-SGN is built on top of Brocade Virtual Core for Mobile (VCM) architecture, which is designed to transform mobile networks by giving operators the flexibility to scale the control plane, user plane, and session plane independently. This architecture is tailor-made for implementing a control plane-centric network function (such as C-SGN), and can easily scale to accommodate the significant growth expected in IoT devices. The stateless design of Brocade vC-SGN, aided by a separately scalable and low-latency session plane, ensures a highly available and optimized solution (see Figure 1).

**Figure 1:** Brocade vC-SGN logical architecture.
Brocade Virtual Core for Mobile (VCM) architecture transforms mobile networks through a feature-rich and highly scalable virtualized Evolved Packet Core (EPC) implementation. Its function-based architecture breaks nodal boundaries to create an optimized collapsed architecture. Built on top of this platform, Brocade vC-SGN adds a layer of enriched functionality to the base feature set and delivers on 3GPP NB-IoT requirements, starting with Release 13.

The Brocade VCM product family consists of Brocade vC-SGN, Brocade vEPC, Brocade vHSS, Brocade vPGW, and Brocade vSAE-GW.

Key benefits include:

- Lower total cost of ownership
- Greater business agility
- Adaptiveness to multiple NB-IoT deployment use cases (examples: smart metering, smart homes, mobile health, asset management)

### NB-IoT Optimized as per 3GPP Release 13

3GPP Release 13 brings forth the C-SGN concept and architecture, and includes multiple new features envisioned for NB-IoT device management. These features aim to accommodate the Low Power Wide Area (LPWA) requirements of NB-IoT devices. In line with 3GPP Release 13, Brocade vC-SGN enables small data delivery over the control plane, supports Extended Discontinuous Reception (eDRX) handling by modifying paging timers, implements Robust Header Compression, and introduces data buffering for latency-tolerant devices. It also allows control and user plane optimization in order to more efficiently support NB-IoT devices. Additionally, Brocade vC-SGN supports both IP and Non-IP Data Delivery (NIDD). Data from the devices can be sent either to CIoT application servers directly over the SGi interface via IP tunneling, or to an SCEF through a T6a interface.

### Integrated Service Capability Exposure Function (SCEF)

Brocade vC-SGN integrates SCEF to securely expose the services and capabilities provided by 3GPP network interfaces to the CIoT-enabling application servers. It provides a layer of abstraction between the 3GPP interfaces and the CIoT application servers. This way, the application servers do not need to support a plethora of protocol stacks and interoperate with a range of 3GPP network elements, such as the MME and HSS. Instead, the application servers just need to integrate with Brocade vC-SGN open APIs for the services required. All underlying protocol selection, translation, and routing is performed by the Brocade vC-SGN. Combining an SCEF with a C-SGN function therefore simplifies the packet core and network control of NB-IoT devices. Authentication and authorization of CIoT application servers, discovery of service capabilities, relative priority handling of data, policy enforcement, metadata insertion, and billing for NB-IoT device usage can all be conducted through a mediating SCEF that rests atop the C-SGN to form a combined product offering (see Figure 2).

### BROCADE vC-SGN: KEY FEATURES

- 3GPP Release 13 compliance
- Support for NB-IoT and Cat-M1 devices
- Secure small data over EMM NAS
- PSM and eDRX support
- Data buffering for latency-tolerant devices
- Non-IP Data Delivery
- Built-in SCEF feature set
- Highly scalable control plane
- Stateless control plane architecture
- Cloud-ready innovative design
- Multiple hypervisor support: VMware ESXi, KVM
- Integration with cloud tools: OpenStack, VMware vCenter, VMware vCloud Director, Cloudify TOSCA-based orchestration
- Commercial cloud-ready: AWS, GCE, Microsoft Azure
- Supported on Intel x86-based general purpose servers
- Management API support, including SNMP, REST, and XML

### An Open, Highly Flexible Solution

Brocade vC-SGN leverages proven industry tools, software, and best practices to provide an open and highly flexible solution. Using general purpose servers and standard operating systems (Linux), Brocade vC-SGN is designed for maximum interoperability, allowing seamless integration with third-party tools for extended functionality.
Higher Service Velocity
As an open solution, Brocade vC-SGN can provide higher service velocity than traditional architectures, which are far more rigid and complex. Its service-based, modular design, combined with open API support, enables operators to quickly create and implement new features for maximum business agility. Operators can add infrastructure to support new users or new services in just days, instead of months. The fully virtualized deployment allows operators to grow their mobile networks at market speed.

Built-in Load Balancing
Brocade vC-SGN provides a configuration tool to set the criteria and threshold for instantiating more Virtual Machines (VMs) to run Brocade vC-SGN modules. These criteria include CPU usage, memory usage, the number of queues in the system, and the number of incoming requests. Brocade vC-SGN uses intelligent logic in configuring the threshold to prevent the “ping pong” effect of instantiating and removing VMs. Once Brocade vC-SGN 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 vC-SGN 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 vC-SGN 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 vC-SGN 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.

Figure 2: Combined CIoT Serving Gateway Node integrates SCEF capabilities.
### Brocade vC-SGN Specifications

#### Features

| Mobility management | • Intra-RAT mobility  
|                     | • Idle mode mobility  
| NAS security        | • Backhaul security for small data delivery  
|                     | • Encryption and integrity for data carried over NAS PDUs  
| Session management  | • Default non-GBR bearer management  
| DCN support         | • Inter-core redirection  
|                     | • Network slicing enabled  
| 3GPP Release 13 compliance | • EMM NAS procedures for NB-IoT devices  
|                     | • Attach without PDN connectivity request  
|                     | • Data over EMM NAS message  
|                     | • Data transfer without DRB (Data Radio Bearer) creation  
|                     | • CP optimization  
|                     | • UP optimization  
|                     | • eDRX and PSM  
|                     | • SMS support without combined attach (SGd)  
|                     | • Efficient support for infrequent small data  
|                     | • Data buffering for latency tolerant devices  
|                     | • ROHC  
|                     | • Non IP Data Delivery (NIDD)  
|                     | • Through SCEF  
|                     | • Over SGi tunneling  
| Device support      | • NB-IoT  
|                     | • Cat-M1  
| Networking functions| • Dual stack IPv4 and IPv6  
|                     | • VLAN tagging  
| Lawful intercept    | • LI over T6a data transport  
|                     | • X1_1/X2/X3 interfaces  
| Policy and charging | • Local Policy Control  
|                     | • Time and volume CDR generation (ASN.1 format)  
|                     | • GTP’ (GTP prime) support  
|                     | • Online charging: DCCA, Gy  
|                     | • Offline charging: Gz  
| DPI                 | • L3/L4/L7 DPI  
|                     | • S-tuple SDF detection  
| Subscriber provisioning | • Optional HSS function  
|                     | • CLI-based subscriber provisioning  
|                     | • Internal or external S6a  
|                     | • Geo-redundant database clustering  
| OAM aspects         | • GUI-based EMS  
|                     | • Follows ITU-T X.733  
|                     | • Manages multiple Brocade VCM instances  
|                     | • User management  
|                     | • In-service software patching  
|                     | • FCAPS  
|                     | • SNMP, XML, REST  
|                     | • CLI  
|                     | • Graphical display of VNFC topology  
|                     | • Real-time resource usage charts  
| 3GPP interface support | • S1-MME  
|                     | • S1-U  
|                     | • S5/S8  
|                     | • SGi  
|                     | • T6a  
|                     | • S6a  
|                     | • Gy  
|                     | • Gz  
|                     | • SGd  

#### Standards Compliance

**3GPP**

- 3GPP TS 23.007: Restoration Procedures
- 3GPP TS 23.008: Organization of subscriber data
- 3GPP TS 23.060: General Packet Radio Service (GPRS); Service description; Stage 2
- 3GPP TS 23.122: Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode
- 3GPP TS 23.203: Policy and charging control architecture
- 3GPP TS 23.272: Circuit Switched (CS) fallback in Evolved Packet System (EPS); Stage 2
- 3GPP TS 23.401: General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access
- 3GPP TS 23.682: Architecture enhancements to facilitate communications with packet data networks and applications
- 3GPP TS 24.008: Mobile radio interface Layer 3 specification; Core network protocols; Stage 3
- 3GPP TS 24.011: Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface
- 3GPP TS 24.301: Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3
- 3GPP TS 33.401: 3GPP System Architecture Evolution (SAE); Security architecture
License Information
Brocade vC-SGN is available with simple, flexible, and scalable perpetual licensing options designed to support different use cases. Contact Brocade for more information on ordering and licensing.

Brocade Global Services
Brocade Global Services has the expertise to help operators 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 operators to maximize their Brocade investments, accelerate new technology deployments, and optimize the performance of networking infrastructures.

Acquisition Options That Match Balance Sheet Objectives
Successful network deployments drive business forward, providing technical and financial agility. Brocade offers the broadest financing models, from traditional leasing to Brocade Network Subscription. Network-as-a-Service allows operators to subscribe to network assets today then upgrade on demand, scale up or down, or return them with 60-day notification. Brocade Network Subscription plans can be structured to meet IASC guidelines for OpEx or CapEx treatment to align with financial goals. Learn more at www.nonetworkcapex.com.

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.

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