VortiQa Software for Networking Equipment

Accelerate development and increase the pace of innovation

The embedded industry is moving to multicore processors in the quest for higher performance and more application integration within the required power budgets of embedded applications. At Freescale, we recognize that challenges exist when it comes to making this move. Networking products built using multicore designs are only as effective as the software's ability to take advantage of the highly advanced processing and acceleration capabilities of the multicore processor. These challenges include:

- Migrating existing software assets to the new multicore architecture
- Leveraging complete advanced capabilities of the processor
- Further extending the competitiveness of your design by creating new innovative applications
- Speeding time to market and time to money

By launching VortiQa software, Freescale is affirming our commitment to embedded networking and to helping you quickly and cost-effectively move beyond the challenges of migrating to multicore so that you can continue to expand, innovate and differentiate your products.

Overview of VortiQa Software for Neworking Equipment

VortiQa software products are production-ready, multicore-optimized software applications that help you accelerate development of your networking equipment products and increase the pace of innovation on Freescale silicon platforms. The new brand name reflects the "whirlwind of innovation" that is enabled by the product lines under the new brand.

VortiQa products deliver on the promise of multicore processing for networking and security functionality. They are built on a broad and mature suite of integrated networking and security functionality such as firewall, IPSec-VPN, intrusion prevention systems (IPS), anti-virus and anti-spam, among others. The software addresses specific vertical markets such as wireless and wired infrastructure, UTM and security appliances, small business gateways and small office/home office (SOHO) residential gateways, and enables threat protection, secure access, convergence and management.

Solution-Centric Approach

The launch of VortiQa software enables Freescale to deliver a solution-centric approach that combines the capabilities of silicon, software and an extended ecosystem to help you create, innovate and bring to market new classes of services in multiple vertical segments. Our solution-centric approach includes:

- The unmatched embedded communications processor expertise embodied in our QorIQ communications platform and PowerQUICC processor product lines that are based on Power Architecture technology
- VortiQa software products developed through world-class, in-house expertise and optimized to take complete advantage of our QorIQ communications platform and PowerQUICC processor silicon
- An expanded and extended ecosystem of partners that can help you to deliver innovative and comprehensive solutions in specific vertical markets. For example, our partners can work with you to integrate legacy applications, switching infrastructure, VoIP, video and other convergence applications, as well as several business applications.

VortiQa Product Features

Freescale brings extensive expertise in security and networking functionality to its VortiQa software products. The feature matrix in Figure 1 provides an overview of the functionality included in VortiQa software products. There are four VortiQa product lines, each developed for one of the following networking market segments:

- Service provider equipment
- Enterprise network equipment
- Small business gateways
- SOHO/residential gateways

The specific VortiQa product lines have different combinations of the features (illustrated in the table below) to address specific needs of each market.

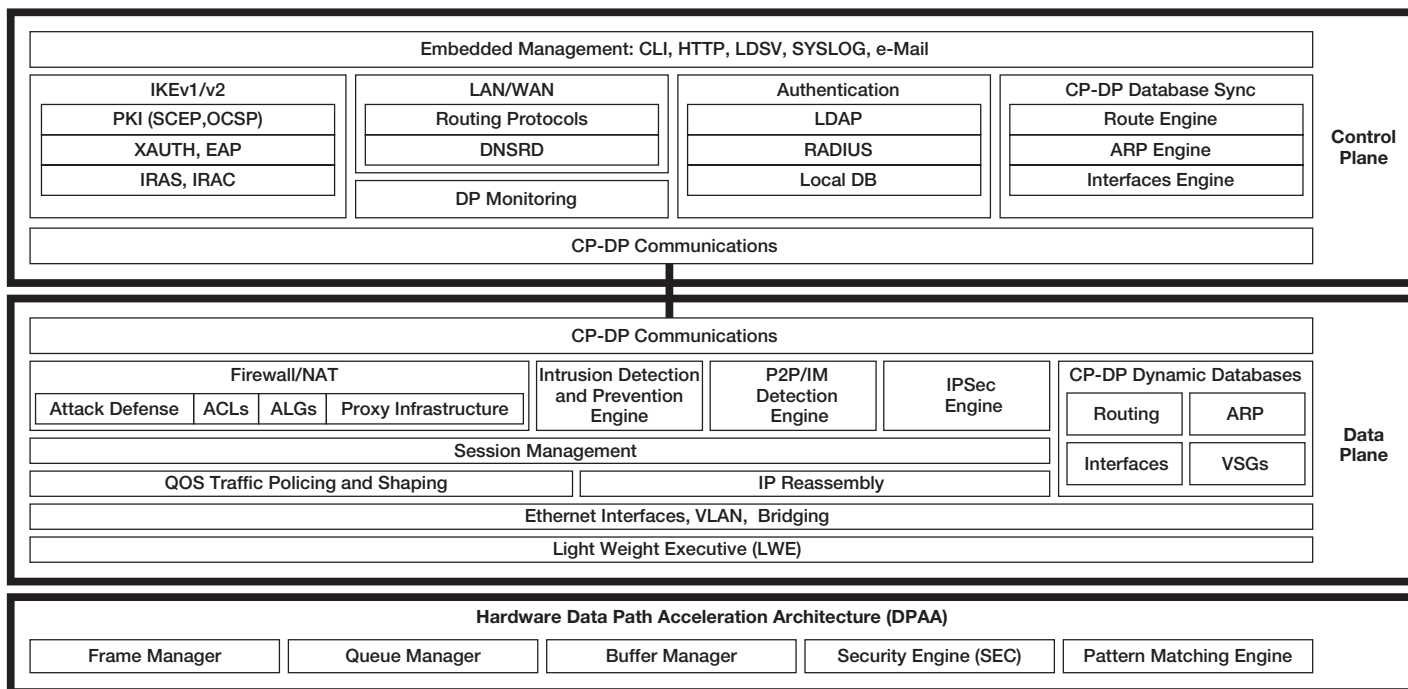| Figure 1: Freescale VortiQa Software Products Feature Overview					
Components/Modules	VortiQa Software for Service Provider Equipment	VortiQa Software for Enterprise Network Equipment	VortiQa Software for Small Business Gateways	VortiQa Software for SOHO/ Residential Gateways	Description
Common utilities and basic networking functions	√√	√√	√√	√√	Provides common software infrastructure facilities and support for several local area and wide area network protocols. Functions include management engines for comprehensive configuration, logging and monitoring
Stateful packet inspection (SPI) firewall and Network Address Translation (NAT)	√√√	√√√	√√	√	Provides SPI firewall policy access, protection from cyber attacks and NAT, along with ALGs
Anti-virus/anti-spam detection and prevention		√√			Offers anti-virus/anti-spam scanning, detection and blocking
Intrusion prevention system (IPS) and deep packet inspection	√√√*	√√√			Offers protection from threats and attacks using protocol/traffic anomaly- and signature-based rules
IPSec virtual private network (VPN)	√√√	√√√	√√	√	Termination function supports IKEv1 and IKEv2 encryption protocols for automatic key negotiation and remote user access
High availability		√√			Offers capabilities of active-active and active-backup high-availability capabilities and clustering of multiple platforms running Freescale solutions
Configuration management interfaces	√√	√√	√√	√√	Provides graphical and command-line based interfaces for configuration of network gateway functions and provision equipment
Quality of service (QoS) and traffic management	√√*	√√	√	√	Offers QoS functions and traffic management (shaping and policing) capabilities
Virtual security gateway (VSG)	√√				Offers multiple virtual (logical) security gateways in one single physical platform

*Avalable in future release

Note: Each check mark represents additional functionality levels for that feature

VortiQa Software for Service Provider Equipment

Manufacturers of wired and wireless infrastructure equipment face increased competition and the need to continuously help service provider customers reduce total cost of deployment. This is driving the need to fully integrate baseband, transport and control functions into a single platform and deliver dramatic cost reductions to carriers. The high integration of Freescale QorIQ communications processors enables you to address the more integrated hardware requirements in this environment, but when coupled with VortiQa software for service provider equipment, the solution provides high-performance data-plane capabilities and substantial architecture flexibility that allows you to migrate legacy applications with minimal changes.

VortiQa software for service provider equipment is designed and optimized for service provider networks, including the need for substantially higher performance and increased session management. In addition, it delivers a mechanism to manage subscriber flows.

Figure 2: VortiQa Software for Service Provider Equipment

Embedded Management: CLI, HTTP, LDSV, SYSLOG, e-Mail				
IKEv1/v2	**LAN/WAN**	**Authentication**	**CP-DP Database Sync**	**Control Plane**
PKI (SCEP,OCSP)	Routing Protocols	LDAP	Route Engine	
XAUTH, EAP	DNSRD	RADIUS	ARP Engine	
IRAS, IRAC	DP Monitoring	Local DB	Interfaces Engine	
CP-DP Communications				

CP-DP Communications					
Firewall/NAT	**Intrusion Detection and Prevention Engine**	**P2P/IM Detection Engine**	**IPSec Engine**	**CP-DP Dynamic Databases**	**Data Plane**
Attack Defense / ACLs / ALGs / Proxy Infrastructure				Routing / ARP	
Session Management				Interfaces / VSGs	
QOS Traffic Policing and Shaping / IP Reassembly					
Ethernet Interfaces, VLAN, Bridging					
Light Weight Executive (LWE)					

Hardware Data Path Acceleration Architecture (DPAA)				
Frame Manager	Queue Manager	Buffer Manager	Security Engine (SEC)	Pattern Matching Engine

VortiQa software for service provider equipment offers comprehensive, production-ready security application functionality for high density, high-performance deployment on Freescale silicon platforms. It extensively leverages a control plane/data plane (CPDP) systems architecture to achieve high throughput and high session rate processing. The software product is designed for the demanding requirements of large enterprise, data center and carrier subscriber traffic aggregation network deployment. It supports symmetric multi processing (SMP), asymmetric multi processing (ASP) and a hybrid model with configurable CPDP architecture that is specifically tuned to take advantage of the multiple cores as well as data offload acceleration engines in the QorIQ platform family. Product features include:

- Common utilities and basic networking functions
- Stateful packet inspection firewall and NAT
- IPSec virtual private network (VPN)
- IPS and deep packet inspection (*) indicates roadmap

- Quality of service (QoS) and traffic management (*) indicates roadmap
- Virtual security gateway (VSG)
- Configuration management interfaces

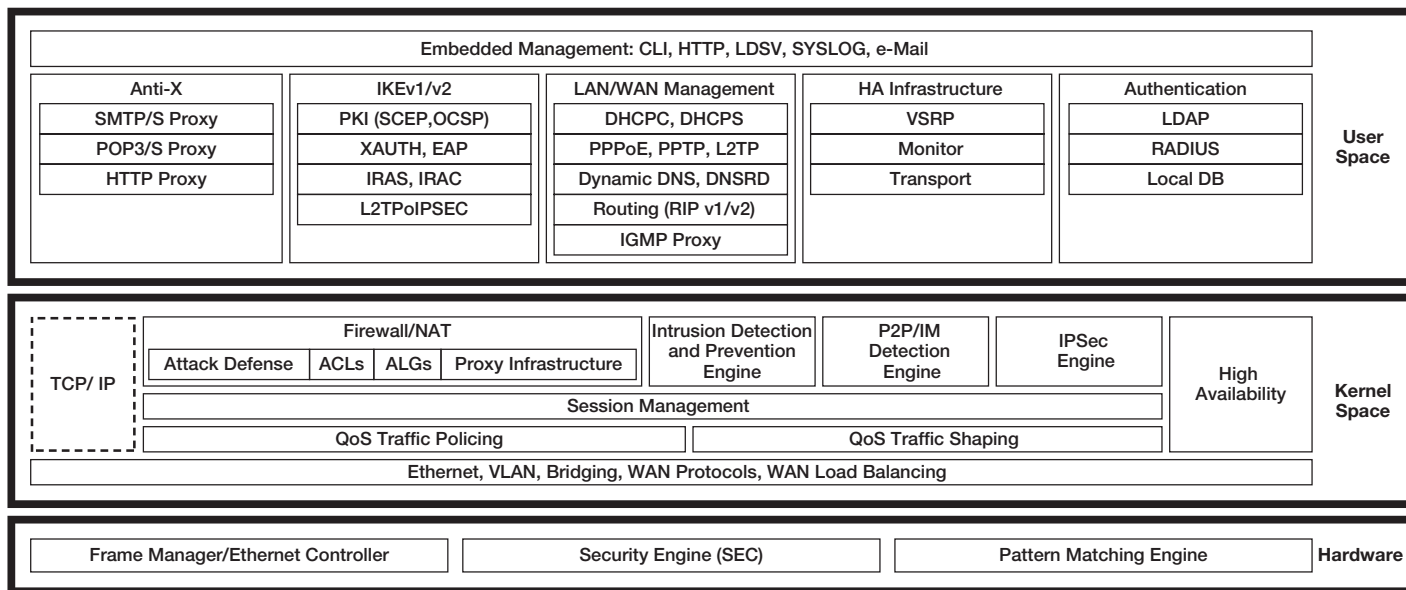# VortiQa Software for Enterprise Network Equipment

As an enterprise network equipment provider, we understand you have an immense need to add new innovative applications in the areas of convergence, collaboration, security, storage and mobility, among other emerging needs for your global enterprise customers. This is driving the need to combine multiple application functions such as routing, switching, security and convergence on a single platform, which in turn improves the overall manageability of disparate applications and reduces operating expenses for your customers. Our high-performance, low-power QorIQ platforms and PowerQUICC processors, combined with VortiQa software for enterprise network equipment can help you meet your customers' needs.

VortiQa software for enterprise network equipment is a production-ready networking and security application that is designed for high-performance secure network connectivity to help protect enterprise networks from malicious attacks built on Freescale silicon platforms. Large enterprise and data center customers prefer high-performance, scalable and reliable threat management systems. VortiQa software provides such a solution that is specifically architected for the large-user enterprise deployment needs with the required interoperability. This solution supports SMP-based software Linux architecture (shown in Figure 3) that allows maximum flexibility and scalability across the PowerQUICC and QorIQ products. Supported features include:

- Common utilities and basic networking functions
- Stateful packet inspection firewall and NAT
- IPSec VPN
- IPS and deep packet inspection

- Anti-virus/anti-spam detection and prevention (AntiX)
- QoS and traffic management
- High availability
- Configuration management interfaces

VortiQa software for enterprise network equipment runs on standard SMP Linux platforms using Freescale's high-performance PowerQUICC processor and QorIQ platform system on chip (SoC) technology such as MPC8572 and QorIQ P4080 processors. The VortiQa software is fully integrated with PowerQUICC III and QorIQ processor architectures to deliver optimum network performance under both normal and stressful network conditions. The software is optimized to leverage SoC hardware acceleration functions of the Freescale processors, such as the security (SEC) engine for VPN processing, pattern matching engine (PME) for IPS and the data-path acceleration engine for flow management.

Figure 3: VortiQa Software for Enterprise Network Equipment

Embedded Management: CLI, HTTP, LDSV, SYSLOG, e-Mail

Anti-X	IKEv1/v2	LAN/WAN Management	HA Infrastructure	Authentication	User Space
SMTP/S Proxy	PKI (SCEP,OCSP)	DHCPC, DHCPS	VSRP	LDAP	
POP3/S Proxy	XAUTH, EAP	PPPoE, PPTP, L2TP	Monitor	RADIUS	
HTTP Proxy	IRAS, IRAC	Dynamic DNS, DNSRD	Transport	Local DB	
	L2TPoIPSEC	Routing (RIP v1/v2)			
		IGMP Proxy			

TCP/IP

Firewall/NAT — Attack Defense | ACLs | ALGs | Proxy Infrastructure

Intrusion Detection and Prevention Engine | P2P/IM Detection Engine | IPSec Engine | High Availability — Kernel Space

Session Management

QoS Traffic Policing | QoS Traffic Shaping

Ethernet, VLAN, Bridging, WAN Protocols, WAN Load Balancing

Frame Manager/Ethernet Controller	Security Engine (SEC)	Pattern Matching Engine	Hardware

OS Partner offering

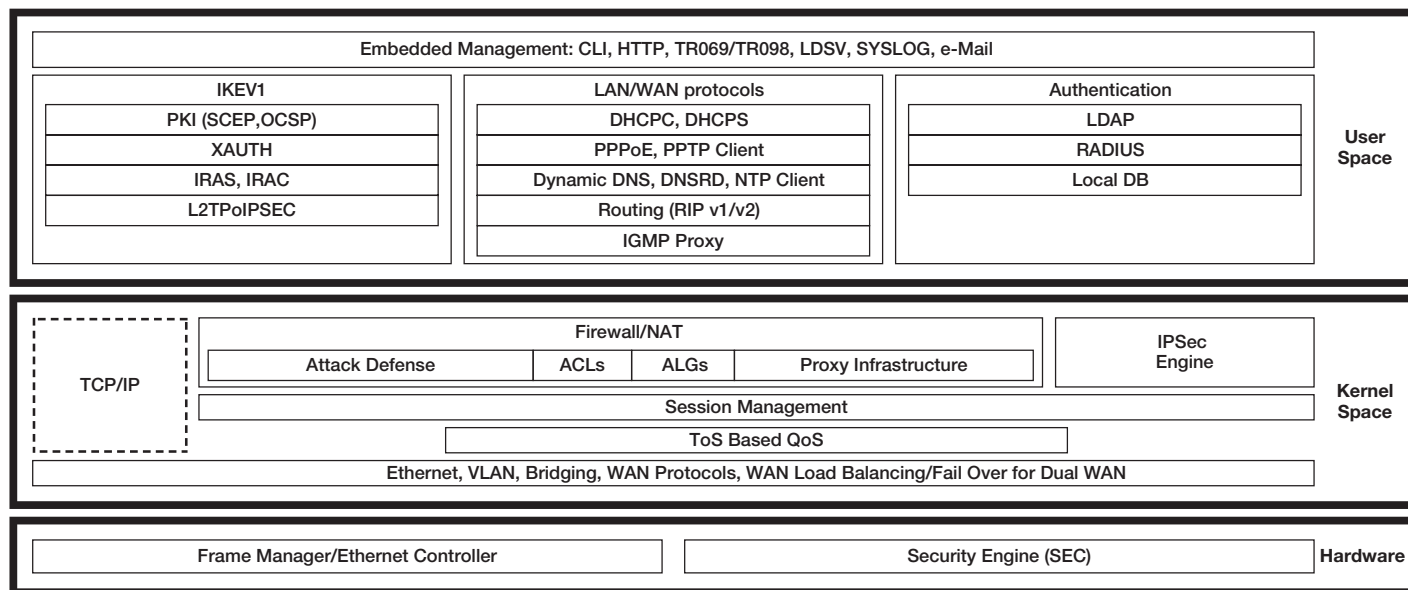# VortiQa Software for Small Business Gateways

Traditionally, network gateway devices have been separate from security devices, but these days small and medium businesses (SMBs) need to optimize deployment by combining gateway and security functions into one device. Secure gateway devices or routers deliver this easy-to-deploy combination.

VortiQa software for small business gateways is a production-ready security and convergence solution specifically tailored for small and branch office gateways on Freescale's silicon platform. This software product line offers a high-performance, feature-rich security product and provides simplified management interfaces. It supports load-balancing and fail-over via separate WAN connections. The software architecture is performance-tuned for PowerQUICC processor and QorIQ platform devices. Supported features include:

- Common utilities and basic networking functions
- Stateful packet inspection firewall and NAT
- IPSec VPN
- QoS and traffic management
- Configuration management interfaces

VortiQa software for small business gateways is pre-integrated with Freescale's PowerQUICC and QorIQ single- and multicore solutions such as the MPC8377 and the QorIQ P2020 processors. The software leverages the special hardware capabilities of the PowerQUICC processors and QorIQ platforms, such as a security engine for IPSec and IKE encryption and decryption.

Figure 4: VortiQa Software for Small Business Gateways

VortiQa Software for SOHO/Residential Gateways

Digital home networking, high-bandwidth wireless and video-on-demand are a few of the applications and services that are driving exponential growth in packet traffic for residential and SOHO networks. Next-generation residential gateways must allow users to experience a wide variety of services and applications, while still ensuring full network security. Such gateways should also support centralized management and secure remote provisioning that allow dynamic management and deployment of services remotely in a cost-effective manner.

VortiQa software for SOHO/residential gateways is a production-ready solution that is specifically architected (see Figure 5) to provide the right level of support for SOHO and consumer broadband customer premises devices, such as routers and digital home gateways on Freescale's silicon platform. It also includes support for TR-069 and TR-098 protocols that allow centralized management and provisioning capabilities.

Supported features include:

- Common utilities and basic networking functions
- Stateful packet inspection firewall and NAT
- IPSec VPN
- QoS and traffic management
- Configuration management interfaces

VortiQa software for SOHO/residential gateways offers high-performance, scalable and secure software solutions that are integrated with Freescale's PowerQUICC processor and QorIQ platform SoC technology such as MPC8315E and MPC8358E. These software platforms are optimized to fully leverage PowerQUICC processor and QorIQ platform SoC capabilities, including SEC engines to help accelerate IPSec and QUICC Engine technology to accelerate NAT/firewall performance.

Figure 5: VortiQa Software for SOHO/Residential Gateways
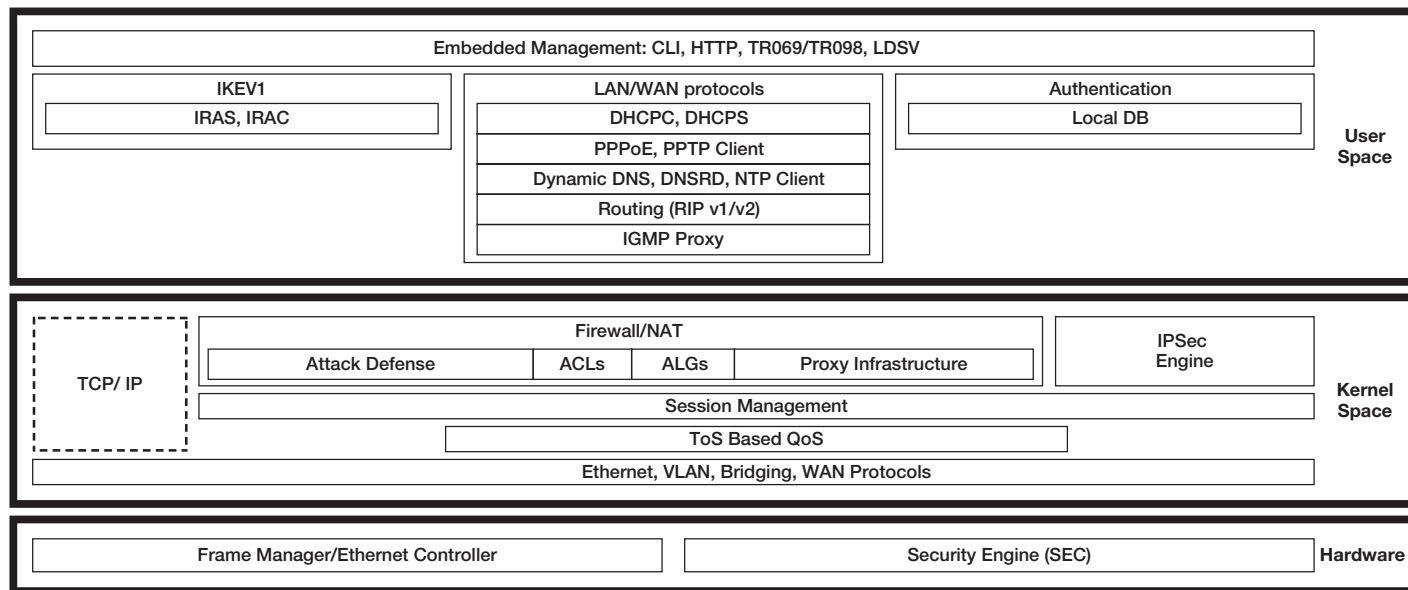
OS Partner offering

Target Processor Architecture

VortiQa software is supported by members of Freescale's PowerQUICC and QorIQ platform processor families. The software has been optimized to take advantage of the acceleration and offload engines of these processors, including:

- Offloading CPU-intensive cryptographic operations to the PowerQUICC processor or QorIQ platform hardware for higher VPN throughput and a faster connection establishment rate
- Offloading content inspection to the PowerQUICC processor and QorIQ platform PME
- Optimizing traffic flow patterns using QorIQ platform datapath acceleration engines

What's in a VortiQa Software Package?

VortiQa software can be delivered as a package containing the following:

- Source code/binaries
- Release document with build instructions
- Toolkit documents describing integration API
- Administrator's guide

Learn more at **www.freescale.com/VortiQa**.

VortiQa™ Software Products: Detailed Features and Functionality

Stateful Packet Inspection Firewall and NAT

VortiQa software contains a powerful stateful packet inspection firewall that defends against a wide range of attacks, such as IP address spoofing, distributed denial of service (DDoS), syn-floods, re-assembly and fragmentation attacks. Comprehensive and fine-grained policy enforcement is supported along with NAT and application layer gateways (ALGs).

- Stateful packet inspection
- Access control lists
- Network object and time windows support in ACL rules
- Multiple security zones
- Network address and port translation (source, destination, one-one, one-many, many-one, many-many)
- Rich set of NAT ALGs for complex protocol support
- Layer 3/Layer 4 attack defenses such as anti-spoofing
- Transparent and routing modes support
- Multicast firewall support in routing mode
- Traffic anomaly and DDoS protection
- Rate limiting support to manage/limit traffic
- Resource reservation for assured service
- Bypass support to enable asymmetric routing deployments
- Keyword content filtering for FTP, SMTP, SMTP, NNTP, HTTP
- User- or group-based firewall control policies
- Port triggering and port forwarding support
- Extensive logging and reporting

Intrusion Prevention System (IPS) and Deep Packet Inspection

Integrated IPS detects and prevents real attacks using protocol/traffic anomaly and signature-based rules. IPS uses an application-aware architecture that substantially reduces false positives. VortiQa software's IPS signature database contains thousands of signatures for malicious attacks and is updated regularly. The IPS includes native support for Freescale pattern matching acceleration engine (PME) technology.

- Signature-based detection and protection
- Protocol anomaly detection and protection
- Traffic anomaly detection and rate limiting
- Deep packet inspection engines including HTTP, SMTP, SNMP, SIP, POP3, Telnet, FTP, IMAP, SUN RPC
- Detection and throttling of P2P/IM application traffic
- Integrated signature editor for authoring user-defined signatures
- Periodic and manual signature download support
- Transparent and routing modes support
- Log viewer: analysis, reporting and alerts

Anti-Virus/Anti-Spam Detection and Prevention (AntiX)

Integrated anti-virus and anti-spam capabilities can scan network data, including e-mail messages for known malware and viruses and protect systems from attacks. VortiQa software AntiX feature includes native support for Freescale pattern matching acceleration engine (PME).

- Proxy support for SMTP/S, POP3/S, HTTP
- Clam AV
- Spam assassin
- Transparent and routing modes support
- Logging and reporting

IPSec Virtual Private Network (VPN)

The IPSec VPN allows seamless and secure connectivity between remote and central sites using VPN. It supports IKEv1 and IKEv2 for automatic key negotiation and remote user access. In addition, VortiQa software IPsec VPN includes native support for Freescale security acceleration engines.

- IPsec: with ESP, AH and IPCOMP protocols
- Multiple encryption and integrity algorithms, including DES, 3DES, AES (CBC,CTR, XCBC) and HMAC-SHA1 and HMAC-MD5
- Supports both route- and policy-based VPN
- Persistent tunnel support
- NAT traversal support
- Extended sequence number support
- Hub and spoke for optimized VPN connectivity for distributed locations
- Stateful failover support for IPsec tunnels
- L2TPoIPsec
- IKEv1 with X-AUTH and ModeConfig
- IKEv2 with EAP and IRAC/IRAS
- Preshared key, RSA and DSA Authentication
- Dead peer detection (DPD), dead peer tunnel detection (DPTD)
- PKI Support: X.509v3 certificates, CRLs, OCSP and SCEP

Quality of Service (QoS) and Traffic Management

Extensive traffic management capability ensures QoS of traffic passing through the network. It limits the bandwidth for lower-priority traffic generated by network file transfers applications and shapes traffic according to bandwidth and queuing policies.

- Classification of traffic based on Layer 3 and Layer 4 criteria
- Ingress traffic metering, policing and DSCP marking
- Egress traffic shaping: queueing, scheduling and DSCP marking
- Multiple queue management algorithms: tail drop, RED, WRED
- Two-level traffic shaping: queue and interface based
- Scheduling algorithms: priority based, CBQ and round robin

High Availability

VortiQa software provides high availability and load sharing support for its security services to ensure no loss of network connectivity.

- Active-backup and active-active support
- Session-based load balancing in active-active mode: least loaded, hash based
- Load balancing exception list
- VSRP protocol support
- HA transport for synchronizing across devices
- Monitoring support: link, device, critical processes
- Mechanisms for takeover/relinquish and graceful shutdown

Common Utilities and Basic Networking Functions

Common utilities and basic networking functions include support for several network protocols for LAN and WAN connectivity. They also provide management engines for comprehensive configuration, logging and monitoring.

- DHCP-Client, server and relay
- DNS relay, dynamic DNS client
- Network time protocol (NTP) client support
- RIP v1/v2 and static routing
- VLAN support
- Layer 2 bridge with STP, RTSP, IGMP Snooping
- WAN interconnectivity support with static IP, DHCP, PPPoE and PPTP
- Multiple WAN support for load balancing and failover
- Authentication client support including RADIUS and LDAP/S
- Local user database support

Configuration Management Interfaces

VortiQa software contains a built-in optimized Web server with easy-to-use GUI and a command-line interface for management of network gateway functions. A log-generation function can direct logs to external syslog servers and send logs as e-mails.

- Configuration of security and gateway functions
- Firmware upgrade
- Configuration export and import
- CLI for added flexibility and scripting
- Diagnostic capabilities include ping, traceroute, domain name, resolution
- Debug trace support
- Log export via syslog, e-mail and to remote database
- Support for protocols such as TR-069 and TR-098
- Configuration and management engines: CLI, HTTP/S, SNMP, Syslog, e-mail log
- Persistent "save and load" of configurations

Virtual Security Gateway (VSG)

VSG provides functionality that allows the creation of fully enabled virtual gateways that can support multiple gateways within a single device.

- Linux name space support for TCP/IP stack virtualization
- Overlapping IP address support
- Dynamic VSG instance management
- Configuration and Run time state information on per-VSG basis

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