



The Edge. Redefined.



How RG Nets Uses FreeBSD to Build the Future of High-Performance Edge Networks

CHALLENGE

With the adoption of 5G broadband and high-speed public Wi-Fi, telcos and service providers are expanding their footprints at the edge, which has led RG Nets to develop a more cost-effective solution than traditional networking equipment vendors for managing higher data loads efficiently while ensuring high performance, security, and scalability, and device fleet management.

SOLUTION

RG Nets decided to use FreeBSD for their network gateways, allowing them to integrate advanced technologies like network function virtualization (NFV) and application containerization. As a result, they can deploy high-throughput NFV with service-chained containers specific to client requirements and enhance performance without any proprietary limitations, which are often found in commercial solutions.

IMPACT

By leveraging FreeBSD, RG Nets significantly enhanced network performance, particularly in edge network deployments critical for serving 5G and Wi-Fi traffic. This allowed them to handle massive data flows more efficiently, which is crucial for environments with LPVs and densely populated urban areas. Furthermore, by integrating future solutions such as Vector Packet Processor (VPP) and Data Plane Development Kit (DPDK), RG Nets can reduce the computational power needed for its gateways, lowering costs and increasing scalability and functionality.

Founded in 2007 by Dr. Simon Lok, RG Nets, Inc. has established itself as a leader in designing and deploying software-defined network gateway technology. The company specializes in creating high-performance, scalable, secure networking solutions catering to diverse environments, from small enterprises to large-scale service providers.

RG Nets' rXg turn-key gateway devices are a powerful solution combining multiple network functions into one appliance. The appliance can be easily managed from a unified console, which is particularly useful for large organizations that need to administer and monitor network access in multiple remote locations.

These capabilities are especially helpful for carriers, hotels, large residential properties, and large public venues (LPVs) such as stadiums, transit hubs, and congested city hot zones.

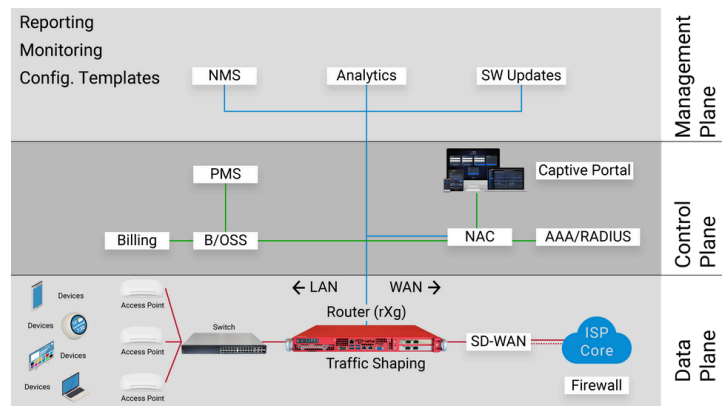
RG Nets: Leveraging FreeBSD to address modern networking challenges

Today, RG Nets utilizes FreeBSD's powerful capabilities to provide innovative and effective solutions to complex edge networking challenges. The company has a strong foundation and has developed advanced networking solutions that cater to the diverse needs of small enterprises and large service providers.

RG Nets uses FreeBSD's robust and modular architecture to create customized solutions that meet the specific demands of modern networks in terms of performance, security, and scalability. By leveraging FreeBSD's flexibility, RG Nets can optimize network functions according to client specifications, significantly improving performance without the limitations and fees associated with commercial networking solutions.

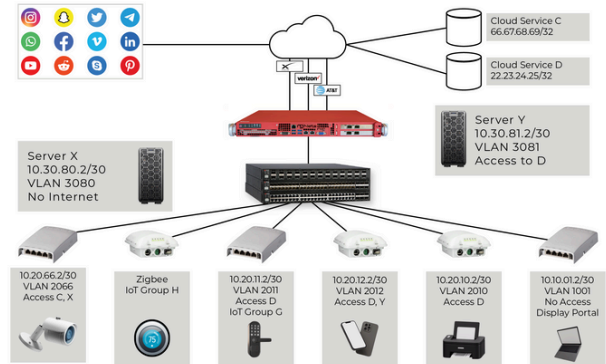
Advanced areas of application

- Software-Defined Networking (SDN):** RG Nets specializes in using FreeBSD for Software-Defined Networking (SDN), a technology that enables efficient network management and operation by separating the control plane from the data plane. By leveraging FreeBSD's unique capability to act as an overlay concentrator and manage the control plane for the underlay, it

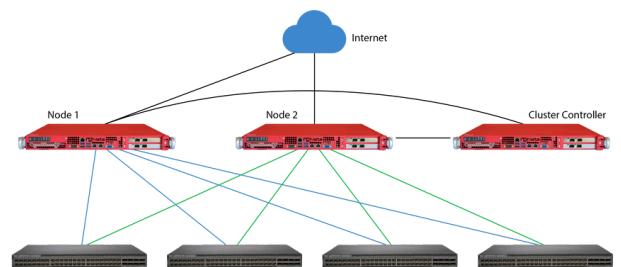


becomes an ideal SDN head-end with high performance and capabilities. RG Nets' SDN solutions on FreeBSD provide unparalleled flexibility and control, enabling automated network management, efficient resource allocation, and adaptable network infrastructure.

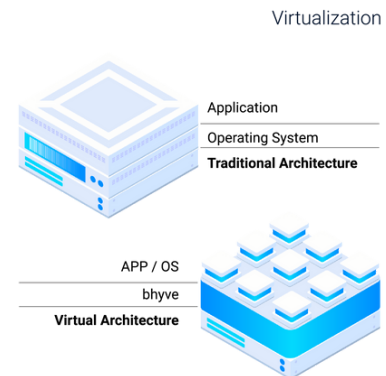
- Network Security:** Securing network infrastructure is paramount in today's landscape, marked by evolving cyber threats. RG Nets leverages FreeBSD's inherently secure environment to develop comprehensive security solutions. These solutions include advanced firewalling, microsegmentation, intrusion detection systems, and secure network gateways that ensure data integrity and protect against breaches.



- High Availability and Disaster Recovery:** FreeBSD's stability and reliability make it an ideal choice for solutions that require high availability and robust disaster recovery capabilities. RG Nets implements FreeBSD-based systems that ensure continuous operation and minimal downtime, which is crucial for mission-critical applications across industries.



- Network Function Virtualization and App Virtualization:** RG Nets can construct highly competitive open-source networking solutions for the most demanding industry applications and modern carrier networks using the **bhyve** hypervisor and **jails** containers, which are FreeBSD's key feature sets for network function virtualization and application virtualization.



- Cost-Effective Innovations:** RG Nets is committed to reducing the cost of network infrastructure for its clients. By using FreeBSD, the company avoids the high licensing fees associated with proprietary software, passing these savings on to customers. This approach not only makes advanced networking more accessible but also promotes a more competitive market.



Community contributions and future technology: Driving innovation at RG Nets

The company is at the forefront of technology integration in its FreeBSD-based solutions for the network's edge, specifically application containerization and network virtualization. This integration enhances scalability and efficiency, allowing RG Nets to provide robust and flexible solutions that meet future digital communication needs, including 5G networks and IoT ecosystems.

Dr. Simon Lok and RG Nets are actively involved in the FreeBSD community, showcasing their dedication to pushing the boundaries of network technology. This engagement ensures that RG Nets remains at the forefront of innovation and significantly contributes to the development of the FreeBSD ecosystem.

In the past, RG Nets has contributed to **pf**, the integrated FreeBSD packet filter firewall, the **altq** network packet scheduler, and enhanced Intel network interface card performance for specific configurations.

A notable example of RG Nets' current contributions is its sponsorship of Vector Packet Processor (VPP) porting and the Data Plane Development Kit (DPDK) to FreeBSD. These projects represent significant advancements in network data processing:

- Vector Packet Processor (VPP): Originally developed by Cisco, VPP is highly scalable, performing packet processing at very high speeds. [Porting VPP to FreeBSD](#) enables the operating system to handle massive data flows more efficiently, reducing latency and increasing throughput for demanding network applications.
- Data Plane Development Kit (DPDK): DPDK is a set of libraries and drivers designed to accelerate packet processing workloads on various CPU architectures. By supporting the porting of DPDK, RG Nets facilitates enhanced performance of network applications on FreeBSD, allowing for faster and more reliable data packet processing.

FreeBSD's future impact on the telecommunications and networking industry

RG Nets has significantly advanced telecommunications and networking by integrating VPP and DPDK into FreeBSD. These technologies enable telecommunications companies to manage higher data loads more efficiently, which is crucial for handling increased traffic from video streaming, cloud computing, and IoT devices.

With the integration of VPP, the company's FreeBSD-based gateways are set to significantly boost performance, particularly in edge network deployments critical for serving 5G and Wi-Fi traffic from mobile devices in challenging environments like large public venues and densely populated urban areas. VPP allows these gateways to achieve higher performance with less CPU usage, reducing the need for brute-force computational power. This efficiency is especially vital for managing the high data throughput and low latency requirements of 5G networks in places like sports stadiums, where thousands of simultaneous connections occur during events.

In addition, RG Nets' systems offer improved performance, reducing the need for significant hardware investments. This makes it possible to use scalable solutions that can grow according to user demands without increasing costs. This scalability is particularly important for telecommunications providers who want to expand their infrastructure efficiently while introducing new services. In the future, it also provides the opportunity to use low-power solutions with very high network throughput, such as Arm and RISC-V-based solutions with VPP and integrated Data Processor Units (DPUs).

RG Nets and its future with the FreeBSD community

RG Nets has made significant contributions to the development of FreeBSD, which has enabled providers to offer new and innovative services to meet the evolving demands of consumers and businesses. These services include enhanced broadband services, more robust security features, and next-generation mobile services, critical in delivering high-quality, reliable, and advanced network services.

RG Nets' involvement in FreeBSD's development is essential in shaping the future of telecommunications. It also underscores the importance of open source solutions in fostering innovation and advancing industry standards. By continuously innovating and leveraging open source technology, RG Nets remains a key player in the telecom industry and contributes to adopting and developing cutting-edge network technologies.

Getting Started with FreeBSD

Led by Dr. Simon Lok, RG Nets is highly committed to contributing to the FreeBSD community and supporting significant projects that reinforce its position as a leader in network solutions. This proactive approach ensures that FreeBSD remains relevant in an ever-evolving technology landscape, fostering ongoing innovation that benefits RG Nets and the global community of network engineers.

Dr. Lok advises any organization considering FreeBSD to engage with the FreeBSD community early and utilize the resources provided by The FreeBSD Foundation. The Foundation offers valuable support, not only in addressing technical and implementation queries but also in networking and fostering connections within the community. If your organization is considering using FreeBSD, Dr. Lok recommends contacting The FreeBSD Foundation through their website's Contact Us page or simply downloading FreeBSD to explore its potential.