Virtualized Networking Software

6WIND Virtual Service Router (VSR)

6WIND Virtual Service Router (VSR) is a high-performance, off-the-shelf virtualized IP router software.

6WIND Virtual Service Router (VSR) is a high-performance and scalable virtualized software router optimized for Communication Service Providers and Enterprises. it is deployed bare-metal, virtualized, or containerized on COTS servers in private and public clouds.

Per design, the 6WIND VSR provides scalable performance at both control plane and data plane allowing customers to build flexible network architectures that deliver high-end routing and security features cost effectively with low TCO.

6WIND VSR comes with a complete and rich management plane that enables customers besides configuring, managing and monitoring the VSR locally through a CLI or remotely through a Netconf based client, to automate operational workloads.

6WIND VSR addresses different use cases including Border Routers, Provider Edge, VPN Concentrators, Large Scale NAT, End-to-End Security, Security Gateways, SD-WAN, etc., and comes with a pay-as-you-grow model that helps customers scale their business appropriately.

6WIND VSR

Key features

- **High Performance**
- **Advanced networking & security features**
- **High Scalability**
- **Multi-service offering**
- **Increased deployment agility**
- **Optimal resource usage**

Benefits

- End-to-End Security
- Reliability & Flexibility
- Increased deployment agility
- Optimized use of resources
- Highly Cost Effective
- Low TCO

Features

High Performance and Scalability

The main concept to reach deterministic high performance is to fully isolate the data plane, where network data packets are processed, from the control and management planes. 6WIND maximizes performance of its control plane and data plane by optimizing its VSR solutions for deployments in scalable and virtualized computing environments.

The 6WIND VSR relies on a software design optimized to drive the best performance from a multi-processors CPU architecture. With an optimized networking stack relying on a lockless design and on poll mode network drivers, the 6WIND VSR delivers high-speed and ultra-low latency packet processing and forwarding.

Furthermore, the 6WIND VSR architecture uses a run to completion model that allows the VSR to deliver linear scalable performance with deterministic low latency.

The separation between the control plane and data plane enables the 6WIND VSR to support compute-intensive control plane tasks and to minimize routing table convergence times.

WWW.6WIND.COM

6WIND EMEA
Paris, France
Phone: + 33 (0)1 39 30 92 10

6WIND Inc. Americas
Santa Clara, CA
Phone: +1 (408) 816-1366

Resiliency and Robustness

The 6WIND VSR software solution is designed and optimized for deployment on generic x86 server platforms (COTS servers) to meet extreme reliability demands for the virtualized environment.

Based a proven stable network stack, widely deployed by major Tier-1 OEMs and Service Providers, the 6WIND VSR software enables creation of highly robust network architectures with advanced resiliency capabilities.

Ease of Deployment

6WIND VSR software supports different deployment options. Whether bare metal as Platform Network Functions (PNFs), or virtualized as Virtual Network Functions (VNFs), or containerized as Container Network Functions (CNFs), the VSR is designed to vertically scale with available hardware resources and deliver the highest performance from the selected deployment environment.

6WIND VSR comes in different binary formats including qcow2, ova and iso.

The 6WIND VSR deployment and orchestration can be seamlessly handled by Openstack and Kubernetes.

Automation through Ansible is used for ease of deployment and provisioning.

Ease of Management and Operations

6WIND VSR relies on a Netconf/Yang management. The VSR onboards a Netconf server that allows managing the VSR locally with a CLI and remotely with any generic Netconf client.

Furthermore, the VSR provides support for different other standard management and monitoring tools including Cloud-init, snmp, and sflow that ease management and operations.

High Efficiency

The 6WIND VSR relies on an efficient and highly optimized network stack that enables driving the highest performance from a multi-processors based platform.

The VSR implements a separation between the control plane and the data plane that allows a linear scalability of the VSR performance. This design enables an optimized use of system resources and increases the VSR efficiency.

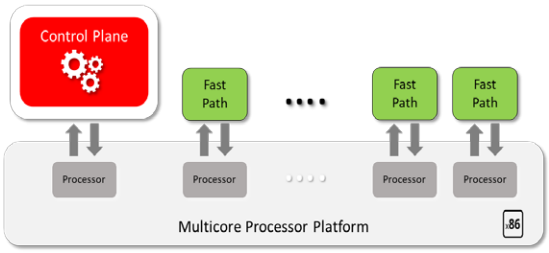
The 6WIND VSR delivers multiple Gigabits of forwarding capabilities with a single CPU core (virtual or physical). Combined with a linear scalability of its data plane, the VSR performance can scale to multiple hundreds of Gigabits on a single instance.

VSR Architecture

The 6WIND VSR relies on 6WIND's expertise in high performance service routing software solutions to deliver optimized architectures and designs for x86 multi-processor platforms.

To deliver the required high performance, the 6WIND VSR adopts advanced implementation and design concepts including the following:

- Separation of control plane and data plane to enable independent scaling of both planes within the VSR instance.
- Lockless data plane network stack for a consistent minimized latency.
- Optimized data plane, named Fast Path (FP), that benefits from a multi-processor environment to deliver high scalability. The FP represents an optimized data path that supports the different data plane functions, including forwarding, routing, filtering, QoS classification, policing, etc.
- Leverage HW acceleration when available to deliver the highest possible data plane performance and drive the best from the available HW resources.



Thanks to these advanced implementation and design concepts, the 6WIND VSR solution allows:

- Separation of control plane and data plane CPU cores
- Optimized usage of deployment environment's resources
- High performance for both control and data planes
- Advanced redundancy features
- Resilient cloud scaling
- Consistent operations across physical and virtualized network elements.

6WIND EMEA
Paris, France
Phone: + 33 (0)1 39 30 92 10

6WIND Inc. Americas
Santa Clara, CA
Phone: +1 (408) 816-1366

Virtual Border Router (vBR)

6WIND Virtual Border Router is a high performance, ready-to-use software router, part of the 6WIND VSR software solutions.

Virtual Security Gateway (vSecGW)

6WIND vSecGW is a product that provides security capabilities along with performance and scalability to address end-to-end security challenges for CSPs and Enterprises.

Virtual CG-NAT Router (vCG-NAT)

6WIND Virtual CG-NAT (Carrier Grade NAT) is a product that provides network address translation capabilities at high scale to enable service providers handle internet IPv4 address exhaustion.

Virtual Provider Edge Router (vPE)

6WIND vPE Router provides an IP/MPLS network edge service for CSPs and Enterprises delivering highly available internet services over IP/MPLS infrastructure. It is deployed as an alternative to using a physical router and can deliver the required functions and performance to enable fast service innovation and extend service reach.

Virtual Cell Site Router (vCSR)

The 6WIND vCSR is a virtualized solution that runs on x86 COTS servers and delivers the features and performance needed to aggregate traffic in a radio access network from baseband units and backhaul it over an aggregation network to the operator's core network.

Virtual CPE Router (vCPE)

The 6WIND vCPE Router is a virtualized routing solution adapted for **Universal Customer Premises Equipment** (vCPE). It runs as a virtualized network function (VNF) to deliver cost effective and highly efficient routing, security and virtual private network connectivity services on simple, inexpensive, on-site x86 devices.

6WIND
WWW.6WIND.COM

6WIND EMEA
Paris, France
Phone: + 33 (0)1 39 30 92 10

6WIND Inc. Americas
Santa Clara, CA
Phone: +1 (408) 816-1366

Virtual Border Router

Virtual Border Router (Peering Router)

A Peering Router allows two Internet networks to connect and exchange traffic.

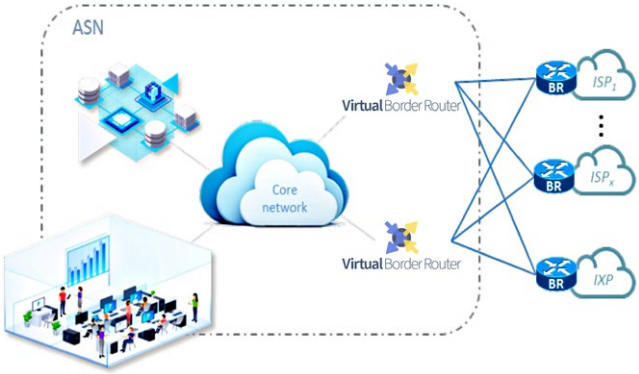
Network operators, ISPs and large Enterprises use peering for greater control over their traffic flows in order to allow optimizing routing decisions and increase performance.

The 6WIND VSR software includes all the features and capabilities needed to deliver a Border Router (Peering Router) service.

For instance, the VSR supports multiple full internet routing table and provides the following capabilities:

- Rich routing protocols (BGP, OSPF v2, OSPF v3, RIP and RIPng)
- Support for access control lists
- Internet peering scale
- Device management
- DDoS protection through BGP flowspec.

Thanks to its optimized design and to its fast route lookup implementation, the 6WIND VSR achieves high scalability, high performance and low convergence time allowing optimal routing decisions.



The 6WIND VSR implements traffic splitting and balancing between multiple links to optimize packet flow, reduce latency and enhance connectivity.

Key features

- **Linear Scalability** (over 300Gbps throughput per single instance)
- **40Gbps per CPU core** (IMIX traffic)
- **Multiple Full Route** (Multiple millions BGP routes)
- **Fast Route Lookup**
- **Fast BGP Convergence**

Benefits

- Multiple full route support
- High Performance and Scalability
- Low convergence time
- Fast route lookups
- Multi-tenancy support
- Support for physical and virtual deployments (PNF and VNF)
- Efficiency with reduced operational costs and complexity

> “6WIND’s vRouters have the **best virtual packet processing engine we’ve seen on any virtual routing platform**. No other products we’ve looked at perform anywhere close to 6WIND.”
>
> *Rick Jenssen, Senior Director of Consulting Systems Engineering at Arbor Networks*
>
> NETSCOUT | Arbor

6WIND
WWW.6WIND.COM

6WIND EMEA
Paris, France
Phone: + 33 (0)1 39 30 92 10

6WIND Inc. Americas
Santa Clara, CA
Phone: +1 (408) 816-1366

Virtual SecGW

Virtual Security Gateway (vSecGW)

The 6WIND VSR can be used as a Virtualized Security Gateway (vSecGW) that provides comprehensive, highly scalable and network-integrated Layer 3 IPsec-based VPN connectivity.

The vSecGW functionality can be applied to any type of network traffic in fixed, wireless and converged environments.

The 6WIND vSecGW covers different deployment use cases including:

- Mobile Security Gateway
- Remote Access IPsec VPN Concentrator
- Secure multi-cloud access
- Site-to-site and network-to-network encrypted IP security

Network operators benefit from superior deployment flexibility, a rich feature set, carrier-grade performance, high availability and enhanced support tools, enabling quick deployment and operationalization of a flexible and powerful IPsec feature set in cloud and hybrid environments.

Key features

- **16 Mpps per CPU core** (Forwarding rate)
- **18 Gbps per CPU core** (Over 200G per single instance)
- **100,000 tunnels** (VPN IPsec tunnels)
- **1,000 tunnel/s** (Establishment rate)

Benefits

- End-to-End encryption and secure VPN IPsec tunnels
- Centralized certificate-based security
- Support for physical and virtual deployments (NFV)
- High scalability (100k+ sessions per instance) and High availability
- Optimized network performance and efficiency with reduced operational costs and complexity

> “6WIND Virtual IPsec vRouters are a **drop-in replacement for Brocade vRouters with an added bonus of high performance IPsec VPN functionality.** 6WIND’s price/performance combo make it a contender for any vRouter, firewall and secure VPN project.”
>
> *Chris Konger, Senior Network Engineer*
>
> sovrn

WWW.6WIND.COM

6WIND EMEA
Paris, France
Phone: + 33 (0)1 39 30 92 10

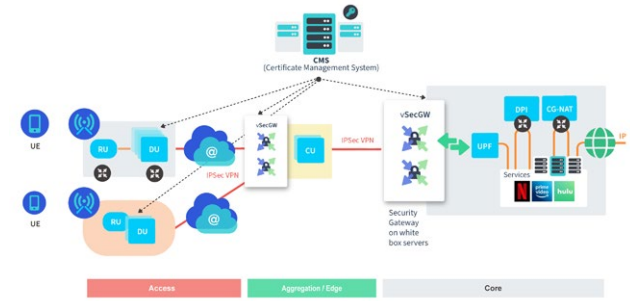
6WIND Inc. Americas
Santa Clara, CA
Phone: +1 (408) 816-1366

The 6WIND vSecGW can be deployed in different use cases, delivering high performance, scalability, resiliency and end-to-end security benefits for each one.

The following sections describe the most relevant deployment use cases for CSP and Enterprise networks.

Mobile Security Gateway

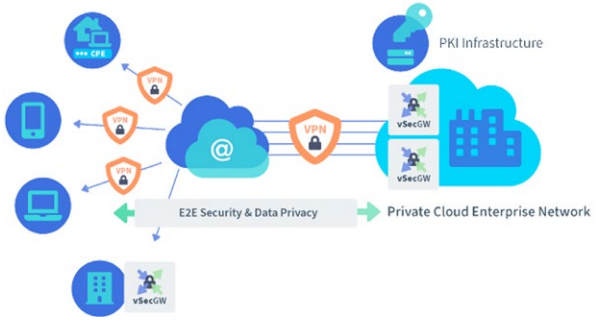
Communication Service Providers can leverage the 6WIND vSecGW to deliver end-to-end encryption and secure IPsec VPN tunnels. The vSecGW can be deployed in a 4G network to secure S1 traffic and terminate VPN tunnels initiated at eNodeBs and small cells. The vSecGW can also be deployed in 5G networks to secure the CU to DU or the CU to core network connectivity.



The 6WIND's vSecGW can use a centralized certificate management to install the required security certificates.

Remote Access IPsec VPN

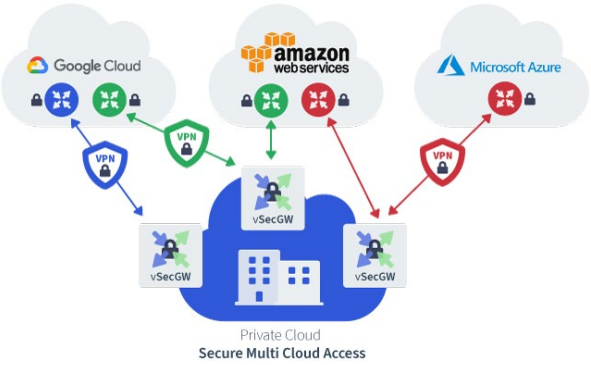
The Remote Access IPsec VPN service addresses CSP and enterprise use cases and offers scalable VPN connectivity to securely connect remote workers and branch offices to the enterprise private network. VSR software provides encryption and interoperability capabilities allowing aggregation of VPN connections issued by any native VPN client solution including Windows, iOS, Android and Linux.



Furthermore, the solution comes with high availability capabilities, for a secure and reliable connectivity service, and delivers highly scalable performance not only on the throughput but also on the number of simultaneous VPN connections.

Secure Multi-Cloud Access

The secure multi-cloud access service allows enterprise customers to securely extend their private networks to the public cloud and thus to leverage cloud hosted services, assets and applications without compromising their data confidentiality and integrity. The solution offers consistent data protection across cloud providers.



Site-to-site and Network-to-network Encrypted IP security

The 6WIND VSR solution provides highly scalable DMVPN capabilities that allows small, mid-scale and large enterprises to securely create site-to-site, network-to-network or light SD-WAN networks over agnostic transport access such as Fiber, Radio Transmission, LTE, and 5G.

6WIND EMEA
Paris, France
Phone: + 33 (0)1 39 30 92 10

6WIND Inc. Americas
Santa Clara, CA
Phone: +1 (408) 816-1366

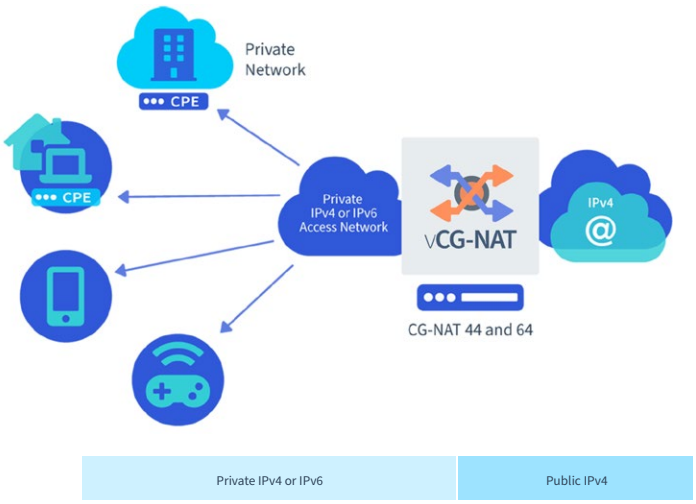
Virtual CG-NAT

Virtualized Carrier Grade Network Address Translation (vCG-NAT)

The adoption of Service Defined Networks drives the need for virtualized network functions to provide flexible and scalable networking capabilities. The 6WIND vCG-NAT service along with the other 6WIND VSR services is designed to run as VNF and provide High performance and scalable networking functions delivering routing, and large-scale NAT capabilities.

6WIND vCG-NAT is a high-performance, software-based solution for a large-scale transparent network addresses and protocols translations. It is deployed in bare metal or in virtual machines on commercial-off-the-shelf (COTS) servers in private and public clouds.

6WIND vCG-NAT enables a smooth transition to IPv6 and allows service providers to efficiently extend their IPv4 networks.



6WIND vCG-NAT aggregates multiple millions of concurrent connections and scales the bandwidth performance from 1G to over 300G.

6WIND vCG-NAT works as a Virtual Machine on top of standard x86 server to provide flexibility and cost-efficiency for small and large deployments.

The 6WIND vCG-NAT allows sharing small pools of public addresses among multiple end-sites and end-users, thus helps greatly expand the capacity of existing networks with a limited extra investment.

It enables Internet and telecom Service Providers overcome the exhaustion of public IPv4 addresses by leveraging IPv4 to IPv4 (NAT44) or IPv6 to IPv4 (NAT64) translations to optimize the private networks usage and sustain a rapid growth in the number of subscribers and devices.

Key features

- **30M Connections** (Concurrent connection per 32G RAM)
- **Linear Scalability** (over 300Gbps throughput per single instance)
- **30Gbps per CPU core** (IMIX traffic)

Benefits

- High Performance
- Support for NAT44, NAT64 and DNS64
- High scalability to address rapid growth in the number of subscribers and devices
- Native support for physical and virtual deployments (PNF, VNF)
- Rich features: including Endpoint-independent Mapping (EIM), Endpoint-independent Filtering (EIF), port preservation, hair-pinning and address pooling for a seamless user experience across a NAT environment

6WIND
WWW.6WIND.COM

6WIND EMEA
Paris, France
Phone: + 33 (0)1 39 30 92 10

6WIND Inc. Americas
Santa Clara, CA
Phone: +1 (408) 816-1366

vPE

Virtual Provider Edge Router (vPE)

The legacy and traditional way to deploy a CSP network edge relies on physical routers. While this deployment seems to be efficient for centralized service delivery, it is expensive and not optimized for low-bandwidth applications, and could be seen as an artificial barrier for a CSP to enter new markets and services.

The 6WIND vPE solution is a virtualized network function (VNF) serving as an Edge Router. It is designed and optimized to deliver high performance and scalability with optimized resource usage.

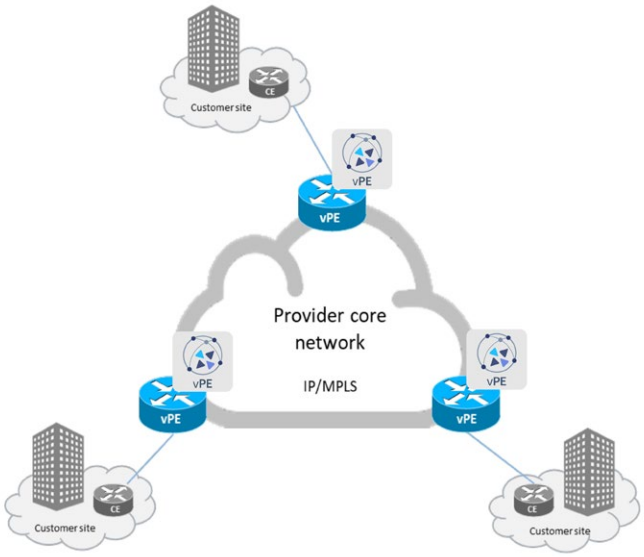
The 6WIND vPE meets a wide variety of market requirements by delivering all the traditional provider edge services, such as IP/MPLS, virtual private networks (VPN) services, Layer 2 and Layer 3 routing, encapsulation protocols – including IPsec, Segment Routing (SR), Ethernet VPN, VxLAN, etc.

The 6WIND vPE solution brings a major advantage in the communication service provider edge network by enabling easy and rapid bandwidth and services scale up.

Communication Service Providers (CSPs) can leverage the 6WIND Virtual Provider Edge solution (vPE) for agile service introduction, distributed edge architectures, and to meet specific service requirements associated with low-risk expansion into new markets and geographies.

Benefits

- High Performance
- Support for NAT44, NAT64 and DNS64
- High scalability to address rapid growth in the number of subscribers and devices
- Native support for physical and virtual deployments (PNF, VNF)
- Rich features: including Endpoint-independent Mapping (EIM), Endpoint-independent Filtering (EIF), port preservation, hair-pinning and address pooling for a seamless user experience across a NAT environment



vCSR

Virtual Cell Site Router (vCSR)

5G adoption is, nowadays, taking place in all major Mobile Network Operators (MNOs). With the new 5G service introductions, MNOs seek out for new densification strategies at the RAN, placing the RAN purchases at about 80 percent of mobile operators' CAPEX.

In addition, densifying the RAN brings new challenges and puts a huge pressure on mobile operators to improve operational economics while meeting the increasing demands of the legacy services, and the new 5G offerings.

Thus, transforming and evolving the RAN by virtualizing it and making it software defined makes it the most viable solution to address these challenges.

The 6WIND Virtual Service Router provides a virtual Cell Site Router (vCSR) solution that aligns with this evolution.

The 6WIND vCSR is designed to be deployed as virtual network function on an x86 COTS server. It provides all the required features to deliver layer 3 connectivity between the access network and the 5G core network.

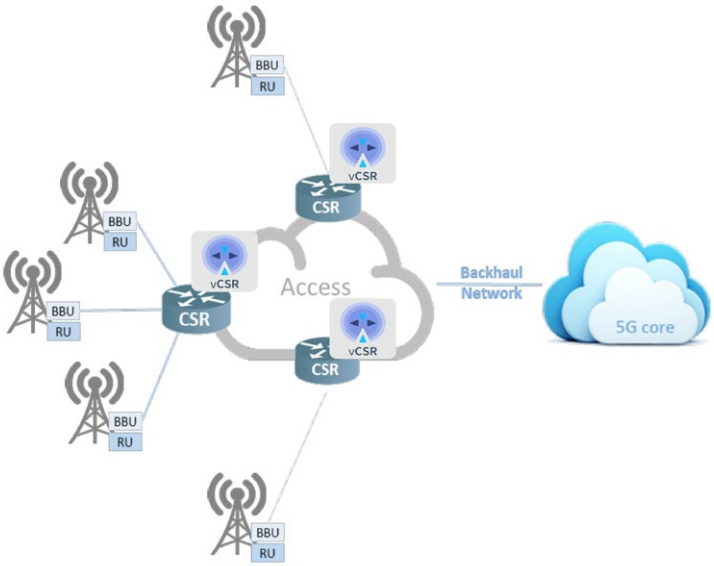
The 6WIND vCSR simplifies the mobile network architecture and significantly reduces operator TCO. It is optimized to develop high performance routing and IPsec VPN connectivity with minimal CPU resource usage.

In addition, the 6WIND vCSR comes with an open and automated management to ease integration with Operator's NMS and OSS.

The 6WIND Cell Site Router can be enhanced with additional IP/MPLS capabilities to connect with a Provider Edge network.

Benefits

- High performance and scalable full featured cell site gateway router.
- Deployed as VNF on x86 COTS servers
- Optimized resource usage for minimal hardware requirements
- Low TCO
- Provides scalable and high-performance routing and IPsec VPN security.
- Extendible with additional IP/MPLS capabilities



Specification

IP Networking:

- IPv4 and IPv6
- IPv6 auto-configuration
- Multi-tenancy (VRF)
- IPv4 and IPv6 tunneling
- Network address translation
- Multi-cast

Routing:

- BGP4, BGP4+
- BGP RPKI
- OSPFv2, OSPFv3
- RIPv1, RIPv2, RIPng
- Static routes & path monitoring
- BGP multi-path (ECMP)
- Policy base routing (PBR)
- MPLS
- BGP L3VPN
- BFD
- NHRP
- VXLAN EVPN

L2 and Encapsulations:

- GRE, mGRE
- VLAN (802.1Q, QinQ)
- VXLAN
- LAG (802.3ad, LACP)
- Ethernet bridge

QoS:

- Rate limiting per Interface
- Rate limiting per VRF
- Class-based QoS
- Classification: ToS/IP/DSCP/CoS
- Shaping and policing
- Scheduling: PQ, PB-DWRR

IP Services:

- DHCP server / client / relay
- DNS client / proxy
- NTP

Management / Monitoring:

- SSHv2
- CLI
- NETCONF / YANG
- KPIs / telemetry (YANG-based)
- SNMP
- RBAC with AAA
- Syslog
- 802.1ab LLDP
- sFlow

Security:

- ACLs (stateless & stateful)
- uRPF
- CP protection
- BGP FlowSpec

High Availability:

- VRRPv2 (IPv4/IPv6)
- VRRPv3 (IPv6)

System Requirements

- Processor: single or multi-sockets Intel® Xeon® and Atom® processor
- CPU cores: 2 minimum (one for control, one for data plane)
- Memory: 2GB minimum
- NICs:
  - Intel 1G, 10G, 40G, 100G
  - Mellanox 10G/ 25G/ 40G/ 50G/ 100G: CX4, CX5
  - Broadcom NetExtreme E-Series
  - Virtio, SR-IOV, PCI pass-through, VMXNET3, ENA

Deployment / Hypervisor

- Bare metal, KVM, VMware ESXi, OpenStack NFV, AWS, containers (Kubernetes/Docker)
- Installation: PXE, USB, ISO, QCOW2, OVA
- Update / rollback support
- Provisioning: cloud-init, Ansible, ZTP
- Licensing: Online licensing system for feature and capacity enablement

Server Hardware Recommendations

- www.6wind.com/server-hardware-suggestions

6WIND
WWW.6WIND.COM

6WIND EMEA
Paris, France
Phone: + 33 (0)1 39 30 92 10

6WIND Inc. Americas
Santa Clara, CA
Phone: +1 (408) 816-1366