



6WIND vRouter Provides BGP-Based Border Routing for ISPs

6WIND Border vRouter leverages 6WINDGate network stack, DPDK, and Intel® Xeon® processors to deliver BGP routing performance of 15 Gbps per core.¹ Built-in NETCONF/YANG-based management capabilities simplify integration into an internet service provider's network.



The benefits to internet service providers (ISPs) of moving from fixed-function routers to virtualized, software-based routers running on Intel® processor-powered servers include network agility, potential for reduced costs, and automated lifecycle management. Border routers are no exception, but they have performance and complexity challenges that make them harder to virtualize and still get acceptable performance. Leveraging its experience with high-performance vRouters, 6WIND, an Intel® Network Builders ecosystem partner, has developed one of the industry's first virtual routers with the performance for successful deployment in network border applications.



Border Routing Performance Is Critical

When building services that extend beyond an ISP's network, a border router is needed to manage the interconnectivity between these networks. ISPs deploy border routers at the point of presence (PoP) or internet exchange point (IXP) and connect them to transit routers from other ISPs to act as the interconnection point.

Because it is a network aggregation point, the network performance of many customers depends on the border router, and the critical nature of the border router means it is typically replicated on the ISP network for redundancy, and is connected to several transit routers for network optimization.

Border gateway protocol (BGP) is the main external routing protocol for these routers. It is designed for redundancy and multi-path routing. To accomplish this, it features a large number of attributes that can be attached to a route, and it has detailed route selection rules and other filter mechanisms and configuration options.

Depending on the size of the network, it is common for a border router to handle 10 Gbps of routing and multiple BGP full routes due to redundancy and BGP multihoming. BGP convergence time is also a critical item. Both the high bandwidth and complex routing protocols have made it difficult to virtualize a border router and still have it deliver the same performance as an appliance-based device.




6WIND vRouter for Border Network Deployments

The 6WIND border vRouter (see Figure 1) includes the company's proven 6WIND Turbo Router software with the following features:

- **Border router features:** BGP routing, firewalling, (simple network management protocol) SNMP, and sFlow to manage traffic with visibility across data center and point of presence (PoP) networks.

- **Wide protocol support:** IPv4 and IPv6 packets are supported along with BGP4 and BGP4+, BGP FlowSpec, and OSPFv2 and OSPFv3 routing protocols.
- **BGP performance:** BGP route table population supports two million routes with the fast route lookup and convergence speed required to build large peering networks.
- **Software scalability:** Ability to increase capacity for existing vRouters as an alternative to deploying new routers when business growth requires additional performance.
- **Virtualized or bare metal:** 6WIND border router can run in a virtual machine (VM) from popular hypervisors or in a bare metal configuration.

6WIND vRouter: Border Router Software For ISPs



- **Routing Performance**
 - 15 Gbps throughput per core / 12 Mpps per core
 - Millions of routes; only limited by memory
 - Industry leading convergence times
- **Software Scalability**
 - Data plane performance scales with CPU cores
 - Control plane performance scales with system memory
- **Features**
 - BGP, OSPF, FlowSpec, PBR, NAT, CG-NAT, more
 - Deploy on-premise or in the Cloud
- **Next-gen management**
 - CLI and NETCONF/YANG-based APIs for automation
 - Telemetry and analytics continuously monitor network status and optimize performance

Bare Metal and Virtual Machine Deployment

Commercial-off-the-Shelf (COTS) Servers

Figure 1. Features and benefits of 6WIND border vRouter.²

6WIND Turbo Router utilizes the company's own 6WINDGate networking stacks along with the open source Data Plane Development Kit (DPDK) for improved packet throughput. DPDK includes software libraries that route packets around the Linux OS to improve packet throughput.

High Performance

Due to the high-bandwidth nature of the application, border routers can be connected to a 10 Gbps link and need to deliver full line rate performance. In 6WIND's own tests, using Intel® Xeon® Platinum 8170 processor-based servers, the 6WIND border vRouter demonstrated packet forwarding performance of 15 Gbps and 12 million packets per second (Mpps).¹ These tests were conducted on a single processor core. The 6WIND border vRouter architecture can add additional cores for linear scalability when used with faster network links.

Up to four full BGP routes are possible using the vRouter with the number of routes available dependent only on the amount of available memory in the system. Fast BGP route convergence is another important metric and is determined by the amount of CPU cores allocated for the control plane.

Managing Hundreds of Border Routers

An ISP can have hundreds of border routers in its network—along with other network systems—which makes it important to simplify the addition of the vRouter into the network's overall management system.

The 6WIND border vRouter includes APIs that allow configuration and management via the ISP's management and orchestration framework. NETCONF/YANG is also supported providing further configuration and monitoring options at a more granular level. Management data can be exported to a database for visualization via third-party software. InfluxDB and Grafana are pre-integrated into the vRouter for visualization.

These open APIs and easy integration are very important to PIT US and PIT Chile, two internet exchange points (IXPs) that serve more than 80 internet service providers with a combined user base of 10 million people. The companies deployed 6WIND border vRouters to connect their network of internet service providers (ISPs) between data centers in Santiago, Chile, and Miami, Florida. In addition to easy management of these worldwide deployments, PIT US selected 6WIND's border vRouter software running on Intel®-powered hardware for its performance, scalability, functionality, and cost effectiveness.

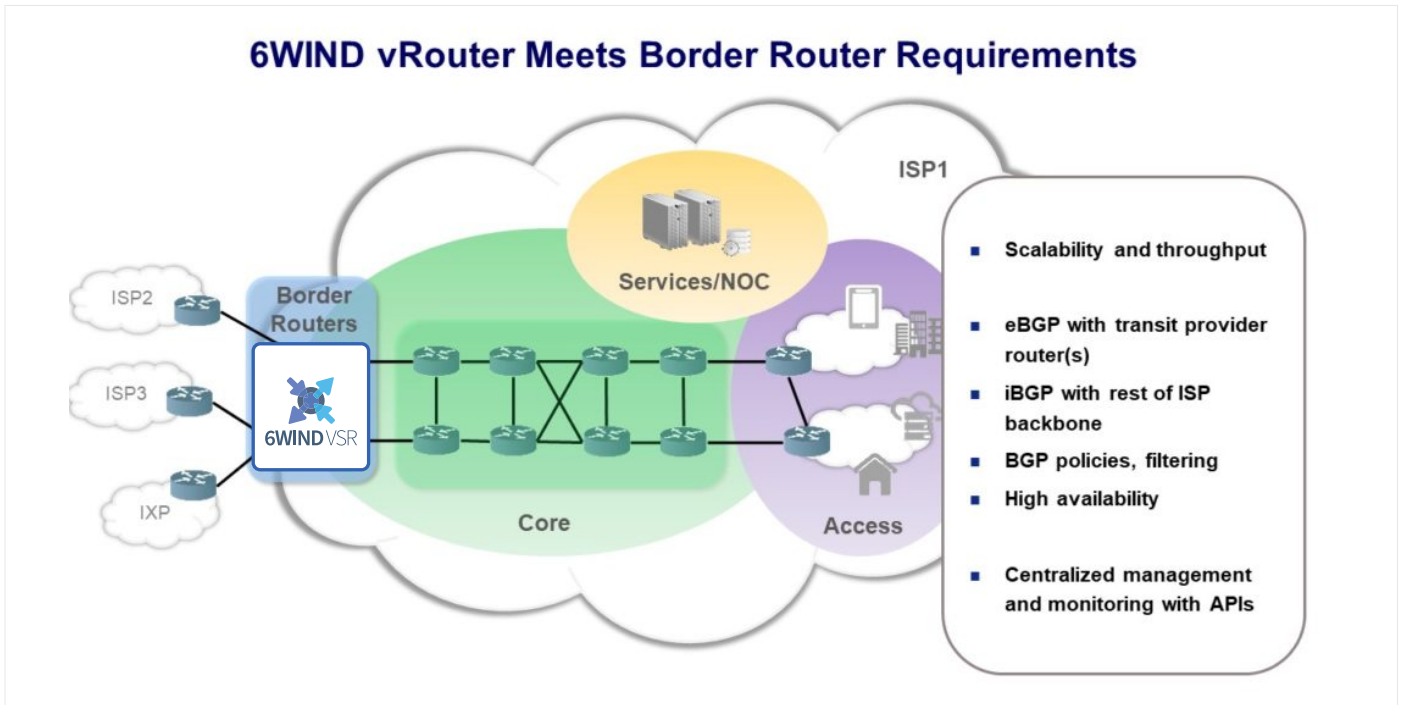


Figure 2. 6WIND border vRouter connects multiple ISP networks.²

Intel® CPUs Provide Performance, Scalability

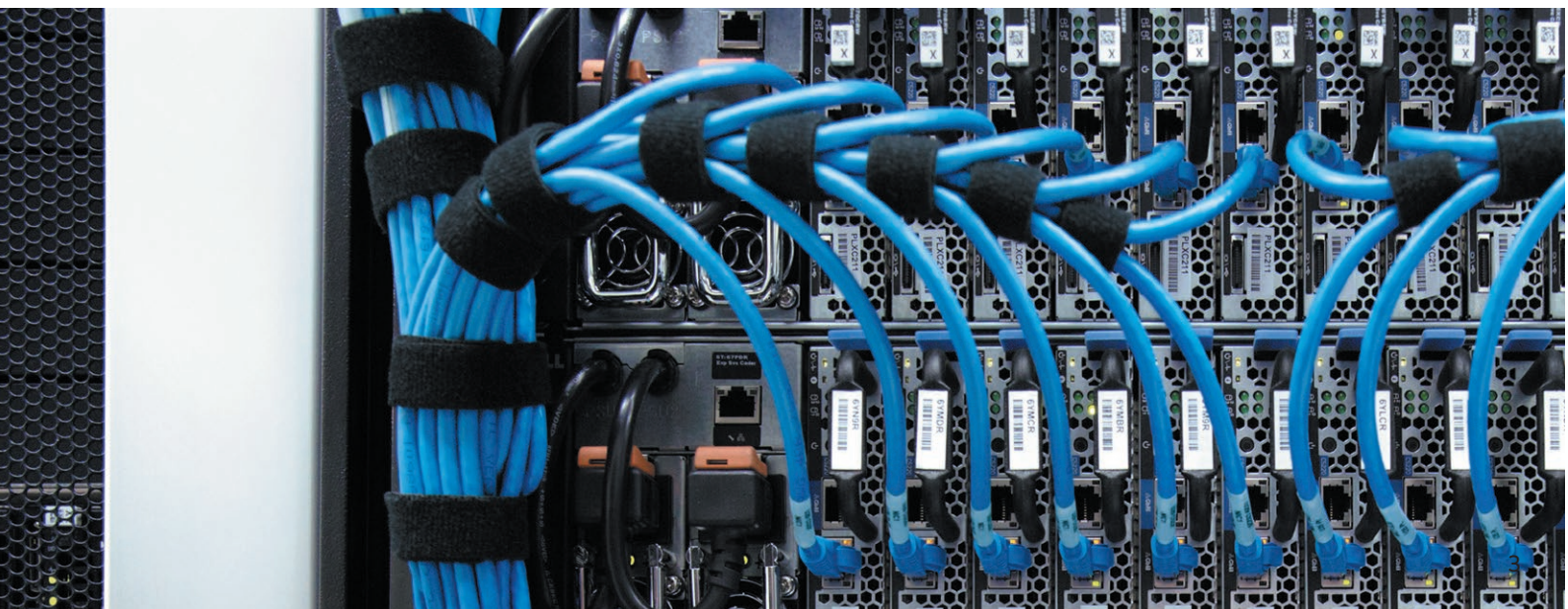
6WIND offers the border vRouter on servers based on a wide range of Intel CPUs for performance scalability and cost effectiveness. For uCPE environments, Intel Atom® C3000 processors are recommended. The Intel Atom C3000 is Intel's third-generation system-on-a-chip (SoC)-based CPU and is designed for light scaled-out workloads that require very low power, high density, and high I/O integration. Intel® QuickAssist Technology (Intel® QAT) functionality is built into the Intel Atom C3000 SoCs for accelerating encryption of customer data, freeing up valuable CPU processor cycles for other critical needs such as data path processing.

For higher performance applications, servers powered by Intel Xeon Scalable processors provide the compute performance required for higher throughput. Intel Xeon

Scalable processors deliver data center processing performance. These processors feature an open architecture that scales and adapts with ease to handle the demands of emerging applications. The platform provides a future-ready foundation for agile networks that can operate with cloud economics, be highly automated and responsive, and support rapid and more secure delivery of new and enhanced services.

Conclusion

Developing high-performance border vRouter solutions meant combining 6WIND's high performance network routing stack along with DPDK and Intel® architecture-based servers. Now ISPs and IXPs like PIT Chile and PIT US can reduce costs and improve network agility without sacrificing performance at this critical network location.



About 6WIND

6WIND's networking software solves performance and time-to-market challenges for Service Providers, Enterprises, and OEMs. The company's flagship vRouter technology is available in software appliance, source code and hypervisor networking form factors optimized for cost-effective hardware, such as Commercial-off-the-Shelf (COTS) servers. 6WIND is based near Paris, France, with regional offices in China and the United States. For more information visit <http://www.6WIND.com>.

About Intel® Network Builders

Intel Network Builders is an ecosystem of infrastructure, software, and technology vendors coming together with communications service providers and end users to accelerate the adoption of solutions based on network functions virtualization (NFV) and software defined networking (SDN) in telecommunications and data center networks. The program offers technical support, matchmaking, and co-marketing opportunities to help facilitate joint collaboration through to the trial and deployment of NFV and SDN solutions. Learn more at <http://networkbuilders.intel.com>.



¹ Testing done by 6WIND on January 23, 2019. Configurations: Reference test platform powered by an Intel® Xeon® Platinum 8170 processor@ 2.1 GHz (microcode: 0x200005e) and 20 x 10 G ports, 26 cores. Turbo turned off. For the throughput performance, used 1 CPU Core, 6Gb of 2133 MHz RAM and 2 x 10 G Intel® Ethernet Converged Network Adapter X520 NICs. BIOS version: PLYDCRB1.86B.0131.R09.1704131634.

² Figures provided courtesy of 6WIND. See end note 1 for configurations of 15 Gbps and 12 Mpps performance measurements.

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