

Application Note

Provider Edge Router

Changing the economics of edge routing

The Volta Elastic Virtual Routing Engine (VEVRE) can be used in a wide range of applications that used to require an expensive legacy router. Offering the industry's first cloud-based control plane, our virtual routing platform enables customers to begin their migration to open networking, with all the financial and operational benefits that brings.

For service providers, their provider edge (PE) routers are the points at which they deliver many of their revenue-generating services such as direct internet access, VPNs, and cloud on-ramp services. Their PE routers' capabilities and capacity need to evolve and adapt in ways that meet customers' changing needs and expectations. This goal has become increasingly difficult under the legacy router model.

The demand for more ports at higher port speeds results in much greater aggregate throughput and puts pressure on the legacy edge routers. This trend will only increase as new wireless services deliver even more bandwidth to end devices and add a new set of enterprise services. Service segregation will also become more challenging.

It is difficult to justify continued investment in aging routers, but revenue depends on meeting your customers' needs. Adding more line cards can be very expensive. A more effective and compelling alternative is precisely what Volta provides. VERVE operating as a **Provider Edge Router** delivers functionality so innovative and financially compelling that it is giving customers a path to our smarter, more flexible, and far less costly virtual PE Routers while preserving your investment in the aging 'Cadillac' routers.

- Volta's cloud-based architecture allows control plane processing to scale out to support up to 255 virtual routers per switch, each of which runs its own protocol stack and is a separate management domain.
- Volta's cloud architecture leverages APIs and standards like NETCONF and YANG service models for carrier grade automation.
- By fully disaggregating the control plane, service providers can select and manage the life cycle their switches while preserving their investment in MANO integration and service models.

The Role of the PE Router

As the name suggests, the PE router sits at the edge of the service provider's network and connects to a customer's router (CE router). The PE is most typically housed at a provider's Point of Presence (PoP). A service provider will have anywhere from tens to hundreds of PoPs depending on their service area and scope. These physical locations may house many routers depending on the scale of the service provider's customer connectivity requirements. A large service provider may have thousands of PE routers in their network. Legacy PE routers scale up to hundreds of ports within the same product family. It is noteworthy that as the number of ports increase, the control plane processing module does not change which makes it difficult to scale out the control plane into multiple routers per chassis.

The PE is responsible for the Layer 3 service intelligence such as a VPN for an enterprise customer. Thus, the PE must support the necessary protocols for services like layer 2 and layer 3 VPNs.

Why Focus on the Provider Edge?

Today, enterprise customers are adding more ports at faster speeds to send more traffic which puts pressure on the provider edge (PE) router. Enterprise customers are sending more and more traffic to the cloud and SaaS platforms while their use of video and other bandwidth-intensive applications continues to grow rapidly. As a result, service providers are forced to keep investing in their PE routers where the price per port has remained high.

In short, customers today are demanding more of everything – more speed, capacity, and flexibility. For carriers, profitability depends on their ability to meet these expectations by effectively managing service availability and

performance. The changes to service provider networks are pushing IP much closer to the customer in order to drive new service revenues.

How the Legacy Model Falls Short

Meeting the customer demand outlined above using rigid, and hardware-bound routers is very expensive. If there are no open ports, a new line card must be purchased and added. If the router is nearing the end of its lifecycle, this can be undesirable. If the router is full, then an entirely new chassis may be needed. Either scenario drives the incremental cost per port even higher.

The new router or chassis would provide a big step up in capacity, most of which would go unused for a time. For the operator, it meant a swing from one bad position to another – capacity-constrained before the new hardware purchase and expensively over-provisioned after.

These big, blocky purchase requirements, with very limited flexibility in between, make it impossible for network operators and service providers to expand their routing capabilities flexibly, more in alignment with their steadily growing needs. In short, what operators and service providers need to be able to do is scale out incrementally and cost-effectively, not scale up via giant steps.

Volta Networks Provider Edge Router – The Right Resource for Today's Needs

Volta Networks gives network operators and service providers a way to address these limitations where it's needed most – at the provider edge.

With Volta Networks, service providers can use white box switches alongside their existing PE

Router. White box switches are a fraction of the price of a new IO module. Volta's carrier grade software is fully interoperable with all the legacy routers and the protocols needed at the edge. Thus, network operators can cap their investment in their aging routers and gain a much more flexible and cost-effective way to keep up with customer's needs. By using white box switches alongside their legacy routers, service providers can easily scale out their routing capacity at the Provider Edge – or just as quickly dial it back – as their needs or their customers' demands dictate. Because Volta uses existing carrier grade protocols, we can ensure complete interoperability.

Using Volta as a PE Router leverages the cloud, advances in switching ASICs and other next-gen technologies appropriate for today's market and customers' contemporary needs. Best of all, it delivers these benefits **without performance issues, and at costs up to 90% lower than the legacy alternative.**

Volta supports up to 255 separate virtual routers on a single white box switch. In this multi-tenant scenario, each virtual router has a separate set of processes in the cloud and is its own administrative domain that is configured to meet a given customer's exact requirements. Each virtual router can also support multiple VRFs for customer connections. The PE router will have to evolve to support a much broader range of services as 5G applications like network slicing gain traction. Using virtual routers to maintain service separation allow service providers to address these new revenue opportunities while simplifying management.

VERVE significantly simplifies service creation and provisioning by having a separate configuration file for every customer. This all leads to faster service delivery, as well as reducing the errors in the process. Volta's networking service library is delivered as YANG (RFC 6020) data model,

as protobuf schemas and auto-generated protocol bindings, and as a Python library consuming the Python protocol binding. A single API into the cloud simplifies integration into a network operator's Management and Orchestration (MANO) systems.

This simplifies the service edge which enables faster service delivery and more robust solutions for the customers while reducing CAPEX and OPEX. Volta's solution is fully standards-based which ensures interoperability with legacy routers. This allows providers to gradually add white box switches.

Key Features and Benefits

Unique in the industry, the Volta Networks' platform is built on a disaggregated, software-driven architecture that leverages the industry's first cloud-native routing platform:

Feature	Benefit
Dramatic reduction in TCO	<p>Volta allows service providers to choose the hardware that best meets their needs. Volta's VEVRE platform is standards-based, which ensures interoperability with all legacy routers. This gives service providers the ability to make gradual and well-managed transitions to the open networking approach and white box switches. Volta delivers an order of magnitude reduction in TCO compared to legacy routers while adding multiple virtual routers.</p> <p>Open networking brings OpEx relief in the form of reduced router maintenance contracts and automation.</p>
Interoperability with legacy routers	<p>Volta's software is standards-based and run all the relevant carrier-grade protocols to interoperate with legacy vendors.</p>
Multiple virtual routers per switch	<p>Volta is the only platform that can support multiple virtual routers on a single low-cost white box switch. This keeps costs low by eliminating the need for separate routers for different applications. It protects the investment by ensuring that the network can cost effectively support emerging applications.</p> <p>Each virtual router has a separate control plane stack in the cloud and is its own administrative domain so it can be managed separately.</p>
Cloud-scale processing	<p>CPU is limited on white box switches which limits what can be done on low cost devices. By using the cloud to run the control plane, Volta scales processing at the lowest possible cost. This easy and affordable expandability gives operators lots of room for innovating with their service offerings and gaining the competitive advantages that follow.</p>
Carrier grade automation	<p>By using standards like NETCONF and YANG with our APIs, Volta can enable service providers to embrace carrier grade automation and protect their investments in service development and MANO integration.</p>

	<p>This enables more robust offerings and faster service delivery. Increased business agility drives significant competitive advantages and speeds time to revenue.</p>
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Conclusion

By rethinking routing, Volta has created a networking paradigm based on using low-cost white-box switching hardware combined with highly flexible cloud-based control software to deliver networking needs for the most demanding environments.

Contact Us

Take the first step and arrange for an in-depth briefing of the Volta VEVRE. Our virtual routing experts are ready to show you this breakthrough solution, and help your organization start down the open networking path.

Contact us today at info@voltanet.io or visit on the web at voltanet.io.