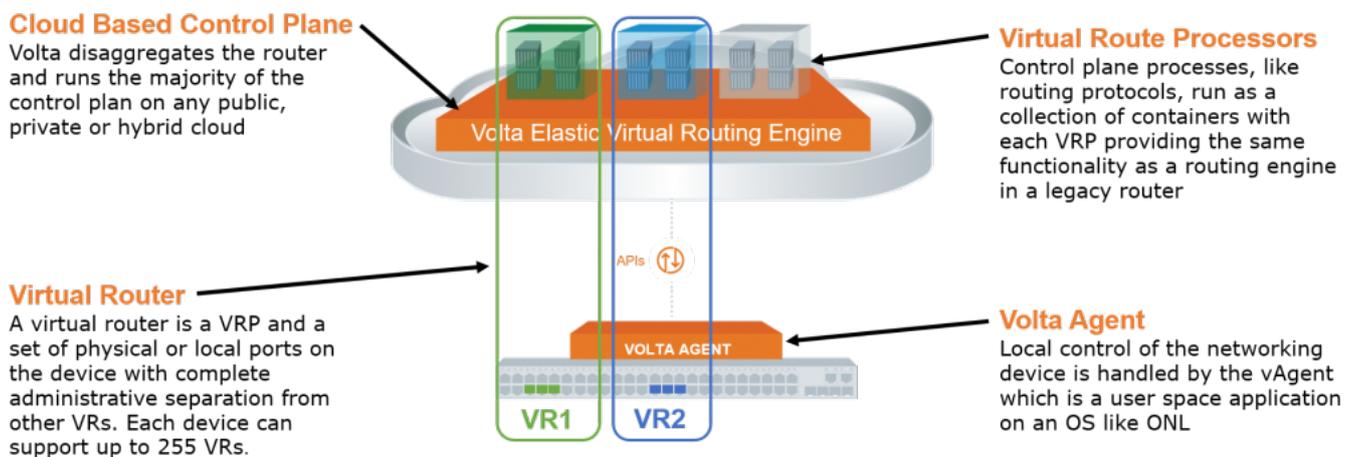


Volta Elastic Virtual Routing Engine

Volta Networks has transformed the router with the first cloud-based control plane, providing unprecedented scale in processing and virtual routing. VEVRE can run on any public, private or hybrid cloud and works with a broad range of open networking devices such as white box switches. This combination of a disaggregated and elastic control plane with open networking devices reduces cost by an order of magnitude compared to legacy routers.



System Components

Volta Elastic Virtual Routing Engine (VEVRE) is a cloud-based network platform. Unlike Network Operating Systems, Volta deconstructs the legacy router by running the control plane on any public, private or hybrid cloud. It is a standards-based implementation that is hardware agnostic – we can work with any open networking device which allows routing to be deployed in places where legacy routers are cost prohibitive. The system supports up to 255 virtual routers on a single switch. It is key enabling technology to utilize open networking devices without requiring an expensive investment in Software Defined Networking (SDN).

VEVRE consists of three major elements:

- The **Volta Agent** (vAgent) runs on the switch OS and provides for local autonomous control. We have filed for a patent on the process we use to compress the instructions (the Forwarding Information Base or FIB) the switch needs. This unique technology ensures the switch will operate at peak performance.
- The vAgent works in tandem with a **Volta Route Processor (VRP)**, which runs in the cloud. VRPs are collections of network services (e.g. IS-IS, BGP etc.), proving the same functionality as a Juniper Routing Engine or Cisco Route Processor. Unlike monolithic routing software, Volta allows the operator to run only

necessary processes for a service. Our approach allows us to dramatically cut the capital cost for network operators while also reducing their operating costs via automation and speeding time to value for new services.

- Volta's **Service Library** enables automation and intent driven networking by having a set of standard services prebuilt using standards like YANG with open APIs. The user specifies device resources desired state via our declarative API. Volta system has the intelligence and knowledge of the state of the network to generate the service schema so the switches can be configured. This results in the ability to deploy services more quickly and accurately at a lower cost. The system easily fits into more complex management architectures by using northbound interfaces like NETCONF, REST and CLI.

A Platform Not a NOS

Network operating systems (NOS) take the first step toward open networking by enabling a choice of software and lower cost hardware. However, this continues to treat the router as an appliance, just like legacy routers. The effect would be to replace one big, proprietary routing appliance with many smaller, open appliances. This forces network operators to continue to manage devices in order to create services which is complicated by the larger number of appliances. Moreover, only one copy of the software can run on a white box switch, making virtualized workloads impossible.

Volta takes a different approach.

We are a platform – not just a NOS. Like a NOS, we enable open networking. We use the same routing protocols which ensures interoperability. Unlike the NOS, we run the majority control plane in the cloud which allows for unprecedented scale in processing. In turn, that allows the network operator to run many virtual routers on a single switch. Local control of the switch is done by our vAgent which runs on the OS and provides for autonomous operations.

What Makes Volta Unique

- Only Volta fully virtualizes the router and can support up to 255 virtual routers per device.
- The majority of the control plane runs on any public, private or hybrid cloud for the lowest cost. Only Volta can truly scale control plane processing.
- Each VRP is the equivalent of a routing engine. Control plane software is cloud-native using containers for maximum scale, flexibility and resiliency.
- The vAgent minimizes the processing overhead on the device and our route compression optimizes device performance.
- Volta's YANG model service library and API approach complies with all the key standards for automation. Unlike appliance approaches, our cloud API provides a single point of connection to MANO platforms to optimize automation and be the foundation for intent based networking.

As a platform, Volta enables network operators to develop services and invest in automation independently of the networking device. This frees operators to have a shorter life cycle for network hardware, allowing upgrades as new hardware becomes available without jeopardizing the investment in service development or automation.

Volta supports a wide range of routing and transport protocols. Our routing suite is based on the [Free Range Routing](#) open source suite. Volta is a contributor to the FRR community.

Why Cloud

The cloud reduces the cost of processing and allows for unmatched scaling of computing resources. Volta is cloud native, built specifically to leverage technologies like containers. Our version of a routing engine, the VRP, runs as a set of containers. Operators only run the processes they need in a VRP. Each VRP is a separate administrative domain running its own copy of the protocols. This improves reliability and resilience.

Scale Virtual Routers

Lots of vendors talk about virtual routers, but they are really referring to virtualized routers- their routing software running as a VM or VNF. That may be fine for x86 based data planes, but will not work with more cost-effective switches. A Volta virtual router is simply a combination of a VRP and a set of physical or logical ports. We can support up to 255 separate virtual routers on a single white box switch, enabling complete separation for services, applications, customers or networks.

Optimize White Box Switches

One of the concerns that many open networking switch users have is how to ensure switch performance. The fast path in the hardware is ideal to ensure the best throughput but all merchant silicon has limits on the size of the Forwarding Information Base (FIB) that can be stored in hardware and this can place significant demands on the bus between the CPU and the ASIC.

Volta has developed a new approach to managing the process of taking the RIB and building the FIB. First, each VRP is running routing protocols and is building a RIB. These RIBs must be consolidated before they are sent to the switching silicon as the FIB.

One of Volta's significant innovations is our compression algorithm. The larger the RIB is, the more effective is the resulting compression. This ensures optimal utilization of the fast path in switch hardware.