

## Application Note

# Cell Site Gateway Router

*Capitalize on Growth Opportunities with Carrier-Grade Virtual Routing at Cell Sites*

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Mobile Network Operators (MNOs) need to make fundamental changes to their infrastructures to capitalize on the growth opportunities in expanded 4G and new 5G environments. 5G will create new revenue opportunities but will require significant CapEx.

Investments by MNOs focus on cell sites because that's where the biggest changes need to happen to pave the way for 5G. RAN disaggregation is proving to be cost effective in 4G deployments and will expand in 5G. Various crosshaul approaches allow operators to run functions like BBUs as software Virtual Network Functions (VNFs) at a midpoint which drive the change from simple backhaul to crosshaul architectures. IP at this midpoint drives the need for routing at those locations.

Cell sites in 5G networks will be far more numerous and much smaller. The legacy routers currently used are unsuited to the expected bandwidth requirements in 5G which require the use of 10 and 100 Gbps Ethernet SFP+ interfaces as backhaul traffic increases exponentially.

Carriers have focused on an open networking approach using a Cell Site Gateway (CSG) router which provides an ideal solution to 5G cell site challenges. The Volta approach delivers carrier-grade routing capabilities with the flexibility, reliability and cost efficiencies that MNOs need.

Volta moves the bulk of the control plane processing to the cloud which allows us to scale the processing far beyond what is possible on the low-cost switches. As a result, Volta can support up to 255 virtual routers per CSG for applications like RAN sharing and network slicing.

- Volta's cloud-based architecture allows control plane processing to scale out to support up to 255 virtual routers per switch which will be critical to CSG applications like RAN sharing and network slicing.
- Volta's cloud architecture supports 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.

## Why disaggregated cell site gateways and why now?

MNOs must address their subscribers' ever-growing data consumption and bandwidth demand, the virtualization of 4G, and the new infrastructure requirements of 5G. Following are some of the trends that are motivating wireless providers to make the necessary changes. This section also details why they are looking to virtualization and disaggregated cell site gateways to provide the new functionality they need to overcome their 5G-related operational and financial challenges.

Providers are focusing on expanding and enhancing their 4G operations (or migrating from 3G to 4G), many are approaching it by disaggregating and virtualizing their cell sites. They are separating the radio units from base band units (BBUs) and moving the BBUs away from cell towers and into intermediate locations, (such as central offices) known as "BBU hotels."

This is an important structural change because it fundamentally alters how mobile networks operate, and more specifically, how the transport piece works. In the prior model, site traffic would be backhauled all the way back to a point of

presence (PoP). Now, wireless providers can use Common Public Radio Interface (CPRI) technology to 'crosshaul' traffic to the BBU hotels running at a midpoint at central offices. There, BBUs can be virtualized, load balanced and distributed across resources, affording the provider easier, more flexible, and more cost-effective management of the site traffic.

For providers, this extension of the service edge to the intermediary point of the central office provides cost savings, flexibility, and ease of management that is sensible and advantageous in 3G to 4G migrations, and for expansion of 4G-based services.

Going forward, providers will use eCPRI for fronthaul from the cell site. With eCPRI, they can get much more bandwidth to connect cell sites with IP or Ethernet transport.

This lets wireless providers connect more closely to their subscribers, and in the case of 5G, help them connect enterprises more closely to more 'things' (in the IoT sense of the word). Cell sites must be closer to the user as the distances supported by 5G will be much smaller (in the range of 500 meters). Thus, the growth will be in small cell sites.

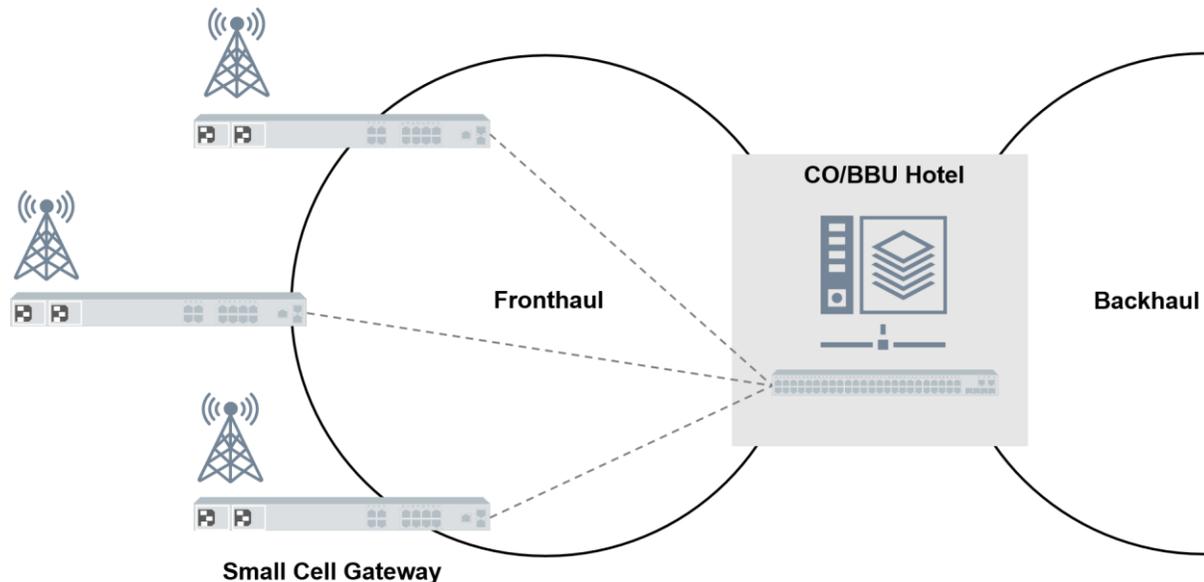


Figure 1: The Cell Site Gateway Model

But that begs the question of where and how the processing – the ‘heavy lifting’ – will get done. Legacy routers – with their outdated architectures, static control planes and endless needs for more line cards – are simply not up to this job. Service providers are specifying their hardware requirements for CSG routers and expect an order of magnitude cost reduction to match the order of magnitude increase in locations.

That’s where VERVE and Volta’s Cell Site Gateway (CSG) Router come in.

Using Volta’s VERVE platform as a CSG Router leverages the cloud, advances in switching ASICs and other next-gen technologies that are ideal for the present and future needs of both wireless network operators and their subscribers. Best of all, the Volta solution delivers these benefits **without performance issues, and does at costs much lower those of comparable legacy routing capabilities, not only meeting but exceeding the demanding new requirements of 5G networking.**

### **Volta Networks Cell Site Gateway (CSG) Router – Carrier-Grade Routing at the New Service Edge**

Volta Networks gives wireless network operators the ability to scale out their routing capacity right at their cell sites.

Service providers are now specifying their requirements for CSGs including the hardware. They require low cost, hardened and open devices with the ability to run carrier grades software. However, the CPU used in these devices limits the processing that can be done on the box.

Using the Volta cloud-based approach, wireless carriers can run carrier-grade routing right at the cell site. Since the control plane runs in the cloud, it can scale without putting a burden on the low-cost white box switches. The Volta Agent provides control of the switch.

Volta can support multiple virtual routers on a single white box switch. Operators can spin up a virtual router from the cloud, and easily associate it with a particular switch at a specific site. And with the centralized management and automation offered in the CSG Router, they can just as easily dial down virtual routers to maintain maximum operational efficiency while controlling costs.

## Use Cases

Having powerful, flexible and reliable routing provided in a way that works – both technologically and financially – at 5G cell sites is obviously a game changer for wireless providers. However, scaling virtual routing will be critical to key applications:

**RAN Sharing** – Going it alone in the build out of next-gen wireless infrastructure is an expensive proposition for providers. Some operators are turning to a Radio Access Network (RAN) sharing. That’s where two or more mobile operators collaborate and share the same infrastructure. For capacity buyers, it provides a lower-cost way to expand their services or enter new markets; for sellers, it creates a new profit center. The Volta CSG Router facilitates RAN sharing by enabling different providers to run multiple virtual routers at the same white box switch-powered cell sites. Each virtual router is a completely separate administrative domain running its own routing protocols and services.

**Network Slicing** - Network slicing allows operators to deploy, and different “slices” of the network, allowing these virtual networks to run on a common infrastructure. Each

network slice is an isolated and tailored to specific requirements required by very different applications like machine-type communication, ultra-reliable low latency communication and enhanced mobile broadband content delivery. The dynamic provisioning and management of network slices must go all the way to the cell site (and its router) where having separate virtual routers each with its own administrative domain is essential to make this service practical. The Volta CSG Router facilitates effective network slicing via multiple virtual routers provisioned and managed from the cloud, but accessed at the same, white box switch-powered cell sites.

**New Service Provisioning and Management** – Carriers recognize that the infrastructure to deploy 5G small cell sites can be reused in innovative ways. The fiber connecting a cell site could also be used to connect business locations that previously were not on-net. This makes services for these enterprise customers more profitable. Having separate virtual routers makes it easy to provision and manage these enterprise services.

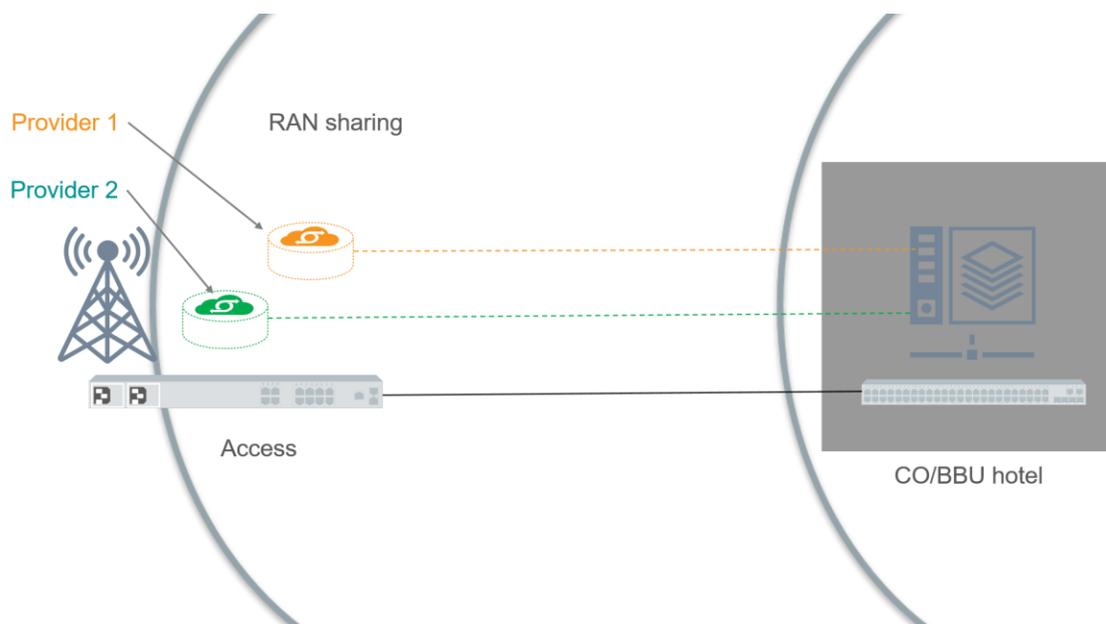


Figure 2: Multiple VRs for RAN Sharing

## Key Features and Benefits

Unique in the industry, the Volta Networks' CSG Router 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>The arrival of 5G will force wireless operators to make fundamental changes to their network architectures. Legacy routers are too expensive to handle these new requirements. Service providers need an order of magnitude cost reduction that matches the order of magnitude increase in locations as routing moves to the small cell site.</p> <p>Volta's unique, cloud-based control plane platform lets wireless carriers easily and cost-effectively serve up multiple virtual routers at cell sites and deliver them via low-cost white-box switches.</p>
Interoperability with legacy routers	<p>Volta's software is standards-based and run all the relevant carrier-grade protocol 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>Ideal for cell site requirements such as network slicing, each virtual router is a separate set of control plane protocols in the cloud. Each one 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</p>

	<p>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>
Open networking	<p>Volta allows service providers to choose the hardware that best meets their needs. Volta's VERVE platform and CSG Routers are standards-based, which ensures interoperability with all legacy routers. This give carriers and other service providers the ability to make gradual and well-managed transitions to the open networking approach and white box switches.</p> <p>Open networking brings OpEx relief in the form of reduced or eliminated router maintenance contracts.</p>

## **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. Our CSG Router does exactly that at the cell site itself. That's where wireless providers will be closest to their subscribers, but also where the biggest 5G-driven changes will happen.

So, that's the new arena in which wireless providers will need to prove themselves to gain and hold competitive advantages in the coming 5G world. To win, they must embrace automation. Volta's CSG Router is a smart and financially sound way to accomplish that.

## **Contact Us**

Take the first step and arrange for an in-depth briefing of the Volta CSG Router. 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](mailto:info@voltanet.io) or visit on the web at [voltanet.io](http://voltanet.io).