

Casa Systems Axyom™ Multiservice Router

Solving the Edge Network Challenge

To keep up with broadband demand, service providers have used proprietary routers to grow their edge networks. Cost and flexibility have been sacrificed because an open model did not exist and commodity hardware was not up for the task.

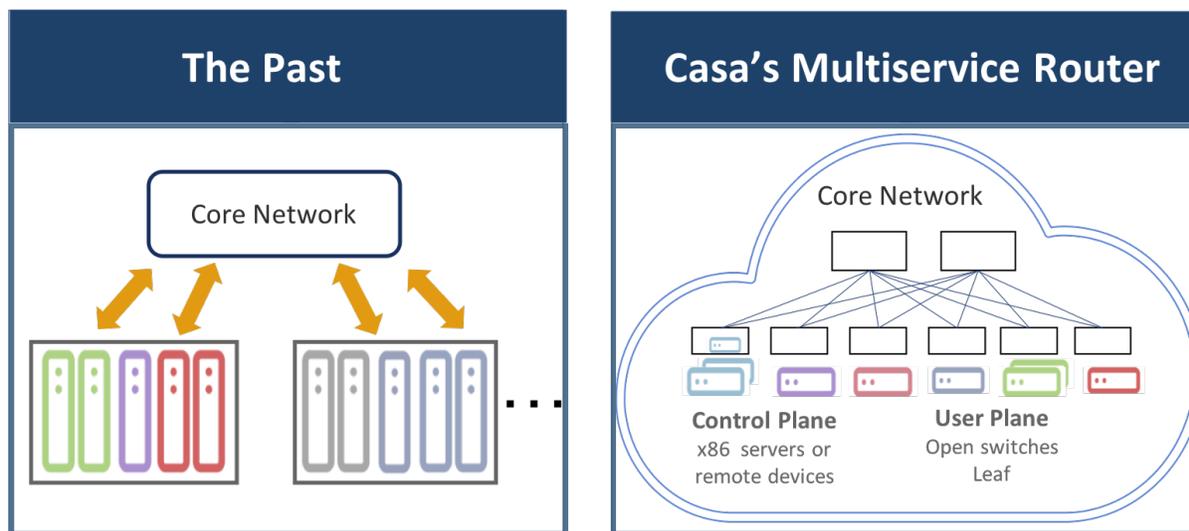
The unfortunate consequences of using proprietary edge routers are:

- **Lack of Differentiation and Business Flexibility** - Service providers are locked into a specific vendor's long-term hardware and software roadmap. This was fine as long as a service provider wants to provide an undifferentiated service, but who wants that?
- **High Costs** - Proprietary hardware is costly because it does not take advantage of the trend towards high performance, low cost, commoditized x86 servers and open switches. Service providers must endure high cost structures and low margins.
- **Unable to Seamlessly Scale** - Significant proprietary hardware and software restrictions exist. For example, independent scaling of the control and data / user plane is not supported.
- **Management Challenges** - Each new edge service is delivered with unique software and sometimes unique hardware. As a result, many edge routers, all running different services on different blades, create a management nightmare and massive inefficiencies.
- **Lack of Flexibility for Edge Computing** - The disaggregation of functions is not provided because proprietary hardware and software are monolithic. Advanced capabilities, such as low latency, Multi-Access Computing (MEC) at the network edge are just not possible.

Things have changed. Casa's Multiservice Router is based upon modern data center principles and as a result, it delivers service providers with superior performance, flexibility, lower costs and seamless scalability.

Figure 1

Moving to a Modern Data Center Architecture



Introducing the Axyom Multiservice Router

The Axyom Multiservice Router (MSR) is a decomposed / disaggregated solution where the control and data planes run on separate x86 compute nodes. The MSR will support many services simultaneously, such as:

- vBNG
- L3 Enterprise VPN
- L2 Enterprise VPN (Carrier Ethernet)
- E-Line and E-Tree
- Peering with Core Routers
- Mobile backhaul traffic aggregation

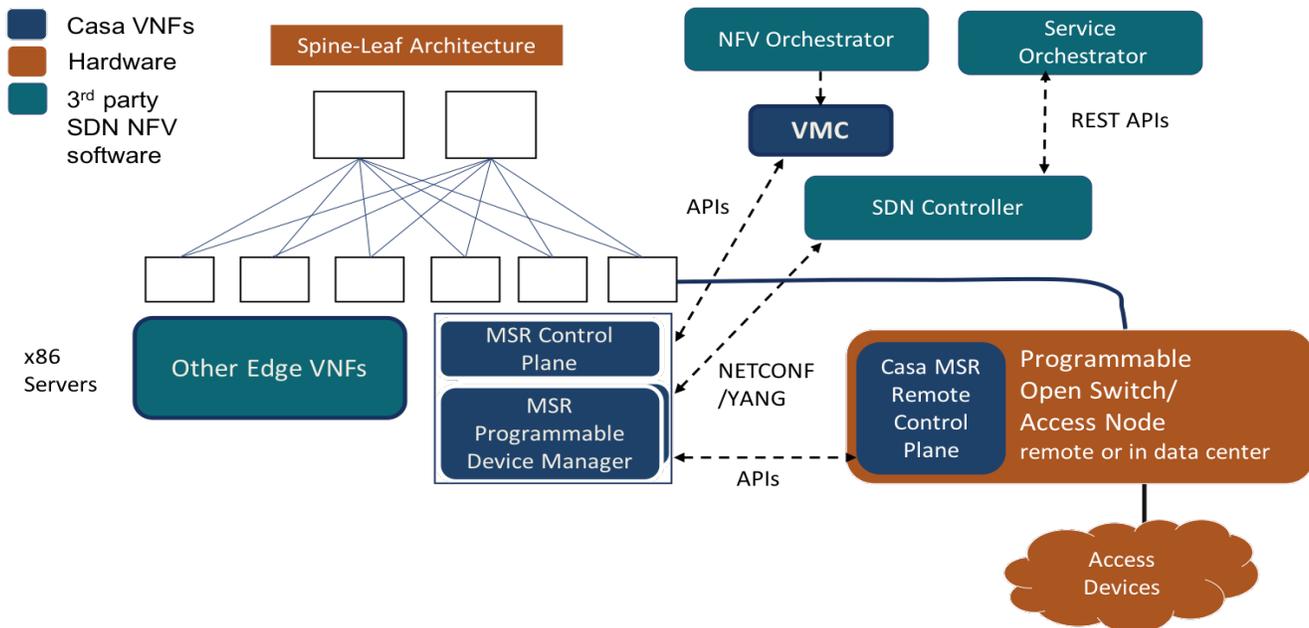
The first two MSR services that Casa is delivering are the vBNG Router and the Provider Edge (PE) Router.

Figure 2 provides a generic view of the MSR architecture. Note that the MSR fits perfectly within the data center architecture with its Spine-Leaf network. As can be seen in the figure, the Casa MSR is decomposed / disaggregated and thus provides a separation of control and data planes. This allows each Virtual Network Function (VNF) to be located where it provides the most value. Depending on the application MSR VNFs can run on:

- x86 servers in the data center or,
- programmable open switches / access nodes.

Figure 2

Axyom MSR Data Center Reference Architecture



The maturity of the data center architecture, high performance commodity servers and open programmable switches mean that flexibility, performance and cost savings can be achieved without compromise. The data center architecture delivers seamless scaling to tens of Tbps and allows each VNF to scale independently. Using commoditized hardware will also drive significant cost savings.

Deploying the Axyom Multiservice Router

As shown in Figure 2, the MSR is often deployed in an SDN-NFV framework. As a result, it provides open APIs to the NFV orchestrator via the Axyom Virtual Controller (VMC). The VMC itself provides life-cycle VNF Management and EMS functions. Further, OpenFlow and NETCONF / YANG can be used by SDN Controllers to configure and monitor the MSR's routing functions.

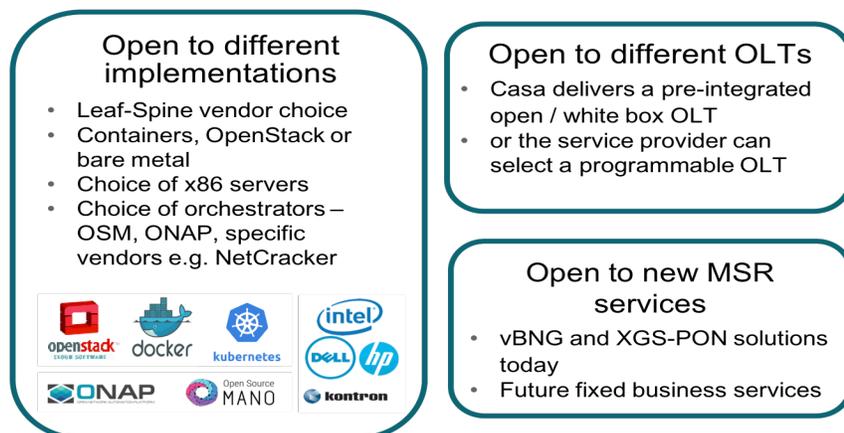
Based on Casa's distributed, microservices Axyom Software Platform, the MSR inherits the following key Axyom benefits:

- **Superior Performance** – Several years ago, ASICs delivered better performance than x86 processors however, those days are long gone for the control plane. As a result, the MSR is a virtual solution that uses x86 based servers for control plane processing. Beware, not all virtualized solutions are the same. Compared with its competitors, Axyom achieves superior throughput of up to 5X per virtual x86 CPU. Higher performance means fewer x86 servers are needed to run the MSR control plane VNFs. And, fewer servers means significantly lower CAPEX and OPEX expense.
- **Maximum Flexibility** – As mentioned above, Axyom VNFs can be located at remote locations near subscribers for lower latency applications. The remote Axyom VNFs can be scaled down to a "lean" vCPU footprint allowing service providers to reduce power consumption and minimize the use of scarce edge compute resources.
- **Superior Deployment Flexibility** - Casa's Axyom microservices based VNFs can run on bare metal, on virtual machines or in containers. Many current wireless NFV deployments have been implemented using OpenStack. Alternatively, Cloud Native design principles, from the data center world, use Docker containers with Kubernetes orchestration because of their ability to spin up faster and thus adjust more rapidly to capacity surges. It's your choice - Casa supports both OpenStack and Container / Kubernetes based deployments.

Because Casa's MSR aligns with an open data center architecture, it supports service provider choice. The result is a lower cost structure and flexibility. No longer will service providers be locked into a single vendor's monolithic hardware and software roadmap. The following figure highlights some of the choices provided by Casa's open architecture:

Figure 3

MSR's Open Architecture Enables Service Provider Choice



Virtual Broadband Gateway (vBNG) Router Innovations

The vBNG Router is an early MSR service. Painfully, the installed base of legacy BNGs and Broadband Remote Access Servers (BRAS) using proprietary hardware is large and continues to grow. The footprint, power consumption and as a result, the OPEX of these solutions is high but could be radically reduced on a per Gbps basis with the Casa vBNG Router.

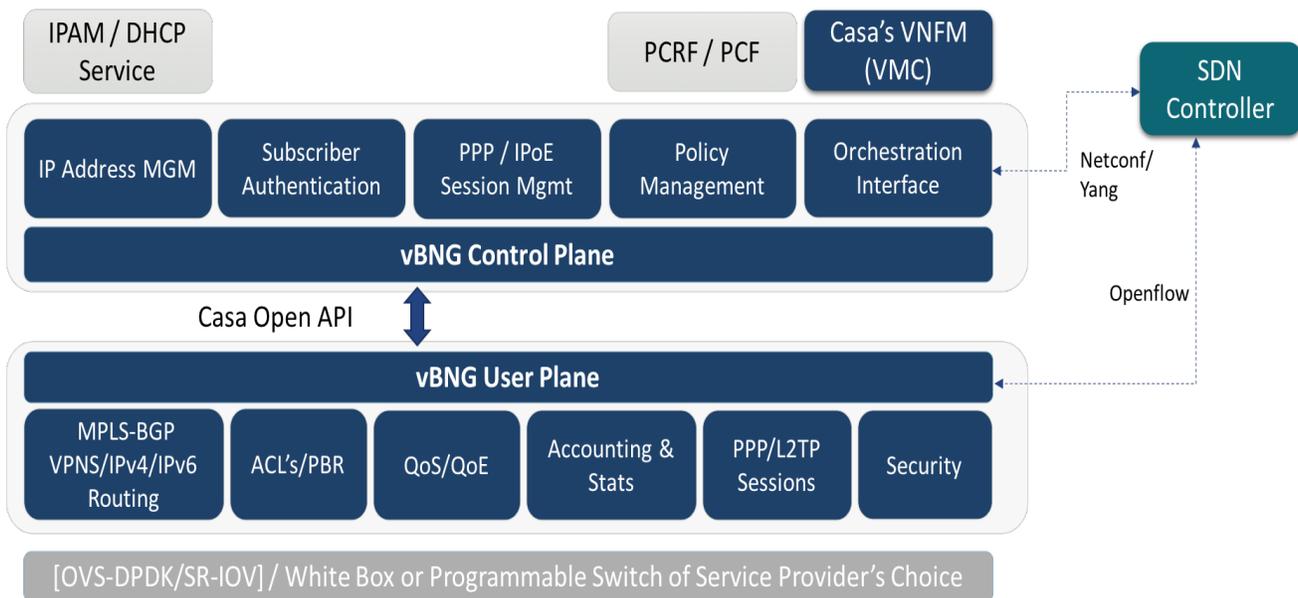
Service providers can achieve a quick win in their virtualization efforts by either a complete replacement of current BNGs by Casa's vBNG or a cap-and-grow strategy. Casa's superior virtualized performance will result in immediate power and space savings.

Figure 4 shows the vBNG Router architecture, please note:

- The control and data / user planes are separated.
- The solution is composed of microservices.
- Open interfaces are provided to the SDN Controller and NFV Orchestrator (via the VMC).

Figure 4

Axyom vBNG - Decomposed, Microservice Based



Axyom Provider Edge (PE) Router

Another early MSR service is the PE Router. The Axyom PE Router can support the following enterprise and mobile network functions:

- L3 Enterprise VPN
- L2 Enterprise VPN (Carrier Ethernet)
- E-Line and E-Tree
- Mobile backhaul traffic aggregation

- Peering with Core Routers

As a PE router, the MSR supports a wide array of virtualized subscriber management, session management and edge routing capabilities. The MSR reference model in Figure 2 applies to the Axyom PE Router. Casa's Axyom PE Router operates within the data center architecture with its Spine-Leaf network. Control and data plane separation of VNFs allows for independent VNF scaling along with centralized or distributed deployment options. Overall, the Axyom PE Router is designed for performance and deployment flexibility.

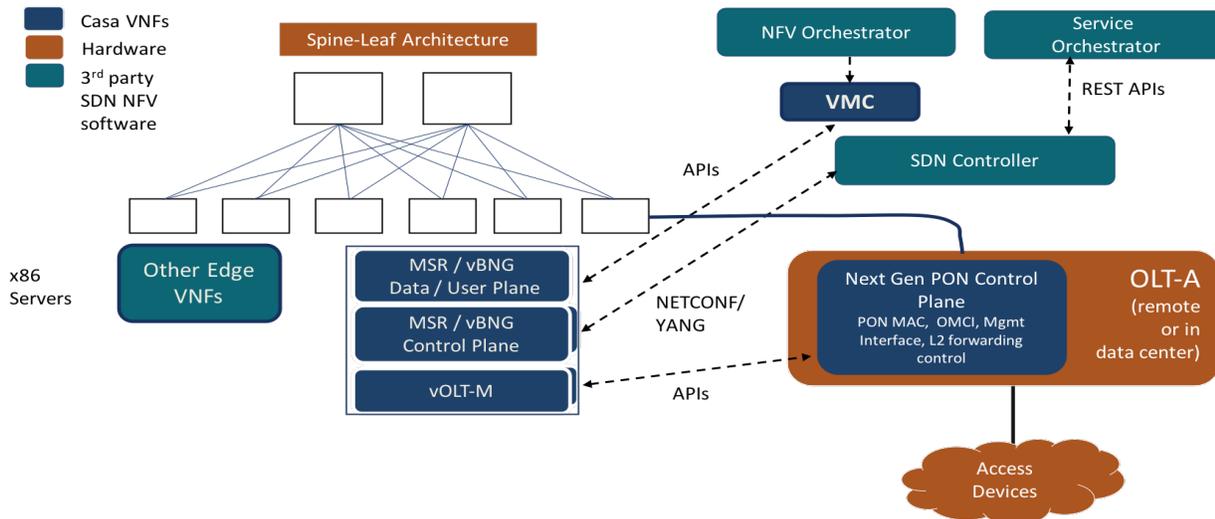
Application Example - Using the Axyom MSR / vBNG to support Next Gen PON Solutions

XGS-PON and NG-PON2 solutions are often referred to as next generation PON. As their rollouts increase, service providers should try to avoid the trap of proprietary hardware / software solutions or underperforming lift-and-shift virtual solutions.

As can be seen in Figure 5, Casa's Next Gen PON solutions are supported by the Axyom MSR data center architecture detailed in Figure 2. The following specific software and network elements are used:

- Axyom MSR / vBNG Control and Data/User Plane VNFs running on x86 based servers in the data center - The Axyom vBNG manages subscriber access, including security, policy and QoS as well, the vBNG communicates with the back office (AAA, billing...).
- Axyom vOLT-M – The virtual OLT Manager manages and communicates with the Casa control plane VNFs running on the open, programmable OLT-As. The vOLT-M does not participate in the data path and but supports control and monitoring functions. The vOLT-M provides API based access to northbound controllers for operations & management. With the vOLT-M, heavy SDN controller platforms, such as OpenDaylight are not needed.
- OLT-A – The OLT-Adaptable is an open or white box / physical OLT. The OLT-A is programmable and run's Casa's OLT control plane VNF which is managed, configured and monitored by the OLT-M. The OLT-A can be located at the data center or at a remote site closer to subscribers. The OLT-A solution is pre-packaged and sold / supported by Casa. In a typical deployment, the service provider will install a stack of OLT-As to provide the needed number of XGS-PON or NG-PON2 ports for access. As an alternative to Casa's OLT-A, the customer can use a programmable OLT of their choice that runs Casa's OLT control software.

Figure 5 Casa's Axyom Next Gen PON Solution



Casa's Next Gen PON solution uniquely reduces latency. User plane packets are directly routed over to the Core Router avoiding a hop to the vBNG server. The initial subscriber authentication traverses the vBNG data plane, but subsequent data packet flows go directly between the OLT-A and the spine switch. This reduces the number of hops and lowers the packet latency.

Overall, Casa's Axyom MSR Next Generation PON solution delivers lower costs and greater flexibility for the following reasons:

- It uses the well proven, efficient and seamlessly scalable data center architecture
- The control plane is virtualized on commodity x86 compute nodes located at either the data center or on open programmable switches
- It implements open APIs to 3rd party controllers for orchestration, management and monitoring

Summary

Your edge network can become a powerful, flexible and cost-effective asset. Casa's Axyom Multiservice Router (MSR) has been designed to allow service providers to break free from the current high cost, inflexible, proprietary edge router architecture.

The Multiservice Router leverages the modern concepts of data center design, specifically:

- A network design that includes a Spine-Leaf core network along with commodity, high performance x86 based servers and open, programable OLTs and switches.
- The separation of control and data/user plane virtualized network functions to support independent scaling and edge computing.
- Cloud native design principles to deliver seamless scalability.
- Flexibility to virtualize using bare metal, OpenStack or Containers with Kubernetes orchestration.
- Open APIs to 3rd party controllers for orchestration, management and monitoring.

The Axyom MSR will enable the edge network to deliver better performance at a lower cost with more flexibility. All of this is possible with no compromises because the network is open and with the MSR, the service provider is free to make the choices they need.

Contact us at Casa Systems to begin your journey and learn about to a better way to implement core network solutions with Axyom.