

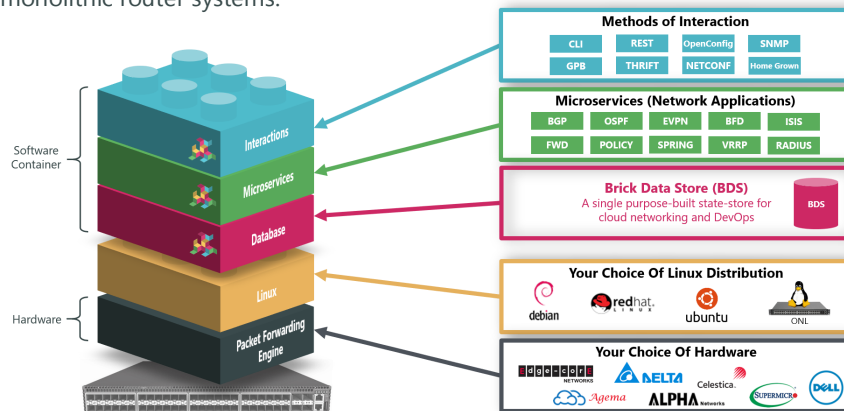
## Data Sheet

# Open BNG (Broadband Network Gateway)

Over recent years, 'cloud-native' service providers have developed ways to build and run massive data centers with a high degree of automation, to reduce operational overheads and deliver levels of service agility beyond traditional carrier infrastructure. RtBrick's disaggregated open BNG brings these same benefits to carrier access networks, by using agile methodologies and the same battle-hardened DevOps cloud automation tools that have been adopted by the world's biggest cloud providers.

## Architecture

The RtBrick BNG is delivered using RtBrick Full Stack software, which takes advantage of the latest merchant silicon running on powerful bare-metal switches to give you high-performance at a fraction of the cost of conventional monolithic router systems.



The RtBrick BNG is delivered as a Linux container and packaged for bare-metal switches within an Open Network Linux (ONL) installation for a seamless experience out-of-the-box. ONL handles peripherals such as LEDs, temperature sensors, and other platform management tasks. The entire networking stack, including the forwarding elements, is implemented in userspace as containerized processes.

The platform provides an in-memory database custom-built to meet networking scale and performance requirements and also provides primitives needed to build network applications. Application instances can themselves be scaled out to meet performance requirements.

## Deployment at Scale

The BNG's subscriber management capacity is provided in a scale-out architecture called the Point-Of-Deployment (PoD). A large-scale PoD consists of Access Leaves aggregated by a layer of Spines in an auto-provisioned CLOS topology (see Figure 2). The Access Leaves deliver subscriber management functionality and the Border Leaves provide connectivity to the core of the provider network.

The leaves can be scaled out horizontally to increase the number of subscribers supported on the PoD, providing a pay-as-you-grow architecture. For smaller PoDs, Spine and Border Leaf functionality can be collapsed onto a single Spine hardware platform. The RtBrick BNG software can also run on an x86 server, to deliver low volume or more niche service feature sets.

## Benefits

RtBrick's disaggregated open BNG delivers some significant benefits compared to traditional monolithic systems:

- **Greater agility** – you can add new services in minutes rather than weeks
- **Reduced risk** – no more vendor lock-in and a simpler automated operating environment
- **Cloud cost-levels** – leverage low-cost merchant silicon and automate your operations like an 'Internet-native'

### Agility

ZTP (Zero-Touch-Provisioning) ensures that each switch is booted, provisioned and operational without requiring manual intervention. This means that you can add capacity, or roll-out new service features, in a matter of minutes instead of days or weeks.

The software itself is developed using Agile methodologies so that features are rapidly prototyped and implemented, reducing the time-to-market for new services.

### Reduced risk

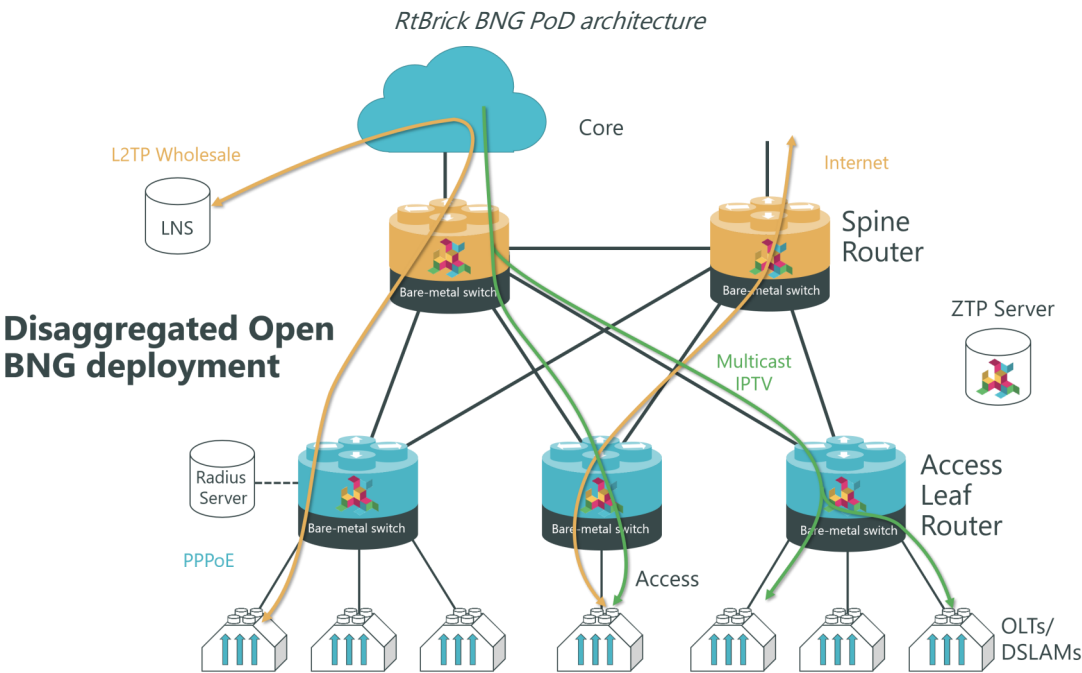
RtBrick's BNG software also allows you to pick and mix between the latest silicon and the best available software. It is also compiled for your specific use-case, using only the features you need. With an order of magnitude fewer lines of code, and a single state database rather than hundreds, the whole system is less complex, less prone to bugs and has much faster restart times.

### Cloud cost-levels

Now you can take advantage of the low cost-points of merchant silicon on your choice of bare-metal switches, significantly reducing your capex bill. And opex costs can be reduced by automating your operations, using ZTP and the same Web2.0 operational tools that the 'cloud-natives' use to run their infrastructure.



PPPoE subscribers can be terminated on the Access Leaf Routers or tunneled to an LNS over L2TPv2. L2 Cross Connect (L2X) allows subscriber traffic to be tunneled out of the PoD at Layer 2, providing wholesale connectivity. You can re-use your existing infrastructure to continue to provide lower volume legacy services, and optimize the rest of the network for the bulk of your traffic - providing large volumes of high bandwidth services at a lower cost-point with a web-scale operating environment.



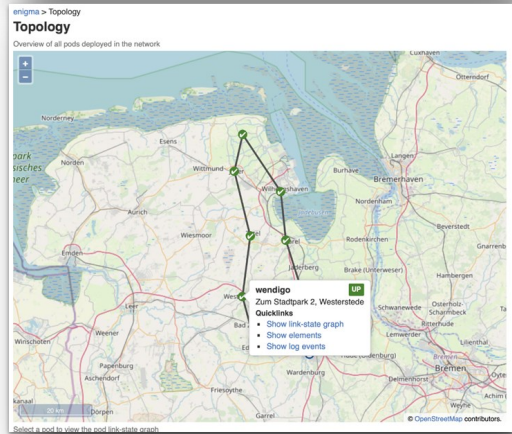
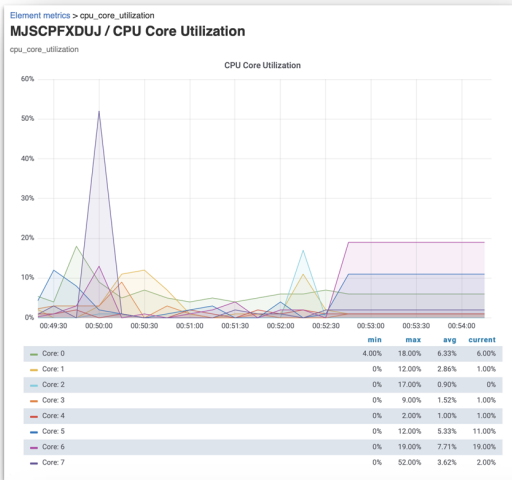
So your RtBrick BNG can also act as a service cross-connect, routing each subscriber to the appropriate network infrastructure and extending the life of your high-cost legacy BRAS or BNG systems, for example.

## Management and Operations

Along with the traditional CLI and SNMP, more ‘cloud-native’ means of interactions are also supported, such as gNMI, NetConf and a full REST API.

RtBrick’s Management System, RBMS, takes this a step further, by providing network level workflows such as Image Lifecycle Management, Network Upgrades and Event and Log Management. RBMS actions are available through REST APIs making them easy to integrate into existing OSS systems. RBMS provides a single point of interaction for operations staff – from provisioning and management to monitoring and debugging.

The result is a BNG that can be managed using the latest Web2.0 tools through a ‘single pane of glass’, with Zero-Touch-Provisioning.



Element configurations > running-configuration

**Element MJSCPFXDUIJ (Test) running-configuration revisions**

Revisions of running-configuration configuration of element MJSCPFXDUIJ (Test)

Compare	State	Creator	Last Modified	Comment	Download
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<input type="radio"/>	SUPERSEDED	admin	08-AUG-2019 15:17:31.677	Commit Immediate	Download

RtBrick Management System example screenshots



## RtBrick BNG Features

The following list may include some road-map features—please check with us for the latest details.

Feature	Description
Base OS	<ul style="list-style-type: none"> <li>RBFS Linux container based on <b>Ubuntu 18.04 LTS</b></li> </ul>
Supported Hardware	<ul style="list-style-type: none"> <li>Edgecore 5916-XKS</li> <li>Edgecore 5916-XK</li> <li>Containerized deployment on x86 servers with DPDK interfaces</li> </ul>
Access Protocols	<ul style="list-style-type: none"> <li><b>PPPoE</b> - RFC 1332, 1334, 1516, 1661, 5072</li> <li><b>Radius</b> - RFC 2865, 2868 - only 1 attribute, 3162, 2866*, 4372</li> <li><b>L2TPv2</b> - RFC 2661, LAC only, 5515</li> </ul>
L3 Protocols*	<ul style="list-style-type: none"> <li><b>BGP</b> - RFC 1771, 2385, 2545, 2918, 3107, 4271, 4364, 4456, 4486, 4659, 4760, 4798, 4893, 5065, 5492, 5549, 6513, 6608, 6793, 7313, 7911, 8092, draft-walton-bgp-hostname-capability-02, draft-kumar-idr-link-local-nexthop-02, draft-ietf-idr-bgp-prefix-sid-27</li> <li><b>OSPF</b> - RFC 2328, 3137, 3509, 4136, 4576, 4577, 5185, 5250, draft-ietf-ospf-segment-routing-extensions-24</li> <li><b>ISIS</b> - RFC 1195, 3277, 3787, 5301, 5302, 5303, 5304, 5306, 5308, 6130, 7775, 7794, ietf-isis-segment-routing-09</li> </ul>
IPTV	<ul style="list-style-type: none"> <li>Multicast - PIM*, MVPN*, IGMP v2/3*, SSM Mapping</li> <li>Radius integration for subscriber channel policy, blacklisting and whitelisting</li> <li>Sub-second channel zap time</li> <li>Preview up to 15 other channels</li> <li>IGMPv2 for older set-top box support</li> <li>IPTV usage statistics</li> </ul>
User Interface	<ul style="list-style-type: none"> <li>CLI</li> <li>RBFS REST API</li> <li>RBMS</li> </ul>
RBMS RtBrick Management System	<ul style="list-style-type: none"> <li>Image Lifecycle Management</li> <li>ZTP</li> <li>Monitoring</li> <li>Log &amp; Event Management</li> <li>REST API</li> </ul>

\*RFC and draft compliance partial except as specified