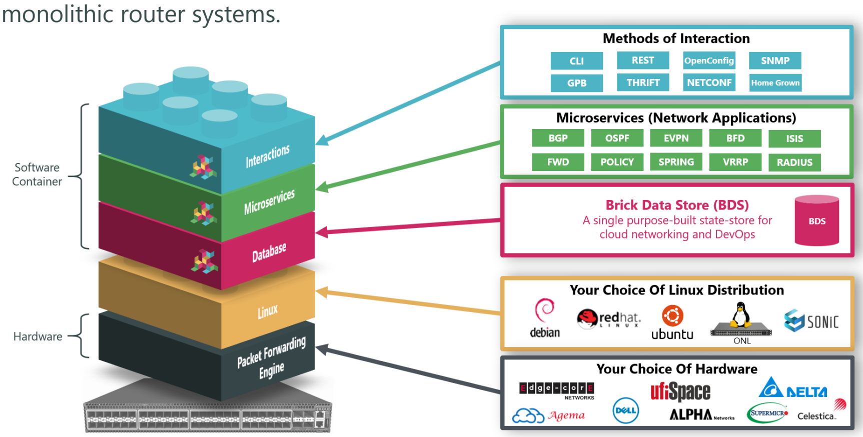
Data Sheet

Disaggregated 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 any Scale

The BNG's subscriber management capacity is provided in a Spine-Leaf 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 or spines can be scaled out horizontally to increase the number of subscribers supported on the PoD, providing a pay-as-you-grow architecture.

For smaller concentrations of subscribers, or deployment in more remote hardened environments, spine-leaf functionality can be collapsed onto a single switch as a *Consolidated BNG*, offering all the functionality on a single physical switch. The RtBrick BNG software can also run on an x86 server.

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.

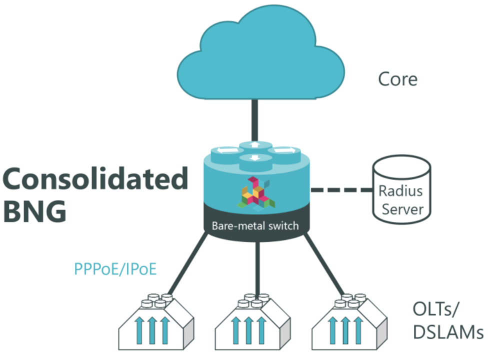
Reduced risk

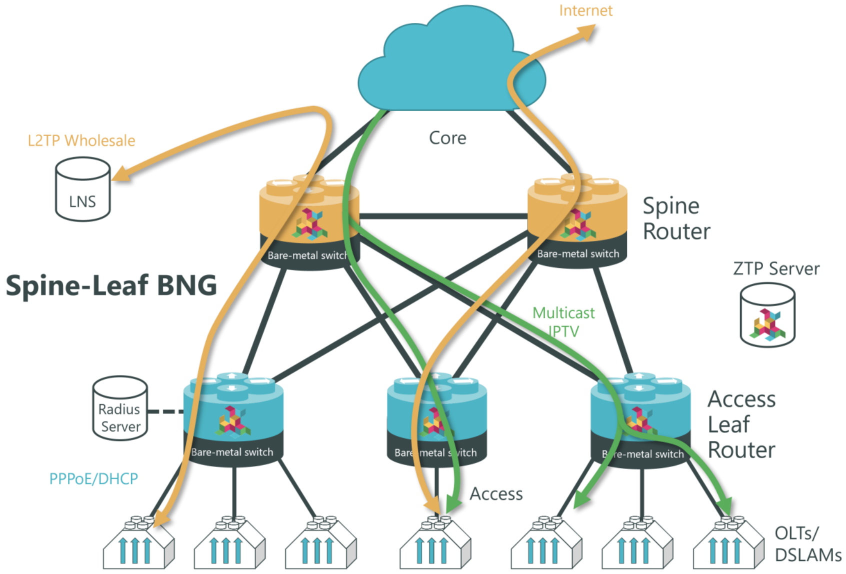
RtBrick's BNG software also allows you to pick and mix between the latest silicon and the best available software . It is also compiled for your specific use-case, using only the features you need. With an order of magnitude fewer lines of code, and a single state database rather than hundreds, the whole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

Broadband 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 or connectivity for legacy services. This allows you to 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.

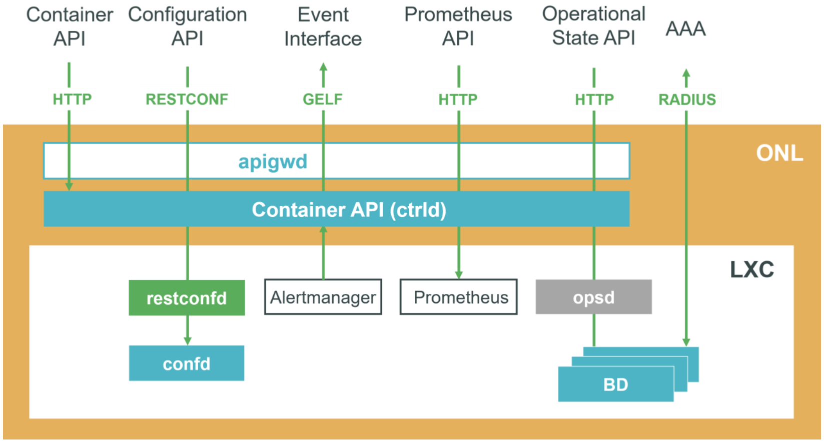




So your RtBrick BNG can also act as a service cross-connect, routing each subscriber to the appropriate network infrastructure and extending the life of your high-cost legacy BRAS or BNG systems, for example.

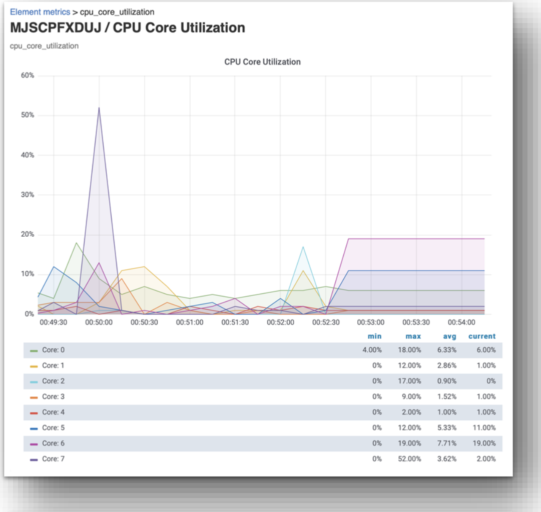
Management and Operations

RtBrick's Management API has been designed to simplify the integration with your existing OSS and BSS systems. It reduces the amount of time and effort required to make your disaggregated network operational, and it leverages widely-adopted industry tools and programming languages. RtBrick's API is 'consumer-driven' – which means you can use the formats and languages of your choice, rather than have them imposed on you by a vendor. This allows you to build a client in Python, Go or Java, for example, as you prefer. And the APIs are all edited in Swagger, which is also a widely understood tool used by developers.



As an alternative to integrating directly into your own OSS system, you can use the RtBrick Management Suite (RBMS), which is an 'off-the-shelf' client that we have built using our own Management API. It is available to you as open-source software. It can be used as a standalone system for software management, ZTP (Zero-Touch-Provisioning) and switch inventory. Or you can use it as an open reference model to build your own client.

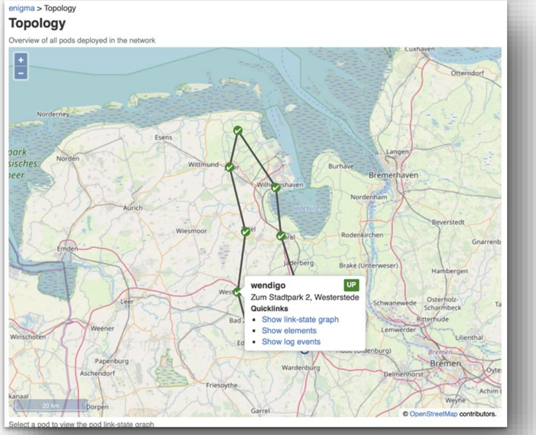
RtBrick Management System example screenshots


Element metrics > cpu_core_utilization

MJSCPFXDUJ / CPU Core Utilization

cpu_core_utilization

	min	max	avg	current
Core: 0	4.00%	18.00%	6.33%	6.00%
Core: 1	0%	12.00%	2.86%	1.00%
Core: 2	0%	17.00%	0.90%	0%
Core: 3	0%	9.00%	1.52%	1.00%
Core: 4	0%	2.00%	1.00%	1.00%
Core: 5	0%	12.00%	5.33%	11.00%
Core: 6	0%	19.00%	7.71%	19.00%
Core: 7	0%	52.00%	3.62%	2.00%


enigma > Topology

Topology

Overview of all pods deployed in the network

wendigo UP
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Quicklinks
- Show link-state graph
- Show elements
- Show log events

Select a pod to view the pod link-state graph

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RtBrick BNG Features

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

Feature	Description
Base OS	• RBFS Linux container based on **Ubuntu 18.04 LTS**
Supported Hardware	• **Delta**: AGCVA48S • **Edgecore:** AS7316-26XB, AS5916-54XKS • **UfiSpace:** S9500-22XST, S9600-32X, S9600-72XC • Containerized deployment on x86 servers with DPDK interfaces
Access Protocols	• **PPPoE** - RFC 1332, 1334, 1516, 1661, 5072 • **IPoE** - DHCP Relay, DHCP Server, DHCPv6 Server, DHCP Proxy • **Radius** - RFC 2865, 2868 - only 1 attribute, 3162, 2866*, 4372 • **Lawful Intercept** • **HQoS** - Policing, Classification, Remarking, Multi-Level Queuing, Shaping • **L2TPv2** - RFC 2661, LAC only, 5515
L3 Protocols*	• **BGP** - 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 • **OSPF** - RFC 2328, 3137, 3509, 4136, 4576, 4577, 5185, 5250, draft-ietf-ospf-segment-routing-extensions-24 • **ISIS** - RFC 1195, 3277, 3787, 5301, 5302, 5303, 5304, 5306, 5308, 6130, 7775, 7794, ietf-isis-segment-routing-09
IPTV	• Multicast - PIM*, MVPN*, IGMP v2/3*, SSM Mapping • Radius integration for subscriber channel policy, blacklisting and whitelisting • Sub-second channel zap time • Preview up to 15 other channels • IGMPv2 for older set-top box support • IPTV usage statistics
User Interface	• CLI • RESTCONF • RBFS REST API • RBMS
RBMS RtBrick Management System	• Image Lifecycle Management • ZTP • Monitoring • Log & Event Management • REST API

*RFC and draft compliance partial except as specified

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