



## **Monetizing the Business Edge with Hosted Private Cloud Services**

### **An Analysis of the Economic Impact for Network Service Providers (NSPs)**

**Sponsored by Juniper Networks**

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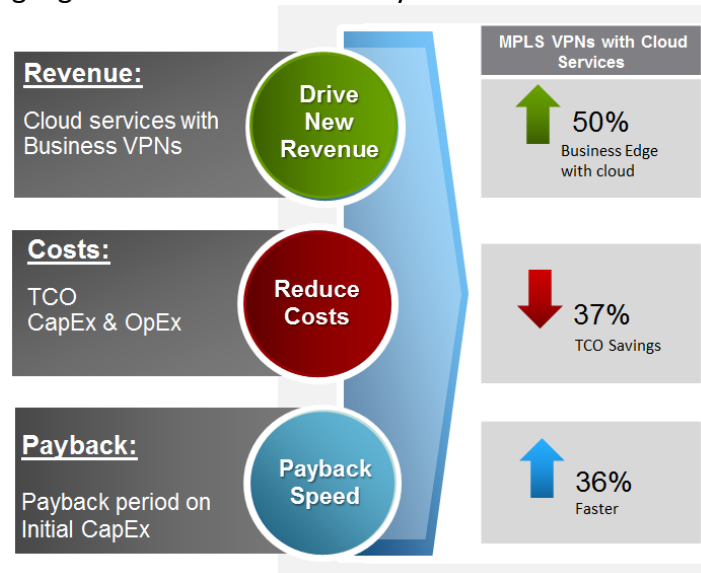
## Executive Summary

The last decade has seen a major transformation in enterprise networking communications. There are two key trends that clearly define that transformation—the proliferation of MPLS virtual private networks (VPNs), and the adoption of cloud services. Another trend, which blends the two, is fast emerging—cloud computing services delivered over MPLS VPNs as a hosted private cloud, referred to here as "Hosted Private Cloud" services. Hosted Private Cloud services are facilitated and enhanced by Juniper's combined routing and switching solutions with Business Edge technology, as analyzed in this paper.

Network service providers (NSPs) are embracing cloud services to grow new revenue streams and increase customer retention. The Juniper solution leverages the VPN services of NSPs, while addressing the needs of their enterprise customers. Unlike most public cloud offerings delivered over "best-effort" Internet, NSPs can provide end-to-end performance assurances with service-level agreements (SLAs) and security for cloud services hosted by them or by other cloud providers. This solution is particularly appealing to large enterprises with sizable VPN networks.

The analysis presented in this paper is focused on the economic impact of leveraging the Juniper solution for providing end-to-end Hosted Private Cloud services over existing VPN networks. We analyzed both the revenue uplift potential for NSPs, as well as the total cost of ownership (TCO) advantages as compared with an equivalent solution from a competing Brand X over a five year period from 2013-2017. Our analysis relies upon an extensive accounting and economic analysis of financial statements from leading U.S. and global NSPs, as well as market research, industry studies and surveys, and other related sources.

Figure 1 shows the highlights of our economic analysis results.



**Figure 1. Summary of economic analysis of Juniper's Business Edge solution**

# Introduction—The Evolution of Hosted Private Cloud Services at the Business Edge

## Trends in the Enterprise Networking Communications Market

MPLS/IP VPN services are VPN services enabled over a networking service provider's private MPLS network.<sup>1</sup> A private IP VPN network relies on the infrastructure of a single service provider, which allows the provider to manage the network end to end, and deliver higher quality of service (QoS) guarantees supported by contractually binding service-level agreements (SLAs). A recent global survey of 520 large enterprises conducted by Ovum found that 72% use a modern VPN service as their primary networking technology.<sup>2</sup>

The National Institute of Standards and Technology (NIST) defines cloud computing as a “model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”<sup>3</sup> IDC estimates that the broad public cloud services market will increase from \$40 billion in 2012 to \$100 billion by 2016.<sup>4</sup>

Data from recent industry studies and surveys document a shift towards increased adoption of cloud services by business customers. A May 2011 Morgan Stanley cloud survey shows that about 50% of respondents cited using either a public cloud or a managed hosting model to run at least a portion of their workloads, and predicted that this percentage would increase to 70% over the next three years.<sup>5</sup> This is consistent with the findings of an August 2011 survey of 257 IT and data managers and professionals conducted by the Oracle User Group, which also found that both private and public cloud adoption rates are on the rise. About 30% of respondents reported having limited to large-scale private cloud deployments, up from 24% the year before. An additional 25% of respondents were either testing or considering private cloud projects. Public cloud services were also being adopted by more than 20% of respondents.<sup>6</sup>

Cloud service providers such as Amazon Web Services (AWS) and RackSpace are the main providers of public cloud services over the public Internet. The most common types of cloud services include:<sup>7</sup>

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<sup>1</sup> “U.S. MPLS IP/VPN Services Market Update 2010,” *Frost & Sullivan*, October 2010, p. 9.

<sup>2</sup> “Opportunities for CSPs in Enterprise-Grade Public Cloud Computing,” *Ovum*, May 2012, p. 12.

<sup>3</sup> National Information Technology Laboratory – NIST Cloud Computing Program, <http://www.nist.gov/itl/cloud/>.

<sup>4</sup> “Enabling IP-Based VPN, Broadband, and Cloud Service Delivery on Next-Generation Edge Router Platform,” *IDC White Paper*, sponsored by Juniper, October 2012.

<sup>5</sup> “Cloud Computing Takes Off,” *Morgan Stanley*, May 2011, p. 87.

<sup>6</sup> “Enterprises Advance into the Cloud: 2011 IOUG Cloud Computing Survey,” *Oracle Users Group Study*, November 2011, p. 3.

<sup>7</sup> Cloud services definitions taken from “Cloud Computing Takes Off,” *Morgan Stanley*, May 2011, p. 55.

- **Infrastructure as a Service (IaaS):** Infrastructure services utilizing pools of basic resources such as compute power and storage, delivered as a service over the Internet. Key players include Amazon's Enterprise Compute Cloud (EC2). This segment is expected to grow 45% annually to \$6.5 billion by 2014.<sup>8</sup>
- **Platform as a Service (PaaS):** On-demand platforms on which new applications can be developed. PaaS is targeted at developers and simplifies the application development and deployment process. Key players include Microsoft's Azure, Salesforce's Force.com, and Google's AppEngine. This segment is expected to grow 94% annually to \$8 billion by 2014.<sup>9</sup>
- **Software as a Service (SaaS):** Delivers complete, functional applications as a service over the Internet. Key players include Salesforce.com Sales Force Automation applications, and office productivity applications like Zoho and Google Apps. This segment is expected to grow 16% annually to \$17.5 billion by 2014.<sup>10</sup>

## Network Service Providers' Opportunity with Cloud Services

Public cloud services lack the SLA and QoS guarantee levels that enterprises have grown accustomed to with their VPN networks. Recent power outages associated with major public cloud service providers have impacted many popular websites and highlighted issues associated with reliance on public cloud services. Hosted Private Cloud services are a cost-effective, robust solution to the quality and reliability issues associated with the public cloud. They incorporate the additional security and QoS features for all components of an end-to-end enterprise network. At the same time, unlike in a pure private cloud solution, all of these components are still virtualized, providing most of the cost benefits of public cloud computing.

While the cloud services market is highly competitive, there is an opportunity for NSPs to differentiate their service offerings by leveraging their enterprise-grade VPN infrastructure to provide Hosted Private Cloud services with enhanced end-to-end security and service-level guarantees. In addition to enterprise-grade connectivity, NSPs can offer other important features such as enhanced security, which effectively brings the cloud platform behind the enterprise firewall.<sup>11</sup>

NSPs are looking at new areas to boost revenue growth, and cloud computing is one of the key areas being evaluated. Based on research from STL Partner's Telco 2.0 report, the Hosted Private Cloud market is expected to grow 34% annually to \$6.5 billion by 2014.<sup>12</sup> Since they already own the network assets, as well as the infrastructure around them (billing and management systems), NSPs are primed to monetize the cloud opportunity.

<sup>8</sup> "Telco 2.0: Don't Blow it Telcos," *STL Partners*, September 2011

<sup>9</sup> *Ibid*

<sup>10</sup> *Ibid*

<sup>11</sup> "Opportunities for CSPs in Enterprise-Grade Public Cloud Computing," *Ovum*, May 2012, p.6

<sup>12</sup> "Telco 2.0: Don't Blow it Telcos," *STL Partners*, September 2011

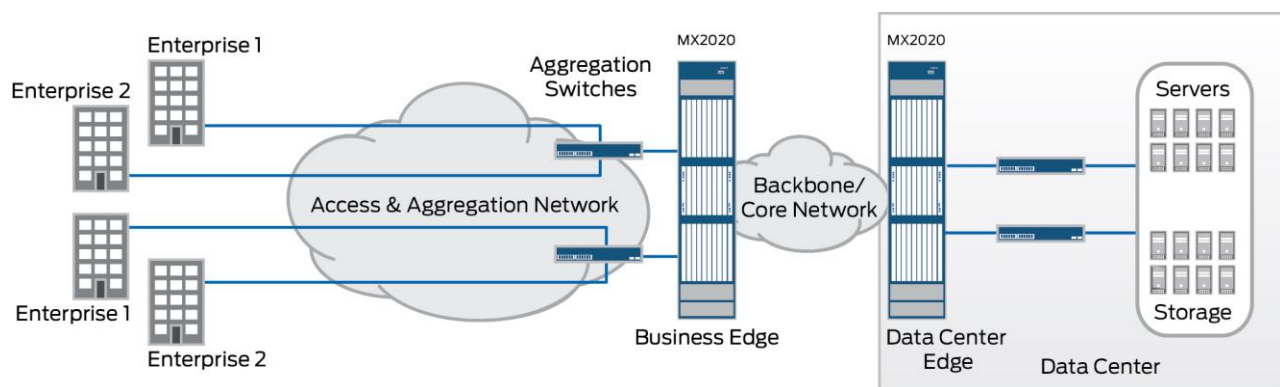
## The Juniper Solution for Hosted Private Cloud over VPN

The Juniper Universal Edge solution leverages the network capabilities of NSPs, while addressing the needs of their enterprise customers. NSPs can bring differentiated value by delivering cloud services as a managed service over VPN, assuring service performance and security from the customer premise to the cloud data center. Unlike competing offerings that are delivered over the unmanaged Internet, NSPs can provide end-to-end performance assurances and security for cloud services hosted by them or by other cloud providers with the Juniper solution. This is particularly appealing to large enterprises with sizable branch locations on VPN networks, as well as for small and medium businesses (SMBs) that are looking to get SaaS applications delivered with a performance and security guarantee.

The Juniper solution for creating Hosted Private Cloud delivery is presented in Figure 2. It seamlessly extends customer VPNs to cloud data centers by using:

- Integrated provider edge (PE) routers and Layer 4 to Layer 7 services at NSP service point of presence (POP) with massive VPN scale and port density
- Collapsed layers of data center routing, switching, and security devices otherwise required with Juniper Networks® MX Series 3D Universal Edge Routers in a Virtual Chassis configuration
- Simplified management of thousands of data center servers and storage interfaces over Juniper's top-of-rack (ToR) switches
- Cloud customer security extended to virtual machines

The Juniper Universal Edge solution provides service agility not possible with the separately provisioned PE routers, subscriber services routers, and layers of data center routing and switching devices offered by competing vendors.



**Figure 2. Juniper's Universal Edge solution for Hosted Private Cloud**

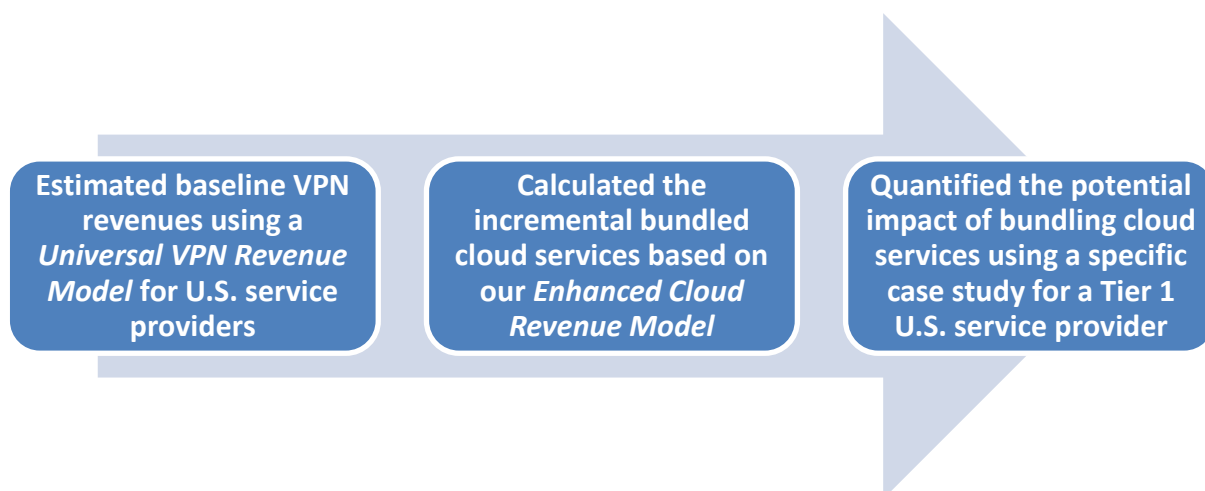
**Source: Juniper Networks**

## Revenue Uplift with Hosted Private Cloud Services

### Framework for Revenue Analysis of Hosted Private Cloud Services

The new Juniper Universal Edge technology allows NSPs to seamlessly and cost-effectively upgrade their VPN service offerings by enabling the bundling of Hosted Private Cloud services for business customers over their existing VPN network connections. The recent migration to cloud services allows service providers to capitalize on their existing IP VPN services and significantly elevate revenue generation potential in this declining segment. In order to estimate the impact of bundling cloud services with existing VPN services, we conducted an extensive accounting and economic analysis focusing on the financial statements of leading U.S. and global NSPs, as well as market research, industry studies and surveys, and other related sources.

Our analysis follows three major steps, as presented in Figure 3 below.



**Figure 3. Revenue analysis framework**

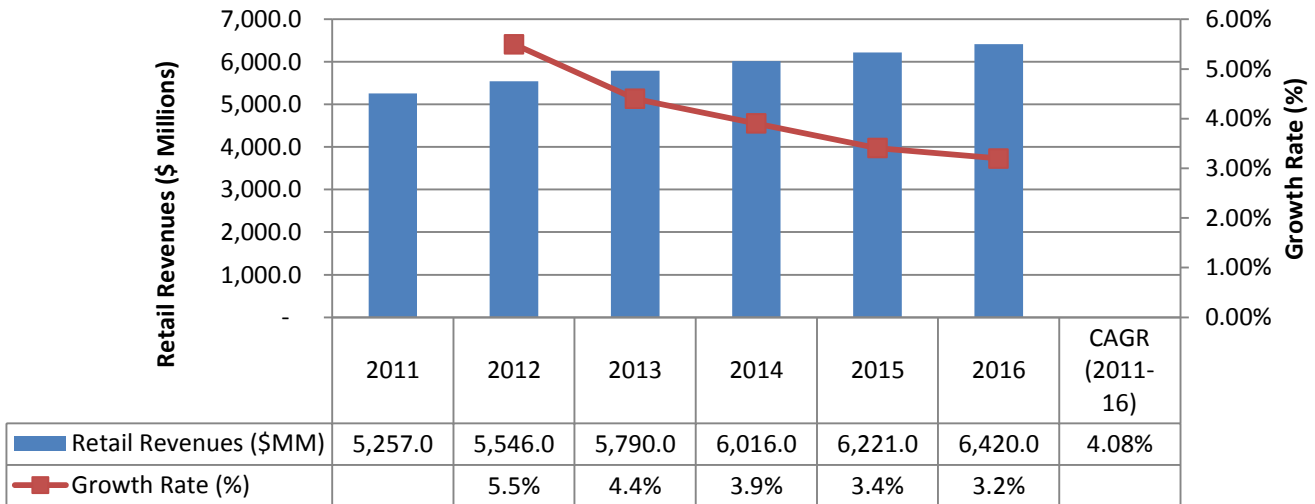
### The Universal VPN Revenue Model for Service Providers

VPN revenues are not separately reported by NSPs as a line item in their financial statements. Instead, these revenues are usually lumped together in one global number with other sources of enterprise revenues. In order to overcome this reporting gap, we had to first identify VPN revenues separately from other enterprise revenues, so that we could properly measure the impact of additional cloud services.

We reconstructed VPN revenue per service provider by creating a *Universal VPN Revenue Model*, based on an accounting analysis of financial statements of U.S. service providers, and on current and projected IDC data on the MPLS/IP VPN market.

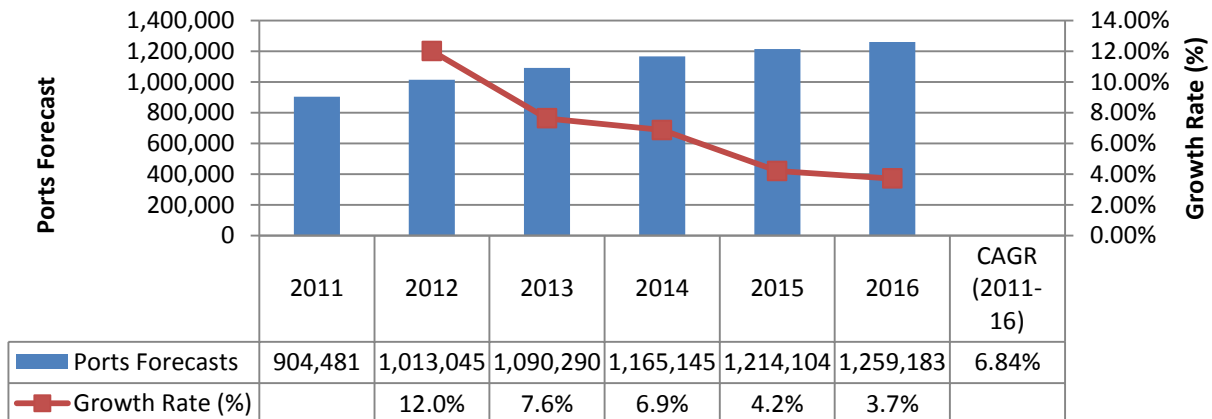
VPN services are generally priced by NSPs based on two factors: **(1) number of MPLS/IP VPN access ports; (2) monthly recurring charge (MRC) per port.** These factors were used as the building blocks for our revenue model.

We based our analysis on the most recent IDC projections (2011-2016) of retail MPLS/IP VPN U.S. market revenues and retail MPLS/IP VPN ports, as presented in Figure 4 and Figure 5, respectively.



**Figure 4. Retail MPLS/IP VPN service market: Revenue forecasts (U.S.), 2011-2016**

Source: IDC



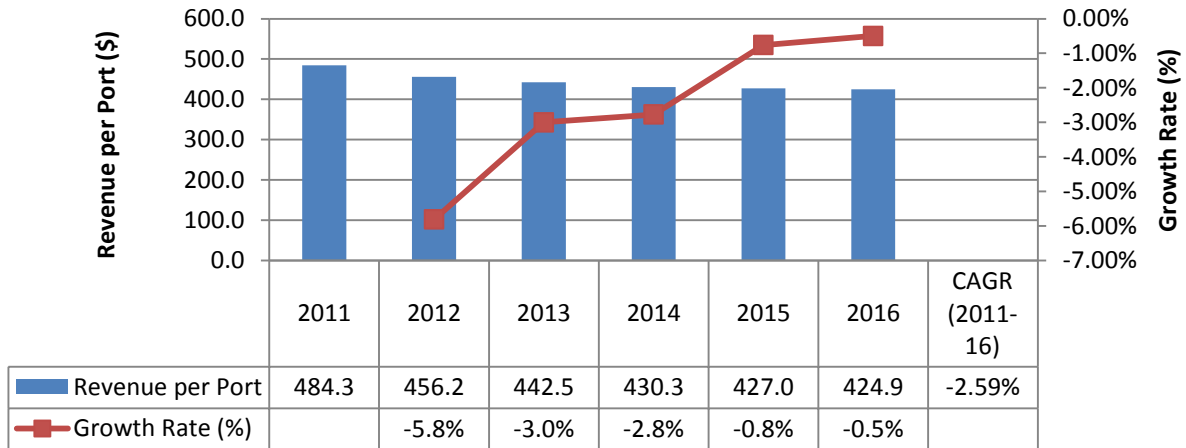
**Figure 5. Retail MPLS/IP VPN services market: Ports forecast (U.S.), 2011-2016**

Source: IDC

Based on the total market revenues and total ports projected by IDC, we calculated the **industry average monthly recurring charge (MRC) per port (2011-2016).**



As depicted in Figure 6, the *MRC per port* is predicted to be declining (e.g., growing at a negative rate), as the port growth rate outpaces the VPN revenue growth rate per IDC's projections.



**Figure 6. U.S. market average monthly recurring charge per port, 2011-2016**

*Source: IDC*

Based on the most recent IDC market share data, we allocated the revenue for each of the top four U.S. service providers (which together account for close to 80% of the MPLS/IP VPN market in the U.S.). Applying the market share analysis to the total market revenue and port projections, we created a five year forecast (2013-2017) of ports and MPLS/IP VPN revenues for each major U.S. service provider.

Below are the assumptions for one service provider, Carrier 1, as applied in our use case analysis below.

**Table 1. Universal VPN Revenue Model Assumptions, Carrier 1**

VPN Model Assumption	Input	Source
MPLS/IP VPN port count	2012 baseline: 342,174 CAGR (through 2017): 6.8%	IDC, 2012
MPLS/IP VPN per port price	2012 baseline: \$456/month CAGR (through 2017): -2.6%	IDC, 2012

## The Enhanced Revenue Model with Hosted Cloud Services over VPN

Next, we turn to calculate the **incremental revenue from Hosted Private Cloud services**. Hosted Private Cloud services are comprised of SLA guarantees and assured cloud delivery, and are billed as a premium on basic cloud delivery services (which could be bundled with basic VPN services). The underlying premise here is that enterprise customers are willing to pay a premium price for a Hosted Private Cloud, which is only available on cloud services accessed over a secure VPN connection.

Cloud billing models are still evolving in the marketplace as more NSPs are incorporating cloud capabilities through acquisitions of data centers, or through extensions of existing network assets. Several Tier 1 NSPs that were surveyed for this study, both in the U.S. and in Europe, all pointed towards bundling cloud services with VPN services in one service bill. Cloud services are billed on a *company* (user) basis, and not on a port basis. In order to be able to consolidate the VPN and cloud billing for our revenue model, we converted the port count into customers using the **average number of ports per customer ratio**. We utilized publicly available data from Tier 1 U.S. NSPs to arrive at an estimate of **approximately 30 ports per customer**.

To build the Enhanced Cloud Revenue Model, we applied data from a McKinsey survey (2010) of SMBs to derive the composition and basic pricing of bundled public cloud services. We used the adoption mix of each cloud service from the McKinsey survey to calculate a **weighted average monthly cloud services cost per customer**. Since the McKinsey survey was based on SMBs, and our revenue model is focused on Tier 1 providers that usually cater to larger enterprises, we adjusted the McKinsey pricing upwards. In doing so, we applied a 10x multiplier factor to account for higher volume of services by larger enterprises.

Using the adjusted **weighted average monthly cloud services cost per customer** as our baseline, we then applied a 2x premium for secure private cloud delivery on top of this baseline price. This premium is based on published and field surveys of IT managers, who indicated they would be willing to pay up to four times public cloud prices for cloud delivery over a secure VPN.

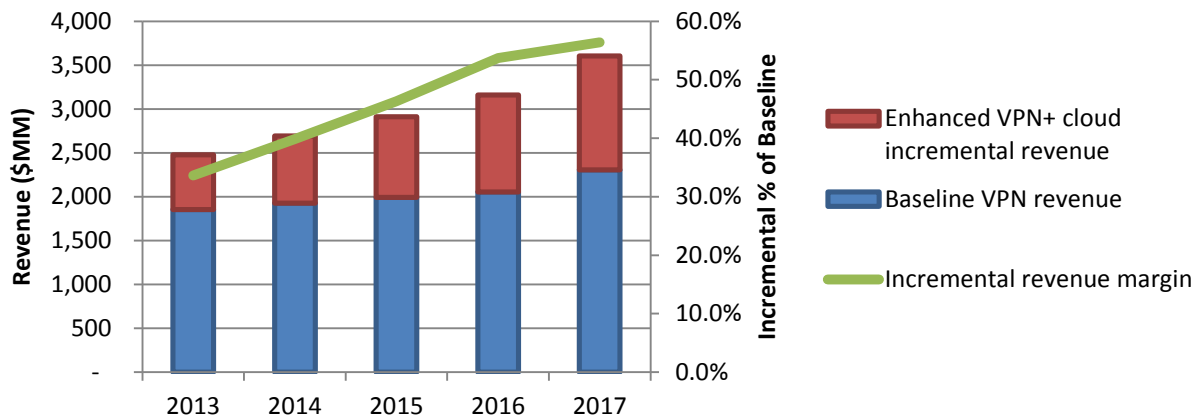
The assumptions used for cloud pricing in our model are outlined in Table 2 below.

**Table 2. Enhanced Cloud Revenue Model Assumptions**

Assumption	Input	Source
Baseline MPLS/IP VPN ports per customer	~30	Reported by Tier 1 U.S. NSPs
Baseline adoption of cloud services	Web: 64% Infrastructure: 17% E-mail: 14% VoIP: 7% SaaS: 30%	McKinsey SMB Survey, 2010
Large enterprise size multiple	10x	Foresight Valuation Group and Juniper Networks estimates
Premium cloud delivery premium	2x	Surveys of IT managers

### U.S. Tier 1 Service Provider Use Case: Revenue Uplift from Hosted Private Cloud Services

As a case study, we combined the two revenue models and calculated the **incremental impact of Hosted Private Cloud service revenues** on a Tier 1 U.S. service provider’s baseline VPN revenues. Based on our analysis, the revenue uplift potential is significant, ranging from 35% in 2013, to over 50% by 2017, as presented in Figure 7.



**Figure 7. Revenue uplift over basic VPN services, Carrier 1**

**Key Takeaway: By 2017, Tier 1 service providers can realize over 50% revenue increase over their basic VPN services by providing premium cloud delivery.**

We ran a similar analysis to show the impact of Hosted Private Cloud service revenues when compared to the entire strategic business services segment as reported on financial statements. The impact here is also quite remarkable, and ranges from 8.5% in 2013 to 10% by 2017, as presented in Figure 8.

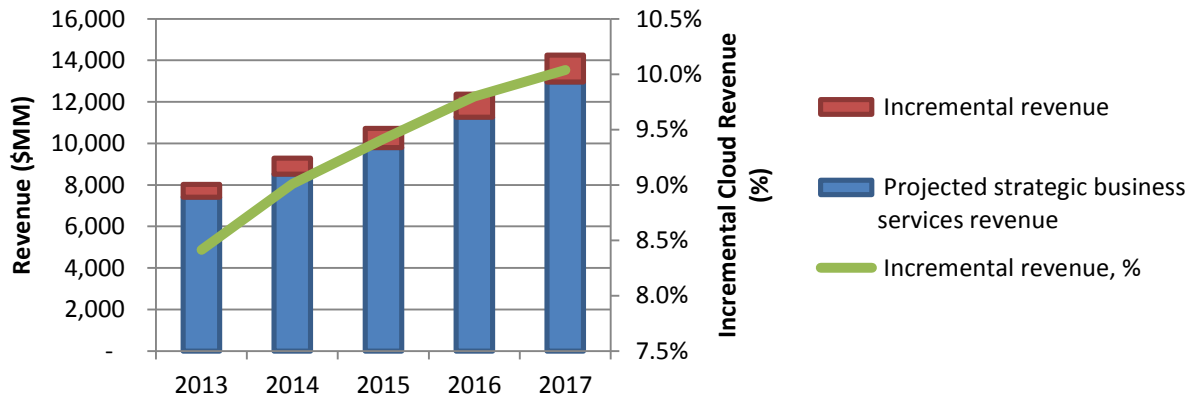


Figure 8. Revenue uplift over strategic business services, Carrier 1

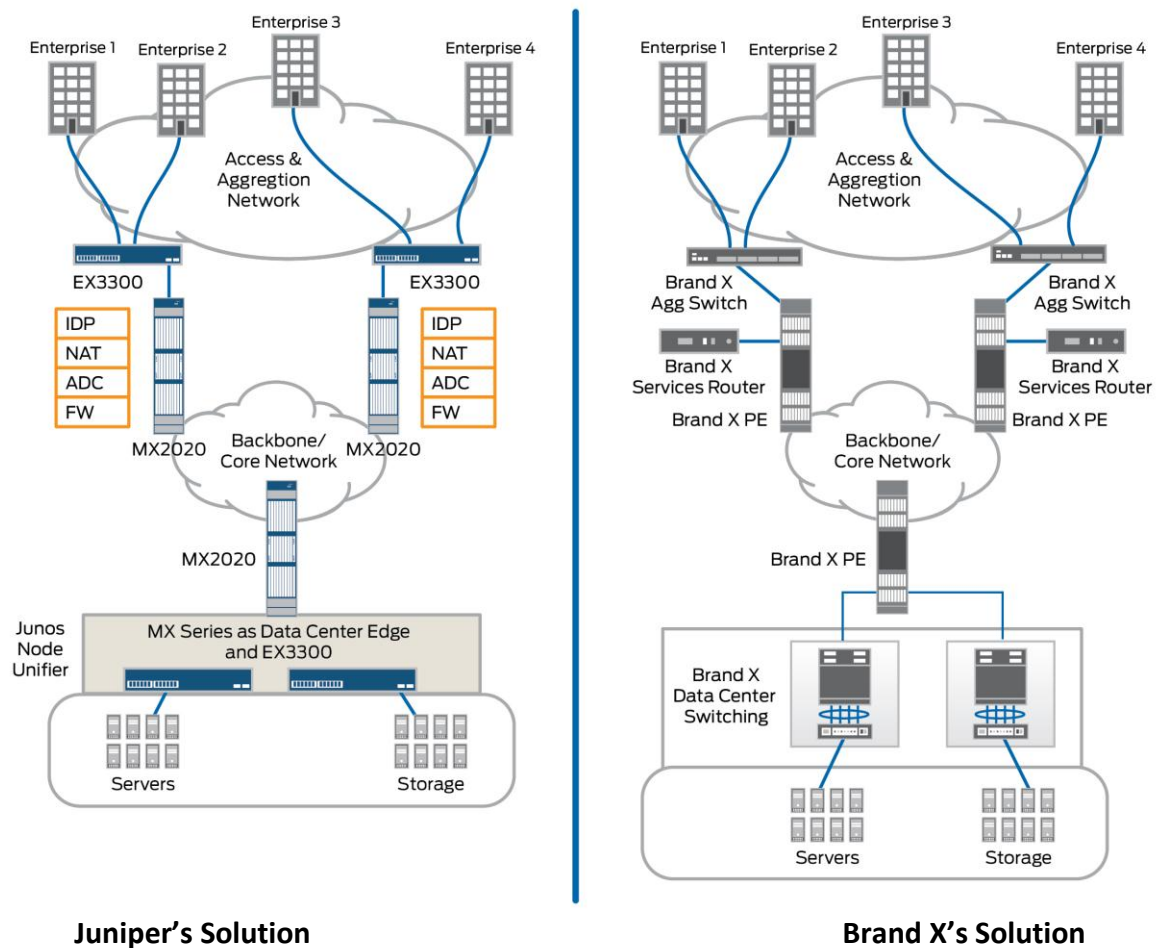
**Key Takeaway:** By 2017, Tier 1 service providers can realize around 10% revenue increase over their Strategic Services revenues\* by providing premium cloud delivery .

*\*Strategic Services are part of Global Enterprise Services (wireline segment), which include networking products and solutions, advanced communications services, and other core communications services to medium and large business customers.*

# TCO Analysis of Hosted Private Cloud Solutions

## Network Architecture and Traffic Profile for Business Edge TCO Analysis

The Juniper Business Edge solution leverages Juniper Networks MX2020 3D Universal Edge Router functionality and allows Hosted Private Cloud services to be delivered by combining PE routers and Data Center Edge to deliver hosted cloud services over Layer 3 VPNs to enterprises. Based on this framework, Juniper has created a model for calculating TCO at the Business Edge, comparing the Juniper Business Edge solution and a solution delivering the same functionality by a leading competitor (Brand X). The comparison assumes a new installation of both the Juniper and Brand X solutions, without any existing legacy equipment. It incorporates the following components, as presented in Figure 9 below.



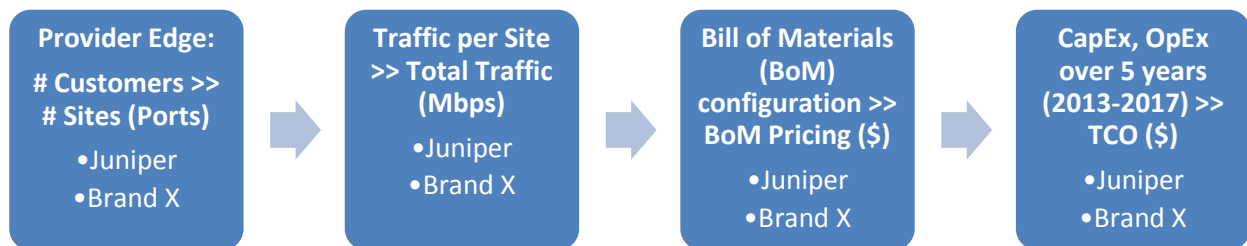
**Figure 9. Reference solutions for cost modeling of Private Hosted Cloud**  
*Source: Juniper Networks*

The Juniper TCO model was created with a focus on the equipment at the Business Edge, both on the PE router and Data Center Edge side, and not on the entire network. It highlights the competitive advantage that Juniper has at the Business Edge.

Below are key cost modeling assumptions as they relate to both solutions:

- Private Hosted Cloud services are delivered from the NSP data center to enterprises over IP VPNs.
- Cloud service flows are mapped to the enterprise IP VPNs at the business PE router.
- Cloud service flows are mapped to Layer 2 data center architecture at the Data Center Edge.
- Each incorporates stateful firewall, Network Address Translation (NAT), deep packet inspection, and server load balancing on PE routers.
- Each provides redundancy of 1:1 for transport line cards on both business PE routers and Data Center Edge.
- 40% of all customer traffic is directed to the cloud data center.

Figure 10 is an overview of the major steps in this model.



**Figure 10. TCO modeling overview**

The traffic profile for the Business Edge is based on assumptions of service and traffic profiles for medium to large enterprises, and has been applied for both Juniper and Brand X. These traffic assumptions drive the Bill of Materials (BoM) for both the Juniper and Brand X solutions. The BoM configuration underlies the capital expenses (CapEx) and operating expenses (OpEx), which determine the TCO results for each solution.

**Table 3. Cost Modeling Inputs**

TCO Model Assumptions	2013	2017	CAGR
Number of customers	125	205	13%
Number of sites (ports)	27	25	-2%
Average provider edge/customer edge bandwidth (Mbps)	10	20	19%

### **Total Cost of Ownership (TCO) Analysis: Juniper’s Cost Advantage**

The Juniper solution is poised to deliver significant cost savings over the competing Brand X solution due primarily to several key advantages of the Juniper Universal Edge solution.

#### On the CapEx side:

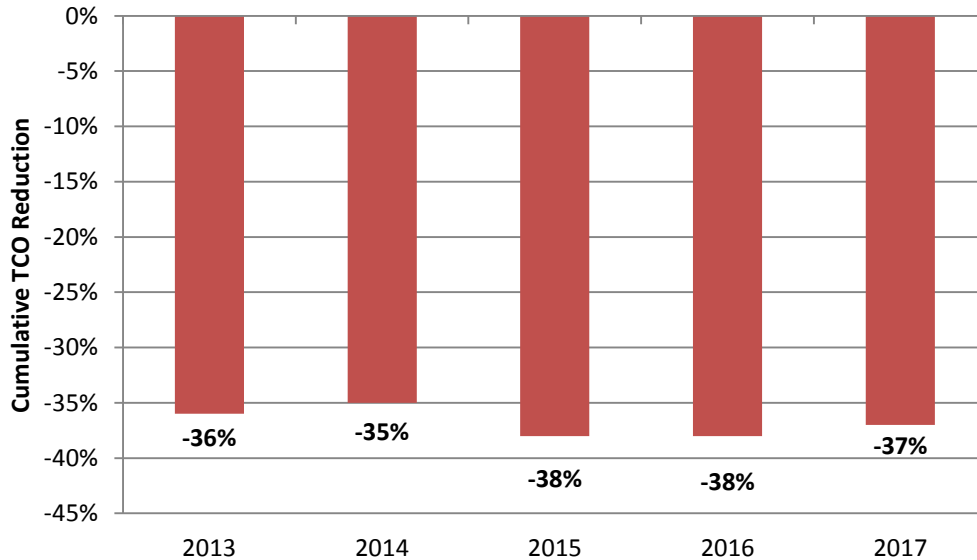
- Juniper Networks MX 2020 3D Universal Edge Router has 2x scaling compared to Brand X’s solution for MPLS VPN at the Business Edge, and for mapping customer cloud flows over to the data center network. This yields a CapEx advantage with higher investment protection because fewer upgrades are needed as subscribers grow over time.
- Juniper’s solution supports multiple Layer 4 to Layer 7 services on the MX Series services card, whereas Brand X requires a separate box for additional services. This greatly affects the BoM for Brand X, resulting in high CapEx and OpEx.

#### On the OpEx side:

- Vendor support contracts drive most of the OpEx savings over Brand X. Since Juniper’s Universal Edge solution has a lower number of touch points, there are fewer components that need to be supported and therefore fewer maintenance agreements to be signed.
- The Juniper solution is more energy efficient, with both power and cooling consumption at a rate that is much lower than that of Brand X. This advantage goes beyond cost savings, as it enables NSPs to comply with strict power operating restrictions at the PE routers and the Data Center Edge.

The results of the TCO analysis point to significant cost savings for NSPs by deploying Juniper's Universal Edge solution, as compared with Brand X.

**Cumulative TCO reduction of 37% is realized over five years, as compared with Brand X** (see Figure 11 below).



**Figure 11. Juniper's cumulative TCO reduction relative to Brand X**

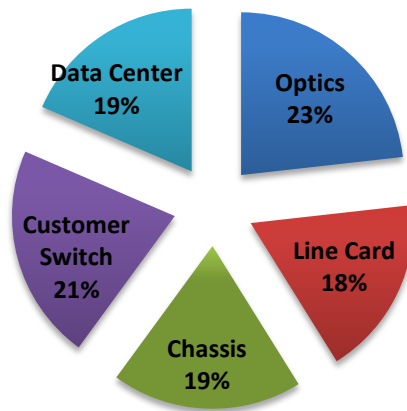
**Key Takeaway: By 2017, Tier 1 service providers can realize a cumulative TCO reduction of 37%, as compared with the competing Brand X.**

We have calculated relative payback periods for the Juniper solution and competing Brand X based on the initial installation of each solution. The initial installation is based on the total CapEx and OpEx incurred in year 1. Since both the Juniper and Brand X solutions enable the generation of similar incremental revenues from hosted cloud services, the payback period for each of these solutions is therefore a function of the relative size of the initial investment. Based on that analysis, we have determined that **the payback for the Juniper solution is 36% faster than that of Brand X.**



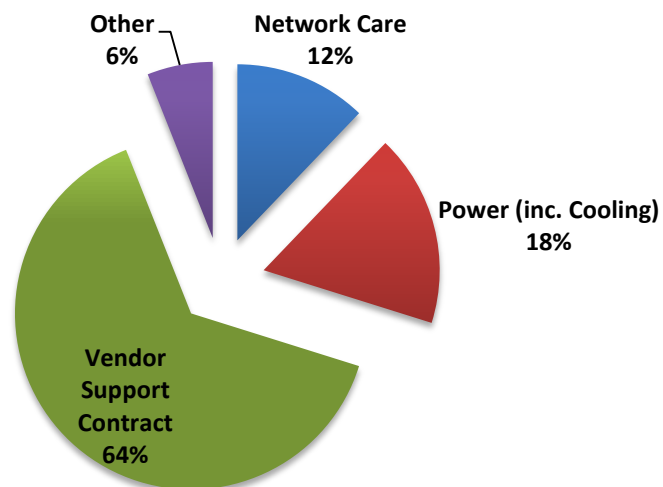
Based on this TCO analysis, 64% of the savings are driven by CapEx, and the remaining 36% by OpEx savings. We break out CapEx and OpEx separately in the charts below.

Figure 12 shows the distribution of Juniper's cumulative CapEx cost savings over Brand X by category over the five year period (2013-2017):



**Figure 12. Juniper cumulative cloud hardware savings over Brand X (2013-2017), by category**

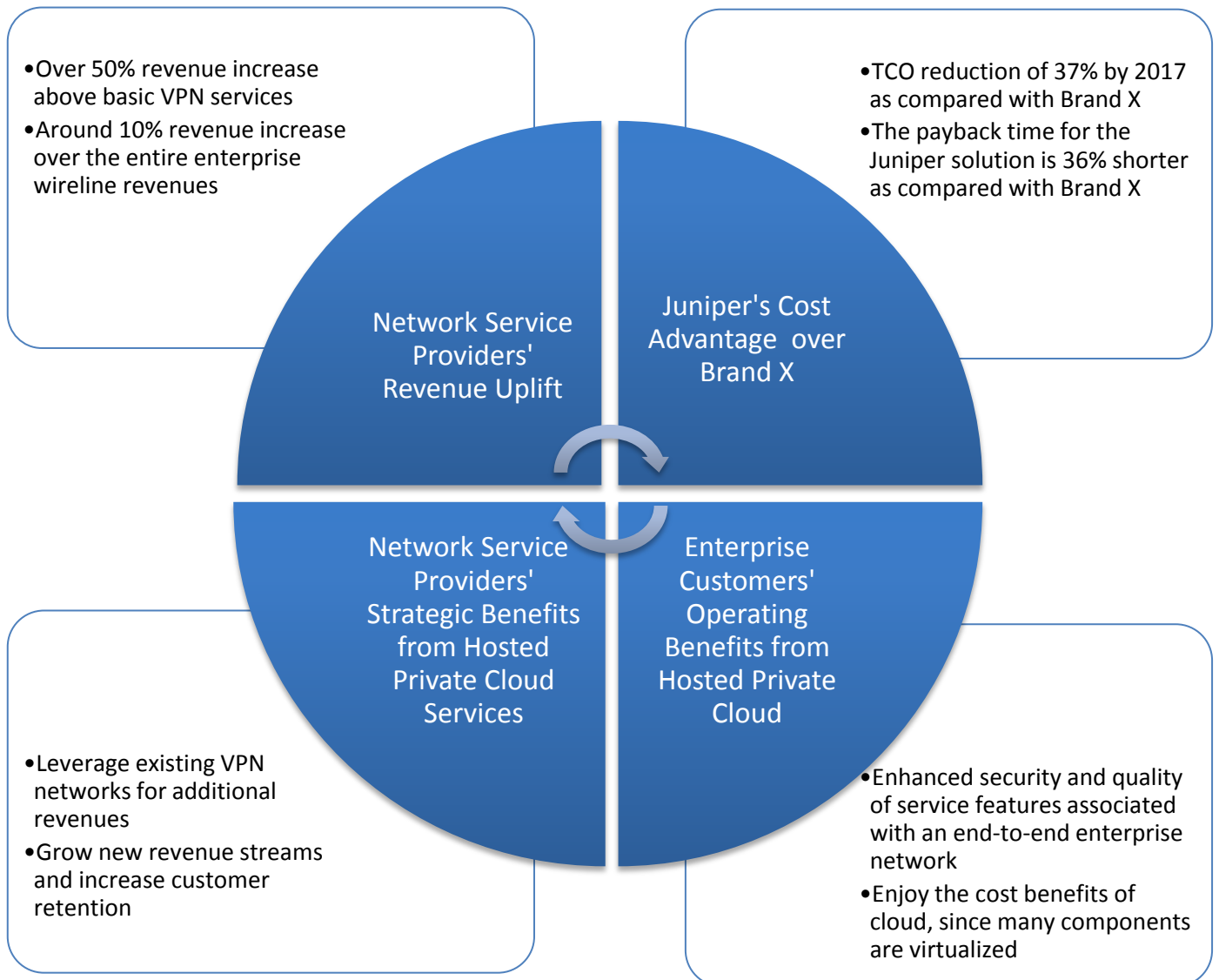
Figure 13 shows the distribution of Juniper's cumulative OpEx cost savings over Brand X by category over the same five year period (2013-2017).



**Figure 13. Juniper cumulative cloud OpEx savings over Brand X (2013-2017), by category**

## Conclusion

Hosted Private Cloud services represent a new wave of revenue potential for service providers offering business services to enterprises. By leveraging MPLS VPNs, service providers have a readily accessible insertion point to add Hosted Private Cloud services while ensuring SLA guarantees to their enterprise customers. The chart below summarizes the advantage of the new Juniper Business Edge solution using the MX2020 3D Universal Edge Router, as analyzed in this paper. The Juniper solution addresses the needs of both NSPs and enterprise customers. NSPs can realize significant revenue enhancement opportunities while deploying the solution in a cost-effective way, as compared with competing solutions such as Brand X.



**Figure 14. Advantages of the Juniper solution over Brand X**

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