Flexible and Scalable Control Plane

Synergy Research Group Case Study

Key Findings JCS 1200 Juniper

- Shortens the time to new revenue and reduces the risk of impacting existing revenue
- Allows SPs and carriers to carve out a piece of their network to establish a prototype and target a specific market without affecting their entire network
- Flexible and allows for scalability in the control planes
- Service isolation without the additional capital expenditures

JCS 1200 JUNIPER CONTROL SYSTEM

Service providers face extensive challenges with their architecture as more of their service requirements converge around Ethernet; these challenges focus on successful IP/MPLS network implementation and consolidation of their IP overlay networks. To keep pace with the evolving demands of IP traffic growth, service providers are deploying more edge, aggregation, and core routers. Consolidation of these IP overlays with a control plane solution allows them to scale services, network, control, and, ultimately, to improve their profitability.

Services carried over IP or Ethernet will continue to increase. This development forces carriers to roll out services extremely quickly if they are to capitalize from these new deployments. However, their traditional business models simply do not address this rapidly evolving market demand.

Instead, they must find new solutions that are fast and at the same time risk free: Solutions that allow them to introduce services that permit them to partition their networks every time they introduce a new service. The Juniper Control System JCS 1200 is a next logical step in improving service providers' networks to address scalability, control, service enablement, and operational efficiency.

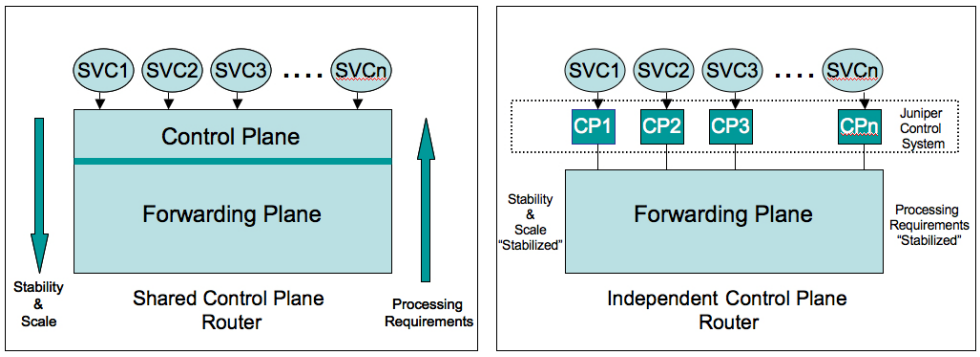


Figure 1: Prototyping Capabilities: Shared vs. Independent Control Plane

Deployment Challenges

To stay competitive, carriers must expeditiously deploy new services: video, traffic into multicast, unicast traffic, and peer-to-peer traffic. These services have different traffic engineering, quality, and security requirements, as well as different growth rates, business plans, and partners. A quick deployment strategy can result in too many services running over their infrastructures, thereby making it difficult to manage them and to control their costs. Addressing this challenge requires a control system that is scalable and provides increased system control and service enablement while operating efficiently and economically.

Service providers are feeling competitive pressure primarily due to service convergence. This convergence creates challenges: How to monetize the physical connections and how to leverage long-standing relationships that SPs have with their customers. They are evaluating their business models and looking at ways to deliver cost effectively new experienced-based services that customers are demanding. As a result, SPs see a need for increased performance demands on the network infrastructure primarily due to richer service offerings such as video, traffic into multicast, unicast traffic, tier-to-tier traffic, and Web 2.0 traffic. The most straightforward way to achieve this — and to avoid larger capital expenses — is with multiple control planes. This demand should not be accompanied with an unnecessary quantity of extra network elements.

The acceptance of carrier Ethernet, combined with a worldwide push to build out next-generation networks to deploy voice, video, and data, has firmly placed the focus on the network's edge. Next-generation services require scalability and high levels of interworking. These services are not a one-size-fits-all model; there are various Level 2 and Level 3 implementation approaches in play.

The requirements for an underlying, high-performance network demand greater operational efficiency from the network infrastructure: independent service scaling, flexible, and reduced risk service enablement.

Mitigating Risk Factors

Risk is defined by adding services in an existing network on existing routers. Every time carriers introduce services on their existing network, they have to go through a series of compound scaling and regression testing to ensure that the new service will not adversely impact the existing service. Repeated additions require more and more testing. Equally as important, at the same time a carrier introduces more services into the network, the risk of affecting existing users increases greatly and could impact the quality of service they provide to the customers. Furthermore, service interruption becomes greater with the creation of added services. A control system that allows partitioning for a specific service always ensures that just one service is introduced.

Advantages of the JCS 1200 Control Plane Scaling

In addition to providing scaling with its multicore CPU routing engines and generic service platform and increased control ability, the JCS 1200 greatly increases service introduction and time to market (TTM). One study showed a TTM in seven months instead of 11 months, resulting in immediate, accelerated revenue, which translates to tens of million dollars per month. With partitioning, there is no complex multidimensional testing. Additional

economics of using the JCS 1200 include:

- Lower operational expenses due to simple capacity planning (no service dependencies)
- Errors are contained within a domain (failure isolation)
- Lower capital expenses compared to standalone routers, common control boards, chassis, etc.
- Power and cooling footprint reduction
- Savings resulting from simpler topology and fewer interconnected links

OPEX Savings	**$1,133,322**
Total Profit (5% Margin based on TTM Window of Opportunity	**$252,000**
Total Profit of Project	**$2,733,322**

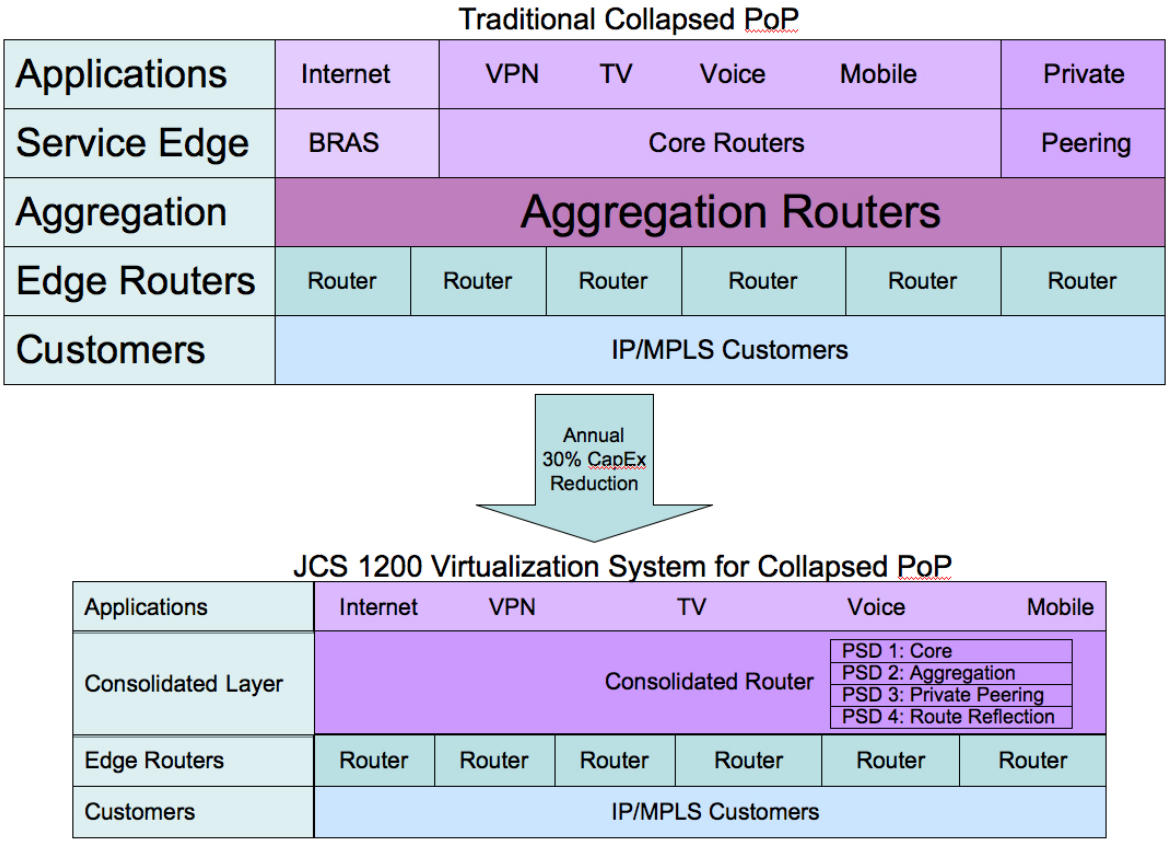
As an example, assume the rollout of two, new services (MPLS VPN and VPLS) with 25 sites and two routers/sites. The following illustrates the return on investment:

	JCS /Total Cost	Without JCS /Total Cost
Lab Set Up	**$83,332.00**	**$83,332.00**
Service Rollout	**$491,660.00**	**$1,108,317**
Service Rollout and Maintenance 1 Yr	**$716,659**	**$1,849,981**

This example includes factors such as the cost of lab and equipment, test engineers, research and testing and management. The financial comparison (TTM profit) of CAPEX plus OPEX savings is $2,733,322.

Other key savings are in the area of network consolidation through virtualization. Consider a case where JCS 1200 is used to collapse the core and aggregation routers in a point of presence (PoP). Or, contemplate the following scenario where JCS 1200 is used to eliminate chassis, power, line cards, and links in the core and aggregation layers of a PoP.

The diagram illustrates how a JCS 1200 creates hardware-virtualized routers or Protected System Domains (PSD) when combined with a Juniper networks router. Routing engines on the JCS 1200 are assigned to forwarding cards on the Juniper router, forming the protected system domain (PSD). The connections from the JCS 1200 to the Juniper router are Gigabit Ethernet (GE) connections to the control board. Thus, the use of JCS 1200 to collapse even a simple PoP architecture is on the order of 30 percent CapEx saving.



Summary

Service providers (SP) and carriers are demanding greater flexibility, robust routing capabilities, and more bandwidth in their architecture. Additionally, providers want their architecture to support new requirements, such as multicast support for video services, greater per-subscriber bandwidth capacity, and improved subscriber management and control capabilities to support dynamic personalized service profiles. Analogously, service providers insist on rapid rollout.

Ultimately, a control system that scales to control platforms separately and that allows carriers to share links in their network decreases their capital expenditure and operating expenses. With these control plane requirements Juniper has positively and strategically positioned itself by developing the JCS 1200 to support this architecture model. And, as important, the Juniper control system will allow carriers to drive new sources of revenue without jeopardizing existing services while simultaneously reducing complexity in their networks and decreasing OPEX and CAPEX.

"Separation of data plane from control plane is vital as it allows the network technology to focus on the optimization of the data plane, most importantly cost reduction."

Ray Mota, Ph.D.
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