IMPROVING THE ECONOMICS OF NETWORKING WITH ROUTER INTEGRATED APPLICATIONS

Reducing Network Cost and Complexity with Software-Centric Infrastructure

Table of Contents

Executive Summary . . . 3
Introduction . . . 3
Router-independent Applications . . . 3
Adopting New Application-Specific Appliances . . . 3
Router integrated Applications . . . 4
Architectural Integrity . . . 4
Adopting Router Integrated Applications . . . 4
Juniper Networks Router Integrated Applications . . . 5
Application and Subscriber Awareness . . . 5
Security Services . . . 5
Flow Monitoring . . . 5
Video Monitoring . . . 5
VoIP and IP Monitoring . . . 6
Carrier Grade NAT (CGN) . . . 6
Traffic Direct . . . 6
Summary . . . 6
About Juniper Networks . . . 7

Executive Summary

Multiple factors have converged to force service providers into a continuous cycle of network capacity investment; however, these investments have not translated into increased profitability. Constant investment with limited return on invested capital threatens the very business models of service providers, and if forecasts for exponential increases in traffic and subscribers are correct, this problem will only worsen.

One area that can help reverse this trend is network equipment consolidation. Today, services are delivered using a wide variety of physically and logically independent, capacity-centric network elements. Service providers can improve the economics of networking by focusing their infrastructure investment dollars towards more software centric network equipment that integrates network and service layer technologies. As routers are well proven and ubiquitously deployed, integrating services with routers offers a practical approach to consolidation and achieving capital efficiency.

This paper is intended for network planners, operations managers and product managers who are involved in the definition, delivery and ongoing support of service delivery networks. The paper contrasts service delivery approaches, with a focus on the merits of software centric networks and router-integrated services that drive network monetization through consolidation and increased efficiency.

Introduction

Several major market forces are driving service providers to focus on improving the economics of networking. Challenged by exponential traffic growth that is being driven by mass adoption of smart-phones, video and high speed broadband access, service providers have been in a continuous investment cycle to improve network capacity, scale and performance. At the same time, the service provider market is becoming even more competitive, with wireline, cable and mobile operators all offering voice, video, data, and wireless packages for every market, from residential subscribers to the largest enterprises. This competition has resulted in significant price erosion, especially in mature markets, where the prices of most basic services have fallen dramatically year over year.

Given the combined effects of continuous network investment (based on increased demand) and a diminished return on investment (based on increased competition) service providers are struggling to improve margins and profitability. Considering the forecasts for bandwidth growth, their very business models are under threat.

Overcoming these challenges is critical to service provider's success; and, in this document, we will discuss how this can be achieved through investment in software centric infrastructure that offers capacity, performance, and scale, and is also service oriented. This effort is made possible with router integrated services that are easy to deploy and efficient to operate, so that total cost of ownership doesn't accelerate as the customer base grows and traffic demands increase.

Router-independent Applications

Traditionally, services are delivered over a combination of routers and one or more service-specific appliances that are physically and logically independent. Using this model, service providers must acquire more routers to address increased traffic demands, while at the same time purchasing additional appliances as service demand grows. These disparate network elements must not only be physically racked and powered; they must also be integrated and operationally proven by the service provider or a system integrator. 'Operationalizing' the multiple network elements required to support a single service is a complex, time consuming and expensive process that delays time to revenue and slows the pace of service innovation.

Adopting New Application-Specific Appliances

1. Appliances must be evaluated and tested against a host of criteria encompassing everything from physical dimensions and power requirements through performance, reliability, recovery, upgrade procedures. The appliances must also be integrated with the operations environment, including operational support systems (OSS), and business support systems (BSS), followed by exhaustive testing.
2. Once the appliance has successfully passed its individual tests, it must be tested for interoperability with pre-existing network elements, like routers, and tested at the service level.
3. Assuming successful system and service testing, detailed deployment, sparing, and support plans are created.

This process involves major upfront investment, and comes with significant complexity and risk. And return on investment is not assured or immediate, as the the first office deployment of a new service often begins 12-24 months after a new appliance is first tested.

Inefficiencies abound with appliance-based application approaches: service capacity is restricted to the network interface on the appliance; adding service scale requires additional appliances; and cabling to interconnect all the appliances with the network consumes valuable service ports. Worse yet, as appliances are application specific, introducing new services means introducing new appliances. The end result is a complex and inflexible network environment where routers are surrounded by racks of application-specific appliances.

Router integrated Applications

Router integrated applications eliminate the need for service-specific appliances, as applications are physically hosted on the router and logically integrated with the routers operating system. Because this integration is 'out of the box', service design and testing complexity, time and cost are greatly reduced. Eliminating appliances also eliminates space or power requirements, and integration with operational and management tools, OSS and BSS is already in place. Deployment, sparing, and support planning and processes are also greatly simplified.

Architectural Integrity

By design, legacy routers with shared routing and service resources lack the ability to host applications at scale; instead, application-specific appliances are required. This results in complex and inefficient network design as each appliance comes with its own unique operating system, command line interface (CLI), element management system (EMS), software release schedule, and feature set. As complexity increases so does costs, even as service efficiency and reliability decreases. Service efficiency, on the other hand, is maximized when the number of network elements and operating systems are minimized.

Successfully implementing router integrated applications requires advanced routing platforms that feature architectural integrity, a term that refers to the clean separation--and tight coupling--of the forwarding plane, control plane, and services plane on a routing platform. Juniper has maintained architectural integrity in its products since the introduction of the industry's first true carrier-class router in 1998. In order to avoid resource contention under all network conditions, Juniper routers perform packet forwarding, route processing, and service processing in separate physical entities within the router, each with its own resources. With architectural integrity, each plane can be independently scaled to address unique and evolving business and technical requirements, and each plane can perform to full capacity without drawing resources away from any other plane.

In addition to dedicated routing cards and forwarding cards, Juniper routers optionally host service cards that provide dedicated processing power to a broad range of applications—from network and service layer monitoring to application and subscriber visibility (see the following section for a complete list). Contrasted with service-specific appliances, service cards enable fast, flexible service deployment with lower risk and lower total cost of ownership. Service cards, and the applications they host, leverage the performance, scale and reliability of Juniper routers, and can be incrementally added over time, providing low start-up costs with the ability to cost-effectively scale applications as needed.

Adopting Router Integrated Applications

1. The new application must be tested, however, no additional network elements are required, no additional hardware integration and testing is required, and no additional space or cabling is required.
2. Because the new application is integrated with the routers operating system, it is fully interoperable with the router and any other router service 'out of the box,' and leverages any existing integration with operational tools.
3. Detailed deployment and support plans are needed, however, installation plans are greatly simplified (software upgrade versus new equipment installation).

Router integrated applications promote network consolidation and dramatically improve efficiency.

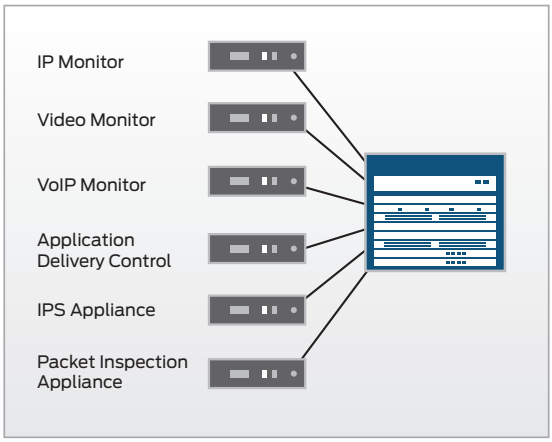

Figure 1: Appliance-based service delivery approaches add complexity and cost to network operations

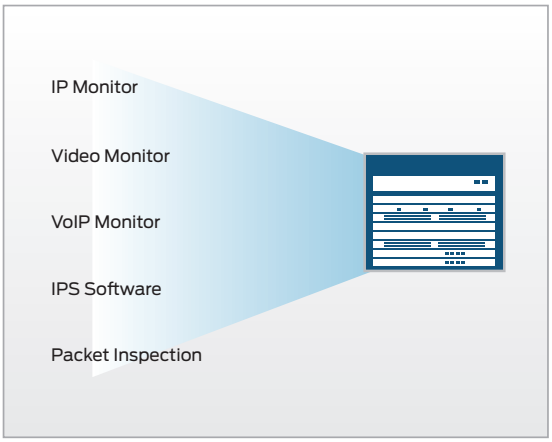

Figure 2: Router integrated applications promote network consolidation and reduce operation costs for network operators

With router integrated applications, service capacity is no longer restricted to the network interface on an appliance, applications can be applied to any session over any interface on the router. Scaling applications is as simple as adding more service cards to existing routers, and requires no additional equipment or cabling. Router integrated applications reduces costs and complexity, and provides a highly efficient and flexible service oriented network environment where routers provide network and service layer performance, reliability and scale all from a single platform.

Juniper Networks Router Integrated Applications

Juniper Networks router integrated applications portfolio consists of optional, individually licensed applications that run on service-cards deployed on Juniper Networks M Series, MX Series and T Series routers. The following list is a brief description of our router integrated application product portfolio.

Application and Subscriber Awareness

Juniper utilizes router-integrated deep inspection technology to dynamically identify applications and subscribers; this supports the creation of highly differentiated service offerings as well as the collection of application-layer and / or subscriber-specific statistics that can be used to enhance operations and improve route and capacity planning activities.

Security Services

Juniper offers advanced router-integrated security applications, including intrusion protection system (IPS), stateful firewall, and IPsec. These applications support the latest security capabilities in order to protect the network, networked resources, services and subscribers from malware, trojans, and keyloggers as well as a wide range of other attacks.

Flow Monitoring

At the network layer, Juniper offers router-integrated flow monitoring applications that provide a comprehensive set of IP flow layer statistics collection capabilities for use by back-office systems in support of a wide variety of operational tasks (e.g.; accounting and billing, SLA monitoring, capacity planning, and traffic engineering), as well as lawful intercept.

Video Monitoring

StreamScope eRM offers router-integrated MDI and MPEG layer monitoring and analysis of video streams, enabling the rapid identification and isolation of video quality issues in IPTV and cable networks. StreamScope eRM was developed by Triveni Digital, a leading provider of digital signal monitoring and analysis solutions and a Junos OS Development Partner.

VoIP and IP Monitoring

TePM is a router integrated performance monitoring application for VoIP, IPTV and videoconferencing that facilitates service level monitoring and troubleshooting and act on IP and VoIP quality issues. TePM was developed in partnership with Telchemy, a leading provider of IP service monitoring and analysis solutions and a Junos OS Development Partner.

Carrier Grade NAT (CGN)

Juniper is building the industry's fastest and most scalable CGN solutions that are easily integrated with other router-router integrated applications like subscriber management and monitoring services in order to provide customers with a flexible toolbox that helps them mitigate IPv4 address depletion and ensure IPv4 and IPv6 coexistence, without placing current services, applications—and revenues—at risk.

Traffic Direct

Traffic Direct addresses the experience and cost challenges caused by the exponential growth of mobile data traffic by combining intelligent subscriber and application policies to offload bulk data traffic directly to the Internet, resulting in a better mobile experience with less network congestion and lower total cost of ownership.

Summary

Adding applications to Juniper routers is a simple, quick and non disruptive process, a real game-changer for service providers, and interposes where new service introductions are traditionally expensive and high risk activities. Applications can be incrementally added as needed, allowing customers to purchase and deploy a Juniper routers strictly for routing applications, and easily add additional applications in the future as needed, providing low start-up costs with future proof investment protection. Customers can select just the applications they want, and only for the platforms on which they need them.

Unlike appliances, service cards consume do not rack space, a major advantage to network planners who must design for space constrained facilities. Furthermore, service cards typically consume an order of magnitude less power than application-specific standalone appliances, an important advantage to network planners who must consider power availability and power costs in their designs. And Juniper routers are built for "always on" operation, offering fully redundant hardware configuration. The modular Juniper Networks Junos® operating system architecture also promotes nonstop operation, including unified in-service software upgrade (unified ISSU), which enables non-service affecting upgrades between major releases.

Juniper's router integrated applications help to improve the economics of networking by addressing diverse service requirements from a single carrier class routing platform, and by eliminating the time and expense needed to qualify and implement appliance-based solutions.

Our comprehensive and ever-expanding router integrated applications portfolio leverages Juniper's unmatched architectural integrity to support high performance and scale, provide service flexibility and velocity, and increase operational efficiency. Service cards provide dedicated hardware acceleration without impacting control plane stability or forwarding plane performance. Multiple service cards on one router or across multiple routers to accommodate service growth or additional services as technical and business requirements evolve.

Taken together Juniper Networks router integrated applications portfolio creates a software-centric infrastructure that helps improve the economics of networking.

About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at **www.juniper.net**.

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2000295-004-EN June 2011 Printed on recycled paper