

## **Open Network Services Platforms for High-Value Network Services**

Peder Jungck, Founder & Chief Technology Officer

### **Introduction**

CloudShield Open Network Services Platforms, or ONSPs, are fully programmable packet processing servers. Early deployments of the ONSP are largely network security applications, but ONSPs can support a wide range of packet processing applications. This paper is one of a series that explores different applications of CloudShield's flexible platform.

### **Background**

Service providers today face the greatest challenges in the history of the communications market. In a 15-year span, the communications services marketplace has made a quantum leap from providing subscribers a POTS line for local phone calls to today's delivery of multiple choices from a lengthy menu of services...from long distance and call waiting to DSL, bandwidth on demand, high-speed cable modem services, online gaming, hosted web space, conditioned/enhanced e-mail and instant messaging services.

Whipsawed by daunting competition, their best-laid business models sliced to the bone by razor-thin margins, many service providers and carriers have vanished from the landscape. Those who remain will survive only by deploying and delivering the optimal menu of services more cost-effectively than the global service provider community has ever done before. Doing so will equip them to win new business and retain existing customers by providing services that are simultaneously affordable to their customers and profitable for them as suppliers.

Service providers of all types are tackling ambitious yet essential goals. Looking inward, they need to leverage their existing infrastructure to deliver multiple services and serve more subscribers. Looking outward, they must embrace a brave new world where delivering a single service involves managing networks that span a spectrum of technologies and equipment vendors and provide for "co-opetition" with other, competitive service providers. This document describes a breakthrough solution that service providers can deploy to help ensure survival and prosperity, one that puts a flexible infrastructure in place to rapidly and cost-effectively deliver new services over time, and, in the process, future-proofing their operations.

At the heart of this new solution is the ability to rapidly expand service offerings, and most importantly, the decision support needed to determine the features that a critical mass of customers is willing to pay for. While local dial tone, local toll and long distance are the staples of voice services, and call waiting and caller ID are the common non-bandwidth based add-ons, data- and Internet-related services are still evolving. The successful service providers will have the flexibility to support a wide array of services without having to change their communications infrastructure or investing significant capital and operational expense (capex and opex) with each change.

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### Fundamental Drivers

Delivery of communications services is based upon some simple yet critical premises: by providing more benefits for customers at a lower aggregate cost, revenue should rise and customer loyalty should increase, and customer churn should decrease. If all of these fall into place, a service provider can grow its bottom line. The key is how to do so most cost-effectively as relates to both capex and opex.

Multi-service delivery may start with voice and data as base components, but over time, content-based services and streaming applications will become major parts of the service demand mix. The benefits of value-added, content-based services on the bottom line are already being seen by the service provider community as a key driver of churn reduction. By adding as little as two additional services on top of a base data service, companies such as Cox Communications—which is perhaps the most truly convergent service provider in the Western Hemisphere—have reduced their customer churn by as much as 53% year-over-year.

Yet simply delivering multiple services will not provide perfect customer retention in and of itself. The value and quality of those services must be competitive. This means services that are sufficiently differentiated from those of competitors, with service levels that meet or exceed expectations. Over time, the metrics needed to maintain service levels, and to manage and visualize the benefits and performance of a solution—to accurately assess the customer experience—will change.

Determining how to provide services from a business and architectural standpoint is as difficult as determining what they should be. While flexible modular billing and delivery is a driving force in customer expectations, modularity and flexibility should be equally important drivers in the creation of delivery subsystems. Transport switching and routing equipment is great at switching and routing...and should remain focused on those functions. Content exists on servers, so those systems should remain focused on content storage and delivery upon request.

Neither current network equipment such as switches and routers, nor servers, are built to manage transactions and analyze network traffic and content in real time. What is needed? A Open Network Services Platforms.

The flexibility of a Open Network Services Platforms lets service providers define rules for controlling bandwidth by customer, by time, by service, by priority...by whatever definition fits tomorrow's business need. It enables the correlation of complex relationships, customers-to-content, and determines accordingly how traffic should be treated by the infrastructure. Without such granularity and flexibility, service offerings will either become another cookie-cutter "me too," or too costly and outdated to attract or retain customers.

### Delivering Services

Rapid deployment of services requires control systems in the network. If transport equipment is set to allow full rate, packet- and content-aware systems must provide the necessary "bandwidth metering" to enable bandwidth on demand. If content and access to other networks impacts service provider costs, such as non-cacheable peer-to-peer traffic, that requires visibility and control over such traffic. If a premium service is desirable and can add revenue by

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providing differentiated bandwidth when accessing a home office worker's employer's site vs. surfing the web, then customer-specific content access provisioning needs to be readily configurable.

All of these are attainable through a singular collection of tools in a converged system on the network. The solution that can provide this—CloudShield's Open Network Services Platform—is described as relates to each of six core service categories:

- *Bandwidth on demand*
- *Packet-based billing*
- *Peer-to-peer usage management*
- *Class of service bandwidth management*
- *DNS-based services control*
- *Quality of service (QoS) management*

### ***Bandwidth on demand***

This is the ability to enable differentiated levels of bandwidth based on time period, access to a particular portion of the network for access to special content, or bandwidth controls based upon authenticated access to a particular piece of content. The Open Network Services Platforms can achieve this by rate-limiting all traffic down to a base upload and download bandwidth, and allowing multiple levels of additional traffic via bandwidth "gates."

### ***Packet-based billing***

If new services are to be offered on a selective basis, the ability to control and monitor the usage of these services is critical. The granularity of the billing metrics and reporting must match the level at which the services are offered. CloudShield's Open Network Services Platforms can help deliver this information based upon broad levels of access to a set of servers and systems monitoring time, data rate or specific transaction-level requests. Since tracing down DHCP logs for post-processing billing mediation is a labor-intensive and daunting task, flexible IP-addressed solutions must have user-level identification occurring through either direct monitoring of the authentication to identify a user or performing facets of this functionality by the solution itself. Once this information is identified and captured, the granularity of reporting must be able to address a broad range of outputs from by data rate per group, by protocol, by application or even by specific item of content downloaded or accessed. The beauty of IP, the Internet and its impact on billing is that by its very nature, protocols must be compatible regardless of which device is providing the content within the protocol. By watching the transactions as they occur, as the content serving devices change, the protocols remain consistent and a dramatic reduction in back-end billing integration can be achieved through a singular primary source of billing data.

### ***Peer-to-peer usage management***

The growth in usage of peer-to-peer networking has yielded equally fast-growing problems. For service providers who initially focused on web content and pay surcharges for upstream bandwidth, the effects of content caching are lost on this new technology. Even without downstream bandwidth consumption or any resulting new revenue, upstream traffic usage can

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surge. Visibility into these new protocols and how they are affecting the network—and the ability to control them—is a critical path and must be part of any new service provider network's infrastructure, and is the core of what can be provided by CloudShield's Open Network Services Platforms. At the same time, peer-to-peer networking can offer a new revenue source as flexible treatment of this traffic and associated services will continue to be identified. The security flaws in these protocols and their contents as well as third party organizations with expectations of compliance management require capabilities and initiatives to begin.

### ***Class of Service bandwidth***

Granular bandwidth management creates the opportunity for a service provider to deliver various tiers of services, value and quality to customers. Attention must be paid to the QoS and prioritization of these streams by switching and routing systems during peak periods. More focus, however, must be placed on what messages you are sending to peering points and how this traffic will be treated as it leaves a service provider network on its way to a final destination. The ability to control and “meter” QoS, prospective routing path markers and other packet-level controls is critical to succeed at offering end-to-end QoS for customers and the services they purchase. Without attention to these details, by default a network might inform other networks that a peer-to-peer file download on a low-cost DSL circuit is as valuable for congestion management treatment as is the high-dollar DSL circuit customer's corporate IPsec VPN traffic. Providing QoS treatment controls over network traffic based upon service offerings being consumed is a prerequisite to developing class of service bandwidth. All of this functionality is supported by CloudShield's Open Network Services Platforms.

### ***DNS-based service control and QoS management***

In the quest for simplified, consolidated, easier-to-manage networks leveraging existing investment and providing rapid ROI, it is vital to consolidate infrastructure. Providing control over DNS and QoS is critical to any content-focused service offering. Integrating the base management features within service management and provisioning solutions enables not only by content or service flexibility but simplified and integrated reporting and visualization of the network's configuration. CloudShield's Open Network Services Platforms provides the ideal single platform for consolidation and integration of these crucial processes.

### **CloudShield's Open Network Services Platforms in the Service Provider Environment**

Providing content-based network control is the foundation of offering new services; identifying the business model and what will customers actually procure is equally daunting. CloudShield's Open Network Services Platforms provides the layer 2-7 content control that can make profitable new service and business models a reality:

### ***Broadband bundles***

Today's DSL access market provides one example of what communications subscribers are paying for. Consumers and business pay differing amounts for varying levels of bandwidth, but increased bandwidth alone does not necessarily support the pricing disparities between, say,

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ADSL and VDSL or SDSL. Gaining other advantages along with higher bandwidth might help DSL subscribers cost-justify paying that extra premium.

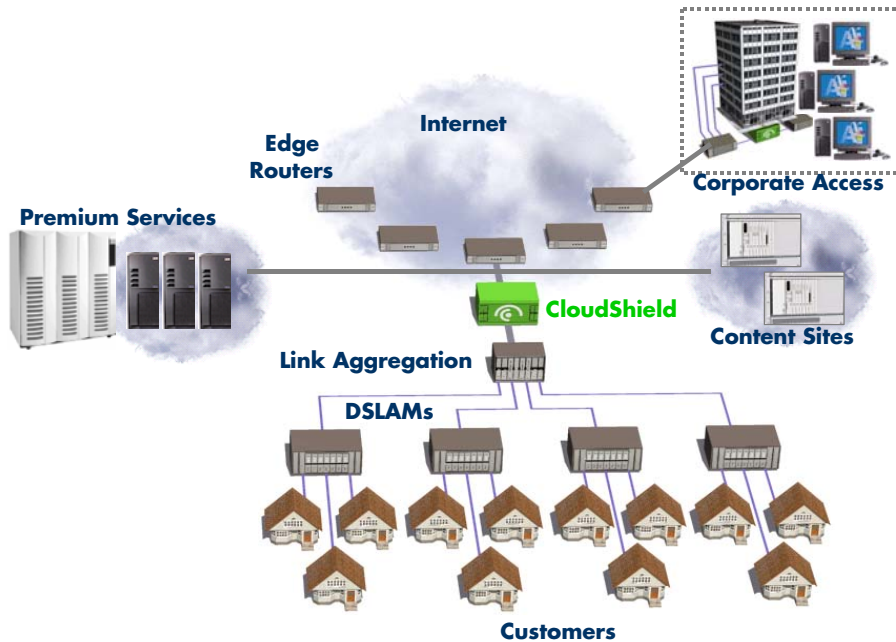


Figure C-1: CloudShield's Open Network Services Platforms fits in service provider networks at key aggregation points (e.g., DSL above the DSLAM)

For example, a common theme in today's market is purchasing broadband access plus a premium service such as AOL Broadband or MSN 8 for \$9.95. The problem is that the additional \$9.95 doesn't appear on the same bill or go to the same service provider. This means multiple bills and can lead to faster churn for both services, higher cost per customer and no intrinsic loyalty through bundling. A better way might be to offer DSL customers the ability to get AOL Broadband or MSN 8 on the same bill for the same price. And one can imagine how attractive it would be to the market if along with that came premium bandwidth when accessing that service. A DSL customer with 768k download speeds might in effect "get in the fast lane" when using AOL Broadband or MSN 8, the network boosting them up to 1.5Mbps download speeds whenever they are on the premium site.

From a service provider's perspective it is simply opening up the gates to that area...and the bandwidth cost for that service could be even dramatically reduced through caching or special peering. To the service provider, expending a relatively few dollars for wholesaling and billing of the service can gain them (as well as the content site) increased subscriber loyalty and sharply reduced churn. Customers can enjoy a richer broadband experience with their new bundled service package than they could have achieved shopping around on their own.

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### *Telecommuting subscriber packages*

Another example is the growing trend of home office telecommuters. Companies are rolling out the telecommuters and linking them to the mother ship through VPN tunneling that involves software and/or hardware in the home office. Businesses are paying the freight for this remote broadband capability and expecting value for their money. By improving traffic visibility on these links, corporations can ensure management oversight of their telecommuters that is comparable to what they have at the office. Providing this visibility to business customers represents another revenue opportunity for the service provider by creating offerings attuned to this business need.

For example, consider DSL bundles that offered a special category for telecommuters. Open Internet surfing might be offered at a small nominal data rate such as 384k download, but a service provider could offer, at a price premium, higher bandwidth and QoS for IPSec, PPTP or specified IP blocks. This could remove a key obstacle corporations are facing to justify home broadband expense payments...and indeed, in cost-justifying telecommuting in their organization.

### **Summary**

Current services are evolving, and no one can know for certain which services will emerge in the future. What can be stated with absolutely certainty is that if the network is not designed with flexibility in mind and a soft definition of what the intelligence in the network must do, emerging services and the network changes needed to provide them will become an ever-increasing drain on service provider resources and, for some, will preclude their survival.

Content-aware network must be deployed to perform the complex transaction management and content control to future-proof service provider infrastructure and pave the way for rapid service rollout and evolution. With content-based control, transport configurations can be simplified to allow for maximum configurable bandwidth to a customer. Content-based systems can constrain this to basic service levels under normal operations and open as required to allow for burst, time-based or content area, access-based bandwidth metering. While providing differentiated services, access control, authorization monitoring and packet accurate or content based billing can be enabled from a single integrated solution: CloudShield's Open Network Services Platforms. This approach supports differentiated services, increased retention, ROI...and service provider survival.