Business Case Analysis: Ericsson Router 8801 Distributed Subscriber Management

Executive Summary

OTT traffic places huge demands on the backbone network. Three major trends are contributing to this: 1. Content moving towards 4K media streaming and requiring seven-times the bandwidth for each individual stream; 2. Increase in subscriber scale with the explosion of connected devices; 3. End users' expectation of 24x7 connectivity with a high quality of experience to all of their favorite content from any location or device.

To address these trends, service providers must be able to satisfy consumers' expectations and offer personalized services in a dynamic manner. To prepare the network to handle the relentless growth, service providers are reassessing their network and system architectures and building their content distribution networks based on:

A. Distributed network deployment model: Today, most of the service termination points are centralized. To address the tremendous traffic and device growths, moving content and subscriber termination closer to the end user becomes inevitable. By caching the most popular content close to the subscriber it is possible to reduce the backbone load by up to 80 percent during peak hours, and it also increases the quality of experience for end users.

B. Disaggregated system architecture: At the system level, functional disaggregation of compute and route forwarding enable flexible, agile and cost-efficient service delivery model, taking advantage of the virtualization trends.

This paper will primarily focus on the shift in service providers' requirements for the subscriber management function. It also discusses the disaggregation of functions in relation to subscriber management and distributed cloud-based networking.

ACG Research conducted an analysis of Router 8801 deployment in a distributed subscriber management network architecture. The scenario compares Router 8801 to a leading second best alternative offering. The study found Router 8801 return on investment (ROI) levels of **299%** for a single stack (IPv4 or IPv6 addresses) and **335%** in a dual-stack (IPv4 and IPv6 addressing) mode over seven years. Total cost of ownership (TCO) savings levels of **65%** (single stack) and **66%** (dual stack) were found during the same period.

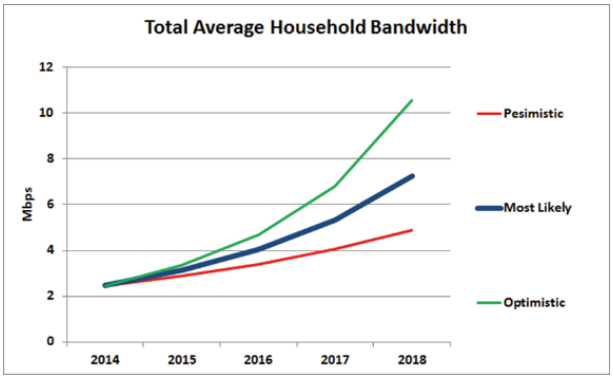
KEY FINDINGS

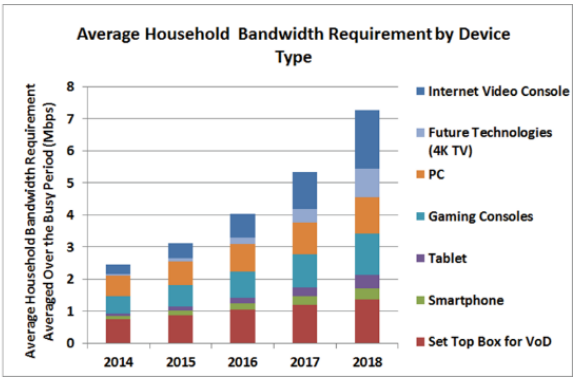
Ericsson Router 8801 is a versatile, programmable, highly scalable subscriber management platform that benefits from architectural flexibility, service agility and rapid service provisioning. Over seven years, ACG Research found:

- TCO savings of **65**% for single stack (IPv4 or IPv6 addressing) and **66**% for dual stack (IPv4 and IPv6 addressing).
- TCO based ROI levels of **299%** (single stack) and 335% (dual stack), respectively.
- Primary reasons for the lower TCO: superior scaling and throughput levels, yielding a lower number of chassis. The Router 8801 Advantages are architectural flexibility, service agility and rapid service provisioning.

Introduction

Network operators are facing a great opportunity to monetize the continuing hyper growth in network traffic primarily led by over-the-top (OTT) video streaming. Various sources, including ACG's own research (Figures 1 and 2) point to an increase in traffic rates through year 2018 (Table 1).





Figures 1, 2. Household Bandwidth Traffic Forecast (ACG Research)

Source	Traffic Type	Traffic Volume	Rate of Increase
Ericsson Mobility Report (Nov. 2015)	Fixed Data	60 Exabytes (EB) in 2016, 150 EB (2021)	CAGR of 20%, between 2015 to 2021
Cisco VNI Report (2014)	IP Video Traffic	80% of All IP Traffic	**Consumer VoD traffic will nearly double by 2019**. (VoD traffic in 2019 will be equivalent to 7 billion DVDs per month)

Table 1. Growth Rates of Fixed Data/Video Traffic[1]

Cord-cutting has grown by 44 percent in the past four years, with 7.6 million households using high-speed Internet for streaming or downloading videos instead of traditional cable or satellite television. ACG Research forecasts that the OTT market, already showing huge consumer uptake, is expected to increase fourfold by 2019. According to Sandvine, by the end of 2015, real-time entertainment (streaming video and audio) traffic accounted for over 70% of North American downstream traffic in the peak evening hours on fixed access networks. Five years ago it accounted for less than 35%. The top three sources for OTT video traffic on fixed access networks in North America were: Netflix (37.1%), YouTube (17.9%), and Amazon Video (3.1%). They all saw an increase in traffic share over the levels

[1] See http://www.ericsson.com/res/docs/2015/mobility-report/ericsson-mobility-report-nov-2015.pdf & http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.html.

observed earlier in the year[2]. With the advent of 4K and 3D OTT video, the continuous rise in video traffic is inevitable.

This trend places tremendous pressure on the operators' networks, e.g., multi-service operators (MSOs). Adding that Netflix had close to 45 million[3] subscribers in the U.S. alone in Q4 2015, service providers are faced with having to expand/upgrade their networks to cope with two dual points of pressure, i.e., traffic increase and subscribers' expectations for delivery of high quality of experience (QoE) services. Therefore, they are re-focusing their network requirements on two levels: network architecture and system architecture.

At the network architecture level, operators are deploying the critical functions of the network closer to consumers to be able to offer better QoE levels and also reduce traffic in the backhaul network. This was seen in deployment of content delivery networks (CDN) for video caching and is very relevant to the subscriber management function. This architecture offers more bandwidth to each subscriber and aligns with the growing traffic trends. The proximity of services to subscribers offers substantially better performance and QoE. Figure 3 depicts the distributed service architecture.

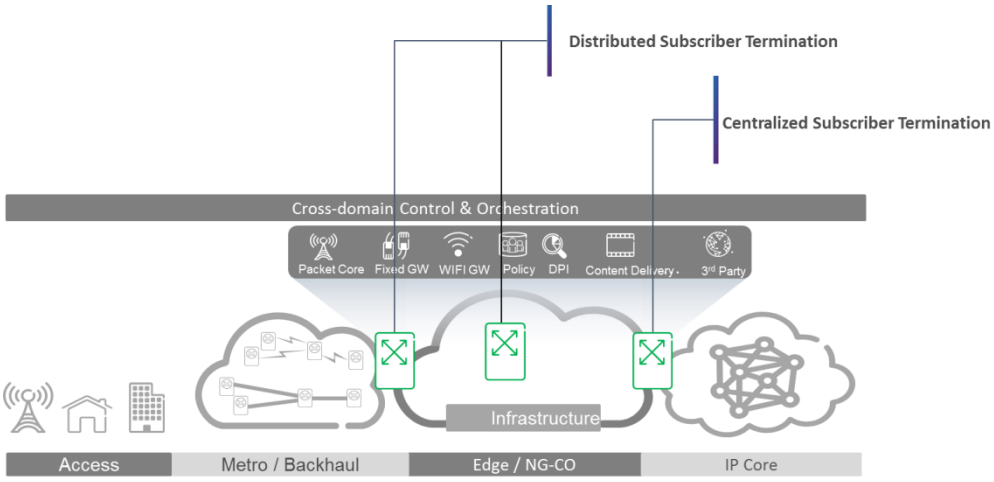


Figure 3. Distributed and Centralized Subscriber Management Deployments

At the system level, functional disaggregation of compute and route-forwarding enables a flexible, agile and cost-efficient service delivery model, taking advantage of the virtualization trends. Disaggregated systems are being evaluated by Tier-1 service providers globally as they want separation of the compute-heavy functions (compute node) and the route processing and forwarding functions. This is especially useful when they shift their network operation to a distributed cloud architecture where they can intelligently steer network traffic. Disaggregation also reduces network management complexities of

[2] https://www.sandvine.com/pr/2015/12/7/sandvine-over-70-of-north-american-traffic-is-now-streaming-video-and-audio.html.

[3] http://www.statista.com/statistics/250937/quarterly-number-of-netflix-streaming-subscribers-in-the-us/.

consolidated services and allows the operator to deploy the preferred vendor solution for each particular application or service, e.g., subscriber management.

Subscriber termination is a critical network function that ensures the end user receives the expected services per service level agreements (SLA). To fulfill this major requirement, subscriber management solutions need to provide architectural flexibility, service agility and rapid service provisioning.

Architectural flexibility must leverage high-touch services (e.g., DPI, firewall) as they are introduced in the network for marginal increases in monetization. It must also enable bandwidth increases or absorb additional subscriber pools with ease. Additionally, it should be capable of creating a smooth migration path for network automation and programmability.

Service agility is an important factor in creating and offering new and differentiated services to increase revenue streams. This agility is greatly enhanced as subscriber management functions become capable of cloud-based networking, taking advantage of software defined networks (SDN) and network function virtualization (NFV).

Rapid service provisioning to add a new subscriber, modify subscriber's SLA or support any access technology will offer competitive advantages to service providers. It must be able to provision subscribers' services regardless of the access technology, e.g., OLT or DSLAM. Automation of service provisioning reduces time-to-market (TTM) and operational costs as subscribers are able to provision their services with minimal interaction with the service provider.

All of the criteria must be complemented with high scaling, high throughput and feature richness.

Ericsson's Router 8801

Ericsson has been a leading vendor in offering subscriber management products. Its fixed subscriber management portfolio has been deployed by 15 of the top 20 service providers in the world. It continues to innovate and improve its line of subscriber management products to ensure that operators are ready to manage the ever-increasing traffic, led by OTT video streaming and gaming.

Ericsson's Router 8801 is the most recent addition to Ericsson's subscriber management product portfolio. Its design has taken a holistic approach to operators' immediate and future needs. It is an enabler of managing the avalanche of OTT traffic by addressing high traffic volumes as well as susbcribers' high expectations for quality of experience (QoE). Router 8801 addresses the distributed cloud applications, where the cloud-ready content can be deployed closer to the end user at optimal cost points. SDN enablement (e.g., with L2/L3 services, OpenFlow, segment routing, path computation element, Netconf/Yang) plus its capability to service-chain VNFs make the Router 8801 ideal for the impending wave of distributed cloud architecture.

Router 8801 addresses the three requirements discussed in the previous section: architectural flexibility, service agility and rapid service provisioning. Table 2 details these advantages.

Subject	Features Description	Benefits
Architectural Flexibility	Addresses: 1. The shift to a distributed subscriber management architecture 2. Service providers' requirement for disaggregation of services (separation of compute and routing)	• With its performance, scale and footprint it is well suited for distributed deployment scenarios. • Its fabric-interconnect option helps service providers double the bandwidth and the subscriber scale in a 2RU platform for centralized applications. • Enables service providers to address diverse requirements with a single device. • Enables higher QoE for consumers. • Enables intelligent traffic steering in a distributed cloud, for efficient use of resources. • Availability of 10/40/100GE interfaces
Service Agility	1. Programmability for both the control plane and the data plane 2. Scalable service chaining support for network functions	• Rapid creation of differentiated services to increase service portfolio, extend competitiveness and increase revenue streams. • Enables migration to distributed cloud networks for further reduction of TCO.
Rapid Service Provisioning	Single and simplified provisioning model	• Ability to support any access technology. • OpEx savings in a hybrid environment (purpose-built and/or virtual networks).

Table 2. Router 8801 Features and Benefits

For the operator, the ability to create new differentiated services is essential to its growth and competitiveness. Router 8801 operating with L4-L7 (Figure 4) value-add services offers application and subscriber awareness to enable personlized services (such as high-quality 4K video streaming on a per user/per device basis) for increased revenue streams.

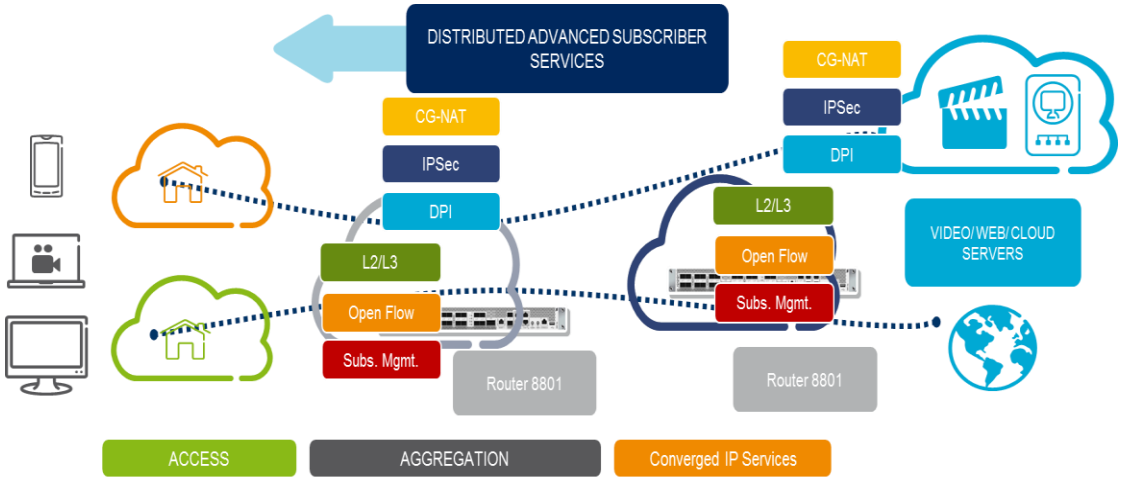


Figure 4. Router 8801 L4-L7 Value-Added Services

Although there are technical advantages in using a distributed subscriber management deployment, by design, it does require more platforms than a centralized architecture. Therefore, economic considerations become vitally important when selecting a platform for this type of deployment. The selection requires fulfilling both the technical and economic dimensions for the operator.

Router 8801 Economic Advantages

To examine the Router 8801 economic advantages, Ericsson commissioned ACG Research to conduct an analysis of Router 8801 deployment in a distributed subscriber management network architecture. The scenario compares Router 8801 to a leading second best alternative offering.

The advantages of the Router 8801 subscriber management in scaling and high throughput are analyzed by comparing the TCO of the Router 8801 with that of a leading competitor's product. The application is triple play with the emphasis on OTT video traffic and its expected annual increase based on market projections previously cited. The comparison is made by projecting subscribers and the expected traffic requirements per subscriber at the aggregation network over seven years. The initial subscriber pool was set at 2.5M with a sustained bandwidth of 1Mpbs per subscriber. The Router 8801 and the competing platform configurations must meet the projected total traffic requirements. Capital expense (CapEx) and operational expense (OpEx) were analyzed for each platform.

Both platforms are used in a distributed subscriber management deployment but the similarities basically end there. The scaling and performance superiority result in a high ROI (based on TCO) and other KPIs shown in subsequent discussions.

System Configurations

For the competing platform, we use publicly available data in its scaling and performance. For Router 8801, 1x10GE ports were used for ingress and 1x100GE used for egress traffic. For the competing platform, the best case scenario for I/O traffic was used: 1x10GE for ingress and 1x40GE for egress traffic. The analysis did not assume oversubscription of I/O, balanced I/O for both platforms.

Additionally, the analysis was done separately for "Single Stack" – either IPv4 or IPv6 addressing, as well as "Dual Stack" – both IPv4 and IPv6 addressing system configuration. No other services are assumed to be running on either platform; IP/MPLS routing is integrated in both platforms operating systems.

CapEx Calculation Variables

The CapEx calculation for both platforms included hardware (chassis, accessories where applicable, for example, interface ports), operating system and subscriber management software licenses, network management software and cost of network rollout. Average selling price (ASP) levels were used for the competitor platform. For Router 8801, projected ASP was used, as well.

OpEx Calculation Variables

OpEx variables used were the same for both:

- Engineering Facilities Installation
- Solution Life Cycle Management
- Solution/Product Support
- Network Operation Center
- Power Consumption and Real Estate Costs

TCO Results and Cash Flow Analysis

The network dimensioning details were based on the following:

Scenario Assumptions: 7 Years	
Number of subscribers in Year 1	2,500,000
CAGR for subscriber increase	5%
Sustained bandwidth per subscriber in Year 1	1Mbps
CAGR for sustained bandwidth for Years 2–7	20%

Table 3. Assumptions for the Scenario under Analysis

TCO based ROI analysis was conducted over seven years on both single-stack and dual-stack configurations and the study found TCO based ROI levels of **299% and 335%** respectively, in favor of Router 8801.

The charts below show the TCO advantages of the Router 8801 for both single and dual stacks. The cumulative TCO savings are also shown.

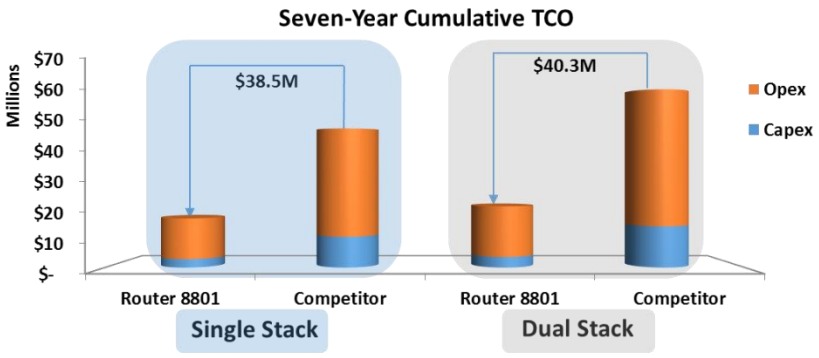


Figure 5. TCO Comparisons

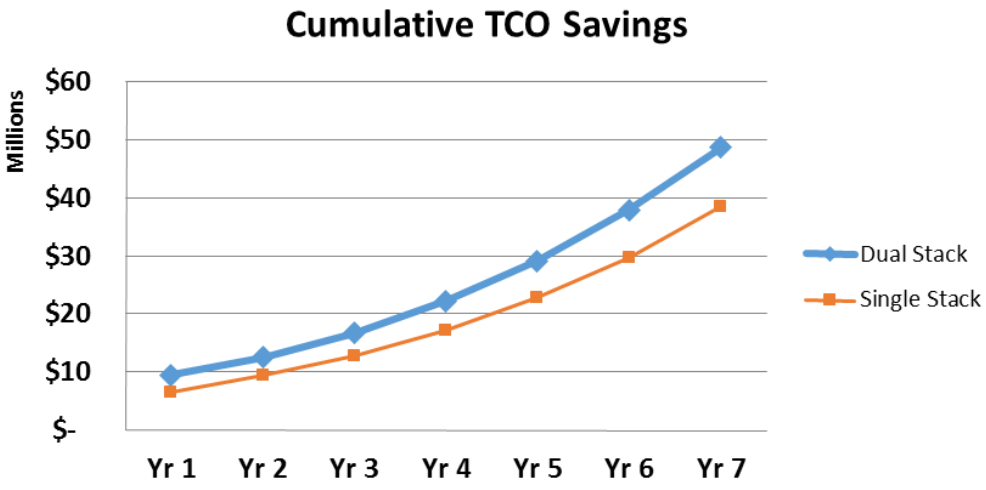


Figure 6. TCO Savings for Router 8801

Additional analyses were done to examine the cost per bit moved and cost per subscriber, shown in Figures 7 and 8. The metrics are useful in helping operators assess the overall cost of business KPIs, which could include costs such as cost of subscriber acquisition and COGS.

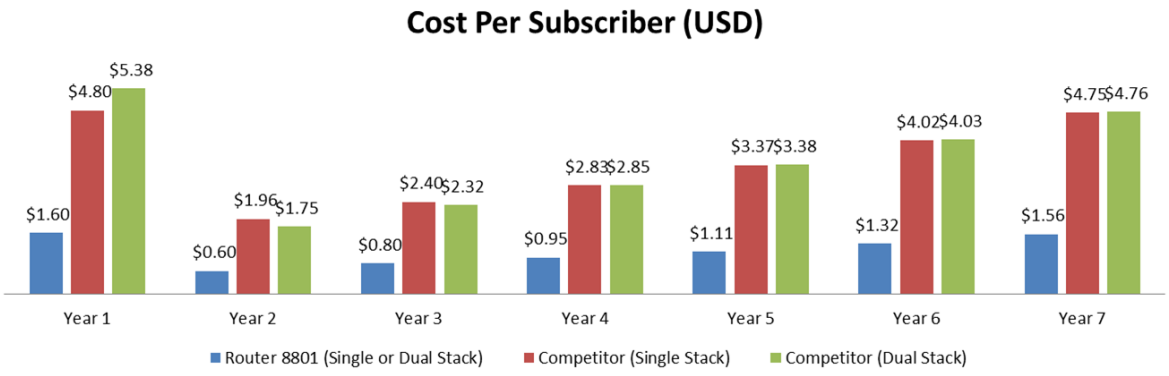
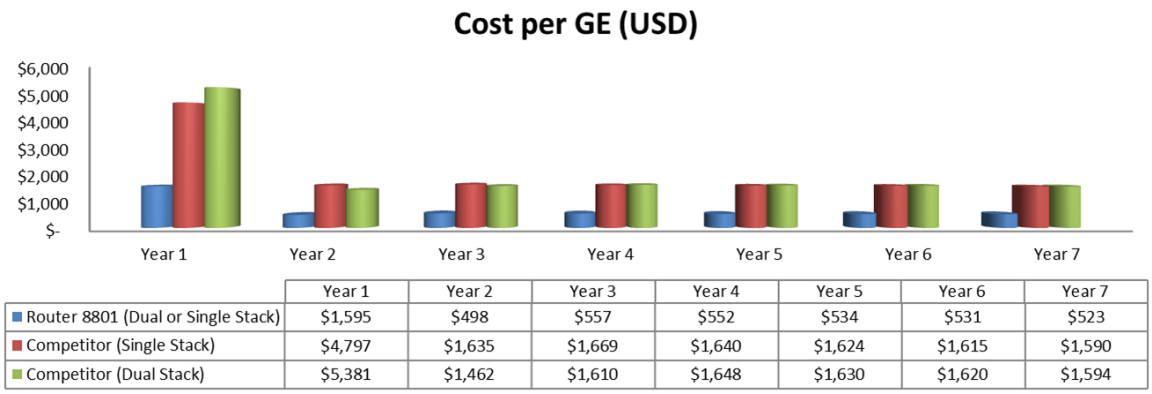


Figure 7. Cost per Subscriber



	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Router 8801 (Dual or Single Stack)	$1,595	$498	$557	$552	$534	$531	$523
Competitor (Single Stack)	$4,797	$1,635	$1,669	$1,640	$1,624	$1,615	$1,590
Competitor (Dual Stack)	$5,381	$1,462	$1,610	$1,648	$1,630	$1,620	$1,594

Figure 8. Cost per GE of Traffic Moved

The Router 8801 advantages in TCO and the other metrics simply reflect its superior scaling and performance.

OpEx Calculations and Analysis

OpEx calculations are shown in Figure 9. Router 8801 commands lower OpEx over seven years via its superior scaling, which results in fewer chassis for deployment. This results in lower service contract cost, fewer installations and other OpEx attributes (Figure 9). The lower number of chassis required per Router 8801 reduces these costs in two ways. First, since there is less work to do when the numbers of chassis are lower, the total man-hours are decreased accordingly. Second, fewer chassis reduce the complexity of conducting the annual operational activities, for example network operation center (NOC) costs. Environmental expenses (cooling, power and floor space) are also lower for Router 8801 because of fewer chassis in the network.

Power and cooling costs increase with the number of chassis in service as there are overhead costs associated with each chassis. On average, power used per subscriber for the competitor was found to be x1.76 and x1.82 times (single stack and dual stack, respectively) that of the Router 8801. Service contract and engineering, facilities and installation (EFI) expenses are directly associated with CapEx. With its lower CapEx, the Router 8801 also has correspondingly lower service contract and EF&I expenses.

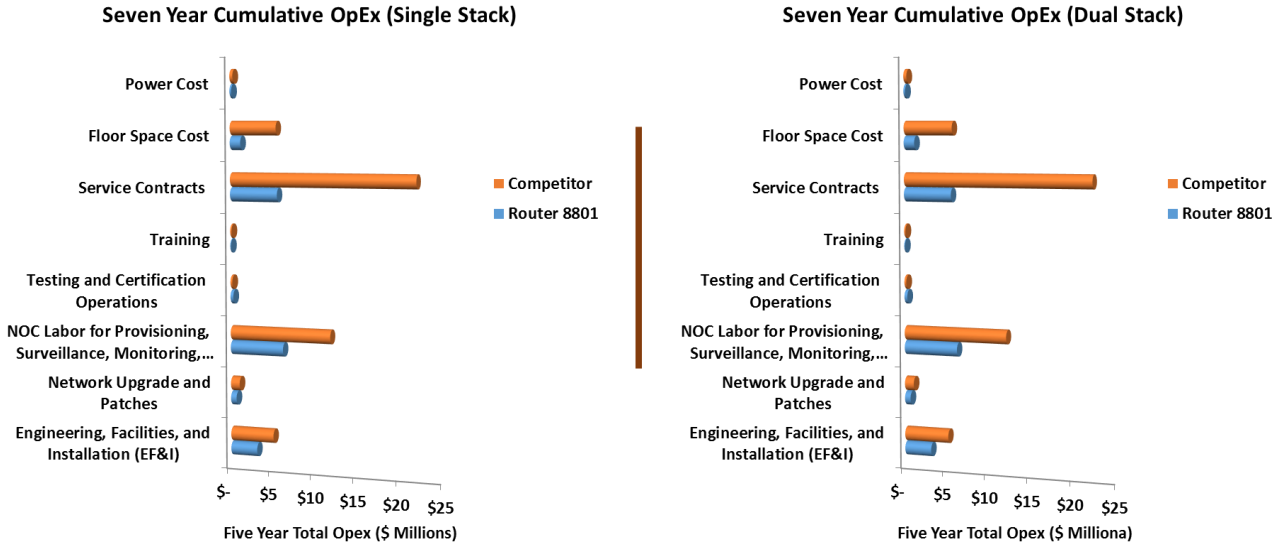


Figure 9. OpEx Comparisons

Figure 10. Cumulative Cash Flow for Hewlett Packard Enterprise Solution

Revenue Projection Analysis

The lower number of chassis required for deploying Router 8801s can directly contribute to the revenue levels that an operator is capable to achieve. Because the competitor requires more chassis each year relative to Router 8801, the time to deploy the additional chassis will translate to longer time to market and potentially loss of market share, resulting in lower revenues over seven years. A sample analysis is shown in Table 4 in which Company A selects to deploy Router 8801 and Company B selects the competitor's subscriber management. We use the following assumptions to examine the differential in total revenue:

Service Creation Assumptions: 7 Years	
Number of subscribers in Year 1	500,000
Annual CAGR in subscriber growth	5%
ARPU per month	$100
Loss of market share per month due to delay in integration of additional boxes	2%
Average time to deploy a chassis in weeks	1
Work days per week and month	5 & 22

Table 4. Service Creation Scale per Solution

Based on the assumption in Table 4, the operator (Company A) with Router 8801 deployment will have an extra **$382 M** in revenue over seven years, assuming the same labor is used for all chassis deployments.

Conclusion

The growth of video traffic presents technical challenges but more importantly a great opportunity for service providers to monetize it. This growth is primarily from OTT video services, led by Netflix (expanding globally), YouTube, Amazon, and more recently, by a Netflix-like launch by Alibaba in China. At the same time, consumer expectations on QoE and price sensitivity continue to place additional pressure on network operators. These factors require a reassessment of the current network architecture for the deployment of a critical network element, specifically the subscriber management function. Traditionally, the subscriber management has been deployed at the edge of the IP network as a centralized point for subscriber management and other relevant services. To ensure continued subscriber QoE and reduce network traffic, specifically backhaul, a distributed architecture, where the subscriber management is deployed closer to the subscriber, is more suited for delivery of the high-quality video traffic. Naturally, the distributed architecture will require more subscriber managements by design. Therefore, economic and technical factors must be considered in selection of a vendor. Containment of TCO and longevity of solution become important factors.

ACG compared the Router 8801 against a major competitor's subscriber management product. Its analysis found that the Router 8801 offers TCO based ROI levels of 299% for a single stack and 335% in a dual-stack mode over seven years. TCO savings levels of 65% (single stack) and 66% (dual stack) were found over the same period. CapEx and OpEx savings were at

- 72% and 62% respectively (single stack)
- 74% and 63% (dual stack)

The primary reasons for the lower TCO were Router 8801 superior scaling and throughput levels yielding a lower number of chassis. The advantages of Router 8801 other capabilities add to these two dimensions. It offers architectural flexibility, service agility and rapid service provisioning, the three main requirements of an advanced subscriber management product.