VCO TCO Solution Brief

A Virtual Central Office Results in Reduced Total Cost of Ownership

The OPNFV Enterprise VCO concept helps CSPs deliver network services to their customers at up to 43% lower total cost of ownership (TCO)

KEY OPEN SOURCE PROJECTS:

- Open Compute Platform (OCP)
- OpenDaylight
- OPNFV
- OpenStack

MAJOR AREAS OF TCO REDUCTION:

- Hardware costs
- Staff costs

METHODOLOGY USED:

- Assumptions build on the OPNFV Enterprise VCO demo
- Intel®, PA Consulting Group vE-CPE TCO calculator

PROBLEM STATEMENT

Communication service providers (CSPs) offer a variety of services to enterprises that complement basic network connectivity such as router, firewall, carrier-grade network address translation (CGNAT), session border controller (SBC), virtual private network (VPN), WAN traffic control, WAN acceleration, WAN traffic monitoring functionality, and so on. Conventionally, these services are offered through fixed-function proprietary boxes installed on customer premises.

The conventional approach has a number of limitations. First, it takes multiple weeks to deploy a new service. Once the service is ordered, the equipment has to be shipped, installed and provisioned—a manual process with project managers, sales executives, and fulfillment and sales engineers involved. Second, the service has to be kept in operation for a certain minimum duration to recoup the hardware and installation costs. Third, even if the utilization of the hardware is low, these boxes cannot be used for any other purpose. Finally, the current approach limits flexibility and agility in terms of configuration changes, software updates, upgrades etc.

ENTERPRISE VIRTUAL CENTRAL OFFICE (VCO)

The solution to this problem is to use Network Functions Virtualization (NFV) and software-defined networking (SDN) technologies to virtualize enterprise network services.

Once virtualized, there are different deployment options. In the first option, called thin vCPE (virtual customer premise equipment), the on-premises equipment is simply a bridge-forwarding device, and all virtual network functions (VNFs) reside in the central office (or cable headend/edge cloud). In the second option, there is a programmable vCPE device (also called thick vCPE or universal CPE) at the customer site to host a set of VNFs, with ancillary VNFs in the central office. In both the thin and the thick vCPE deployment models, the virtual central office (VCO) serves an important role.

The move to SDN and NFV addresses the above problems by allowing a CSP to:

1. Improve customer satisfaction and increase revenue by rolling out new services rapidly. It is a lot faster to develop new software as opposed to designing, ordering and installing new hardware/ASICs, which allows CSPs to reduce the time from order to service delivery from weeks to minutes and upsell new offerings with techniques such as try-before-you-buy.
2. Simplify the management of highly dynamic operations by rapidly scaling out services, automating post-deployment configuration changes, and shaving commitment durations from months to hours.
3. Cut costs and improve asset utilization by sharing hardware and staffing costs across multiple services.

The first two factors vary depending on a CSP's specific situation. However, the last factor can be modeled across CSPs fairly consistently. In this paper we will take a deeper look into the last factor—how a VCO concept can cut the TCO of delivering enterprise services.

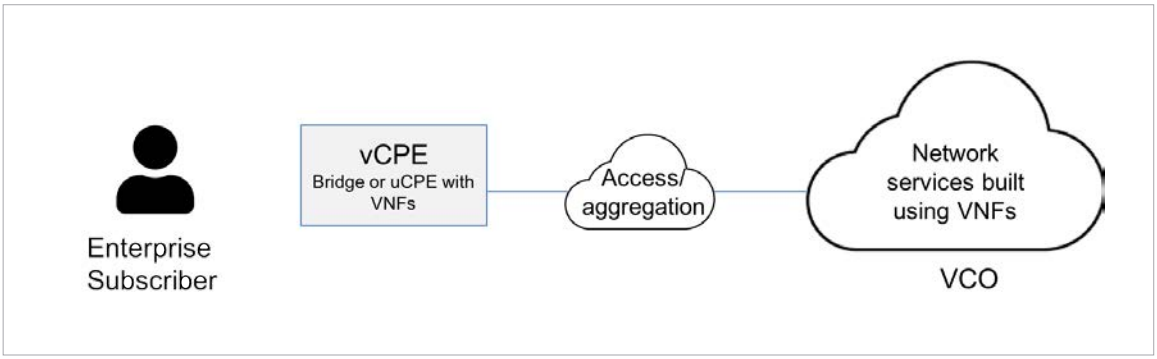


Figure 1: Enterprise VCO Concept

OPNFV VCO DEMOS

The OPNFV community created a two-faceted VCO demo in 2017 — residential and enterprise. The VCO demo was based on an OPNFV reference architecture stack including OpenDaylight and OpenStack combined with other open source and proprietary products.

For purposes of this analysis, we are going to use the overall enterprise VCO concept, but not the specific elements of the 2017 demo. Instead, we are making the following assumptions:

1. We will limit our analysis to a scenario where all VNFs reside in the VCO; i.e. we are assuming 100% thin vCPE.
2. We will consider a broader set of VNFs than were included in the VCO demo: VPN, firewall, router, CGNAT, SBC, WAN traffic control, WAN acceleration, WAN traffic monitoring; we are also assuming 100% virtualization i.e. no physical network functions in the VCO scenario.

MODEL ASSUMPTIONS

Additionally, the TCO model assumes:

1. Five year TCO duration
2. Asia-Pacific region (to recognize the fact that the OPNFV VCO demo debuted in Beijing)
3. 20% regional market share for the fictitious CSP being used for this analysis
4. Sub-scenarios:
    - Small/medium enterprise (SME) with one site and less than 25 employees
    - Larger enterprises with multiple sites; the sites are of three types: small (<25 employees), medium (25-500 employees) and large (>500 employees)
5. Conventional scenario on-premise box assumptions:

Sub-Scenario	Assumptions
SME	2 boxes (1 router, 1 firewall)
Small enterprise	4 boxes (1 router, 1 firewall, 1 WAN traffic control, 1 WAN acceleration)
Medium enterprise	5 boxes (2 routers, 1 firewall, 1 WAN traffic control, 1 WAN acceleration)
Large enterprise	15 boxes (4 routers, 2 firewalls, 2 CGNAT, 1 SBC, 1 VPN, 2 WAN traffic control, 2 WAN acceleration, 1 WAN traffic monitoring)

Table 1: Conventional Scenario Assumptions

MODEL COST COMPONENTS

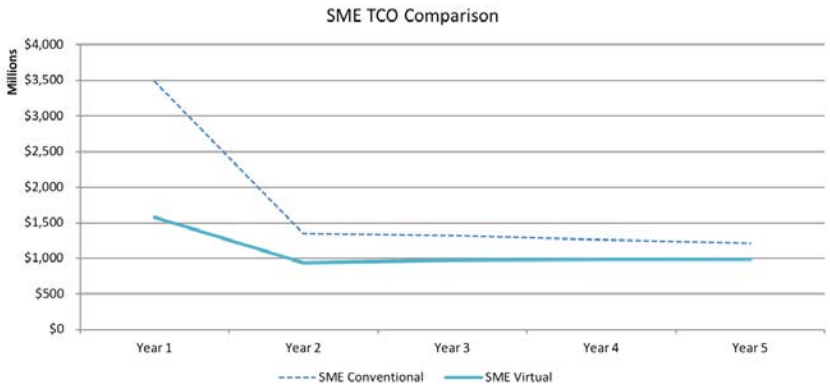
The enterprise VCO TCO model consists of the following cost components:

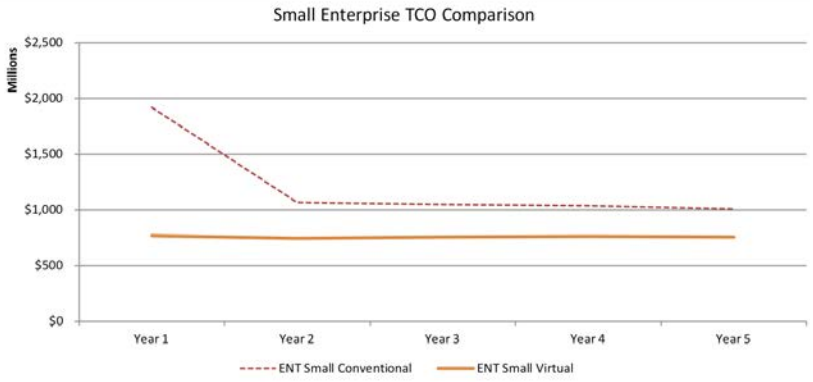
Cost component	Included items in a conventional environment	Included items in an enterprise VCO environment
Hardware	Cost of dedicated physical network functions and related switches	Physical switches, network connectivity equipment (bridge-forwarding device) and industry standard cloud servers in the central office
Software	N/A	VNF software cost
Datacenter	N/A	Cloud server and switch hosting costs in a central office
Staff	Staff for deploying and managing conventional services	Staff for deploying and managing virtual network services
Communication links	Metro Ethernet or DSL communication link costs — assumed to be the same in both cases	

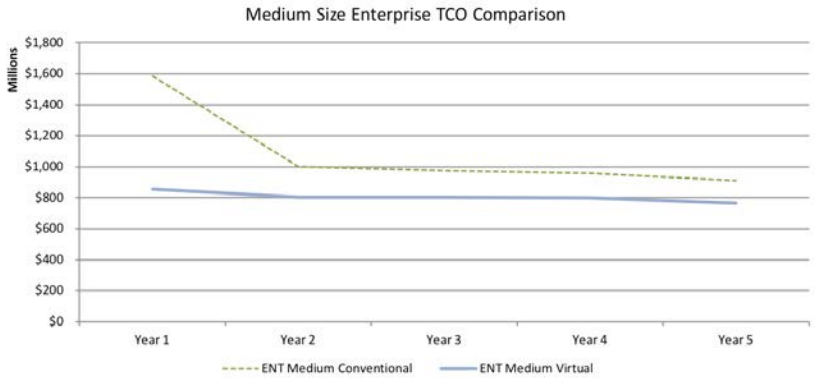
Table 2: Cost Components of TCO Analysis

ENTERPRISE VCO TCO MODEL RESULTS

The TCO analysis results are as follows:







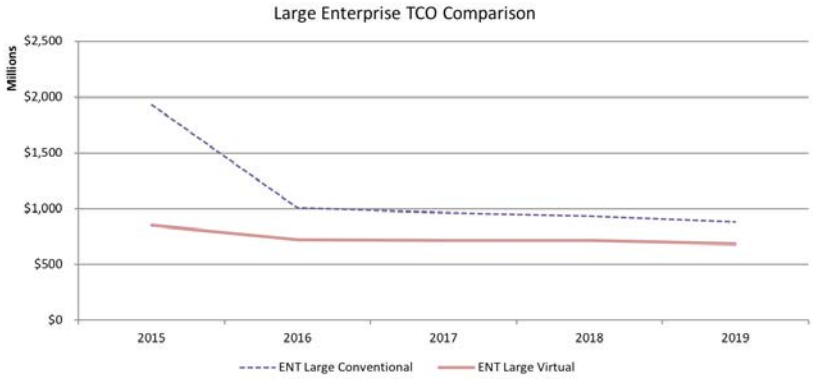


Figure 2: Conventional vs. VCO TCO Comparison

The above charts show the absolute TCO for the four sub-scenarios in both conventional and VCO use cases. In each instance, upfront hardware and installation/provisioning costs make the first year the most expensive.

The largest savings in a VCO scenario come from two sources: hardware and service costs. Transitioning dedicated, often underutilized, proprietary networking gear to VNFs on commodity compute infrastructure reduces new capital expenditures and ongoing management costs ranging from initial deployment, configuration, post-deployment changes, monitoring, troubleshooting, updates, and upgrades. Service cost savings are realized in the areas of customer premises equipment delivery and installation (often requiring one or more truck rolls), commissioning of services, resolving trouble tickets, and decommissioning the equipment. In a VCO scenario, some remote management costs—such as remote configuration of CPE firmware—actually go up, but these are minor compared to the overall savings realized.

The relative savings, including regions in addition to AsiaPac, are as follows:

	AsiaPac	Europe	LatAm	US
SME	36%	36%	36%	36%
Enterprise Small	38%	34%	39%	33%
Enterprise Medium	26%	27%	30%	22%
Enterprise Large	36%	43%	41%	33%

Table 3: Summary of Worldwide Enterprise VCO TCO Savings

SUMMARY

Virtualizing enterprise network connectivity services provides CSPs with numerous business benefits, including TCO savings of up to 43%. The OPNFV Enterprise VCO demo provides CSPs with a tangible path toward a VCO proof-of-concept that can drive NFV transformation within their organization.

RESOURCES

OPNFV VCO Demo

Intel-PA-BT brief on vCPE cost analysis