Seizing the Opportunities: Improving Performance and ROI with an Arm-based uCPE Platform

Introduction: A Compelling Market Opportunity

Today's telecoms market is changing fast. Consumer expectations are escalating, as new technologies and services become available. The pace of change is accelerating as well, forcing providers to jump start innovation and get services to market faster.

To gain the business agility they require in a dynamic environment, managed service providers and operators are embracing Network Function Virtualization (NFV). NFV lets operators decouple network functions from hardware appliances so they can run in software. This approach enables telecommunications networks to dramatically enhance service agility, simplify network operations, and control costs.

Traditionally, network services such as routing, security, SD-WAN and WAN optimization, have been delivered via dedicated, purpose-built physical network appliances, deployed at the mobile core or enterprise campus. In the NFV world, these services will be delivered with Virtual Customer Premise Equipment (vCPE) or Universal Customer Premise (uCPE) Equipment (the terms will be used interchangeably in this document).

Under this new paradigm, network services will be software-defined and delivered at the customer site, or the network edge, using commodity white box hardware. This approach lets providers centrally define and provision solutions to uCPE devices.

Telecommunication providers are increasingly sold on the potential benefits of NFV in general, with surveys forecasting impressive growth through 2021 in enterprise hardware and software solutions. Revenue is expected to soar from $7.2 billion in 2017 to $20.2 billion by 2021[1].
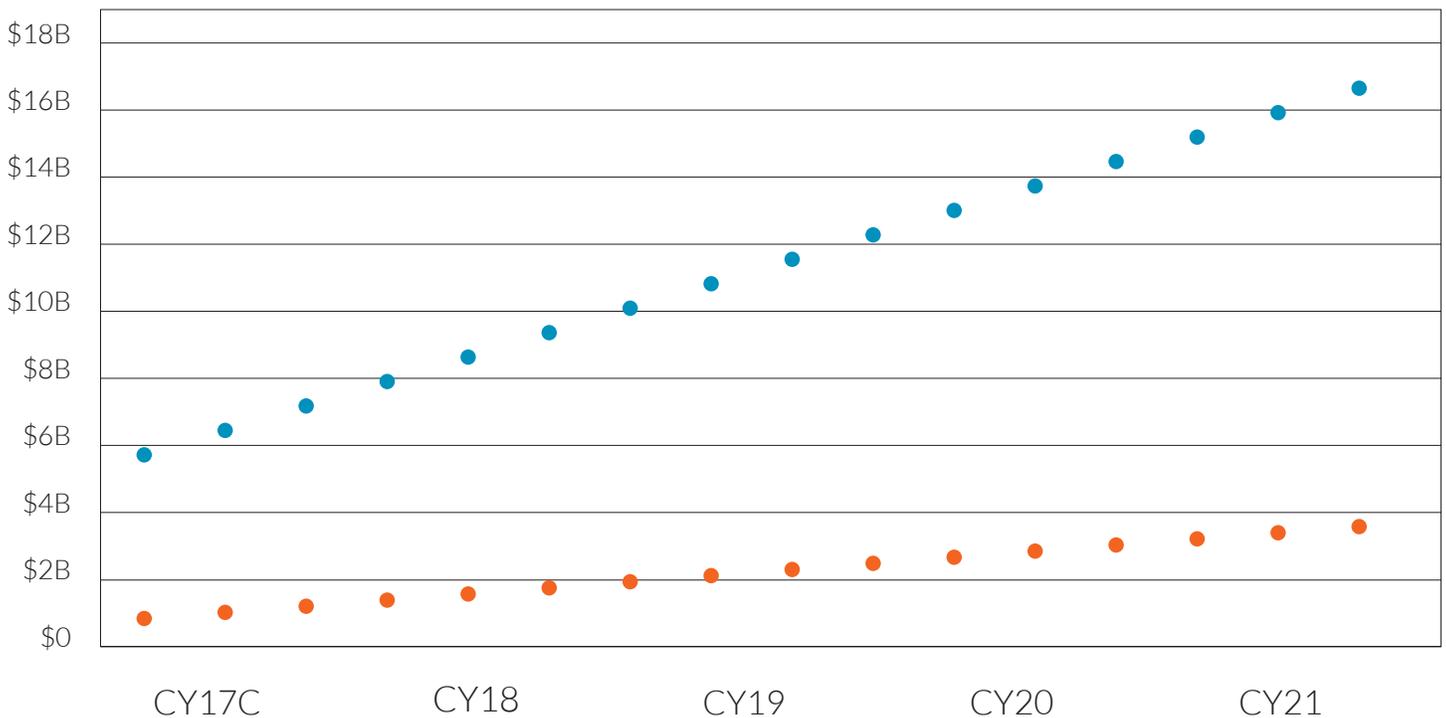
● Software Total   ● HW Total

Figure 1. NFV Market Sizing

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[1] IHS Markit.

Software is the main driver of this explosive growth, but surveys reflect significant progress in hardware as well. According to IHS, the total NFVi hardware revenue is expected to grow from $1.18 billion to $3.08 billion between 2017 and 2021[2].

In the enterprise space, hardware revenue for Virtual Customer Premises Equipment vCPE/uCPE solutions is expected to grow from $27 million in 2017 to $457 million by 2021[3].

Another new forecast from International Data Corporation (IDC) estimates that the worldwide virtual CPE infrastructure market – hardware and software – will exceed $3 billion by 2021[4].
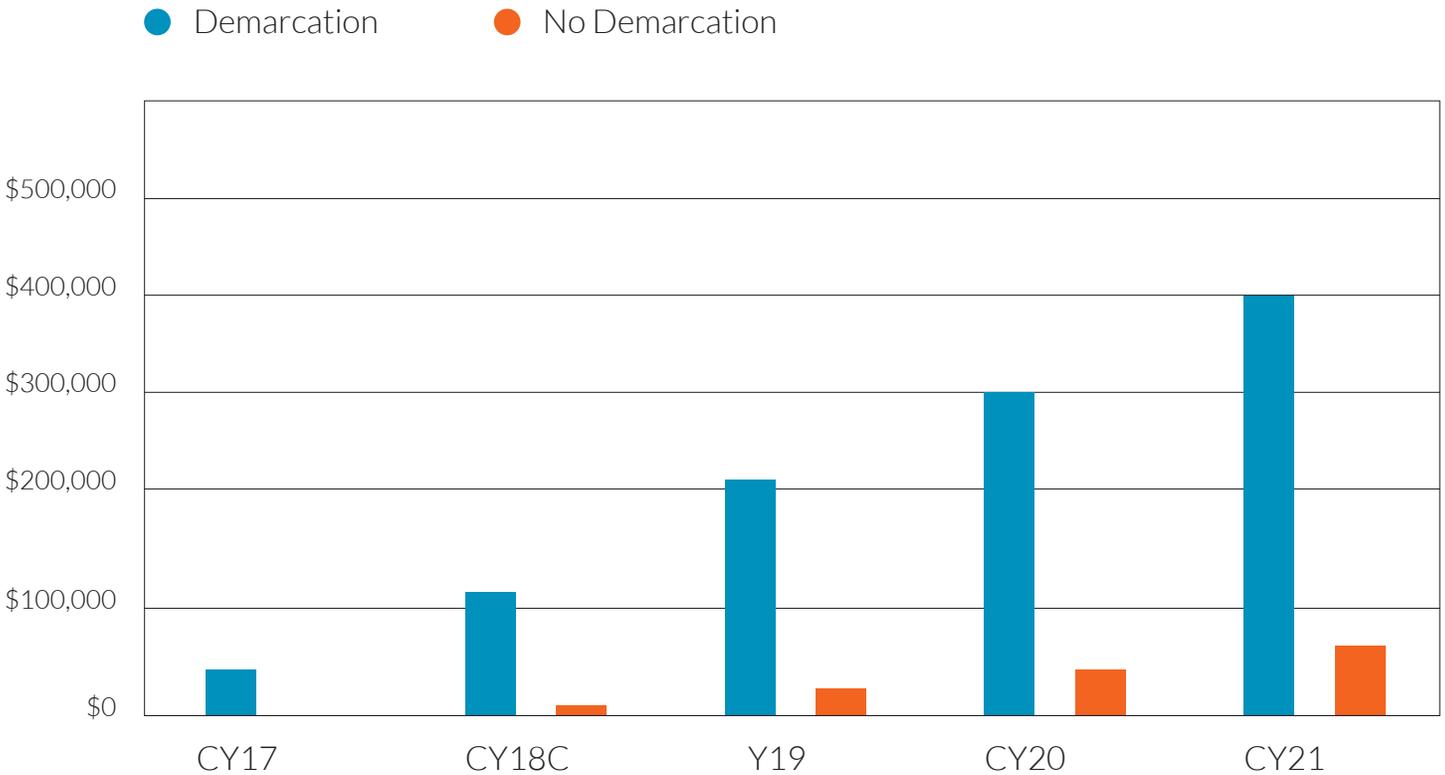
Figure 2. vCPE/uCPE Hardware Revenue

Conservative estimates forecast approximately 415,000 units will ship in 2021. Estimates are encouraging not only for enterprises, but for consumer and SMB customers as well, where uCPE sales are expected to gain momentum beginning in 2019.

According to IDC, the virtual CPE hardware market is expected to grow from a base of $67.8 million in 2016 to $1.16 billion in 2021 at a CAGR of 76.4%[5].

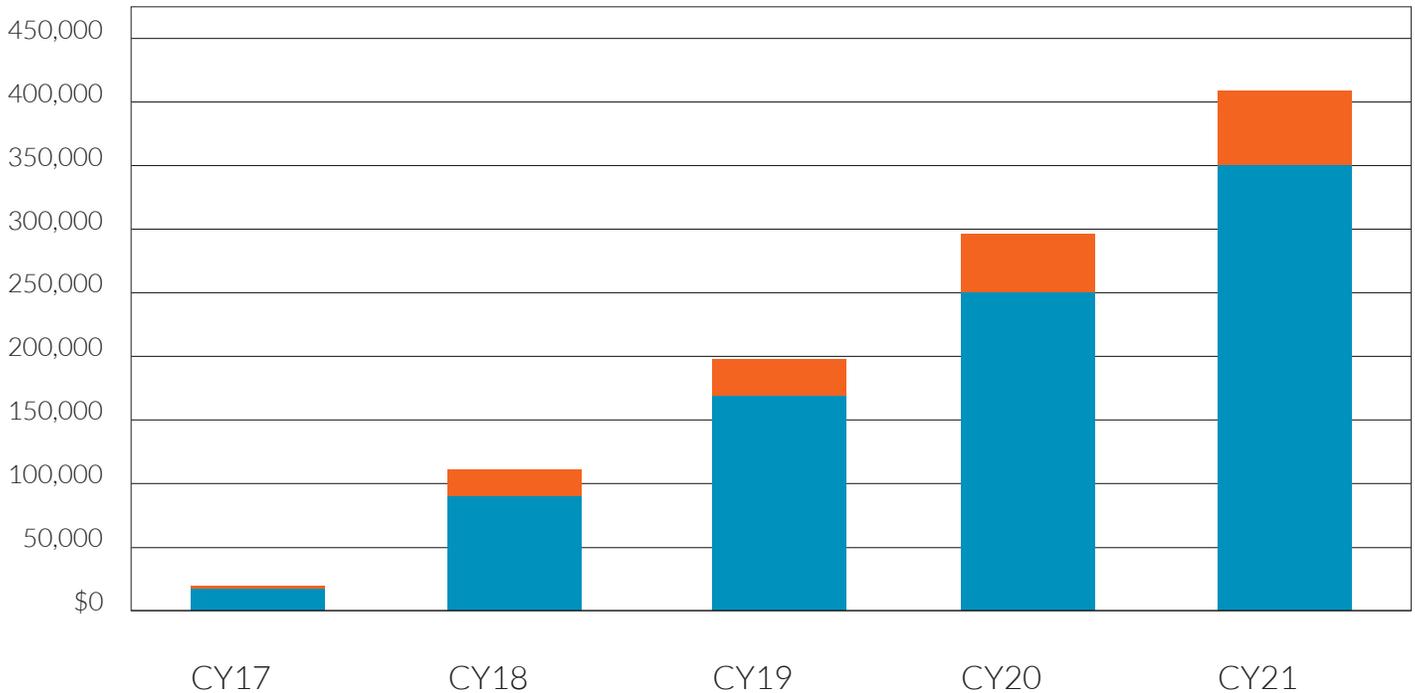[2] IHS Markit. Figure excludes vCPE and uCPE revenue.

[3] IHS Markit

[4] Worldwide vCPE/uCPE Forecast, 2017-2021: NFV at the Network Edge", IDC, 2017

[5] Worldwide vCPE/uCPE Forecast, 2017-2021: NFV at the Network Edge", IDC, 2017

Legend: ● No Demarcation ● Demarcation

Chart data (vertical axis: $0 to 450,000 in increments of 50,000; horizontal axis: CY17, CY18, CY19, CY20, CY21)

Figure 3. vCPE Unit Opportunity

What makes vCPE one of the most compelling use cases for NFV adoption? This component lets operators consolidate key operations and services like routing, policy management, and security compliance. These functions are traditionally handled by multiple proprietary hardware devices, making vCPE a compelling opportunity for partners to get aboard the NFV train. Today's marketplace has expressed its demands for multi-technology, multi-vendor white box solutions for telecoms and MSPs.

Arm offers a variety of advantages to support these white box solutions. It offers multi-core performance platformsthat support hardware acceleration and flexibility. With an Arm-based communications platform, partners can take advantage of superior price/performance as well as power/performance capabilities.

"While the short-term business benefit (of vCPE) may be in the form of lower acquisition costs, the long-term business case rests on the advantages that accrue from simplicity, flexibility, and agility that it bestows on the enterprise or the service provider delivering the network service," says Rajesh Ghai, research director, Carrier Network Infrastructure [6].

A key to success provided by uCPE solutions is service agility and the ability to deliver services for a wide range of use cases and form factors. In order to do this, service providers are looking for solutions beyond the traditional x86-based hardware.

[6] "Worldwide vCPE/uCPE Forecast, 2017-2021: NFV at the Network Edge", IDC, 2017

A Comprehensive uCPE Solution

To address this need, Arm and its ecosystem partners have introduced the market's first Arm-based uCPE solution. This open, complete white box offering lets telcos and managed service providers select the best technology for their operational environments and business targets.

The uCPE solution that Arm and its ecosystem partners have introduced enables service providers to easily deploy multiple VNFs such as security and routing. Providers can expand their solution easily, adding additional VNFs using zero touch provisioning and automated service deployment. By providing new hardware solutions, Arm allows service providers to create a mixed hardware environment that includes Arm based uCPEs, as well as any other COTS white box available in the market, using unified management systems.

The solution was developed through a cooperative effort between Arm, NXP Semiconductors, and Telco Systems. It gives service providers out-of-the-box support for SD-WAN, managed routing, and managed security. Providers can also add other VNFs remotely at any time, for additional services and capabilities.

At the heart of the solution is the NXP LS2088A platform, residing on a NEXCOM NSA 3640 white box appliance. Featuring eight 64-bit Arm Cortex-A72 cores, this communications platform offers a performance, power, and cost point that's superior to existing architectures on the market.

The solution employs NFVTime from Telco Systems, with hardware-agnostic NFVi-OS and uCPE MANO OS software. "NFVTime enables zero-touch service provisioning for rapid, effective deployment of new services. It enables VNFs to run on any COTS hardware, providing high performance, automatic service deployment and advanced management and security capabilities. Its Open vSwitch (OVS) enables network automation through standard management interfaces and protocols. Built-in Data Plan Development Kit (DPDK) support and dedicated packet processing offloading help accelerate performance.

The Arm-based uCPE solution is just the first of a series of solutions that will be delivered in the near future. Additional platforms are planned for launch in 2018, based on platforms from Arm partners such as Marvell.

Preconfigured with Commercial-Grade VNFs

To help operators accelerate their service delivery, the uCPE solution ships with fully configured, commercial-grade VNFs. The 6Wind Turbo Router and Turbo IPSec is a high performance, ready-to-use software network appliance. With 12 million packets per second per core of IP forwarding performance, it provides the performance of hardware networking equipment with the ease of deployment and flexibility of software.

To help ensure robust security and compliance, the uCPE also includes a VNF Inspector from Trend Micro Incorporated, a global leader in cybersecurity solutions.

Promising Performance Results

The new uCPE solution enables operators and managed service providers to take advantage of the agility and flexibility of NFV, while delivering impressive performance against leading competitive offerings.

For example, initial benchmarks compared to Intel Atom and Skylake processors show the following:

Packet Size (Bytes)	Intel Atom c2758 (8C/8T) - Mbps	Intel Sky-lake i7 (4C/8T) - Mbps	NXP LS2088 (8C) - Mbps
64	402	627	700
128	592	851	1200
256	652	1242	2100
390	701	1623	2786
512	1791	1990	3499
1024	1872	3380	4999
1280	1929	3975	5619
1518	1938	4957	6191

Running on an operational environment based on NFVTime-OS NFVI, with DPDK and OVS, the NXP LS2088 achieved 700 Mbps for 64-byte packets, compared to just 402 and 627 Mbps for Intel Atom c2578 and Skylake i7, respectively. For 1518-bye packets, the NXP delivered 6191 Mbps, compared to 1938 and 4957 Mbps for the Intel processors.

Enabled by a Robust NFV Service Environment

A distinct differentiator for the uCPE solution is its open, neutral full NFV service environment. Designed for today's competitive environments, it enables zero-touch provisioning for rapid, effective deployment of new services.

NFVTime is a service-ready suite with out-of-box support for a variety of uCPE capabilities. It features the NFVTime Central Networking Management and Orchestration (MANO) solution. This architectural framework for managing and orchestrating virtualized network functions is highly flexible, and can plug into other MANO solutions. It includes a uCPE Manager, as well as EdgeGenie Service Manager Carrier Ethernet (CE) 2.0. This service management system (SMS) offers a complete, modular solution for the full cycle of network deployment, from planning to managing, monitoring, and maintaining ethernet services.

Another key component is NFVTime Access, for configuration of vCPE devices. Two service delivery options are available. Verge appliance configuration enables operators to choose the white box that best meets their needs, and employ management software

from Telco Systems. Operators can also choose the CloudMetro CE 2.0 metro edge solution, where Telco Systems provides a complete system, as well as complete management support.

The NFVTime OS features a small system footprint and high performance. Optimized for superior performance, it is a perfect solution for operators seeking to rapidly deploy end-to-end, carrier-class services in the business or metro environment. NFVTime OS provides support for RTKernel, as well as OpenStack solutions including Cinder, Glance, and Nova Neutron. It also supports OVS, proprietary lifecycle management, and call home applications.

Backed by a Diverse Alliance

Arm is an active participant in a growing ecosystem of alliance and partners. The uCPE solution is backed by NFVTime Alliance and certified vendors. This rich ecosystem for SDN-NFV services includes partners and certified hardware and VNFs vendors.

Key VNFs include routing, firewall, security, VPN encryption, WAN optimization, SD-WAN, unified communications, anti-spyware, content filtering and IDS/IPS from leading VNF vendors such as SilverPeak, Fortinet, Check Point, Netrounds, Certes, Juniper, Cisco, Palo Alto, NEC/Netcracker, 6 Wind, Trend Micro, and Riverbed.

Arm is also taking the initiative to expand the ecosystem of NFV vendors who are running their VNFs on Arm-based platforms.

Conclusion: A Bright Future for Arm-Based NFV Solutions

It's clear that today's fast-moving marketplace presents a substantial market opportunity for partners targeting operators who are migrating to NFV. To enable partners to make the most of this opportunity, Arm and Telco Systems are actively engaging with ODMs for development of new platforms at competitive prices.

The uCPE solution is just the first offering to enable partners to meet the demand for innovative NFV solutions. Its initial benchmarking provides a compelling value proposition for operators—at very competitive prices.

Arm is committed to continuing to engage and lead development of compelling solutions for our partner ecosystem and their end customers. For example, our AIDC portal provides a one-stop resource that helps developers quickly find the all resources they need to realize their vision. This central showcase provides access to the building blocks, solution providers, and domain experts to help ecosystem partners move their initiatives forward. Arm is also proactively building its community through participation in events and other activities.

To learn more about the AIDC and other Arm initiatives, visit the community portal.

Visit Telco System to learn more about the Telco Systems NFVTime solution.