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Exposing the cost tradeoffs of cloud-native NFV

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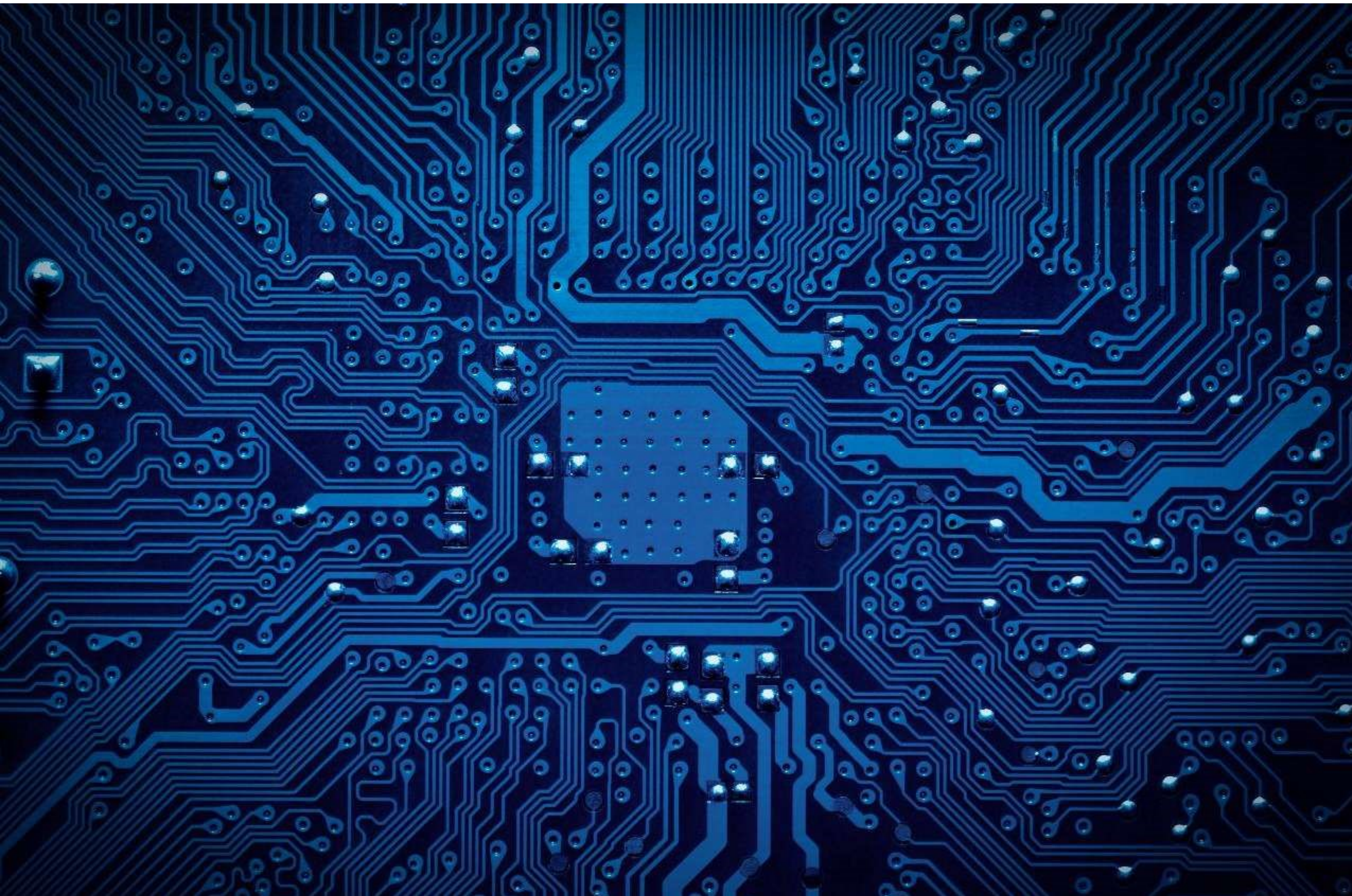

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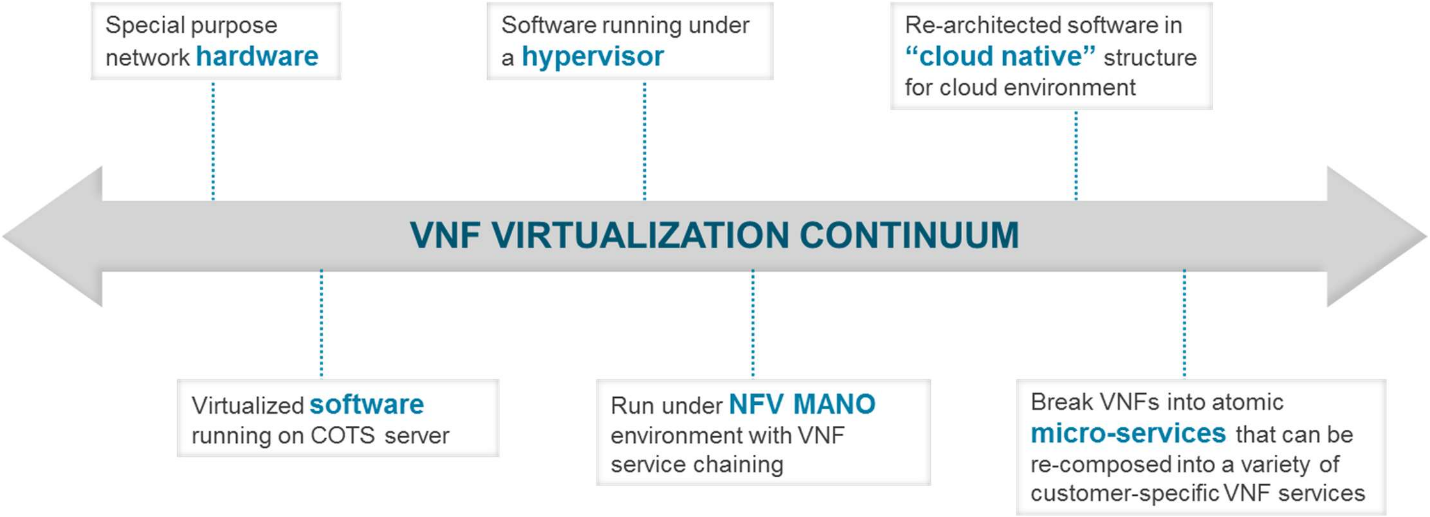
Introduction

Virtualization is a continuum of deployment options

In the journey to take more control of their networks and services, operators have told vendors they are seeking to virtualize over time everything from enterprise site devices (e.g., firewalls, VPNs, customer edge routers, WAN optimization controllers) and provider edge routers to mobile core and IMS functions, including PCRF, EPC, and gateways. Today the vision has evolved, expanded, and grown more sophisticated. There are a variety of virtualization options from fully integrated software on special purpose hardware to independent microservices, as depicted in Exhibit 1.

VNF virtualization is a continuum of options, each with its own advantages. An operator can easily use all of them for services or even use several of the options for delivery of a single service—including physical network functions (PNF), virtual network functions (VNF) on a server, VNF under hypervisor, VNF under NFV MANO (management and operations), cloud-native VNF, and/or a cloud-native VNF composed of microservices.

Exhibit 1: VNF virtualization continuum—a range of deployment options



Source: IHS Markit | Technology, now a part of Informa Tech, Mobile VNFs: A Market in Motion White Paper; 2017.

One of the main challenges with today's standard practice of using special purpose network hardware, is that solutions built of dedicated hardware cannot be quickly changed—there is no aspect of agility or quick time to market. Typical lead times of 1.5 years are not un-common when functionality for new or upgraded services is required in the market (e.g., customer site firewall) or in the operation (mobile core).

The "softwarization" to create a virtualized network functions (VNF) from the function implemented in hardware/software is the first step of VNF virtualization. It is a gross step of just translating all the functionality to a software-only version in a single piece of code. This type of monolithic VNF has value in many situations that operators are using today. Many operators use this as an initial foray into virtualization as a monolithic VNF can be deployed in much the same manner in terms of network operations, with no worries or operational changes due to using hypervisors or NFV MANO.

Adding the capability to run under a hypervisor can add an order of magnitude of flexibility, resiliency, operational efficiencies, and much better utilization of server capacity.

The NFV MANO is a more complex environment with a rich set of capabilities to handle VNFs in a standardized way: onboarding VNFs from multiple vendors, scaling-out and scaling-in by adding/deleting VMs, or delivering a variety of customer services using service chaining, just to name a few.

A monolithic VNF can be useful in some situations, but great advantages can be gained by rearchitecting the VNF software into separate parts with the cloud architecture in mind—that is, **cloud-native** for NFV. cloud-native opens up many possibilities:

- Multiple parts of the VNF can be executing simultaneously
- Server processors can have multiple cores
- Multiple servers in the same location or different locations can be used for a VNF or a service chain
- Control plane separation from user plane
    - control plane parts can be executing in 1 or more cores, VMs, or containers
    - …while user/data plane parts can be executing in other cores
- The advantage? These features can be used to achieve service/VNF resiliency and handle varying traffic loads.

Separating functional parts—for example, control plane from data plane—of a VNF to efficiently take advantage of a cloud environment to create the first stage of a cloud-native VNF typically leaves the service content part of the VNF untouched.

The most critical element of cloud-native is the move to **microservices** -- the next stage of cloud-native. Microservices involve breaking the monolithic VNF into submodules that take advantage of cloud environments with VMs, containers, multiple-core processors, multiple servers, and more. We see a growing number of cloud-native VNFs in the market today, and their heyday is in motion today in 2019 and later.

The “micro” granularity is achieved by separating out the various service subfunctions of the VNF into individual microservices. Some common separations are user interface, network interface, and then separating the core VNF into its constituent service subfunctions. An example is separating a firewall into its atomic parts, such as parental control, virus detection, DDoS traffic handling, spam recognition, etc.

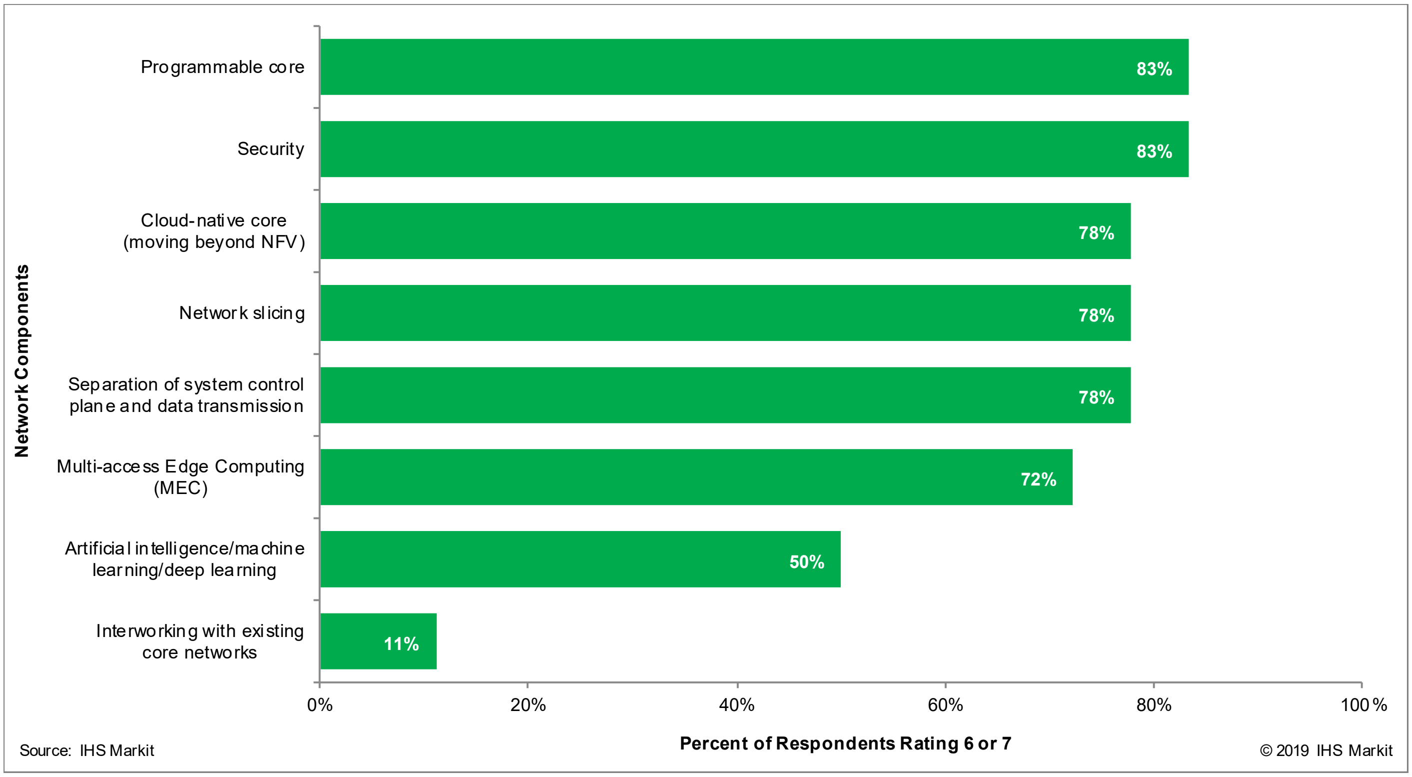
The benefit of this disaggregation or decomposition of a VNF into microservices is that it allows the creation of new services by recomposing these atomic elements, allowing the creation of many variations of VNF services that suit the purposes of operators, their customers, and their markets and make them more competitive. For example, a consumer firewall service might contain parental control and virus protection but not DDoS, whereas an enterprise firewall service could contain all but the parental control.

All in all, VNFs are important, pragmatic ingredients that operators require to help achieve their goals in transforming their networks and operations to be automated and agile in an on-demand world.

Operators consider cloud-native essential for their 5G networks

In a recent IHS Market global operator survey (*Evolution from 4G to 5G, global service provider survey, July, 2019*), operators consider cloud-native essential for their 5G networks. In fact, cloud-native core, network slicing, separation of system control plane and data transmission, and multi-access edge computing were rated strongly as essential 5G network features, making components and functions of the 5G end-to-end service-based architecture defined by the 3GPP. In the following chart, we show the percentage of respondents rating each factor 6 or 7 (Scale: 1 = not important; 7 = critical).

Exhibit 2: 5G network features



Source: IHS Markit | Technology, now a part of Informa Tech, Evolution From 4G to 5G Service Provider Survey; 2019

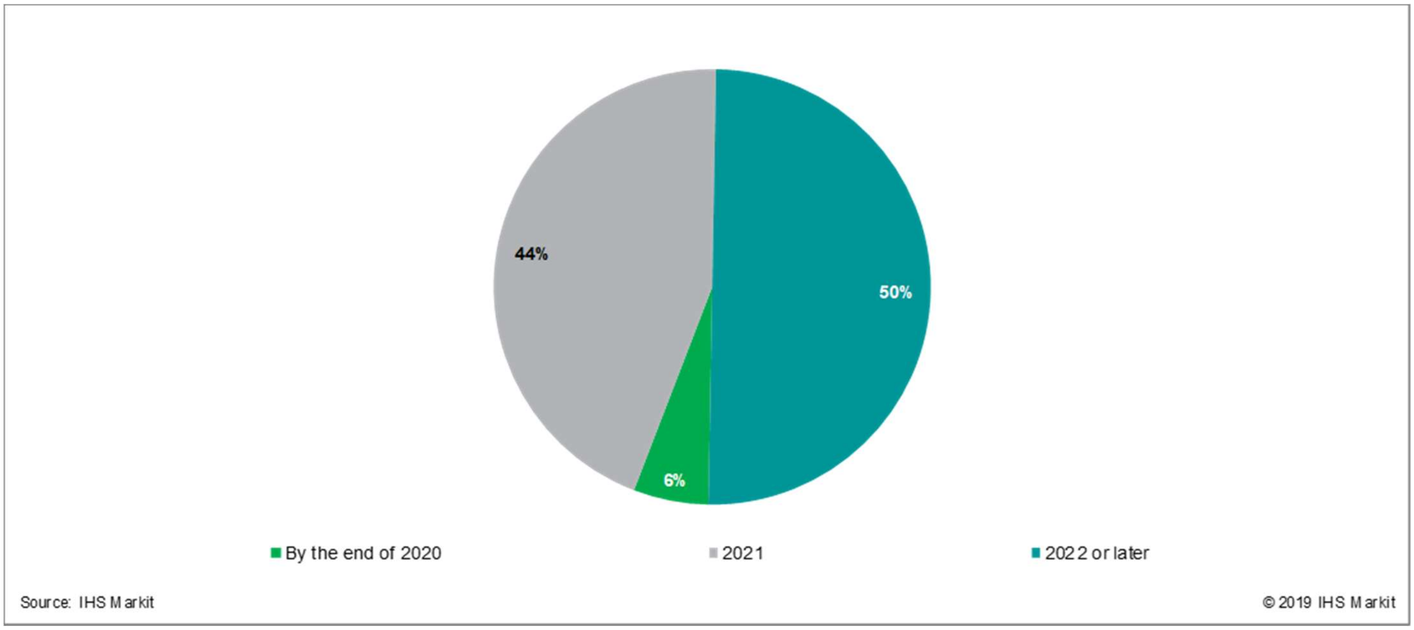
Although it's not ready yet, network slicing is coming…and cloud-native software is one of the critical automation technologies

We know that operators believe that cloud-native is critical to network slicing. In our recently published *Evolution From 4G to 5G Service Provider Survey*, we asked, "When do you expect the network slicing function to be commercially available in your 5G network?" Half of the respondents expect it in 2022 or later, 44% in 2021, and 6% by the end of next year (2020). Everyone sees network slicing as the key mechanism to enable a large variety of 5G use cases.

5G network slicing enables operators to build agile and flexible networks to cater to multiple use cases in different industry verticals. Automation is critical. These services are made possible through a number of automation technologies including software-defined networking (SDN) and network function virtualization (NFV) to incorporate different layers of access, transport, and core domains of a network to create custom slices for each use case. Many technologies come into play, not just SDN and NFV. SDN is a strong technology for slicing itself while NFV may or may not be used along with the slice for the particular use case. Other automation technologies are involved, including AI and ML, zero-touch automation, cloud-native, provisioning, and more.

By far, the main capital and especially operational benefit of network slicing is the simplification of network infrastructure to a single, shared network to deploy multiple services—heretofore, most operators used multiple networks for multiple services. Again, automation is critical—the human and manual processes must be expelled or micro-miniaturized.

Exhibit 3: Network slicing availability



Source: IHS Markit | Technology, now a part of Informa Tech, Evolution From 4G to 5G Service Provider Survey; 2019

Bottom line

Operators are driven to automate their networks to become "digital transformation service providers" in order to meet the customer experience expectations and operational efficiencies required to compete and survive in this modern world. Many fundamental changes are required to reach these goals, most importantly the move to more software-based services and operations, a key ingredient of which is the move to a cloud-native environment

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ACCEDIAN VOLTA Networks

LIVE: Thursday, September 12, 2019
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