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## Business Value Highlights

**603%**  
five-year ROI

**12 months**  
to payback

**38%**  
lower five-year cost of operations

**42%**  
more efficient IT infrastructure management

**28%**  
more efficient network operations teams

**45%**  
faster development life cycles, new applications

**79%**  
less unplanned downtime

**\$462,500**  
additional revenue per year per VNF

# The Business Value for Telecommunications Service Providers of Virtualizing Network Functions on the Red Hat OpenStack Platform

## EXECUTIVE SUMMARY

Telecommunications service providers (SPs) face three existential challenges — service commoditization, intense competition from within the industry and increasingly from hyperscale cloud players, and infrastructure complexity, which plagues their ability to innovate, resist commoditization, and fend off new competition. Consequently, their ability to generate business value is under severe threat. Over the past few years, inspired by the success of the hyperscale cloud, they have embarked on a journey of redesigning their networks to a cloud architecture. The question remains whether these early initiatives have created business value.

IDC interviewed a selection of telecommunications service providers in three geographic markets about the impact of virtualizing network functions on Red Hat OpenStack Platform. These telecoms companies have fundamentally changed important aspects of their business operations through virtualization with Red Hat OpenStack Platform. Specifically, they reported making their telecoms networks more agile, scalable, and robust and less hardware dependent. As a result, they have improved their ability to deliver services that resonate with their customers. Their efforts to virtualize network functions with Red Hat OpenStack Platform have yielded substantial value, which IDC quantifies as worth an annual average of \$125.72 million per interviewed telecom service company (\$108,600 per virtualized network function) by:

- **Reducing IT costs** through virtualization and more efficient use of server and other infrastructure
- **Enabling network operations teams** to shift focus from supporting infrastructure and day-to-day network operational activities to ensuring the delivery of more timely, relevant, and robust telecoms services

- **Lowering business risk** by reducing the frequency and duration of infrastructure- and network-related outages and performance problems that affect employees and customer-facing services
- **Increasing revenue** by better meeting customer demand with scalable, high-performing, and innovative telecoms services

## SITUATION OVERVIEW

According to IDC's Global Telecom Indicators database, telecommunications service providers globally have seen their revenue, operating margins, and capex trend flat to down over the past five years (see Table 1). A few observations from this data are:

- The telecom service provider industry's revenue has declined from the levels seen in 2014 and held flat over the past four years. This trend has occurred despite the industry adding significantly more users and provisioning more bandwidth and more services globally across their networks. Clearly network monetization has been a significant challenge. The specter of *service commoditization* manifesting in terms of lower Average Revenue per User (ARPU) per user or lower dollar per byte is very real.
- Consequently, the ability of telecommunications service providers to generate business value has come under severe threat. This is evident in their declining operating margins. They are earning less per dollar of revenue they generate. This pricing power erosion is occurring because increasingly customer value is being appropriated by hyperscale players using carrier networks to deliver over-the-top (OTT) services to the end customer. This *hyperscale competition* is only likely to intensify over the foreseeable future.
- Service providers recognize the need to be innovative and to be more agile and flexible in order to fend off service commoditization and rising competition but are unable to do so given that their existing legacy *network infrastructure is very complex and rigid*.

TABLE 1 Global Telecom Financials, 2014–2018

	2014	2015	2016	2017	2018
Revenue (\$T)	1.75	1.62	1.62	1.63	1.64
Operating margins as a percentage of revenue	22.9	22.3	22.9	22.7	21.3
Operating income (\$B)	304	282	277	270	282
Capital expense (\$B)	333	331	310	301	295

Source: IDC's Global Telecom Indicators database, 2019

Over the past few years, inspired by the success that hyperscale cloud players have seen in terms of infrastructure agility, flexibility, scalability, and efficiency, telecommunication service providers have embarked on a journey of digitally transforming their network infrastructure. This digital transformation has involved adopting network functions virtualization (NFV) and software-defined networks — architectural principles common in cloud infrastructures.

However, the question remains: have these initiatives of adopting virtual network functions (VNFs) under a network cloud architecture created business value and helped telecommunication service providers beat back their existential challenges?

## OVERVIEW OF RED HAT OPENSTACK PLATFORM FOR NETWORK FUNCTIONS VIRTUALIZATION

Red Hat OpenStack Platform provides the foundation to build a private or public infrastructure-as-a-service (IaaS) cloud on top of Red Hat Enterprise Linux. It offers a massively scalable, fault-tolerant platform for the development of cloud-enabled workloads.

In the communications service provider context, OpenStack is a platform for the buildout of a telco network cloud that leverages a network functions virtualization architecture. NFV is a way to define, create, and manage networks by replacing dedicated hardware appliances with software and automation. NFV virtualizes network functions on general-purpose, cloud-based infrastructure to provide more agility, flexibility, simplicity, efficiency, and scalability than legacy infrastructure while also reducing costs and allowing greater innovation.

Red Hat offers a carrier-grade solution for NFV to help communication SPs achieve IT and network convergence using the NFV features of OpenStack. Red Hat's OpenStack Platform is open source and standards based, giving communication service providers a stable, interoperable foundation to build a telco network cloud. Red Hat's contributions to the OpenStack, KVM, DPDK, and other open source projects coupled with its integration, testing, support, and experience deliver that foundation, and the solution is strengthened by the company's vast ecosystem of certified hardware, software, and virtual network function partners.

As communication service providers continue their journeys toward network transformation, they are likely to leverage cloud infrastructures running platforms such as Red Hat OpenStack Platform to power production-ready NFV applications. Red Hat OpenStack Platform brings the stability of long-life releases backed by a five-year support life cycle that lets providers focus on business, not managing infrastructure. Red Hat OpenStack Platform's integration with a large ecosystem of partners and ISVs allows customers to choose how to build the most effective solution — beyond what a single vendor can offer.

The most common use cases for Red Hat OpenStack Platform for NFV fall under broad categories such as:

- **Mobility:** This involves helping mobile communication SPs deploy services such as vEPC and vIMS.
- **Managed services:** Managed services are services that service providers offer to small, medium-sized, and large enterprises, such as those for customer premise equipment (CPE), firewall, VPN gateways, intrusion detection, and analytics.
- **Video:** Cable operators (MSOs) and other OTT providers such as Netflix and Amazon Video use a lot of servers and network devices. The general term used for such networks is *content delivery network (CDN)*.

## THE BUSINESS VALUE OF VIRTUALIZING NETWORK FUNCTIONS ON RED HAT OPENSTACK PLATFORM

### Study Demographics

IDC interviewed five telecommunication service providers about their experiences virtualizing network functions with Red Hat OpenStack Platform. Study participants were large telecoms

service providers with an average employee base of 58,800 and almost \$45 billion in annual revenue. Interviewed organizations must build and maintain mobile and fixed networks that deliver various telecommunications services to their customers, including consumer mobile services, consumer fixed-line services, and business services. They spoke to experiences with network functions virtualization with Red Hat OpenStack Platform in three geographic markets: United States (3), Northern Europe, and Southern Europe. Table 2 provides additional details about the companies interviewed for this study.

**TABLE 2 Demographics of Interviewed Organizations**

	Average
Number of employees	58,800
Number of network operations staff	4,630
Revenue per year (\$B)	44.93
Countries	United States (3), Northern Europe, Southern Europe

Source: IDC, 2020

## Red Hat OpenStack Platform and Network Functions Virtualization

Interviewed telecommunication service providers described their efforts to virtualize network functions and their use of Red Hat OpenStack Platform as indistinguishable. In other words, they chose and use Red Hat OpenStack Platform to virtualize network functions because they concluded that it was the right platform for their virtualization efforts. Study participants explained that their organizations have high expectations for network functions virtualization, and Red Hat OpenStack Platform helps them achieve significant cost efficiencies and establish much more agile, scalable, and robust telecom services. Interviewed telecom service providers described the strong link between Red Hat OpenStack Platform, virtualization of network functions, and the expected benefits of virtualization:

- **Platform for network functions virtualization:** *“Red Hat OpenStack Platform is central to our network functions virtualization strategy, which is a game changer from an opex/capex perspective. We are virtualizing for scalability, reliability, and elasticity, as well as cost reduction.”*
- **Platform enables private cloud approach to NFV:** *“Red Hat OpenStack Platform is the core of our network virtualization . . . We chose to virtualize our network with Red Hat*

*OpenStack Platform because we didn't want to go to the public cloud for reasons related to latency and security. We wanted to have a private cloud."*

- **Sought open source platform for NFV:** *"Red Hat OpenStack Platform supports our virtualization and cloud journeys, which we are moving on from legacy to a more cloud-based virtualization platform . . . Our preference is for cloud- and open-source based solutions."*

Table 3 provides an overview of interviewed telecoms service providers' use of Red Hat OpenStack Platform for virtualizing network functions. Telecoms service providers are relying on these network functions to serve large numbers of customers in the consumer (72.1 million mobile users on average) and business space (10.0 million business customers on average).

Interviewed organizations reported that, at the time of interviews, they had virtualized somewhat more than one-quarter of all of their network functions on Red Hat OpenStack Platform (1,158 out of 4,464). Interviewed telecoms companies named various network functions that they have already virtualized, including examples such as IP multimedia system (IMS), core network subsystems (vEPC), user and control plane applications, firewalls, and WAN optimizers. While study participants noted that they have already made substantial progress toward their objectives of virtualizing network functions, they stressed that they intend to continue to extend virtualization to more network functions with Red Hat OpenStack Platform, with several reporting plans to have well over 50% of network functions virtualized within two to three years.

**TABLE 3 Red Hat OpenStack Platform for NFV Environments**

	Average
Number of unique network functions (total)	4,464
Number of unique network functions (virtualized)	1,158
Number of mobile subscribers served (M)	72.1
Number of business customers served (M)	10.0

*n=5 Source: IDC, 2020*

## The Business Value of Network Functions Virtualization with Red Hat OpenStack Platform

Interviewed telecommunications service providers reported that virtualizing network functions on Red Hat OpenStack Platform has enabled them to reduce capital and operational expenses even as they increase their ability to meet customer demand with scalable, high-performing telecoms services. Study participants described the centrality of Red Hat OpenStack Platform to network virtualization:

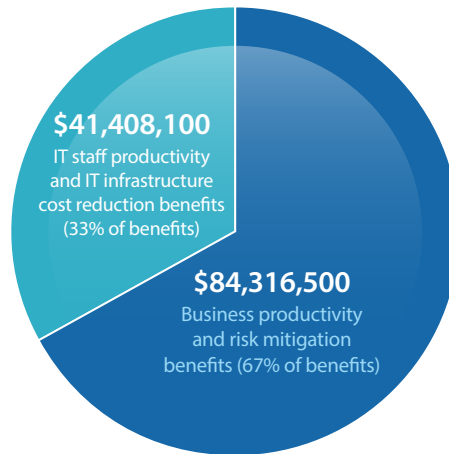
- Delivers needed functionality in terms of network traffic and customer experience:** *"We chose Red Hat OpenStack Platform for NFV because it helps us better utilize resources . . . We're using it for our cellular services because it allows us to better manage traffic and provide a better customer experience."*
- Ability to create common platform for network virtualization:** *"The biggest benefit for us of using Red Hat OpenStack Platform for NFV is that we can unify the infrastructures of multiple different vendors for infrastructure operations, so we can create operational efficiencies."*

The telecommunications service providers interviewed for this study described achieving substantial value in terms of both operational cost savings and efficiencies and business benefits including higher productivity, faster time to market, and additional revenue. In total, IDC estimates that they will realize benefits worth an average of \$125.72 million per organization per year (\$108,600 per VNF) divided between those two areas (see Figure 1):

- IT staff productivity and IT infrastructure cost reductions:** Virtualization with Red Hat OpenStack Platform reduces infrastructure requirements, brings down the amount of staff time needed to maintain and support infrastructure and telecoms networks, and enables development activities. IDC calculates that these benefits will be worth an annual average of \$41.41 million per organization (\$35,800 per VNF) in cost reductions, staff time savings, and higher staff productivity, thereby accounting for about one-third of total benefits.
- Business productivity and risk mitigation benefits:** Virtualizing network functions with Red Hat OpenStack Platform helps interviewed organizations better respond to customer demand, deliver more functional services, and reduce the cost of unplanned outages. IDC quantifies the value of higher revenue and user productivity at an annual average of \$84.32 million per organization per year (\$72,800 per VNF), thereby accounting for about two-thirds of total benefits.

FIGURE 1 Average Annual Benefits per Organization

**\$125.72 M per year per organization**

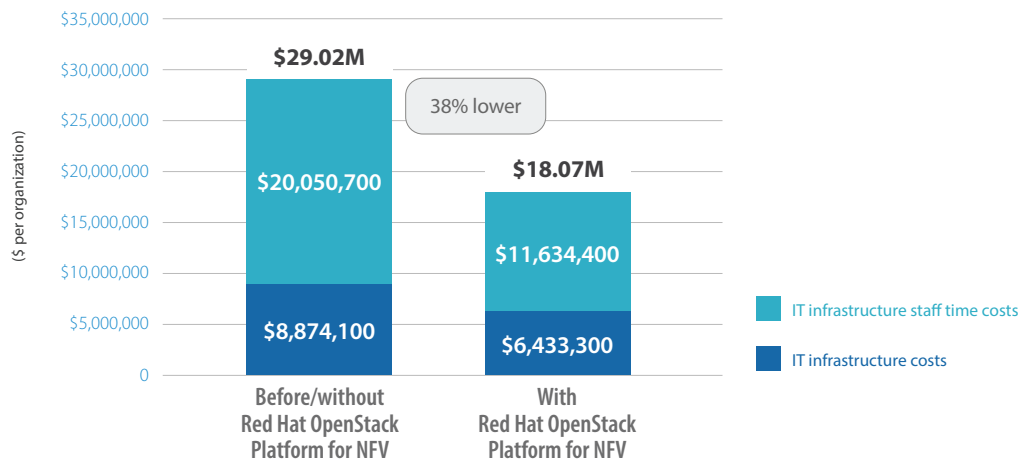


n=5 Source: IDC, 2020

### Lowering the Cost of Operating Telecoms Infrastructure

Interviewed telecoms services providers have leveraged efficiencies gained through network functions virtualization with Red Hat OpenStack Platform to establish significantly more cost-effective IT foundations. IDC calculates that they will lower infrastructure and staff time costs by an average of 38% to run like services and workloads, thereby saving almost \$11 million per organization over five years (see Figure 2).

FIGURE 2 Five-Year Cost of Operations



n=5 Source: IDC, 2020



## *More Cost-Effective Use of Server and Other Hardware*

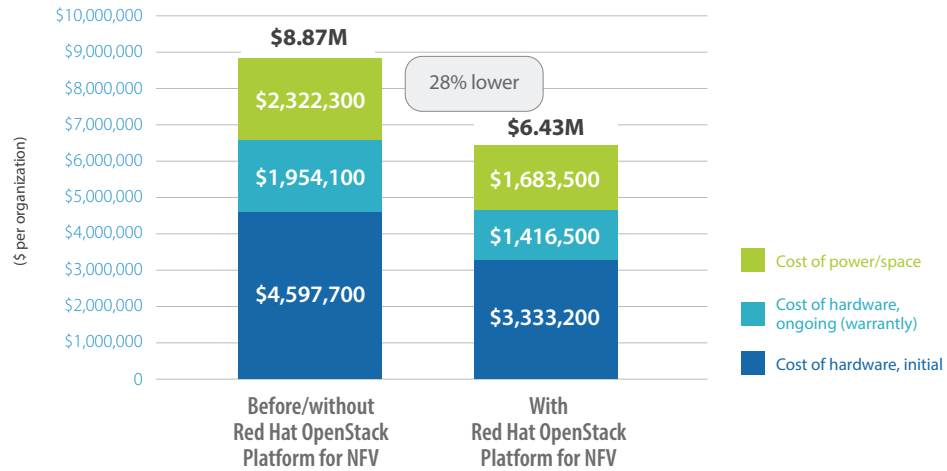
As telecoms service providers, study participants require extensive IT infrastructure to support the delivery of various services to their consumer and business customers. With customers numbering in the tens of millions, their server and hardware environments must provide requisite levels of performance, or they risk customer dissatisfaction. Thus, while they cannot jeopardize service performance levels, their ability to compete on price still relates to the infrastructure costs they incur in deploying and running their services.

Interviewed telecoms service providers described using Red Hat OpenStack Platform to reduce physical infrastructure requirements through increased levels of virtualization and stronger performance. As a result, they require fewer physical servers to support the same workloads and services, thereby delivering more cost-effective infrastructure foundations for their businesses. Study participants spoke to the benefit of Red Hat OpenStack Platform in terms of IT costs:

- **Substantial server and cost of operations cost savings:** “We are seeing about 30% savings in cost in the number of physical servers we need with Red Hat OpenStack Platform. We haven’t virtualized the entire universe yet, but we’re saving \$1,000 per server for hundreds of servers . . . We’re saving, just for power and cooling, easily up to another million dollars over five years.”
- **Benefiting from reduced server and storage requirements:** “The main benefit of Red Hat OpenStack Platform for NFV is the reduced capex; I would say we’re saving about 40%. We’re avoiding servers — we’d need 40% more servers without Red Hat OpenStack Platform . . . We are also in the ballpark of 30% savings for storage — at least 1–2PB, to be conservative. We’re avoiding around 8–10 SANs, which would be \$1 million in hardware.”

Figure 3 shows the significant benefit for interviewed telecom services companies in reducing infrastructure costs through network functions virtualization with Red Hat OpenStack Platform. By lowering these costs by an average of 28% over five years, IDC calculates that they will save or avoid an average of \$2.44 million per organization over five years.

**FIGURE 3 Five-Year IT Infrastructure Costs**



n=5 Source: IDC, 2020

### Enabling Staff Efficiencies in Running Infrastructure

Meanwhile, having more streamlined server and infrastructure environments helps interviewed telecoms services providers limit the staff time required for management and support. One interviewed organization described the impact for its IT infrastructure team: *“To run our Red Hat OpenStack Platform for NFV environment, we need 50 staff members, which include all the server management. If we were using a physical environment, it would take 75 people.”* These efficiencies not only contribute to a lower per-unit cost of running and delivering telecom services but free up staff to support other IT and business initiatives. Table 4 shows the impact of network functions virtualization with Red Hat OpenStack Platform on IT infrastructure teams, with a 42% average efficiency across interviewed organizations. In addition, study participants reduce the frequency and complexity of infrastructure-related problems, thereby reducing the amount of help desk staff time required (an average of 66% less time).

**TABLE 4 Impact on IT Infrastructure Staff**

FTEs per Organization for Equivalent Workloads	Previous Environment	With Red Hat OpenStack Platform for NFV	Difference	Efficiency with Red Hat OpenStack Platform for NFV (%)
Staff time to manage infrastructure (FTEs)	47.2	27.4	19.8	42
Hours of staff time per VM per year	36	21	15	42
Equivalent value of staff time per year per organization (\$M)	4.72	2.74	1.98	42

*n=5 Source: IDC, 2020*

Taken together, lower infrastructure costs and infrastructure staff efficiencies achieved with Red Hat OpenStack Platform mean that interviewed telecoms services providers have a much more cost-effective infrastructure foundation for their businesses.

## Enabling More Efficient and Agile Network Operations

Staff efficiencies for interviewed telecom services providers extend beyond the management and support of platform infrastructure to broader benefits related to the networks that are at the heart of their businesses. Study participants rely on large teams of network engineers and other network specialists to deploy, manage, support, optimize, and extend their various telecoms networks. These teams are responsible for ensuring that their networks provide the quality, agility, and performance to serve their customers. Especially in the context of the constant need to upgrade network technology and performance (e.g., making the move to 5G), it is critical that they maximize the value of these network operations teams.

Virtualization of network functions with Red Hat OpenStack Platform has helped interviewed organizations shift staff responsibilities away from day-to-day activities and put a greater focus on innovation and delivering new services. The value of upshifting the time of network engineers and other specialists is reflected in both improved performance and agility metrics, as well as winning new business and responding robustly to customer demand. Table 5 demonstrates the absolute and relative value for interviewed organizations of pursuing network functions virtualization with Red Hat OpenStack Platform. Efficiencies of 28% across these teams that can number into the thousands generate value worth an average of almost \$43 million per year.

**TABLE 5 Impact on Network Operations Staff**

	Previous Environment	With Red Hat OpenStack Platform for NFV	Difference	Efficiency with Red Hat OpenStack Platform for NFV (%)
Staff time required for equivalent network operations (FTEs)	1,517	1,088	430	28
Equivalent value of staff time for network operations per organization per year (\$M)	151.74	108.75	42.99	28

*n=5 Source: IDC, 2020*

Beyond enabling more efficient network operations, study participants credited network functions virtualization with Red Hat OpenStack Platform with increasing network agility and reducing friction associated with the delivery of IT resources and other service requests. This agility enables more timely responses to business requests and infuses overall operations with greater flexibility to meet changing customer appetite and demand for telecoms services. Table 6 reflects this substantial improvement in agility, with study participants needing two-thirds less time (67%) to complete service requests overall and in terms of staff time required.

**TABLE 6 Impact on Service Provisioning**

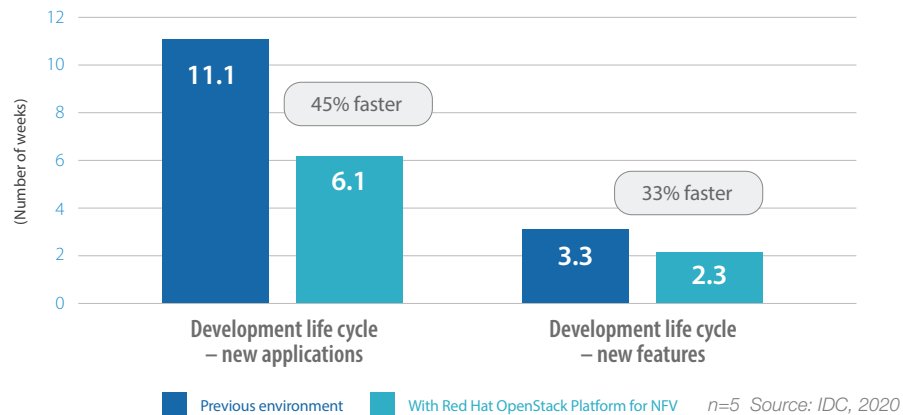
	Previous Environment	With Red Hat OpenStack Platform for NFV	Difference	Efficiency with Red Hat OpenStack Platform for NFV (%)
Time to complete per service request (days)	6.7	2.2	4.5	67
Staff time to complete per service request (total hours)	50	17	33	67

*n=5 Source: IDC, 2020*

Development activities also see a direct benefit from enhanced agility and flexibility achieved through network functions virtualization with Red Hat OpenStack Platform. Constant demand from customers and employees for new telecoms services, applications, and functionality means that development teams are expected to move with ever-increasing speed to meet this demand. Figure 4 provides insight into how network functions virtualization enables developers to turn around projects in less time, thereby reducing time to market. IDC calculates that Red Hat OpenStack Platform for NFV has enabled study participants to trim 45% and 33% from the development life cycles for new applications and new features, respectively. This makes their developers more valuable to the organizations, and IDC quantifies that value as a 12% increase in productivity. With an average of 130 development team members creating

applications, functions, and services on Red Hat OpenStack Platform at interviewed telecom companies, higher productivity contributes strong incremental value related to development.

**FIGURE 4 Impact on Application Development**



## Improved Performance of Telecoms Networks and Infrastructure

Telecommunications services providers know that their customers will not accept unplanned outages and that business success requires smooth internal operations, free of unexpected interruptions. Thus they need their IT infrastructure foundations and networks to deliver the highest possible levels of reliability and availability. The Red Hat customers interviewed for this study reported that virtualizing network functions on Red Hat OpenStack Platform has reduced the frequency and impact of unplanned outages, thereby lowering the cost of lost productivity and bringing down business operational risk, which can be more challenging to quantify but is equally if not more critical to telecom service providers.

Interviewed organizations reported increased IT infrastructure and network resiliency and robustness with capabilities such as automated failover, self-service, and the ease of moving workloads on a more flexible network architecture. One interviewed telecoms services provider explained: *“We’ve decreased downtime significantly with Red Hat OpenStack Platform for NFV because of automation and self-service . . . There’s a revenue loss impact that’s decreased because of NFV. For equivalent services, that loss has been reduced by 20–30% because outages do not last as long; we are gaining back around \$4–6 million in virtual services per year for now.”* Table 7 reflects the extent to which interviewed organizations have reduced the impact of unplanned outages. By lowering the frequency of outages an average of 51% and resolving outages 58% faster, they have brought down productivity losses for internal employees by an average of 79%.

This equates to a savings of 1.7 hours of productive time per IT user per year, equal to millions of dollars (\$3.72 million per year on average) of higher productivity across employee bases numbering in the tens of thousands on average (see Table 7).

**TABLE 7 Impact on Unplanned Downtime**

	Previous Environment	With Red Hat OpenStack Platform for NFV	Difference	Efficiency with Red Hat OpenStack Platform for NFV (%)
Unplanned outages per year per organization	14.6	7.2	7.4	51
MTTR (hours)	4.5	1.9	2.6	58
Hours per user of lost productivity per year	2.2	0.5	1.7	79
FTE impact — lost user productivity per year	67.2	13.9	53.2	79
Equivalent value of lost productive time per organization per year (\$M)	4.70	0.98	3.72	79

n=5 Source: IDC, 2020

## Improved Business Results Through Reliability, Agility, and Performance

Interviewed telecoms service providers must win and maintain business in very competitive markets characterized by constant technological advances, heightened customer expectations, and the threat of customer churn. This leaves them with little margin for error when it comes to customer service and quality of telecom services. Thus they need an IT infrastructure supporting their networks and operations that allows them to meet customer demand with agility, performance, and functionality. Interviewed organizations reported that virtualizing network functions on the Red Hat OpenStack Platform has helped them do this. As a result, they have won revenue from new customers and protected their existing business.

Interviewed telecoms services providers spoke to important ways that Red Hat OpenStack Platform for NFV has enabled them to compete better and thrive in competitive markets:

- Reduced time to market for new solutions:** *“We have benefited from a better time to market with Red Hat OpenStack Platform for NFV compared with our competition. We can work better on new deployments, solutions, and services. If we are able to quickly deploy a solution at the start in production, that is good.”*
- Infrastructure flexibility and positive impact on customer experience:** *“VNF with Red Hat OpenStack Platform gives us flexibility on compute capacity and whatever functions are needed . . . We have an interesting case in one of the countries where there was a major*

failure to move workloads onto a new resource. We can now do that without affecting the customer experience at all, which would have been impossible in the old world. This actually demonstrated there's a real effect and benefit of doing this."

- **Automation supporting reduced delivery time frames:** "Red Hat OpenStack Platform for NFV helps with provisioning of new services by bringing a significant amount of automation for the onboarding of new services . . . With Red Hat OpenStack Platform, automation enables us to shrink deployment timelines, saving about 20–30%. We can now deploy a new service feature or VNF in an hour."
- **Cost-effective basis enabling new customer-facing services:** "SD-WAN is a new product that we started selling on our virtualized environment, and we couldn't have done this without Red Hat OpenStack Platform. We're selling SD-WAN services instead of MPLS services because they're cheaper for our customers and cheaper for us, and it's probably tens of millions of dollars in revenue per year."
- **Lower cost and better able to meet changing business demand:** "We've already achieved a 40% cost reduction with Red Hat OpenStack Platform for NFV. We also have shorter time to implement and use functionality, a reduction from four to six months down to a couple of weeks . . . The biggest benefit is actually the shorter time to deploy new features. And then also what we call the 'future ready.' For example, even though we don't have 5G in operation, we are already testing that platform and Red Hat OpenStack Platform, and virtualization supports this."

Table 8 shows the very substantial business impact for study participants of virtualizing network functions with Red Hat OpenStack Platform. The interviewed telecoms service providers tied revenue worth an average of \$535 million per year to virtualizing network functions with Red Hat OpenStack Platform (\$462,500 per VNF). For these organizations, this demonstrates the importance of the competitive differentiation they have achieved with network functions virtualization with Red Hat OpenStack Platform.

**TABLE 8 Business Productivity Benefits: Increased Revenue**

	Per Organization (\$M)	Per VNF (\$)
Revenue impact, better addressing business opportunities		
Additional revenue per year	535.35	462,500
Recognized net revenue per year, IDC model*	80.30	69,400

\* The IDC model assumes a 15% operating margin for all additional revenue to calculate recognized net revenue.  
n=5 Source: IDC, 2020

## ROI Analysis

Table 9 provides IDC’s analysis of the projected benefits and costs related to study participants’ virtualization of network functions on Red Hat OpenStack Platform. Study participants launched their efforts and investment in Red Hat OpenStack Platform with specific expectations. For example, one explained: “We did an estimated business case when we deployed Red Hat OpenStack Platform for NFV. It turned out to be more profitable than we estimated. We were thinking that cost reductions should be approximately 25% based on the theoretical exercise we did, but we’ve seen a 40% reduction in actual license costs, which are hard numbers. Other benefits like avoiding outages are not included in that. That comes on top of this.” IDC projects that study participants will achieve discounted benefits worth an average of \$433.34 million per organization over five years (\$374,300 per VNF) compared with total investment costs of \$61.60 million per organization (\$53,200 per VNF). These levels of benefits and investment costs would yield an average five-year ROI of 603% and breakeven in one year from deployment commencement, reflecting the strong value for interviewed telecommunications companies of their investment in Red Hat OpenStack Platform and their network functions virtualization efforts.

TABLE 9 ROI Analysis

	Five-Year Average per Organization	Five-Year Average per VNF
Benefit (discounted)	\$433.34 million	\$374,300
Investment (discounted)	\$61.60 million	\$53,200
Net present value (NPV)	\$371.74 million	\$321,100
Return on investment (ROI) (%)	603	603
Payback period (months)	12	12
Discount rate (%)	12	12

*n=5 Source: IDC, 2020*

## CHALLENGES AND OPPORTUNITIES

### Challenges

Carrier skills, which are necessary to manage VNFs, remain in short supply. Carrier networks have typically been the province of network admins who have not been required to use software skills, which are required for VNFs. Even though some large carriers have managed



to hire and/or retrain staff, smaller carriers continue to struggle with hiring and retaining the necessary skills within their organizations.

Adoption of cloud infrastructure such as OpenStack requires more than technology. It requires cultural and process changes, as well, to transform into a cloud services operator. These are often more challenging than the technology changes themselves.

VNF is based on virtual machine technology, and Red Hat OpenStack Platform is very well suited to manage virtual infrastructure. More recently, carriers have begun developing and deploying cloud-native network functions (CNFs), which leverage container technology, and specifically Kubernetes. However, two challenges to CNF adoption remain for carriers. First, few certified and supported CNFs are available “off the shelf” from network equipment vendors and ISVs, limiting early CNF adoption to those carriers that have the ability to develop and support their own CNFs. And while OpenStack may be the de facto standard platform for carrier deployments of VNF, there is no such platform consensus yet for CNF, which faces a fragmented and competitive container platform market.

Red Hat has invested heavily in projects like OVN, Kuryr, and Ember that enable CNFs to share resources used by OpenStack VNFs. Red Hat is also driving carrier-grade requirements into upstream Kubernetes and container projects that are the basis for its container offering, Red Hat OpenShift Container Platform. Red Hat reports that some of its large telco customers that develop their own network function applications are successfully using the Red Hat OpenShift offering to develop and run CNFs in production. Red Hat and its ecosystem partners recently demonstrated this technology live on stage, powering an end-to-end 5G network demo at Kubecon 2019 in San Diego.

## Opportunities

OpenStack is now a mature open source software project. Most of the early issues with feature gaps, stability, many of the installers, and life-cycle management tools have been improved dramatically to make deploying and operating OpenStack smoother and easier than ever before. Commercial distributors, such as Red Hat, have done much of the work to evolve and mature OpenStack, and these distributions have long support cycles, large ecosystems, and integrated robust tooling. While these can't completely abstract away all the complexities of private cloud, building a cloud with OpenStack is much different than even just a couple years ago. The maturation of OpenStack has helped cement its dominance as a virtual infrastructure management platform in carriers.

Red Hat OpenStack Platform is one of the very few truly modern cloud platforms, and it is also an open platform that has broad support from the carrier industry, putting it on the short list for new carriers seeking this functionality on premises.

Red Hat OpenStack Platform can be an effective software-defined infrastructure underneath any large-scale container deployment, as containers evolve to become viable for virtual network services in production environments. The infrastructure market has been and will continue to be very competitive. For highly agile and large-scale container environments, Red Hat OpenStack Platform can be a highly complementary solution.

## CONCLUSION

Telecommunications service providers recognize that their ability to continue creating business value for their stakeholders is predicated on their becoming more agile, flexible, and efficient in the face of existential challenges they face in terms of commoditization, competition, and infrastructure and operations complexity. Embracing cloud architectures is not a choice but an urgent imperative.

Research conducted by IDC across a selection of telecommunications service providers that have embraced cloud architectures in their network infrastructures leveraging Red Hat OpenStack Platform suggests these new initiatives are creating significant business value. While IDC's research quantifies this business value today at \$125.72 million per interviewed telecom service company (\$108,600 per virtualized network function), what augurs well for the future are the qualitative benefits articulated by the interviewed service providers in terms of the increased agility, scalability, resilience, and hardware independency introduced into their networks. Service providers report increased efficiency, automated service delivery, lower business risk and, importantly, the ability to spin up new services more dynamically. These infrastructure attributes create the foundation for sustained and potentially higher business value in the future for these telecom service providers.

Red Hat OpenStack Platform's role in enabling this foundation for sustained business value creation at these telecommunication service providers is fundamental to each of their stories. OpenStack is a platform for the buildout of a telco network cloud that leverages a network functions virtualization (NFV) architecture. It offers a massively scalable, fault-tolerant platform for the development of NFV-based, cloud-enabled workloads. The common thread across all service providers included in this IDC study was the use of Red Hat OpenStack Platform as the virtual infrastructure management platform.

Red Hat OpenStack Platform brings the stability of long-life releases backed by a five-year support life cycle that lets providers focus on business, not managing infrastructure. Red Hat OpenStack Platform's integration with a large ecosystem of partners and ISVs allows customers to choose how to build the most effective solution — beyond what a single vendor

can offer. It is IDC's opinion that telecommunication service providers are likely to see faster time to value by leveraging mature, carrier-ready cloud infrastructure management solutions such as Red Hat OpenStack Platform in their respective network transformation initiatives, along similar lines as the experience telecommunication service providers report in this white paper.

## APPENDIX

### Methodology

IDC's standard ROI methodology was utilized for this project. This methodology is based on gathering data from telecommunication services providers that are currently using Red Hat OpenStack Platform to virtualize network functions. Based on interviews with these study participants, IDC performs a three-step process to calculate the ROI and payback period:

1. Measure the benefits associated with network functions virtualization with Red Hat OpenStack Platform in terms of infrastructure-related cost savings, IT staff efficiency and productivity benefits, higher user productivity, and increased revenue.
2. Ascertain the investment made in undertaking network functions virtualization, including costs associated with using Red Hat OpenStack Platform.
3. Project the costs and benefits over a five-year period and calculate the ROI and payback for virtualizing network functions with Red Hat OpenStack Platform.

IDC bases the payback period and ROI calculations on a number of assumptions, which are summarized as follows:

- Time values are multiplied by burdened salary (salary + 28% for benefits and overhead) to quantify efficiency and manager productivity savings. For purposes of this analysis, IDC has used its standard Business Value assumptions of an average fully loaded salary of \$100,000 per year for IT staff members and an average fully loaded salary of \$70,000 for non-IT staff members. IDC assumes that employees work 1,880 hours per year (47 weeks x 40 hours).
- Downtime values are a product of the number of hours of downtime multiplied by the number of users affected.
- The impact of unplanned downtime is quantified in terms of impaired end-user productivity and lost revenue.

- Lost productivity is a product of downtime multiplied by burdened salary.
- The net present value of the five-year savings is calculated by subtracting the amount that would have been realized by investing the original sum in an instrument yielding a 12% return to allow for the missed opportunity cost. This accounts for both the assumed cost of money and the assumed rate of return.
- Because every hour of downtime does not equate to a lost hour of productivity or revenue generation, IDC attributes only a fraction of the result to savings. As part of our assessment, we asked each company what fraction of downtime hours to use in calculating productivity savings and the reduction in lost revenue. IDC then taxes the revenue at that rate.
- Further, because IT solutions require a deployment period, the full benefits of virtualizing network functions with Red Hat OpenStack Platform are not available during deployment. To capture this reality, IDC prorates the benefits on a monthly basis, and then subtracts the deployment time from the first-year savings.

*Note: All numbers in this document may not be exact due to rounding.*

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