NEC 5G Vertical Business Platform

1.Introduction

5G era: Trends and Challenges

The 5G era will bring significant innovations to every segment of society and business through Intelligent Connectivity. Service providers can leverage 5G to become the biggest disruptive force in today's communications and cloud markets. New capabilities will enable them to deliver fixed-wireless access and enhanced mobile broadband (eMBB) offerings that provide high bandwidth and QoS control, lower costs as well as smart city and IoT applications that use network slicing. 5G will also allow service providers to deliver immersive, low-latency content for virtual and augmented reality, remote medicine or robotics and other Industry 4.0 applications. And by turning the network into a platform, they can expose these powerful 5G capabilities to enable partners to build new services with them.

While the prospect for 5G is far-reaching, capitalizing on this new market opportunity will require service providers to overcome certain challenges. Among the toughest challenges that service providers face is understanding how to cost effectively operationalize and monetize new services. Building and launching 5G-ready services and infrastructure involves complex, time-consuming and costly transformation projects in every stack of the platform. Service providers need to undergo lengthy vendor selections; get their platforms ready; become familiar with new technology and business models; and test, validate and integrate the solutions within their existing environment. However, this cannot be achieved without reskilling the workforce, changing business processes and making significant upfront investments.

NEC/Netcracker is one of the few companies with both the expertise and full stack capabilities to remove the risk associated with those challenges. This expertise includes building and modernizing fixed/wireless networks, building and operating telecom quality data centers, virtualizing and orchestrating networks, launching and delivering cloud-based network and digital services for CSPs and enterprises, i.e. achieving customers' digital transformations.



NEC 5G Vertical Business Platform: An E2E Full-Stack Cloud Platform in the 5G Era

NEC 5G Vertical Business Platform is the realization of an E2E full-stack Cloud Platform, where Intelligent Connectivity of 5G networks gives innovative businesses and services improved performance, greater security and better reliability.



Figure 1 – NEC 5G Vertical Business Platform

Benefits

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NEC 5G Vertical Business Platform helps service providers worldwide to transport legacy fixed/wireless networks and service platforms into a 5G ready cloud platform that capitalizes on unprecedented business opportunities with innovative 5G services and features:

- Single platform for various 5G vertical business solutions spanning all necessary stacks, i.e. network infrastructure, cloud and digital services;
- Open and best-of-breed full-stack platform utilizing cutting-edge 5G technologies and the advantages of CSPs' unique network footprints;
- An automated and fully orchestrated platform that easily operates various and fine- tuned 5G vertical services;
- Through NEC's extensive experience, CSPs gain a smooth transition towards a 5G business platform;
- A wide range of 5G Digital Services with 5G Monetization Solution



Full-Stack Ecosystem with NEC/Netcracker Value Proposition

NEC 5G Vertical Business Platform consists of several stacks. The full stack or just the required components can be chosen by CSPs to fit their business needs. Every stack takes an ecosystem approach to building up best-of-breed solutions and continuously innovating it at the highest speed with cutting-edge technologies. Significant NEC/Netcracker value propositions make the ecosystem a unique business platform, driving service providers toward new business opportunities and drastic TCO savings for their digital transformation.

- A) 5G Ready Network Ecosystem: Best-of-breed networking infrastructure become the foundation to create innovative new businesses and services.
- B) Hybrid Cloud Ecosystem: Telecom Cloud Ecosystem consists of a highly available and reliable telecom NFVI, which serves as the foundation for highquality virtualized 5G services. Additionally, operational effort is minimized for easy transformation from dedicated legacy network hardware towards a 5G service capable cloudified platform. By operating the NFVI with public/private clouds, a hybrid cloud environment helps seamlessly resilient expansion of 5G business between telecom cloud and private cloud.
- C) Digital Services for Business Users: The Digital Marketplace provides a variety of rich network connectivity services, security services, value-added services, and IT & IoT applications. As a result, the best services for each business use case are delivered and launched with minimum turnaround time. Additionally, an intelligent analysis of customer journey and customer experience is provided, resulting in a continuous improvement of service offering and delivery, which prevents a loss of revenue opportunities for CSPs and business users.
- D) NEC Full Stack Security Solutions : Various security risks exist in every layer of services in the 5 G era and digital transformation. For those security risks, we apply "NEC Security Solution for CSP" to all platform layers as Full Stack Security Solutions. NEC can provide the network, Cloud / NFVI, virtual application, and all layers with the optimum security solution based on the customer's security requirements and NEC's experience of service integration with various fields and with ecosystem partners



2.Single Platform for Various Innovative 5G Vertical

Business Solutions

As a full stack business platform, NEC 5G Vertical Business Platform seamlessly integrates various components together at top speed to bring a cutting-edge innovative business vertical solution to market.

While this platform is working as the common platform across broader businesses and social use cases, the required platform capabilities and functions are selected and provided at each stack to build up a vertical full stack solution for each business.



Figure 2 – Example of Full-Stack Vertical Solutions



A) 5G-Ready Network Ecosystem

Building and orchestrating the best of breed ecosystem is the foundation for an elastic and secure 5G-ready network

NEC's 5G-ready network ecosystem encompasses products from both NEC as well as partners in order to offer best-of-breed solutions for all network domains. NEC takes the lead role as the single point of access to assemble the best solution for each CSP's new business and network evolution.

From the CSPs' view point, acquiring network equipment directly from multiple vendors takes time and introduces many complexities, including contract management, procurement and integration processes followed by network operations across vendorspecific siloes of management systems.

NEC is the unique ecosystem supplier proven in its long and rich experiences not only of supplying and integrating traditional IP, Optical and Microwave transport systems in telecom markets but also delivering enterprise networks and services for various types of business cases around the world. These proven capabilities guarantee the delivery of the best ecosystem solution for innovative 5G businesses.

Orchestrating a 5G Ready Network Ecosystem

Orchestration of a multi-vender, multi-layer and multi-domain network is the key to creating dynamic and automated end-to-end services to support this new digital world. NEC and Netcracker have contributed to various standard development organizations (SDOs) to maximize the IP/transport ecosystem benefits of the Orchestration, which are based on open standards. The most recent proof point is OIF SDN T-API interoperability, where multi-vendor interoperability was demonstrated with support from global network operators. NEC and Netcracker have been orchestrating multiple vendor domains, which use open standard APIs developed at ONF and MEF. In that demonstration, NEC/Netcracker provided the software stack to orchestrate the service fulfillment process in a multi-vendor, multi-layer network environment. Through these activities, it has been awarded the technology solution of the year for multi-vendor solutions at MEF's 2018 event.

http://www.mef.net/2018 MEF Awards,

http://www.mef18event.com/index.php/proof-of-concept-showcase, https://www.oiforum.com/meetings-and-events/2018-oif-sdi-t-api-demo/



B)Hybrid Cloud Ecosystem

For seamless and resilient business operations and the best foundation for cloud applications

Continuous evolution of the cloud platform is the foundation of the new digital world. Demands on carrier grade service operation are inevitable to shift from high-scale legacy network infrastructure to Virtualized Network Functions (VNFs), such as vEPC/vIMS, which run on a cloud platform. Innovative 5G services are expanding toward the network edge together with operational coverage to deliver diverse service quality with available resources. In addition, end-to-end service operations for vertical services need hybrid cloud operation capabilities across telecom, private and public clouds.

NEC Telecom Cloud Ecosystem

Requirements and challenges to build up the best-of-breed open telecom cloud ecosystem

NEC's NFVI layer is expected to become the common platform for VNFs to maximize cloud resource usage and simplify cloud operations without siloes. However, in the real world, many NFVI solutions are limited and have no capability of onboarding VNFs as a single common platform. As the result, CSPs need to deploy different NFVI separately to host other VNF, facing complex operations and lifecycle management for NFVI siloes.

Therefore, creating an open telecom cloud ecosystem consisting of best-of-breed open source software and industry standard hardware is the best approach to achieving a common NFVI platform. It also enables CSPs to take cutting-edge cloud technologies to continuously optimize cloud operations and enhance quality, security and reliability.

However, developing an open cloud ecosystem as a carrier grade NFVI also comprises tough challenges. The tools to integrate various open technologies and software requires a deeper knowledge, more experience and development effort. Removing interoperability issues among various components and assuring stable performance and carrier-grade quality for the network services running on the NFVI are the biggest challenges.



What the NEC Telecom Cloud Ecosystem is Delivering

NEC and Netcracker have delivered NFVI system integration to various CSPs, been a top 10 contributor to open source communities, operated their own cloud service (NECCI) and developed and supplied carrier grade physical and virtual networks around the world.

NEC Telecom Cloud Ecosystem maximizes network virtualization and cloudification benefits for 5G services with significant results, which are highlighted below.



Figure 3 – NEC Telecom Cloud Ecosystem

• VNF vendor agnostic and common platform:

A fully open and flexible NFVI platform that can onboard any type of VNF easily and quickly to enable CSPs to launch and deliver new services. The well-established NEC standard VNF/Service onboarding process and pre-integrated Netcracker MANO are enhancing and differentiating such capabilities.

> NEC Telecom Cloud Ecosystem VNF Partnership

VNF onboarding is provided to enable CSPs to run their preferred VNFs very quickly based on NEC/Netcracker's rich experience of onboarding various VNFs at operators around world. Also NEC is leading an NFVI partnership with VNF partners to validate and certify partners to enable CSPs to run VNFs from day one.

These capabilities strongly support CSPs' continuous integration, development and deployment of new innovative services.



• Open & Best-of-breed NFVI:

NEC NFVI is based on various open source software, from OpenStack platform to broad FCAPS components and leveraging innovation speeds, diversity and openness of open source communities. NEC NFVI opens up each CSP's telecom cloud environment without any vendor lock-in and continuously provides updates with cutting-edge cloud technologies. In addition to open source software, NEC NFVI introduces industry-leading hardware and software components from partners to create a best-of-breed and out-of-the-box NFVI solution.

> NEC Telecom Cloud Ecosystem Infrastructure Partnership

In order to assure seamless compatibility among various components, NEC is closely collaborating with Juniper, Red Hat and Dell EMC.

This partnership framework effectively supports NFVI solutions design to create a carrier grade cloud infrastructure, pre-integration and optimization and delivering timely customer support. In addition, joint lifecycle management planning with partners assures seamless and future-proof compatibilities.

For NEC NFVI, the partnership with these industry leaders is fundamental to delivering carrier-grade quality together with cutting-edge cloud technologies.

Auto Deployment & Configuration Tools:

NEC utilizes auto deployment and configuration tools to eliminate complexities in implementation and configuration of NFVI created by various open source software and partner products. These tools are cutting down time for deployment and expansion of NFVI, and it helps accelerate new service delivery and updates.

Continuous Evolution of Cloud Ecosystem

NEC provides professional services while assuring seamless service operations running on the top of NFVI. Furthermore, in order to continuously bring various vertical services, NEC continues to evolve the cloud ecosystem and expand the range of the hybrid cloud.



Figure 4 – Continuous Evolution and Upgrade

Hybrid Cloud Operation

Just having an NFVI operates virtualized network functions, such as, centralized core network functions, is not enough to deliver innovative 5G services. Such services could involve network functions running close to end users, business specific tools running on enterprise private cloud with classified data, and generic applications running on the public cloud. Using multiple clouds is also important for assuring service availability against unexpected failures and traffic changes.

Netcracker orchestrates E2E services crossing over various clouds to maximize innovative 5G service QoE by leveraging the hybrid cloud environment.



Figure 5 – Hybrid Cloud Operation

Based on these advantages, NEC has delivered a telecom cloud ecosystem solution to global network operators, and has continued its strategy of delivering innovative platform and services around the world.

For details about a real world example of the telecom cloud project that NEC has implemented, please see the following press release.

https://www.nec.com/en/press/201804/global 20180405 02.html



C)Digital Services for Business Users

Netcracker Business Cloud

Netcracker Business Cloud eliminates the time, cost and complexity barriers that service providers face towards cloud transformation. This is done by running the industry's first full-stack SDN/NFV solution, from VNFs to orchestration to BSS to OSS to portals and a digital marketplace as a service.



Figure 6 – Netcracker Business Cloud

Delivering Speed, Opportunity and Efficiency

Netcracker Business Cloud can help launch new cloud B2B services, such as SD-WAN, in as little as 8 weeks. That's 8 times faster than a typical self-deployed solution. Through our digital marketplace and self-service portals, Netcracker can help CSPs stand out in a competitive market via digital user experience that brings together all your services.

By moving up the value chain beyond connectivity, Netcracker can also help CSPs expand into the enterprise cloud application and infrastructure markets. Bundling high-value B2B services with next-generation connectivity will help CSPs become a more strategic provider to their customers.

With up to 10 times lower entry cost than self-deployed solutions and flexible revenue share models, Netcracker can mitigate any risks of migrating to virtualization and cloud. This will help CSPs experiment faster with new service offerings and expand into new vertical markets.

Cloud Services & Applications

Netcracker Business Cloud has a broad range of service packages that leverage an extensive set of pre-integrated VNF and cloud partners from our award-winning Ecosystem 2.0 program. By bundling cloud connectivity services, such as SD-WAN, with value-added network services, enterprise applications and IoT infrastructure applications, service providers can create and launch highly differentiated enterprise and vertical-specific offerings. New services and partner software are continuously added to Netcracker Business Cloud based on the service provider's specific market needs.

D) Full Stack Security Solutions

Providing secure connectivity services is the key to creating and growing revenue and becoming even more important in the 5G era. Diversity of 5G vertical services creates a huge business opportunity for CSPs. They can provide the best network service for each vertical tapping into this opportunity with the right tools and offering the best security options.

NEC Security Solution for CSP brings end-to-end security across the entire CSP service infrastructure and provides secured network as a service to customers. This is adopted as a "Full Stack Security Solution" into the NEC 5G Vertical Business Solution.



Figure 7 - NEC Full-Stack Security Solutions



• 5G-Ready Network Security

NEC 5G-ready network security offers scalable, data-driven protection functions to secure next-generation network infrastructure. Our security components portfolio includes industry-leading, high-performance network boundary protection to secure interfaces between the CSP network/DCs and external systems (e.g.: the Internet, 3rd party network, etc.).

• Telecom Cloud Security

Telecom cloud security consists of two equally important layers: platform layer security (NFVI security) and virtualization layer security.

Platform layer security includes a broad range of security topics, e.g.: physical security, system hardening, and access control. Adopting a security-by-design approach, NEC Telecom Cloud Ecosystem are pre-integrated and pre-tested to comply with NEC's high standard of security.

Virtualization layer security make sure the security level of each VNF. This is ensuring service availability and data integrity and confidentiality of every virtual machine and any hardware resource sharing between them. Combining security VNFs, endpoint security and platform security modules with centralized security management, NEC provides the visibility and protection for a virtualized environment.

• Security as a Network Service

Every customer has their own criteria for a secured network. NEC helps CSPs to fulfill their security service portfolio by providing best-of-breed enterprise/residential security functions through a partner ecosystem program, as well as our own technologies, e.g. machine learning algorithms. The NEC AI portfolio utilizes advance analytics to detect threats unique to each system, e.g. agent-less IoT threat detection.

• End to End Security Management

In order to ensure all components work together in harmony and maintain service requirements, a comprehensive and continuous security management system and workflow is required. NEC delivers closed-loop security management realizing end-to-end visibility, advance detection, and response automation.

> Visibility

Traditional network monitoring relies on security equipment placed in critical locations (usually in the network boundary), only giving CSPs a single view of their network. The Full Stack Security Solutions leverages its advanced big data technologies to gather and store various data across the network, giving CSPs real-time visibility of what is happening in their network.

> Advance detection

Using NEC machine learning algorithm, this vast amount of data collected is a treasure trove where valuable information to detect security threats can be found. By leveraging this data, unknown threat can be found using traditional signature-based detection.

> Response automation

Responding to a threat is currently a resource-heavy process involving a significant amount of analysis to get to the root cause and designing and executing a mitigation plan. In conjunction with the Netcracker orchestration system, the NEC solution aims to automate this process, giving CSP security teams the ability to focus on important tasks and stay ahead of the evolving threat.

In order to make these scenarios work, best-of-breed security components that oversee monitoring, protection and assurance must be embedded at every stack depending on CSP and customer requirements and situation. NEC is taking an ecosystem approach in this area to bring the best solution from leading industry partners, such as A10 Networks and Juniper, to offer suitable E2E security solutions fitting CSPs' and customers' requirements.

Securing CSP networks means securing CSPs' and their customers' current and future revenue. Preparing for the upcoming transformation, NEC is helping CSPs getting ready to offer security as their network key value, through comprehensive full-stack security solutions. NEC is eager to partner to support CSPs becoming the security infrastructure provider for a better digital society.



3.Conclusion

Network and IT investments in 5G will ultimately prove beneficial to the mobile industry and provide an upside for a service providers' fixed-line business as well as adjacent industry partners. The business cases for 5G will only be a success through investments and support from all stakeholders in the ecosystem. That ecosystem now becomes more reliant on the joint development of service rollouts and advances in Internet services, consumer electronics and health care, among other factors. 5G will impact the market as communications services become more integrated and embedded into business process and value chain flows.

NEC 5G Vertical Business Platform has been designed to provide full stack capabilities of deliver innovative vertical 5G services. These digital service capabilities will enable CSPs to continuously add new application and services for industry verticals to create new business and monetization opportunities for network operators and enterprises. The solution's universal platform capability minimizes integration efforts and decreases time-to-market by supporting broad vertical business operations on a single platform. The best-of-breed capability based on a cutting-edge ecosystem and sophisticated automation and orchestration capability enables continuous 5G service innovation at incredible speed.

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