Network Transformation with NFV and SDN

A journey toward sustainable competitive advantage

Table of Contents

Executive Summary

The introduction of SDN and Network Functions Virtualization (NFV) has ushered in a new era of innovation that enables communication service providers (CSPs) to create highly automated networks and introduce new customized services. Leading CSPs recognize that innovation does not only come from within; they are constantly looking outside the organization for partners with whom they can jointly capitalize on new market opportunities. An innovative professional service partner can help CSPs take advantage of these immediate opportunities while facilitating a long-term transformation strategy to achieve a sustainable competitive advantage.

Introduction

The evolution of virtualization technology has disrupted traditional service delivery. Alternative cloud service or over-the-top (OTT) providers such as Skype and Line 2 are leveraging these virtualization technologies to rapidly roll out a new platform and services. As enterprises and consumers shift their applications to a cloud-based environment, these nimble OTT players, supported by automated and programmatic platforms, can swiftly scale up new services to address unanticipated demands as well as "fail fast" by almost instantaneously scaling down unsuccessful services. Rapid innovation has slowly but surely rendered conventional network connectivity a commodity.

Transforming to a Virtualized Environment

To remain relevant in today's market and avoid marginalization, CSPs must leverage the latest SDN and NFV innovations to provide virtualized end-to-end solutions that immediately address customers' evolving requirements. CSPs also need to initiate a foundational transformation to build a sustained long-term competitive advantage. Juniper Networks defines foundational transformation as a profound change in the business model, service development processes, skills, and culture.

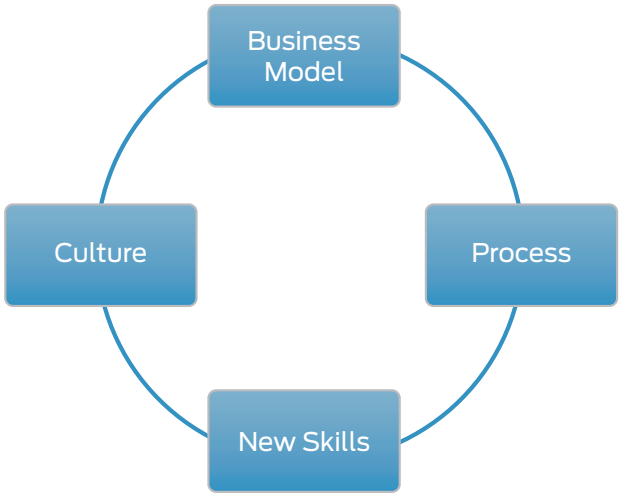

Figure 1: Transformation process

Business Model Evolution

Traditional network infrastructures are designed and deployed in a rigid and complex fashion, with hardcoded workflows and limited flexibility. Service deployment can take from 12 to 18 months, require large upfront capital investments, and demand significant resources to integrate, test, and deploy. As a result, CSPs have traditionally taken a risk-averse approach to new service deployment, limiting their ability to respond to market changes and exploit new opportunities.

A virtualized network based on SDN and NFV technologies transforms this business model and disrupts traditional network economics. Virtualization technologies can significantly reduce upfront capital expenses (CapEx), while a highly scalable and flexible IP infrastructure layer can be optimized instantaneously for efficiency, lowering operational expenses (OpEx). An automated service orchestration layer improves time to market, enabling CSPs to quickly capitalize on new market opportunities with new services.

This increased agility enables CSPs to transform their business, allowing them to offer new services and data analytics as part of a platform-based, on-demand, and pay-as-you-grow model. Lower CapEx and OpEx also allow CSPs to effectively expand their service footprint and target new customer segments and geographies. The resulting expansion of the service portfolio increases customer relevance and drives profitability.

DevOps Practice and Agile Development Methods

Service development has traditionally relied on a waterfall process comprised of multiple stages, each with highly defined requirements that must be completed sequentially. Features are predefined and functionalities are delivered all at once. Needless to say, traditional service development is a lengthy process, compounded by the need to perform time-consuming manual testing over a complex hardware-centric infrastructure. As a result, by the time the service or application is finally delivered, the market has moved on and customer requirements have evolved.

The emergence of DevOps, a new collaborative practice, establishes a process that involves developers and operational organizations collaborating, facilitating an exchange of ideas, and expediting decision making processes that lead to real action. Agile development, on the other hand, is a software development methodology involving cross-functional teams defined within the DevOps process. The agile development approach promotes service flexibility, where software development focuses on evolutionary development, early delivery of incremental features, and continuous improvements.

Moving towards a combined DevOps practice and an agile development methodology enables CSPs to dramatically accelerate the development process, reducing service delivery from months or years to mere days—all while continuously delivering relevant innovation.

Software Development Skill

One of the most dramatic transformations that CSPs must undergo to take full advantages of SDN and NFV is the cultivation of their software development skills. While network engineering will continue to serve a critical role in managing and maintaining the core network, CSPs need to enhance their software development skills as services gradually shift toward an open, programmable platform.

Traditionally, CSPs have relied on outsourced vendors to complement their internal software development needs. However, they have predominantly focused on developing proprietary hardware, often at the expense of applications and an open platform. The transformation to virtualized networks requires CSPs to rapidly build development competencies combining IP, IT, and open-source APIs, leading to simplified integration with third-party open platforms and eliminating legacy lock-in.

Cultural Transformation

It's well established that successful companies undergo constant transformation. Companies such as Apple, IBM, and General Electric have radically transformed their core business over time to retain their leadership position. What is not appreciated is that organizational cultures also need to undergo periodic reinvention. An organizational culture that was appropriate when CSPs focused on hardware-centric connectivity services would not be a good fit for the "software-centric" mentality that prevails in Web services, content, and media companies today.

True culture turnaround requires a complete psychological shift across the entire organization. While it is relatively easy for a start-up with a clean slate to establish the right culture, such a transformation is considerably more complex and problematic for CSPs with an extensive legacy and operating history that involves both external and internal environments.

External cultural transformation defines interactions with those outside the organization, focusing on enterprise customers and consumers. The most foundational transition is for CSPs to shift away from a connectivity mentality to that of an end-to-end solution provider. User experiences are paramount where CSPs need to gain the agility required to enhance the core businesses of their enterprise customers while launching new personalized consumer services.

The internal cultural transformation, on the other hand, requires CSPs to adopt an innovative mentality. The transition to virtualization will require a breakdown of entrenched silos and a more collaborative environment across business units as well as with external partners. Innovation that fosters experimentation with new "beta" services for market traction and promotes a "fast fail" approach must be encouraged. Skill acquisition—where employees are constantly learning new software development and agile methodologies—should also be emphasized.

Company culture is an intangible asset that must be developed and nurtured. The right corporate culture helps CSPs align organizational structures that expedite decision making and establish a long-term competitive advantage.

Professional Services Partners

A transformation is not an incremental change but a retooling that enables the CSP to achieve sustainable improvements in performance, build competitive advantage, and establish a clear path toward its future technology evolution. Due to their comprehensive nature and the need for CSPs to execute them quickly, transformations are complex endeavors, and the risk of failing to realize their full value or implementing new processes and technologies in a timely fashion is high.

To be transformation ready, CSPs first need a clear view of their current capabilities; this will help them identify relative strengths and weaknesses and select an experienced professional services partner that complements their skill set. A professional services partner with a proven track record in rolling out innovative technology platforms can facilitate

transformation more consistently and predictably, make informed technology migration recommendations, and work more effectively and efficiently with the CSP organization as well as with third-party vendors and solution providers.

To evaluate an appropriate professional services partner and how well that partner will fit into the larger organization, CSPs must answer the following questions:

- *Which specific capabilities are needed to support this transformation?* Capabilities include innovation, technical expertise, business planning, and operational excellence.
- *What are our capabilities today, how good do they need to be, and are they available when required?* What, where, and when are reinforcements required in order to reach the desired objectives?
- *What gaps do we need to immediately bridge?* Define capabilities in the areas where they are needed most.

CSPs can leverage the service life cycle as a framework to help structure and answer these questions and select the appropriate professional services. At a high level, three phases comprise an end-to-end view of the service life cycle: plan, build, and operate. Each of these phases encompasses a unique set of objectives that prepare CSPs to meet a broad set of transformation and performance improvement goals.

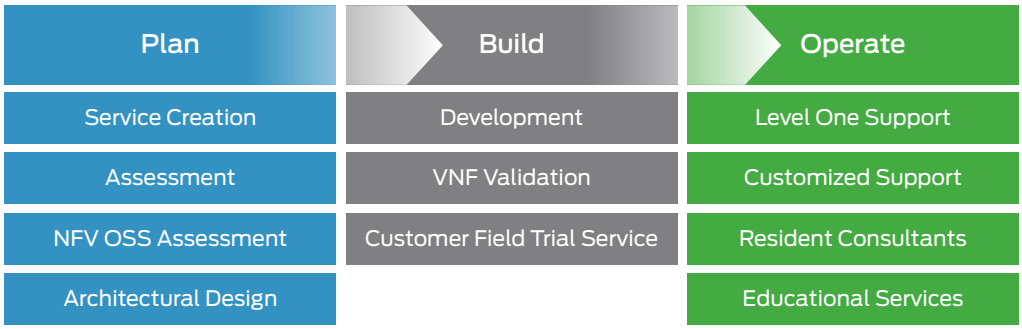

Figure 2: Service life cycle framework

Plan

The "plan" phase involves understanding the business requirements, defining proposed services, and evaluating technology options. There are two functions during the plan phase: *service creation* and *assessment*. Service creation accelerates the go-to-market and planning of new technology platforms. It helps CSPs identify, define, and evaluate new services as well as determine potential business impacts on existing services. Service creation engagement typically involves creating business cases and financial models. This includes forecasting cash inflow and outflow (statement of cash flows), analyzing margins (profit and loss statements), and assessing financial requirements and their respective impact on equipment assets (balance sheet). These financial models help CSPs contrast revenue and OpEx savings between traditional and virtualized solutions, ROI, and TCO.

Assessments enable CSPs to evaluate the integration of new technologies to complement or upgrade existing services and infrastructure. Assessments are aimed at establishing a clear project plan and implementation path that eases the transition into an NFV framework while determining a targeted service rollout to ensure operational readiness. Evaluation typically entails developing a high-level network architecture; configuring and integrating existing operations and business support systems (OSS/BSS); system migration; and mitigating potential impacts on services and the organization.

Build

There are three distinct "build" phase components: *development, validation,* and *trial*. Development takes complex requirements from the plan phase, develops an implementable solution using existing NFV frameworks, and provisions newly created virtualized network functions (VNFs) into a service environment. Validation involves testing VNFs with specific network hardware. A broad testing protocol is followed, including benchmark testing against recommended service specifications, testing the management interface with third-party applications, and interoperability testing with existing network components. The trial phase accelerates deployment and time to value by testing the market acceptance and potential impact on sales and operations within a limited market segment.

Operate

The "operate" phase optimizes and extends new service capabilities deployed during the build phase. It also executes all of the support services required to keep the NFV environment operating and meeting service-level expectations. Depending on the go-to-market path, a professional service partner might be the prime contract owner for the end-to-end NFV project delivery and support. This requires triage and interoperability support with third-party organizations. The operate phase usually includes several large components:

- Level One support providing proactive reports for problem identification, network diagnostics, and resolution across the reference architecture.
- Level Two network service providing more in-depth support of customized deployments.
- Resident engineering resources that provide onsite operational assistance and expertise for all NFV-related technologies and products.
- Resident consultants providing customized design, planning, interoperability, and deployment guidance. Resident consultants also proactively analyze potential service enhancements and optimize solution performance.
- Education services enabling service providers to build a foundation on SDN and NFV technologies in order to configure and operate VNFs.

Juniper Networks Professional Services

Juniper Networks® Professional Services helps CSPs execute foundational transformations that lead to significant competitive advantages and new revenue streams. Managing a network transformation and NFV implementation requires solid planning capabilities, extensive knowledge, and the application of industry best practices to ensure that projects progress smoothly and with minimum risk. Based on years of experience gained from hundreds of global project experiences, Juniper Professional Services leverages a breadth of experiences and a databank of known risks to successfully execute the transformation journey.

Juniper Networks has developed an integrated methodology to manage and execute every step of the Plan, Build, and Operate phases of the service life cycle. At the heart of this integrated methodology is Juniper's structured Service Creation Program and Assessment approach. The Service Creation Program begins by evaluating and sizing the market opportunity and determining the best new service opportunities, as well as identifying the most attractive market segments and verticals. Next, Juniper Professional Services consultants develop a business case for the new service, incorporating comprehensive cash flow models to help CSPs understand the key economic levers, think through different scenarios, and consider the economics of virtualization. Juniper's Service Creation Program also provides comprehensive go-to-market planning and support, including detailed service definitions, pricing, and marketing campaign development.

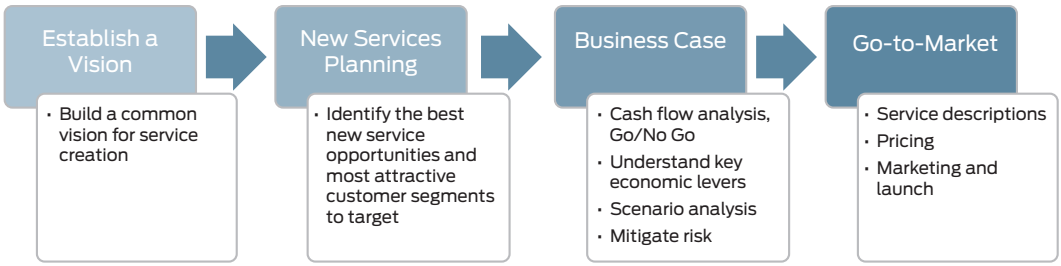

Figure 3: Juniper Service Creation Program

While the Service Creation Program is centered on business strategy and marketing, Juniper Professional Services also works with CSPs in parallel to assess existing business operations. These assessments highlight the gaps and dependencies for integrating an NFV framework, allowing CSPs to foresee and identify milestones, understand the challenges, and plan an optimal path to deploy services within the shortest feasible timeframe. Ultimately, Juniper Professional Services experts can leverage assessment findings to provide a more relevant and accurate project scope and assist CSPs to move towards NFV deployments.

Juniper Networks has extensive experience helping CSPs build and migrate to virtualized platforms, including integration into a multivendor environment, to ensure a smooth transition with minimal or no disruption to existing services and applications. The capabilities available from Juniper during this Build phase include network design, development, installation, and integration of the NFV platform with existing OSS/BSS systems. This phase also includes testing of the virtual network as well as new VNFs. The testing process is based on proven methodologies and environments, allowing CSPs to validate the newly created services based on the proposed implementation and ultimately ensuring interoperability and service-level assurance.

Juniper Professional Services facilitates operational excellence, enabling CSPs to meet performance benchmarks and maximize business objectives with newly deployed services. Service adoption ensures proper network handoffs where customer-focused technical support services identify and resolve issues specific to customer deployment. Additional onsite engineering and consulting services provide both operational and technical assistance, applying Juniper best practices to facilitate a smooth transformation from physical to virtualized environments.

An integrated approach to Plan, Build, and Operate has been developed to align with the Juniper Project Management Methodology (JPMM), which uses standard processes that are scalable yet tailored for each engagement. It provides project management and control as well as a process for identifying and mitigating risks. The methodology delivers a controlled and organized project cycle with flexible decision points, regular progress reviews, and timely completion of projects within budget guidelines and to specification.

Juniper Networks Professional Services also offers a broad range of consulting and customized implementation services to help CSPs transform and migrate to an NFV environment:

- CPE Service Creation Advisory: The CPE Service Creation Advisory service enables CSPs to accelerate the adoption of virtualization for business services such as Cloud CPE. The Advisory service helps CSPs identify, define, evaluate, and launch new services as well as evaluate the potential impact of new business models on existing services.
- CPE Assessment: The CPE Assessment service examines existing services delivered by physical customer premises equipment (CPE) devices and lays out a migration plan and roadmap for decoupling these services from physical hardware to a virtualized solution.
- NFV OSS Assessment: The NFV OSS Assessment service focuses on the OSS/BSS design, management, orchestration, and evaluation of business objectives that can be achieved through deployment and integration of the Juniper Networks Contrail Service Orchestration platform with existing OSS/BSS systems.
- VNF Life-Cycle Service: The VNF Life-Cycle service is a suite of capabilities focused on assuring customers that third-party VNFs are compatible with Juniper's NFV solutions.
- CPE Design and Deployment Services: The CPE Design and Deployment service ensures the optimized design and deployment of CPE-based networks with the Juniper CPE solution architecture.

Additional information on Juniper Networks Professional Services can be found here.

Juniper Networks Education Services and Juniper OpenLab

The best path to NFV transformation depends on a team with the proper training, skills, and knowledge to manage this complicated process. An in-depth knowledge of SDN architecture design, NFV capabilities, and the best operational practices will allow CSPs to make better upfront decisions, resulting in a more complete and successful transformation that minimizes risk and service disruptions.

Juniper Networks Education Services develops and complements the CSP's internal skills and knowledge needed for successful transformation. Education Services helps CSPs extract maximum value from the NFV platform via a combination of custom, onsite knowledge transfer from consultants, and the extensive formal training curriculum tailored to stated goals. A robust catalog of courses from Juniper Networks Education Services delivers the foundation of knowledge and expertise required to effectively design, configure, and operate the next-generation NFV platform. Additional information on Juniper Networks Education Services and Customized Training can be found here.

Juniper OpenLab is an innovation center that provides unique resources for innovators who want to build network-integrated software applications and solutions. OpenLab offers locally and remotely accessible software and hardware resources, enabling innovators to accelerate application development while minimizing risks and infrastructure costs. Resident educational programs and networking experts enable CSPs and third-party developers to conceptualize, develop, test, and validate solutions that harness the automated programmability of Juniper NFV solutions. Additional information on Juniper OpenLab can be found here.

Conclusion

The emergence of SDN, NFV, and virtualization technologies has ushered in a new era of innovation. In the face of these innovations and opportunities, CSPs can maximize business outcomes by undergoing a strategic transformation in business models, internal processes, and culture, while providing training and re-skilling of new software capabilities. CSPs must also leverage existing SDN and NFV solutions to unlock immediate market opportunities in this increasingly competitive market.

More than ever, transformation has become a priority where many forward-looking technology companies are launching preemptive transformations while they still hold a market-leading position, constantly retooling themselves to stay ahead. Only an experienced partner with proven capabilities and transformational experience, complemented by an open, extensible technology platform, can facilitate this transformation process.

Juniper Networks has an unwavering commitment to innovative transformation. With its field-proven service life cycle framework and experience from deployments with global service providers, Juniper has been a collaborative partner for unlocking market opportunities while driving sustainable long-term competitive advantages. Juniper is a leader that has helped CSPs complete the shift from packet solutions to IP platforms, and we will continue working together to facilitate this transformation journey into NFV and beyond.

About Juniper Networks

Juniper Networks challenges the status quo with products, solutions and services that transform the economics of networking. Our team co-innovates with customers and partners to deliver automated, scalable and secure networks with agility, performance and value. Additional information can be found at Juniper Networks or connect with Juniper on Twitter and Facebook.

Corporate and Sales Headquarters
Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, CA 94089 USA
Phone: 888.JUNIPER (888.586.4737)
or +1.408.745.2000
Fax: +1.408.745.2100
www.juniper.net

APAC and EMEA Headquarters
Juniper Networks International B.V.
Boeing Avenue 240
1119 PZ Schiphol-Rijk
Amsterdam, The Netherlands
Phone: +31.0.207.125.700
Fax: +31.0.207.125.701

2000628-002-EN Mar 2017