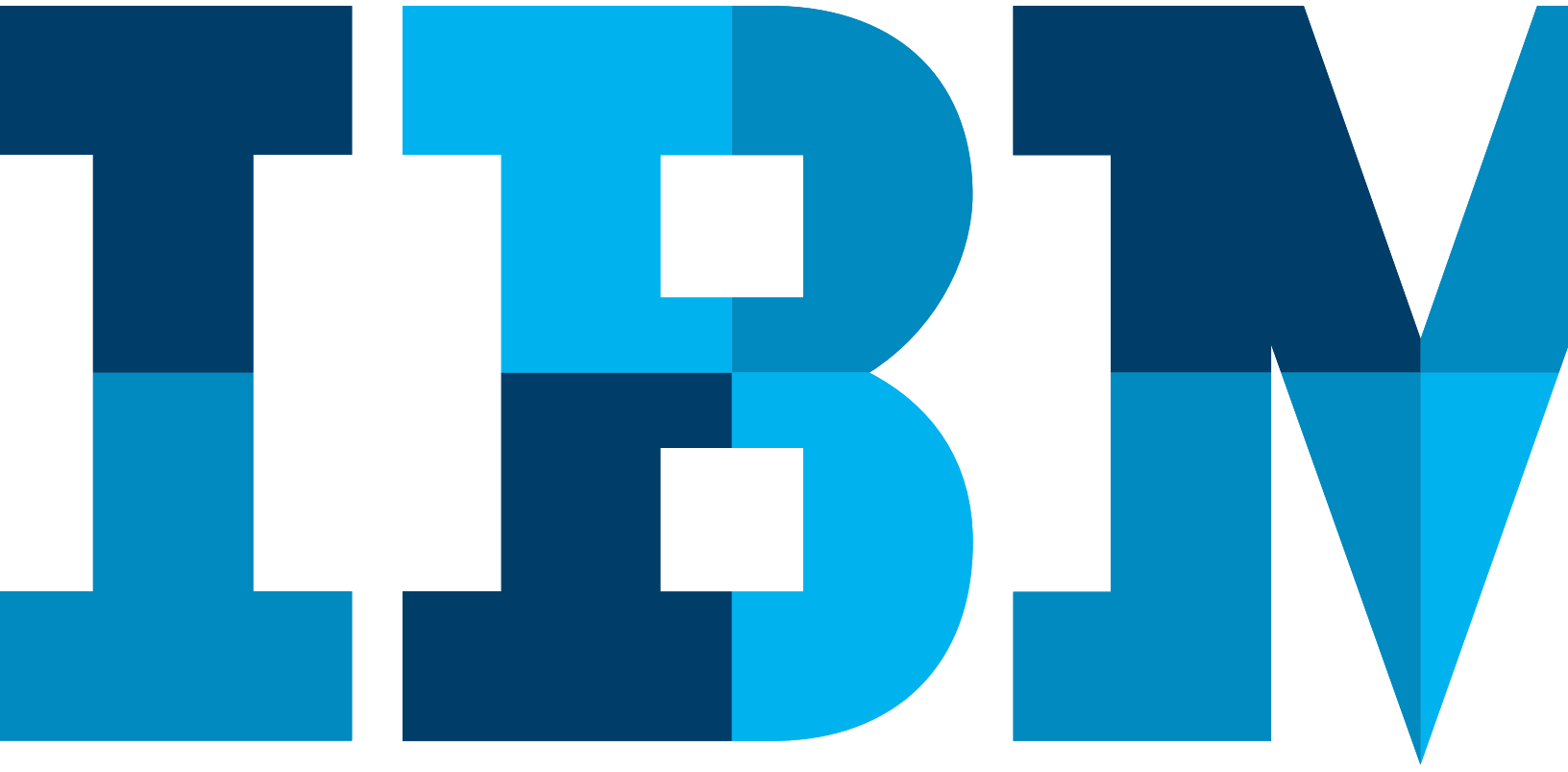
IBM Telecommunications, Media and Entertainment
White Paper

Building the Next Generation Network



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Building the Next Generation Network

In an age where change is the only constant, traditional methods only breed traditional results.

Innovation, transformation and customer engagement are more than mere buzz words; they are the key to a business' survival and competitive edge. Delivering a quality product to the right audience in real time is the new imperative. Traditional technology is no longer capable of driving those results.

Technology should not be a barrier to market innovation. New and improved features can be built, tested and made available for operational use within days and weeks, not months and years. Traditional models designed for large project delivery constrain business innovation and impede organizations from maximizing the benefit of agile transformation.

Agile transformation methods are now being applied to software-defined networking (SDN) and network functions virtualization (NFV).

Business objectives for SDN/NFV

NFV is widely accepted in the industry as the platform for future networks and services. Service providers must now decide when to deploy NFV services and the associated infrastructure. This decision must be based on business strategy. Improve agility and the speed of deploying new services? Reduce the cost of supporting services? Refresh current platforms? Gain a competitive advantage with the latest technology?

NFV is an emerging technology, and development will continue for at least the next five years. Current NFV programs aim to gain early experience and competitive advantage with the new technology. Service providers may not expect cost savings from NFV in the short term. However, in the medium term, cost reduction is a reasonable expectation along with new revenue streams. In contrast, there are use cases today for SDN in the WAN that improve service delivery and reduce cost, such as the automation of provisioning in complex enterprise networks. These are being combined with NFV to enable cost reduction and speed to market to realize cost saving and revenue growth. In addition, new use of virtualization, delivered "as-a-service," provides rapid realization of some of the virtualization savings–along with the ability to add new services more rapidly while the larger transformation is in process within a service provider.

In the long term, cloud-based networking and the ability to deliver network services, will enable cost reduction in CAPEX and OPEX of the network. This reduction will provide the ability to drive revenue growth as CSP's create and deliver services faster, and expose those services to innovators for further revenue growth.

NFV adoption path

Business strategy should drive an NFV program. A service provider needs to consider three interrelated factors when implementing NFV.

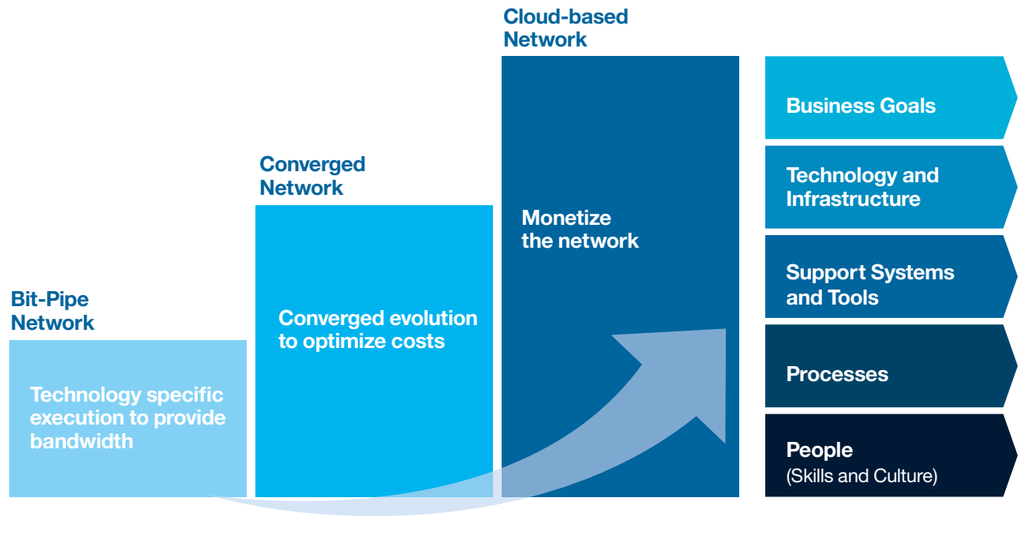

Figure 1: Assess and develop an overall network transformation plan – **Systems, Processes and Organization** transitioning from Legacy/Physical to Virtual/Cloud-based networking environment

1. Does the service provider want to exercise technical control of the program, or just financial control? This decision leads to the selection of a single prime contractor or a system integrator.

2. Does the service provider want a multi-vendor strategy, or are they happy to work with a single vendor? Single vendor may lead to a partnership but at some cost in flexibility.

   An NFV ecosystem is emerging, with multiple specialist vendors providing hardware components such as chips, servers and switches, and software components such as individual virtual network functions (VNF), monitoring tools and orchestration. This ecosystem will drive progress, and service providers will benefit from an open approach.

3. Does the service provider want technical control of the architecture, selecting the best components for each purpose or does the service provider want to control the cloud-based network or the services enabled in a cloud environment? The simplicity of a pre-integrated stack from a single vendor, though it may speed implementation, may come at a cost in flexibility and potential lock-in. Building components or selecting components that need integration may cause the transformation to take longer while allowing the flexibility. An on-premises deployment may allow greater understanding while off premises may allow for rapid deployment with varying degrees of openness and function. Balancing these options based on the needs of the business will allow the right virtual solutions and services for a service provide to seize value and agility from cloud-based networking.

NFV program options

Once the service provider has decided on a strategy, the next step is to consider the participants in an NFV program and their roles. Here are three ways to structure an NFV program.

1. In the classic operate program model of design-build-transfer, a vendor designs and implements a network, and hands over operations to the service provider. This may be a familiar model, and is best suited when the service provider selects a single technology vendor. But it can also be used in the new cloud-based networking model with a network-as-a-service approach to enable the use of virtual networking on an OPEX basis while a service provider transforms their operations to cloud-based networking.
2. Outsourcing has proven its value for realizing transformation, and is most appropriate if the service provider does not have the skills required to develop or run the program. It is not recommended for NFV at the current time as it relies on an established technology platform and commodity skills which are not yet available.
3. With an NFV integration approach of design-build-transfer, an integrator takes responsibility for delivery, but involves the service provider in program management. This model is recommended for NFV programs and in some cases can be combined with the 'as-a-service' approach in build-operate-transfer option to drive combined value rapidly while executing a transformation program. It relies on the integrator's experience of running complex programs. It is essential that the service provider is a partner in the program management to ensure stakeholder alignment in a complex transformation.

The design phase includes vendors because NFV technology is still new. The service provider will benefit from involvement in the design phase to create skills and expertise across the organization.

Governance

NFV programs have multiple stakeholders, including marketing, network strategy, security and operations. This is likely to be a highly political environment. However, this also enables the base of agility of a DevOps environment needed to fully realize the agility of network virtualization. One recommendation is to appoint an experienced program manager who can align the stakeholders while also ensuring successful delivery.

NFV involves the transformation of technology used in the network, the processes used to provision the network and services, the operations and maintenance of the network, and ultimately the organization itself.

An NFV program will be complex, and will probably involve multiple suppliers. It is likely that these will involve: NFV infrastructure (NFVi) made of compute, storage, and network components,Virtual Infrastructure Management (VIM) that provides cloud software (an OpenStack distribution or a virtualization platform like VMware) for control of the infrastructure along with control of the network resources through software definition, and network functions from multiple VNF vendors, an OSS vendor, and a system integrator.

Service providers often underestimate the program scope and complexity for cloud and need to consider:

- Scope definition
- Mobilization of resources
- Geographic location of resources

IBM and NFV Integration

IBM is working with service providers on NFV integration programs. IBM's long experience of managing complex system integration projects is directly applicable to NFV. IBM services include program governance, project management, architecture, and technical design authority, as well as integration, infrastructure design and implementation and operations support.

NFV roadmap

The operator with no experience on NFV should start with either a network "as a service" approach or a proof of concept, with the objective of creating a core team that is familiar with the technology and issues. This team will lead the future NFV program. The business risk of going straight to a full production program is too great.

The next step is to create an NFV lab to be used for technology selection and infrastructure prototyping. Cloud-based networking labs can be made with on-premises and off-premises solutions or use a hybrid environment of resources as a trial for learning. The final stage is the creation of production infrastructure, and includes the wide area infrastructure and the NFV data center. One of the key principles is the use of automation to reduce operating costs: NFV infrastructure should be no different on cloud infrastructure such as IBM SoftLayer® or a third-party service.

Operations

The first challenge in operations is developing the skills to operate and maintain a cloud platform. One approach is to work with a partner who has the required skills and can help to transform the operations team and processes.

Automation is essential to derive benefit from a cloud environment and can be applied to provisioning and testing. Automated testing applies to any potential change to infrastructure or service, and requires a test instance of the NFV infrastructure. The operational model is key to successfully delivering NFV. How are new services on-boarded, tested, and delivered into operation? What is the lifecycle for new software releases and patches?

Operations requires imbedding operational thinking into the development of the virtual service. Thinking about the lifecycle of the service being built from virtual functions shifts how service needs to perform beyond deployment through the stages of the service from the design/develop side to the operate side. Operations needs to be automated as much as possible throughout this lifecycle thinking. Lifecycle management requires enabling the multiple transitions that may occur in the ongoing life of a service (scale, heal, patch) and simplifying how those transitions are made across the multiple services enabled in a cloud-based network. This lifecycle thinking is important to simplify operations for services today and sustain them. As services scale and also become native on the cloud, built on micro-services, this simplified approach to lifecycle management will be critical for networking in a hyper-scaling cloud.

Other areas requiring management focus

Open source technology is different from proprietary products, and not just in the price. Open source technology (such as Linux, OpenStack) is developed by a community and enables rapid innovation from the community. The service provider needs to understand how the open source development process works and how the open source releases can be integrated and supported moving forward. Selecting a distribution that provides support is recommended. That support, combined with an integration service for customization and additional capabilities can help a provider create differentiated value from its competition as the software is implemented.

Skills

Few, if any, operators today have enough staff members skilled in NFV to deploy a project. Also, the industry has a lack of people with cloud skills. One of the advantages of an NFV integrator is a pool of highly skilled people with experience from multiple implementation projects. In addition, if an 'as-a-service' approach is used, common resources can be leveraged to realize virtual benefit while developing skills and a resourcing stratgey.

The industry needs a skills model that is adaptable, where new skills can be developed as they emerge, while retaining a foundation that is technology independent. Individual technologies will continue to develop, though the underlying technology will not; end-to-end architecture and project management are the keys to success.

Applying the DevOps approach to the network

Cloud-based networking opens up the ability to use a similar approach for software-based networking to help rapidly invent new services, update services, and remediate other services.

Agile Network DevOps can help to improve and speed the return on investment in the network. Combining Agile Network DevOps with real-time OSS creates a whole new end-to-end ability for network operations through OSS for cloud-based networking.

Agile Network DevOps help take innovation of a new service from concept to reality. Using agile methods and tools, network services and functions can be composed instead of hardwired. Network services can be tested automatically using the same virtual environment to allow for rapid deployment of a test environment and traffic at scale, and then, when the service has been tested, the resources used can be commissioned for other purposes.

Agile Network DevOps also help in bringing together the new software integration environment brought on by NFV and SDN in cloud-based networking. The power of the cloud can be used for software development to manage the various levels of network software, enable compatibility and confirm the viability of network function combinations that make up the services enabled on the cloud-based network.

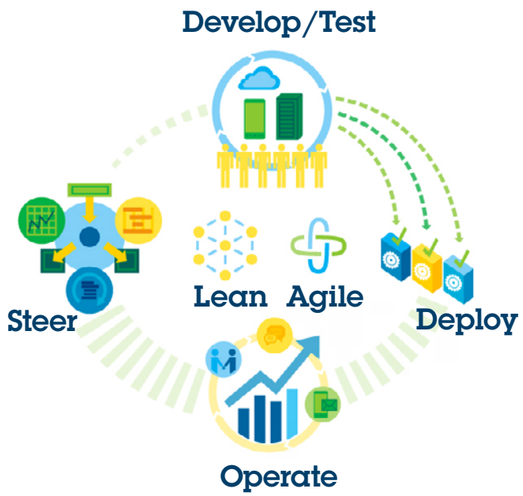

Figure 2: Agile Network DevOps enables a CSP with delivery capability for rapid creation, testing, deployment, continuous improvement and lifecycle management of innovative cloud-based network services

Agile Network DevOps can also be used when combined with cloud innovation to allow for exposing new network services to an emerging cloud development environment. In a carrier or service provider environment, it is essential to verify the operation of new virtual network functions before deployment in production. IBM has developed patent-pending technology for automating the deployment of virtual network functions and the corresponding test functions on a cloud infrastructure, and once testing is complete for using SDN to move the functions into production.

Moving to the new network infrastructures and business models is a complex transformation, but with significant reward that can give the service provider new business models and options. As discussed here, multiple options exist for approaching NFV transformation; a key element is a plan to weigh the options and benefits, identify ROI and business impact, and the creation of a roadmap to success.

IBM services and solutions experts can assist the service provider in developing plans that smooth and accelerate the transition to reach real business benefit. IBM services teams use proven methodologies to build an overall strategy, roadmap and business case, craft a management framework for governance and program execution, and apply in-depth expertise in organizational and change management.

For more information

To learn more about IBM cloud-based networking solutions for the telecommunications industry, please contact your IBM representative or IBM Business Partner, or visit: **ibm.com**/industries/telecom-media-entertainment/telecommunications.html

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