Ensuring Success in a Virtual World:

Demystifying SDN and NFV Migrations

ixia

Get Migration Right the First Time

The "virtualization" of traditional networks promises vast and enduring benefits — if the challenges inherent in the process can be overcome. In replacing proven technologies with unproven techniques, a new approach is needed to reduce complexity, mitigate risk, and get it right the first time.

Today's networks need to adapt quickly, and facilitate change. Strategies like Network Functions Virtualization (NFV) and Software Defined Networking (SDN) provide powerful flexibility gains by moving functions like CPE, BRAS, load balancing, firewalls, and EPC/IMS components off dedicated hardware onto virtualized servers.

Virtualization Drivers:

▸ Speeds delivery and monetization of new services

▸ Enables faster, more elastic scaling of services

▸ Increases automation and "tunability"

▸ Uses open technology, simplifies management

▸ Dramatically reduces spending, total cost of ownership (TCO)

Virtualization Obstacles:

▸ Complexity and performance

▸ New elements like hypervisors and vSwitches introduce new vulnerabilities

▸ Management and orchestration (M&O) of physically or geographically disbursed functionality

▸ Maintaining visibility into "east-west" traffic between virtualized functions within a server

▸ Maintaining dual or blended infrastructures
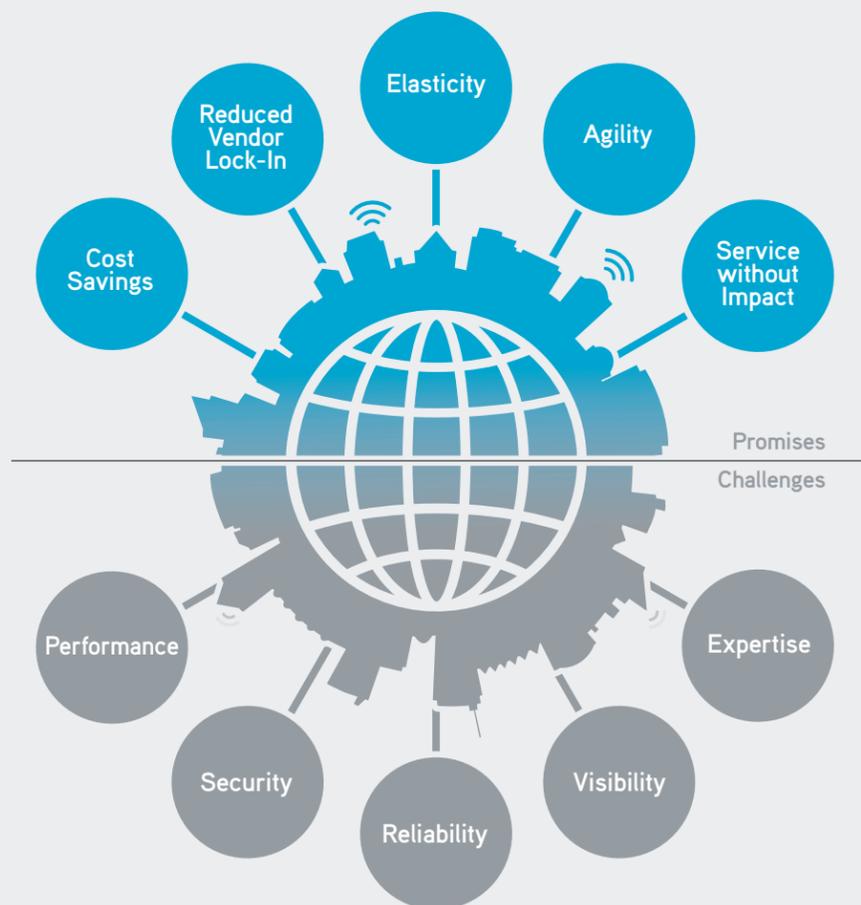
Technology becomes more open, provisioning more fluid, and networks more application-aware. Through increased agility and software-based control, virtualization delivers dramatic cost-savings, and a new networking model that fast-tracks delivery of high-value services.

But at the very least, virtualized network functions (VNFs) need to deliver the same or better performance than the traditional network. With false starts likely to impact the brand as well as the budget, new and old strategies are needed to quantify the benefits, and overcome challenges.

Demystify the Process, Deliver on the Promise

With virtualization, everything known — and proven — becomes unknown and unproven again. Complexity increases. New network elements introduce new vulnerabilities. Visibility is lost as the traditional physical boundaries become blurred in the cloud.

To transcend the hype, and achieve the very real benefits, vital questions need to be answered:

▸ What benefits do we hope to achieve?
▸ Which functions should be virtualized and when?
▸ How will migration to commercial hardware — and the cloud — impact the user experience?
▸ How do we maintain visibility as everything scales?

And last but not least:

▸ How do we know it worked?

Throughout the migration process, enterprises and service providers must weigh the trade-offs between quality and cost; flexibility and control. Moving too fast, and not fast enough.

That's where Ixia comes in, with the industry's only life-cycle solution for eliminating the guesswork, and validating the benefits of virtualization each step of the way.

Validating Virtualization:
How Do We Get from Here to There?

Virtualization won't happen with the flip of a switch. Blended networks, consisting of both physical and virtual components, will exist for some time to come.
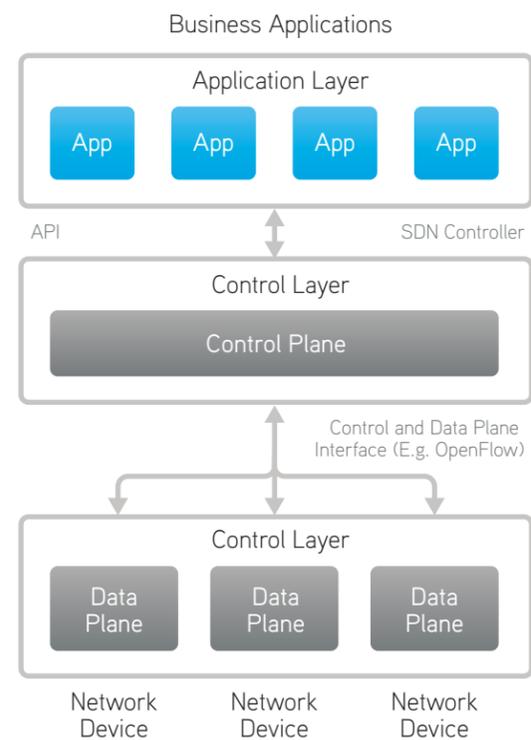
In displacing vital network functions — putting user satisfaction at risk — the practical steps and impact must be fully understood each step of the way. A mix of physical and virtual assessment capabilities are required to fully validate success.

The Virtualization Validation Life-cycle: When, What, and How?

Plan. Test. Secure. Monitor. Optimize. Assess.

What are the goals?
- Baseline current physical device performance to establish goals
- Physical and virtual testing can be used and tailored to the current environment

Will it work?
- Functional and performance testing during Development/ QA
- Virtual test solutions speed setup, reduce cost and cycles, and allow simultaneous testing by multiple engineers

Does it scale?
- High-capacity load testing at realistic scale
- Physical test systems deliver realistic scale and ultra-high accuracy and precision for "apples to apples" comparisons

Does it work in the real world?
- Simulation of live deployments and "what if" testing
- A mix of physical and virtual testing allows precise replication of production networks and intended configurations

Are we meeting expectations?
- Ongoing real-time monitoring of performance and security; replication of field issues in the lab
- Mix of physical and virtual taps (vTaps) ensures 100% visibility into the new network model, including "east-west" traffic between VMs

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End-to-end validation strategies include asking the right questions throughout migration:

- **What are the goals?** Before starting the process, the current performance of physical devices should be baselined, and the target benefits of NFV defined.

- **Will it work?** Virtualized functionality and newly added features must be validated — quickly and completely. Virtual test solutions speed and streamline Development and Quality Assurance (QA) testing with rapid setup and low physical resource requirements.

  Test virtual machines (VMs) can be instantiated on demand, and many virtual assessments and regressions conducted simultaneously, without having to configure and share physical testers.

- **Does it scale?** Can the VNF really replace the physical system? Here, traditional testers deliver powerful advantages in simulating high scale and session rates, and testing real-world capacity.

  High-precision testing helps optimize elasticity as well as performance. Generating traffic with the highest capacity and accuracy, physical testing enables "apples to apples" comparisons between traditional and virtualized functions.

  Testing helps manufacturers define and market new offerings, and allows network operators to compare products slated for deployment in virtualized infrastructures.

Business Applications

Application Layer

| App | App | App | App |

API   SDN Controller

Control Layer

Control Plane

Control and Data Plane Interface (E.g. OpenFlow)

Control Layer

| Data Plane | Data Plane | Data Plane |

Network Device | Network Device | Network Device

In Software Defined Networking (SDN), control of the network is abstracted from the data plane and centralized. SDN simplifies traffic management, increases programmability by external applications, and facilitates customization.
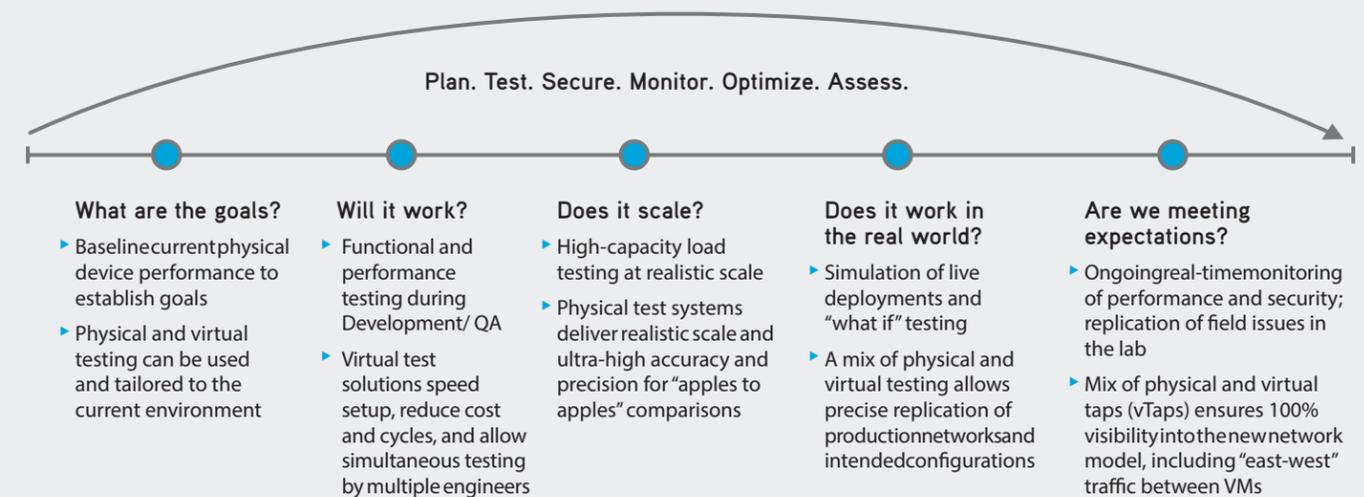
- **Does it work in the real world?** Every network is different, and every network changes. Once key decisions are made, testing to real-world conditions can validate performance prior to deployment.
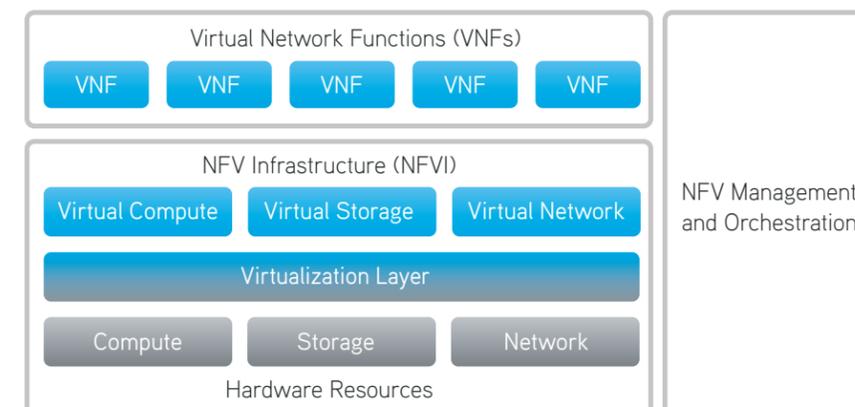
  Here, a mix of physical and virtual testing combines to efficiently replicate the complexities of a hybrid production environment. Intended configurations and new-service activations can be modeled prior to taking on real user traffic.

- **Are we meeting expectations?** Even after all of the above, surprises can still arise upon migration. Physical and virtual test and monitoring solutions can be used to quickly replicate field issues back in the lab to fast-track solutions.

From there, real-time monitoring is needed on an ongoing basis to verify performance and security as deployments evolve. Proactive monitoring also provides a valuable feedback loop that informs ongoing development.

Once again, a mix of physical and virtual solutions combine to cover all the bases. New virtual taps (vTaps) introduce new visibility into the "east-west" traffic between VMs on the server created by virtualization.

Both physical and virtualized testing are needed as deployments evolve to include tens of thousands VMs and functions. The vulnerability of new infrastructure components such as hypervisors and virtual switches (vSwitches) must also be verified.

Virtual Network Functions (VNFs)

| VNF | VNF | VNF | VNF | VNF |

NFV Infrastructure (NFVI)

| Virtual Compute | Virtual Storage | Virtual Network |

Virtualization Layer

| Compute | Storage | Network |

Hardware Resources

NFV Management and Orchestration

NFV increases agility and lowers TCO. NFV reduces the need for specialized hardware and improves the efficiency of resource utilization. At the same time, new architectural elements like hypervisors and vSwitches represent new variables that can compromise performance and introduce new security targets.

Ixia's Life-cycle Advantage:
Testing Virtualization + Virtualized Testing

Making the right decision means taking the right approach to validation throughout the migration process. Ixia offers the industry's only life-cycle solution for ensuring success, and the front-lines experience needed to know what to do when.

Testing with Ixia eliminates guesswork, and reduces the risk and complexity associated with migration. Our test and visibility platforms deliver the insight needed to move forward with confidence, reduce time-to-market, and ensure the quality of the end-user experience (QoE).

Ixia's Test and Visibility Solutions Provide the Industry's Broadest Coverage

L2/3
IxNetwork tests switching and routing infrastructures, and evolving data center architectures

L4-7
IxLoad delivers L4-7 load and application performance testing for wired and wireless networks and products at scale

Wireless
IxVeriWave provides industry-leading Wi-Fi performance and offload testing

IxLoad enables end-to-end testing of 3G and LTE network infrastructures

Security
BreakingPoint testing of security readiness and network resiliency

Visibility
Net Optics and *Net Tool Optimizer*™ monitoring taps and network packet broker (NPB) solutions for highly efficient, real-time monitoring of network, verification, and security performance

Ixia delivers the two vital components of validation: the testing of virtualization, and the virtualization of testing. Along with the *IxVM* virtual editions of our market-leading L2/3 ad L4-7 test platforms, Ixia continues to innovate test and visibility capabilities designed to optimize SDN and NFV from the ground up.

Physical and Virtual Innovation

In traditional testing with physical test ports, VNFs under test are provisioned on the server and mapped to physical network interface card (NIC) interfaces. Forwarding and protocol performance, scalability, and other critical aspects and variables of performance are measured:

- vSwitch and VNF performance
- Optimal resource allocation to VMs
- Instantiation and termination of new services
- Elasticity
- VM migration and service portability

With the *IxVM* Virtual Editions of Ixia's market-leading *IxLoad* and *IxNetwork* test applications, virtualized test ports are inserted at the hypervisor level. *IxVM* acts as an emulated VNF(s) on the same or a different server as the VNFs under test, and executes the same set of tests as a physical tester to isolate and verify performance.

Both traditional testing with physical test ports and testing with virtual test ports measure the same Key Performance Indicators (KPIs), along with unique aspects of the virtual environment such as VNF and VM performance, and virtual appliance or service chaining. Ixia also delivers physical and virtual visibility solutions that efficiently monitor wired, wireless, and cloud-based networks at scale.

Our breakthrough Visibility Architecture provides continuous monitoring of VNFs as VMs move around, which is critical to restoring critical audit trails, hardening security, and ensuring compliance.

And we continue to innovate. Our solutions for testing and maintaining visibility into the newly virtualized environment include:

- *RackSim* virtualized data center simulation emulating large numbers of virtualized hosts running multiple hypervisors. RackSim is used to provision VMs with diverse profiles and to generate events such as start, stop, deploy, destroy, and migrate. RackSim models migration at scale, and lowers CAPEX and OPEX for large data centers over time.

- *AppLibrary* delivering a simplified framework for emulating realistic traffic mixes using pre-defined application flows. Used across multiple Ixia test applications, this specialized library validates scale and performance in content-aware networks and devices, generating traffic at line-rate 10G and 40G speeds.

- *Phantom vTaps* delivering 100% visibility into virtualized environments, including the inter-VM east-west traffic on shared servers. Software-based and vSwitch-agnostic, vTaps installed at the new hypervisor layer eliminate blind spots to optimize performance, capacity, throughput, and utilization of resources.

Why Partner with Ixia?

Ixia solutions test the new and unique aspects and challenges of virtual environments:

▸ **Performance testing of new elements** such as hypervisors, vSwitches, VMs, and VM managers

▸ **Simulating large-scale deployments** and the portability of VMs across multiple servers

▸ **Validating M&O scalability** across a massive virtual infrastructure

▸ **Comprehensive testing of VNFs** individually and in the context of the end-to-end system

▸ **Eliminating newly created blind spots** with visibility into east-west traffic between VMs

Virtualization is too valuable, and too risky, to go it alone. Visit **http://www.ixiacom.com/solutions/nfv-test/** to learn more about how testing with Ixia helps in making the most of networking's latest, most profound paradigm shift.
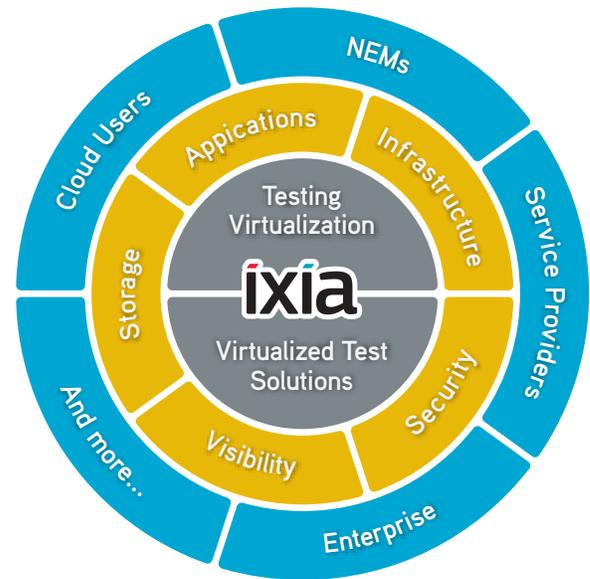
For a more in-depth look at optimizing migrations, download the first-of-its-kind eBook from Ixia, **Demystifying NFV: A Definitive Guide to Successful Migrations** at http://info.ixiacom.com/Mobile_NFV.html.

The Most Trusted Names in Networking Trust Ixia

World-leading chip and equipment manufacturers, service providers, and enterprises rely on Ixia as they build, monitor, and defend the networks their businesses run on. Visit www.ixiacom.com to browse our solutions for testing, monitoring, and securing your services, applications, and a high-quality user experience.

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