Simplify and Accelerate Network Migration

Use Cisco NSO to Introduce New Equipment and Capabilities with Less Time, Cost, and Risk

Executive Summary

New network device innovations emerge seemingly every day. Whether it's the expanded feature sets of next-generation network elements or new cloud capabilities of virtualized devices, service providers have more options than ever to bring new capabilities to customers and differentiate their offerings. Unfortunately, integrating new physical or virtual devices into existing networks can be enormously complex.

Now, service providers can make network migrations a lot simpler with Cisco Network Services Orchestrator (NSO). With NSO's industry-leading, model-driven service automation framework, you can take full advantage of new network device capabilities—much more quickly, with much less operational effort, and with less risk.

Overcoming Barriers to Network Migration

The one constant in life is change—and that holds true for service provider networks. Maybe you want to refresh hardware to take advantage of new features and more capacity. Maybe you have a single-vendor infrastructure and want to open it up to add Cisco equipment. Maybe you're contemplating a more significant transformation—looking to virtualize network elements and start taking advantage of the flexibility and elastic scalability of network functions virtualization (NFV). Pursuing any of these paths can help you reduce costs, complexity, and time-to-market. But actually implementing them in your existing network can be immensely challenging. The biggest problem: changing device configurations for deployed, active equipment can be extremely complex.

A large operator may have tens of thousands of network devices deployed in the field, all precisely configured for the live services they're supporting. Upgrading to newer equipment—much less transitioning to a virtualized environment—requires much more than simply dropping in a new device and switching it on. The device has to be properly configured for all services and interfaces it's supporting, as well as the OSS/BSS environment, to ensure that running services are not impacted. In many cases, there is no central real-time repository tracking all of these device configurations—they're stored in out-of-band spreadsheets or databases maintained by the network team. And even if those configurations are easily accessible, there is no simple way to apply them to the new device. Even similar configurations, for similar services, may need to be applied differently for the new equipment. All of this adds up to a messy, time-consuming manual project.

Migrations, even relatively straightforward hardware refreshes, also carry risk. Hundreds of customers may be depending on services running on a single device—services that are delivered under SLAs, with significant penalties if they're disrupted. Depending on what a device is doing and how it's configured, a single bad configuration can be enough to break a service. Which means that any network migration comes with an exhaustive testing cycle and lengthy burn-in period, once again consuming significant time and resources. Considering everything involved, it's no wonder that many operators are hesitant to upgrade networking equipment, even when they recognize the value that new features and capabilities would bring.

Barriers to Successful Migration and Automation

Growing Complexity
- Proliferating devices and service types
- Heterogeneous environments
- Legacy IT and automation can't keep up
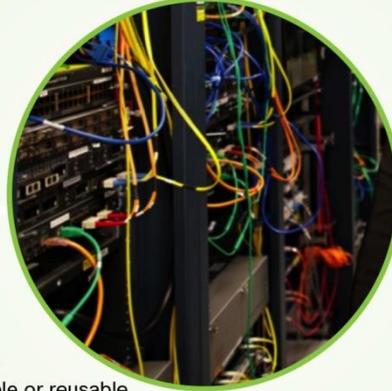
Lack of Visibility and Granular Control
- Data quality issues
- No transactional control
- Complex rollbacks and remediation

Current Automation Complex, Rigid, Fragile
- Hard-coded logic flows and CLI templates
- Fragile, programmatic adapters
- One-off solutions—not repeatable or reusable

Future Challenges
- Requirement for even more complex and dynamic services
- New technologies, elasticity, virtualization

High fallout ratios and broken configurations result in higher costs and slower service activation.

Simplify Network Migration with Cisco Network Services Orchestrator

Cisco makes carrier network migrations much simpler with Cisco Network Services Orchestrator (NSO) enabled by Tail-f. The world's leading vendor-agnostic service automation platform, Cisco NSO, along with our Advance Services organization, enables customers and partners to build solutions to add newer-generation devices, multivendor equipment, and virtualized network resources to your existing environment. With NSO, you can build tools or applications to help you add new equipment and capabilities much more quickly and easily—without disrupting existing services, re-engineering your OSS, or negatively affecting customers.

At the highest level, network migrations require a custom application to read configurations from current network elements, translate them for the new elements, and execute those changes in the network. Traditionally, each of those steps represents a custom software project, with explicit, hardcoded instructions for how to read and write to each individual device. Cisco NSO uses its model-driven framework to dramatically simplify this process.

A network migration tool built on Cisco NSO dynamically reads all of the configuration information for the currently deployed devices in your network. The application can then port current configurations to the new devices and ensure that they're performing as expected. Nothing has to be hardcoded, and you don't have to spell out every read and write step for each device. Instead, the application can use NSO service and device models to standardize and simplify the entire process in an automated fashion—even for migrations of thousands of devices. Additionally, once you've implemented Cisco NSO, you can continue to use it to manage network changes on an ongoing basis—with much less time, effort, and resources than traditional approaches.

NSO is offered by Cisco, but it's a pure multivendor solution. At its core is a model-driven architecture that uses the standard YANG language to model both services and devices. NSO models services in a device-agnostic way—defining just what the service needs to do, not every detail of how it interfaces with the equipment in your network to do it. You can add device models for any vendor's equipment (physical or virtual) in the same YANG modeling language. So you can continually add new devices and capabilities without having to take on an enormous manual project or manage endlessly proliferating scripts.

Simplify Migrations and Automate Service Delivery

Cisco Network Services Orchestrator (NSO) enabled by Tail-f

Inside Cisco NSO for Carrier Network Migration

Cisco NSO brings key capabilities to simplify network migrations:

- **Data models and data model mapping:** Cisco NSO models all services in a precise and semantically rich way using the standardized YANG data modelling language. It's this ability to use common data models and data model mapping to describe all services and devices that is the foundation of automating network configurations. By precisely describing both service-level intent and device-level configurations in a common language, Cisco NSO can manipulate data models programmatically. You can then map service models to device models declaratively—without manual coding, and without having to worry about hard-coded service logic or endlessly proliferating workflows.

- **State convergence:** In an ideal world, when updating networking equipment you would be able to describe the "intent" of the service (or the black box input parameters of the desired service or change), and have the system automatically translate that to real change in the network. Cisco NSO makes this a reality using the concept of state convergence. Using the same common data models and modeling language to describe services and devices, Cisco NSO fully automates device changes and other service modifications end to end. It maps design-time service definitions to the runtime state of the network programmatically, through a single, flexible data model for a service. And this data model mapping becomes an iterative process. Anytime you add a new device to the environment in the future (or make any other changes in the network or service) Cisco NSO dynamically reconfigures the network to fulfill the desired service intent. All of this happens in minutes or even seconds, at runtime.

What does all of this mean in practice for a network migration? When you deploy Cisco NSO in your environment, it connects to every device providing services and reads the current configurations into its configuration database (CDB). When you add a new device, you import a network element driver (NED) for that device. (NEDs are available for all Cisco devices, as well as hundreds of third-party physical and virtual devices.) Now, you can instruct Cisco NSO to push the existing service (described in a YANG service model) onto the new device, all at the application layer. NSO then determines the appropriate configuration for the new device and applies it—with very little manual coding required, and in many cases, none at all.
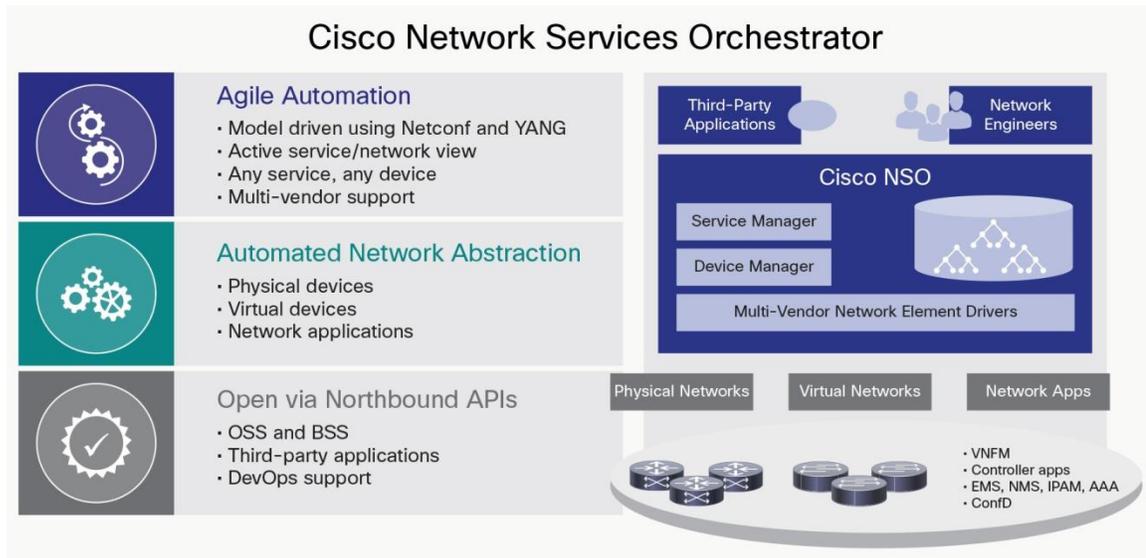
Once this initial process is complete and you have your services and devices described in YANG models—Cisco NSO can now maintain that current state through state convergence. If you change a service parameter or add or change a device, NSO automatically applies the appropriate configurations to deliver the service.

The Cisco NSO Migration Advantage

By using Cisco NSO to introduce new equipment, you can:

- **Accelerate and simplify migrations in your existing network:** Some vendors claim to offer model-driven automation, but they can only provide it in entirely new, "greenfield" environments. Cisco NSO extends model-driven automation to your existing "brownfield" environment. With the ability to automatically onboard existing services and configurations on currently deployed devices, NSO makes it easy to migrate to new equipment or virtualized resources. You don't have to rewrite all of your code, or create new adapters every time you want to add a new device. Much of the work involved in migration now happens automatically.

- **Reduce risk:** By eliminating the need for manual coding for each new device, Cisco NSO improves consistency and reduces human errors. NSO can automatically verify that services are still performing as expected after a change. And if there is an issue, it automatically rolls back any change—preventing service disruptions and preserving the customer experience.

- **Eliminate extensive OSS updates:** Because Cisco NSO maintains all service logic in its YANG-based models, without hard-coded logic, it eliminates the need for massive OSS updates every time you change devices. To northbound systems, the service is still just the service, and the same instructions are communicated over the same API. NSO just applies them now to the new devices. Even if you change your OSS to deliver new capabilities through new equipment, you only need to address the parameters of those new capabilities—NSO handles everything else.

Carrier-Class Migration Services

Simplifying device configurations is a critical part of network migration, but it is not the only part. That's why, in addition to Cisco NSO itself, Cisco offers a suite of professional migration services to complement NSO capabilities and accelerate any network evolution, large or small.

Cisco Carrier Class Migration (CCM) Services augment Cisco NSO with a range of Cisco products, services, and expertise to simplify network migrations, accelerate time-to-market, lower costs, and reduce risk. Part of Cisco's Migration Centre of Excellence, a CCM engagement combines essential hardware and software, best practices, process discipline, and the unparalleled expertise and experience of the Cisco Services team. These engagements include:

- Migration strategy and design, including a readiness assessment to clearly identify your needs for design, consolidation, standardization, and more.
- Cisco NSO service models and NEDs for existing network devices.
- Cisco NSO installation and integration, including test case development and implementation.
- Master and specific method-of-procedure (MOP) documents.
- Remote or onsite migration maintenance window support.
- NSO customization.

Through CCM, you get all the benefits of Cisco NSO delivered through a methodical, repeatable, and reliable service migration—even for the largest and most complex multivendor environments. Your team will collaborate with Cisco experts throughout the migration, and learn how best to continue taking advantage of NSO afterwards. And you can draw on Cisco's unrivaled network knowledge and expertise to help your migration deliver value vaster, at a lower cost, with less risk.

Take the Next Step in Your Network Evolution

Cisco is helping service providers around the globe to automate service delivery, increase innovation, and accelerate revenues with Cisco NSO. Our industry-leading orchestration platform can help you bring the benefits of new physical and virtualized networking solutions to your customers more quickly and easily. With the ability to automate a full range of multivendor physical and virtual devices across your existing environment, you can start capitalizing on new network capabilities without fear of massive manual integration projects, service disruptions, or runaway costs.

Find Out More

To find out more about Cisco Network Services Orchestrator, visit http://www.cisco.com/go/nso

To learn more about how Cisco Advanced Services can help your business, visit http://www.cisco.com/go/advancedservices

Printed in USA

C11-738703-00   03/17