



# Fastmap Templates in Cisco NSO

Rapidly developing a multi-vendor service

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# Use Case

## MEF ELAN

Multi-vendor PE configuration (including UNI)

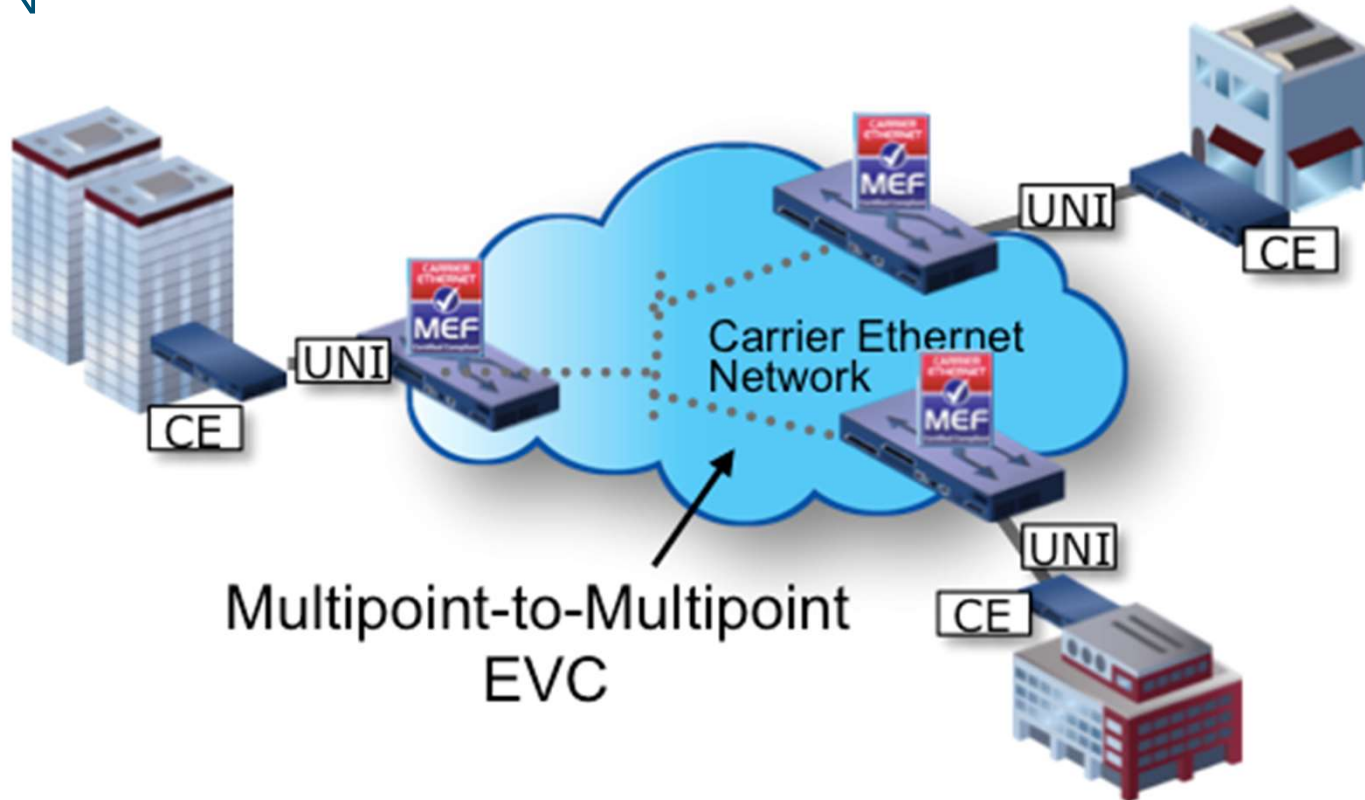
- Cisco IOS L2VPN
- Juniper Junos VPLS
- Alcatel-Lucent VPLS

CE configuration can be added later

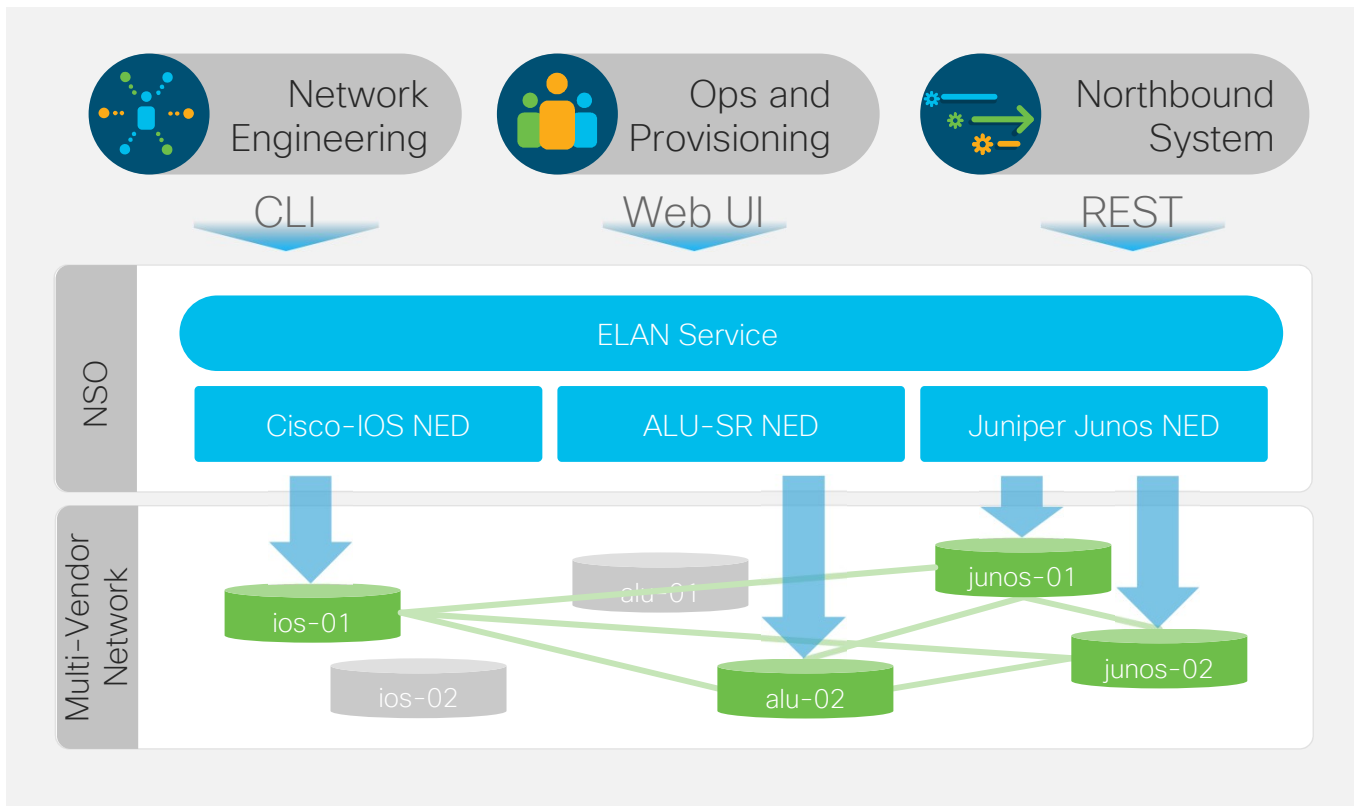
NSO template-only service (no code)

Create / update / migrate / repair and delete all supported

# ELAN



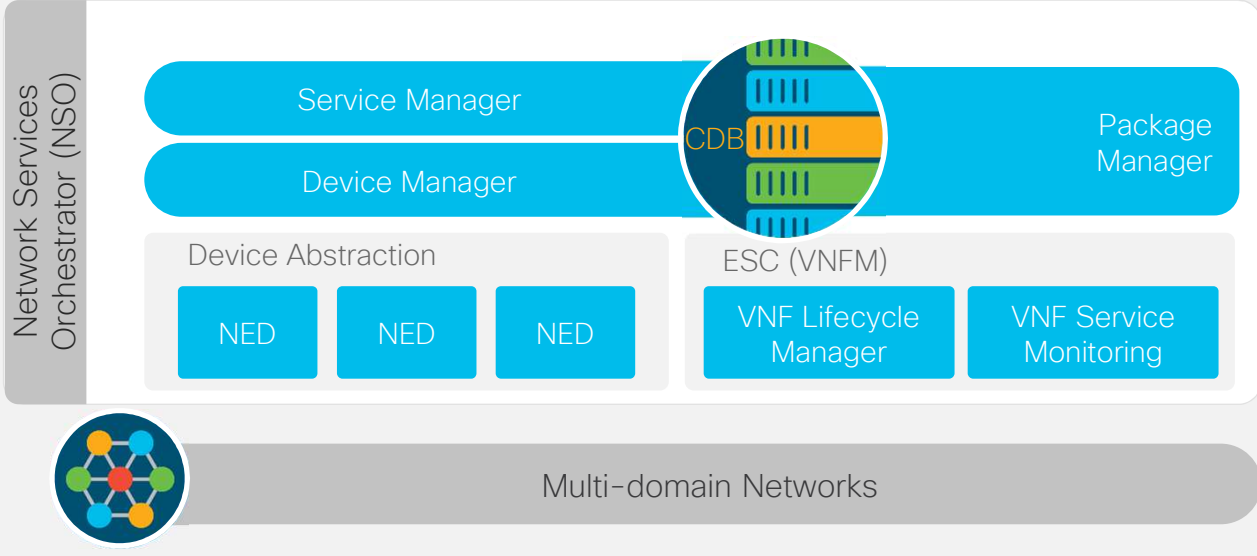
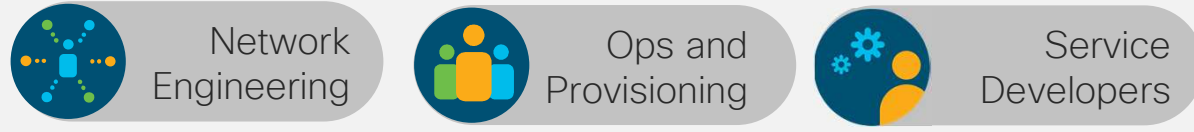
# NSO Multi-Vendor ELAN Service



# NSO Quick Overview



# System Overview



- Model-driven, end-to-end service lifecycle and customer experience focused
- Seamless integration with existing and future OSS/BSS environment
- Loosely-coupled and modular architecture leveraging open APIs and standard protocols
- Orchestration across multi-domain and multi-layer for network-wide, centralized policy and services



# Configuration Datastore



Network Engineering

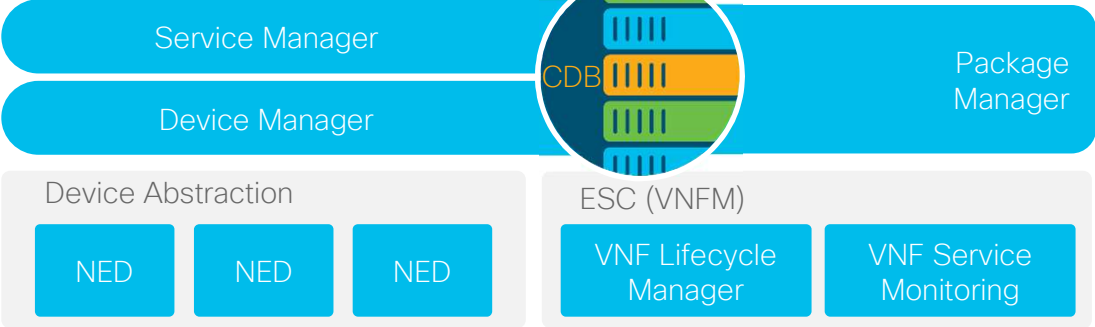


Ops and Provisioning



Service Developers

Network Services Orchestrator (NSO)



Multi-domain Networks

- Built for Speed at Scale
- In memory with journaled backend
  - YANG is native schema language
  - ...including when, must, XPath, etc.

- Highly Available
- 1:N hot-standby
  - Synchronous and asynchronous slaves
  - Slave chaining

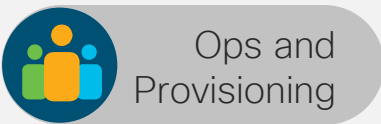
- Fully Integrated
- Managed through NSO interfaces
  - Runs in main process memory
  - Automatic versioning of YANG modules



# Network Element Drivers - Multivendor Abstraction



Network Engineering



Ops and Provisioning



Service Developers

Network Services Orchestrator (NSO)



Multi-domain Networks

A NED abstracts

- Underlying protocol and data-models
- Error-handling

The NED computes the ordered sequence of device-specific commands to go:

- From current configuration state
- To desired configuration state

Key benefits include:

- Removes the device adapter problem
- Removes complex device logic from the service logic



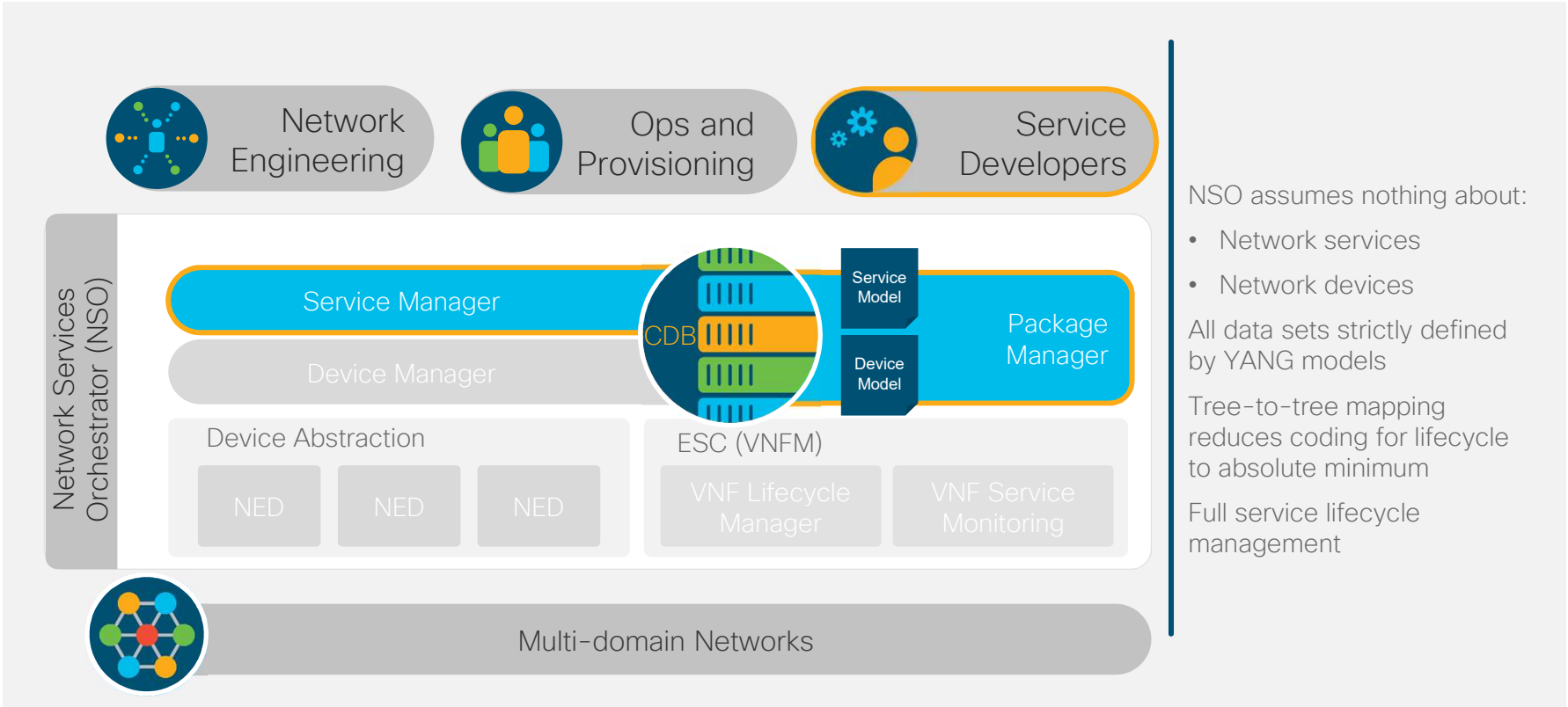


# Industry's Broadest Multivendor Support

Over 100 Supported NEDs – Customization Available




# Model-based Architecture



NSO assumes nothing about:

- Network services
- Network devices

All data sets strictly defined by YANG models

Tree-to-tree mapping reduces coding for lifecycle to absolute minimum

Full service lifecycle management



## Create

- Easy
- Given a set of service-level inputs, provide a known and valid output to network
- May require some additional resource collection to fulfill the configuration set



## Update

- Challenging
- Allow arbitrary changes to the network service
- May require collecting or handing back resources to fulfill configuration set



## Delete

- Hard
- Delete any given instance of a service and clean up the resources
- May require reference counting for shared resources

The ability to dry-run all operations is key for trust



# Stateful Convergence



Network Engineering

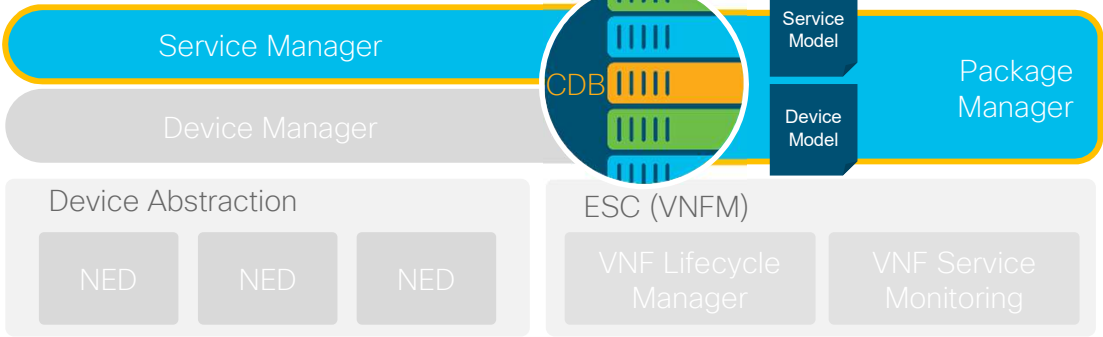


Ops and Provisioning



Service Developers

Network Services Orchestrator (NSO)



Multi-domain Networks

Only create operation needs to be declared

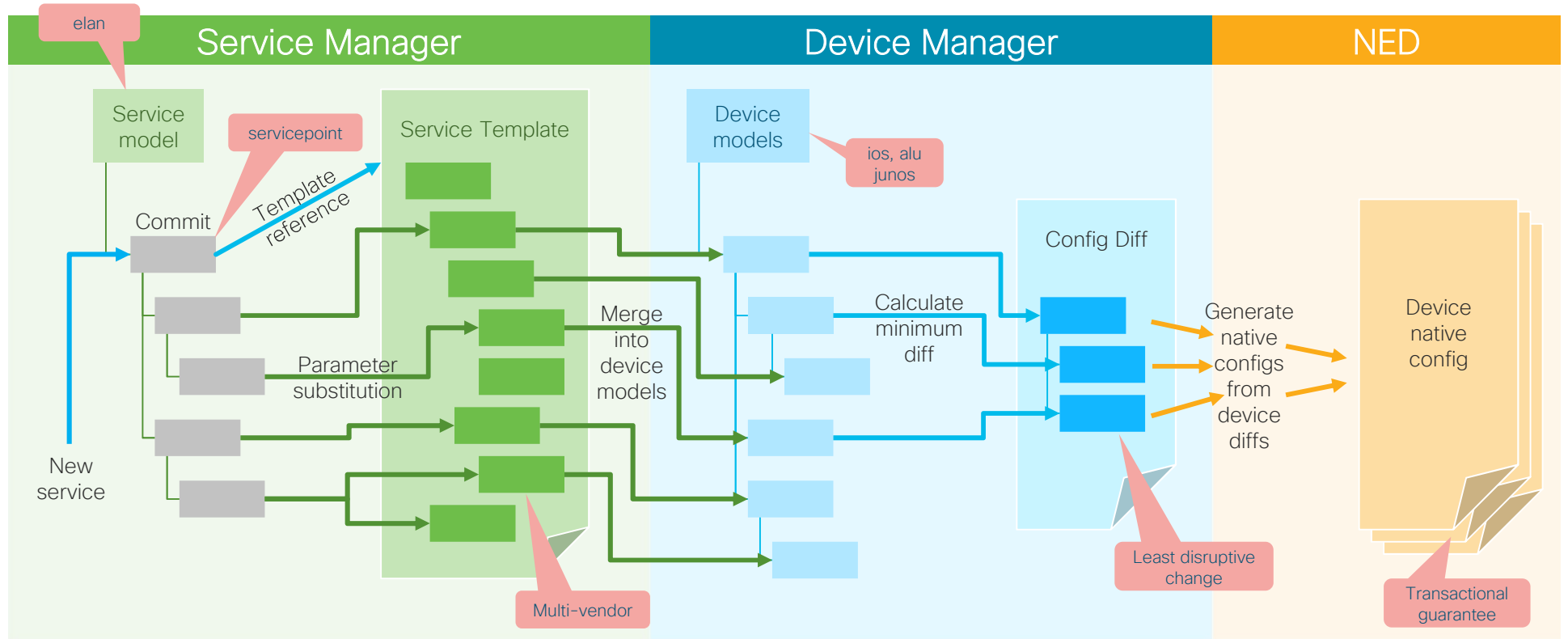
Update, delete inferred

Decomposition logic:

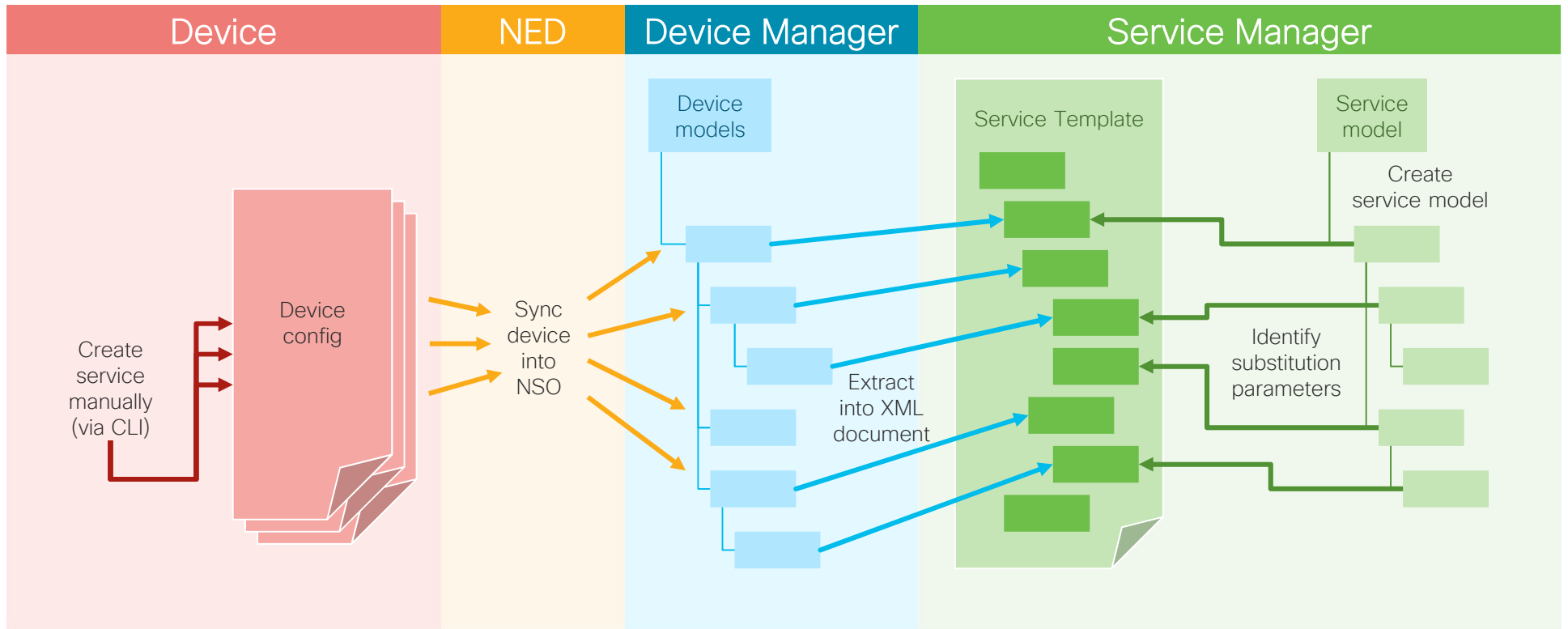
- Service templates for one-to-one mapping
- Java or Python for programmatic mapping (side effects, etc.)
- ...or a combination of both

# Templates Overview

# Using Service Templates



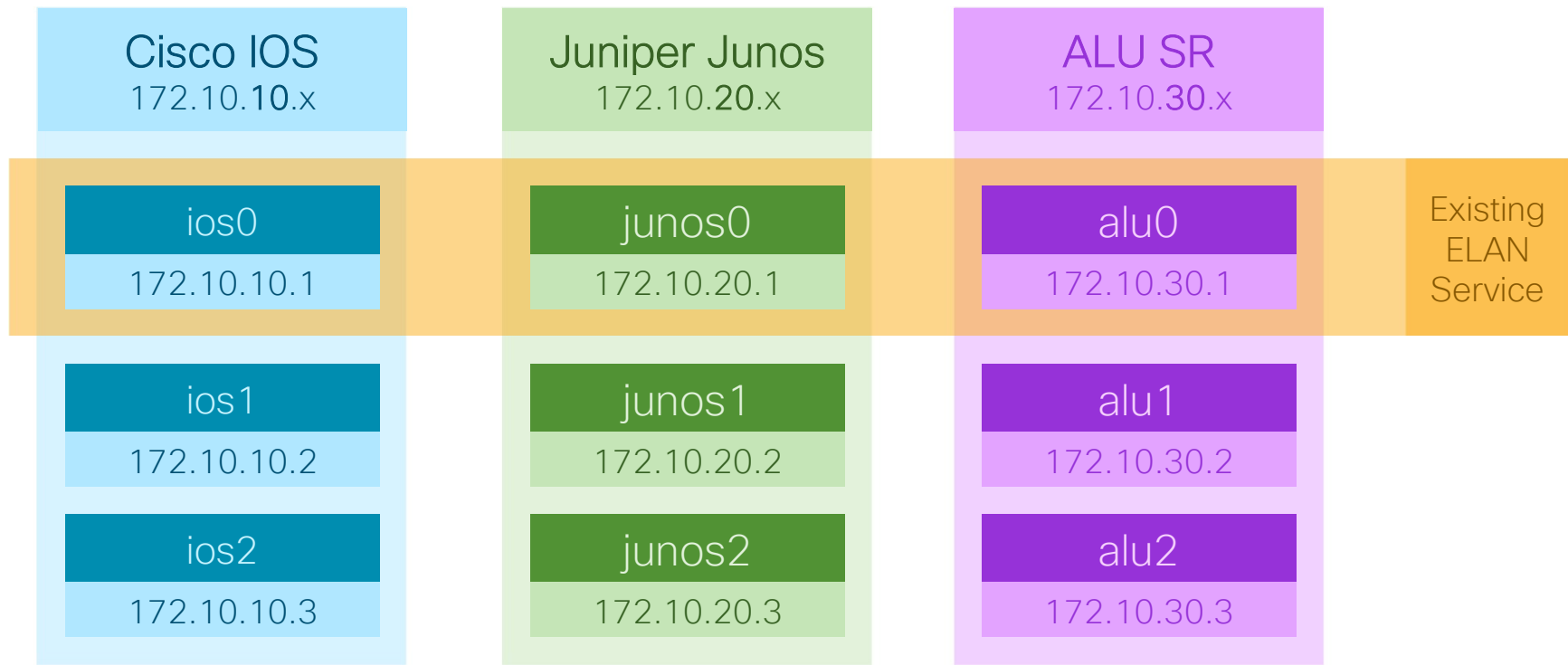
# Creating Service Templates

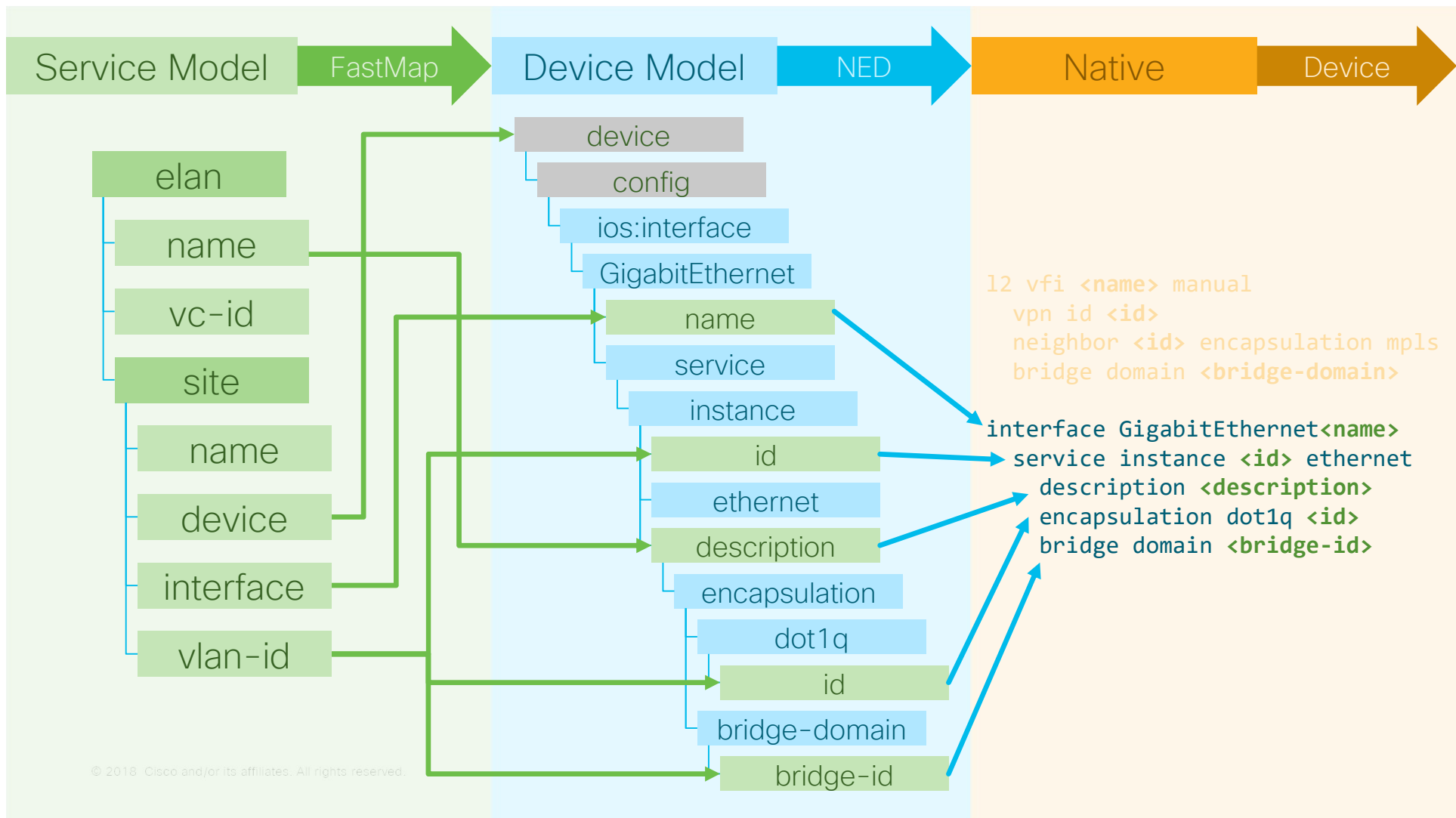


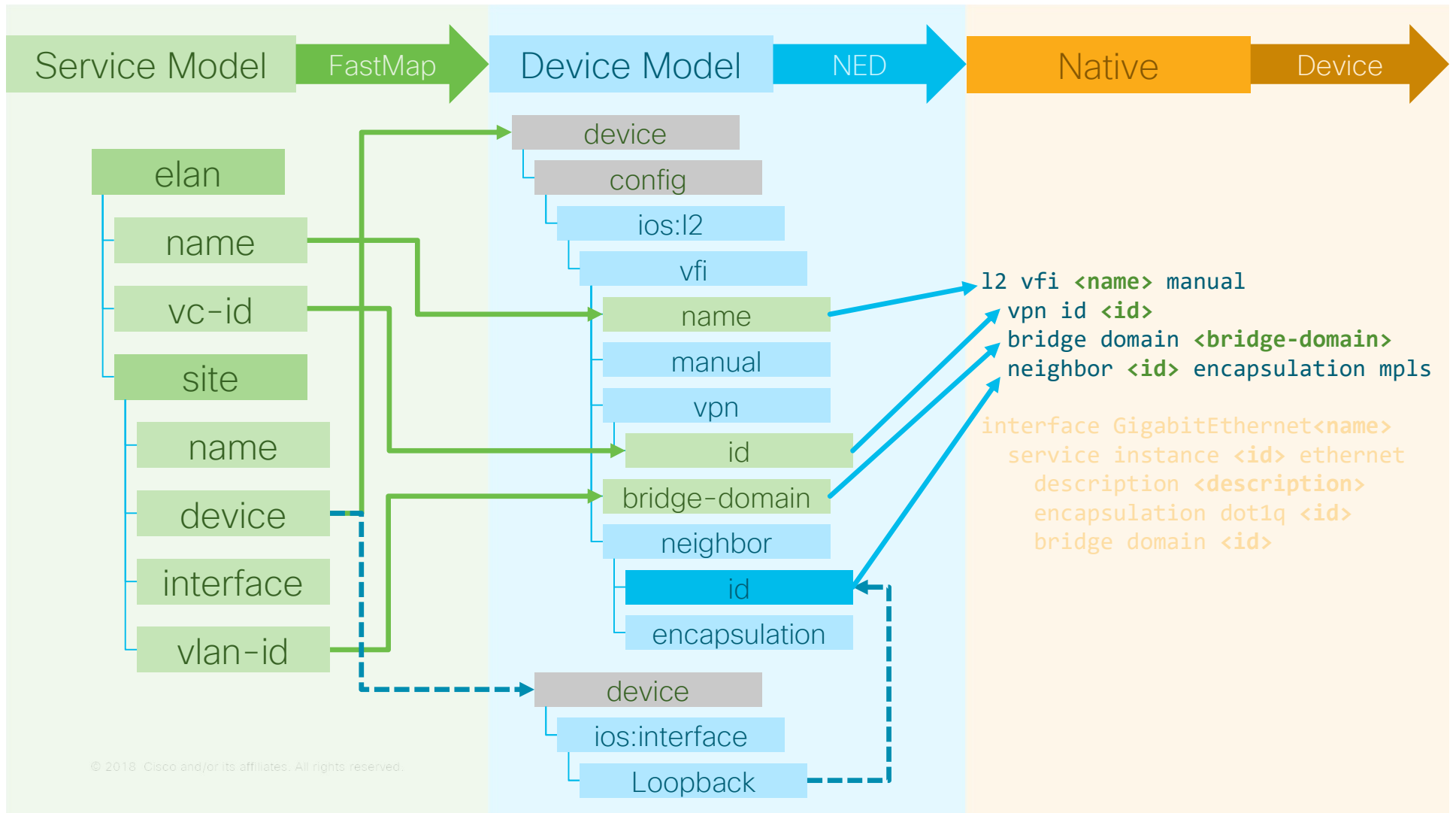
Demo



# Demo Devices







# Demo Summary

New ELAN service developed from scratch

Multiple ELAN services instantiated and updated

Sites added and removed cleanly (all neighbour sites automatically updated)

Device migrations tested (including across vendor)

Broken service repaired (for example, when loopback address is changed)

Web UI automatically generated (and used to provision services)

NBI (REST) automatically generated (and tested via Postman)

All device configuration tracked and removed when service deleted


Questions

# NSO Digital Ecosystem\*



External (Open for all) [www.cisco.com/go/nsodevnet](http://www.cisco.com/go/nsodevnet)


## Public material targeting partners and customers



Selected content



Training material



Shared code



Community and main repository of content and Q&A

\*Customer, Partner, and Cisco \*\*Cisco internal only

