A Network Source of Truth Promotes Trust in Network Automation
Today’s Presenters

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1. Why network engineers tend to distrust network automation
2. Building Trust in Network Automation with a Source of Truth
3. Cisco’s Network Automation Solution with NSO and Crosswork
4. Questions
Building Trust in Network Automation with a Source of Truth

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Agenda

- Network automation has a trust problem
- What is a source of truth and how can it help?
- Establishing an effective network source of truth
Network Automation has a Trust Problem
Only 44% of Companies Fully Trust Network Automation

Sample Size = 250

Trust correlates with success

• 2½ times more likely to be successful with automation
Network Automation Tools Need Data to Build Trust

- Network automation tools must understand the network before it changes the network
  - Network intent
  - Network state
- Data provides understanding
  - Network intent = Configuration data, inventory, policies, IP addresses, etc.
  - Network state = Telemetry, topology, events, etc.
The Trust Gap is Largely a Data Problem

96% of network automation pipelines are undermined by data trouble

- 24% “We are collecting bad data”
- 22% “Politics prevent us from collecting the right data”
- 15% “Inconsistency – we lack a source of truth”

Data Governance

- “We are exposed to someone making a change in the database that could break the network. We don’t have tight controls over those changes. We trust the tools, but we don’t trust the data we are using.”
  - Network reliability engineer, large North American enterprise
What is a Source of Truth and How Can it Help?
A Source of Truth is Foundational to Automation

- 98% of network automation initiatives include a source of truth
- What is it?
  - Authoritative network data repository
  - Provides insight into
    - Network intent
    - Network state
- Many flavors
  - Native capability of a commercial automation tool
  - Specialized, standalone repository
  - A collection of authoritative repositories (NCCM, IPAM, CMDB, etc.)
How a Source of Truth Helps Automation

- Answers critical questions
  - What is the intended state of the network?
  - What is the actual state of the network?
  - What will the network state be after I push automated change?
  - Did the change have the intended effect?

Companies that trust automation recognize the value of a source of truth

- Source of truth is essential
  - Fully trust automation: 58%
  - Partially trust automation: 29%
  - Don't trust automation: 17%

- Source of truth is helpful
  - Fully trust automation: 35%
  - Partially trust automation: 63%
  - Don't trust automation: 58%

- Source of truth has limited value
  - Fully trust automation: 5%
  - Partially trust automation: 6%
  - Don't trust automation: 25%
Establishing an Effective Network Source of Truth
Make it Authoritative

Data conflicts are fatal

• EMA research insights
  • **Authoritative** sources of truth are the best practice
  • Conflicting sources of truth correlate with failure

Network automation tools must recognize authority

• Multiple repositories collecting the same data? Designate one as the authority
• Other tools and data repositories must not overwrite this data
Feed the Right Data Into Your Source of Truth

Network intent and network state are both essential

Recipe for disaster: one without the other

• “We wait for [the NOC] to receive an SNMP trap. If we [commit a change] and nothing bad happens after 15 minutes, we know the change was good.”
  ➢ Network engineer, global pharmaceutical company
Feed the Right Data Into Your Source of Truth

EMA research insights

Essential data for a source of truth

1. Device state metrics
2. Shared services (IPAM, DNS, AD)
3. Network flows
4. Configuration data normalized into key value pairs
Data Management is Essential

**Security**
A source of truth will contain sensitive data
Implement authentication and role-based access control
Encrypt if practicable

**Scale**
Match storage and data processing capacity to your automation pipeline

**Quality**
Don’t rely on manual data entry
Watch for data collection errors
Don’t Try to Build a “God” Database

• A single source of truth is rare
  • 26% of automation initiatives
• 63% of companies have multiple authoritative repositories
  • Especially common for larger networks
• Data overlaps are okay, as long as authority is established
Don’t Try to Build a “God” Database

- You may already have the pieces in place
- “There isn’t a single source of truth. There are systems of record, like IPAM for IP addresses, and DCIM that has a record of all devices on the network. And another that tracks cabling. All of them can be combined to create a system of record.”
  - Network automation engineer
Final Thoughts

- The majority of companies do not fully trust network automation
- A source of truth engenders trust
- A source of truth reveals network intent and network state
- Establish an authoritative source of truth
  - Avoid conflicts
  - Protect data quality and security
  - Don’t force it all into one repository
The difference between faith and trust

Omar Sultan
Leader, Product Management – NSO & ESC
10 Jun 2020
Hello NSO!

170+ Devices, platforms and OSes supported

All top 10 service providers use NSO in production

30+ Cisco products/offers using NSO or ConfD

5x Post-acquisition growth in 3rd-party support

200 Customers

Rapid growth in large enterprises (financial services, healthcare, public sector)
The automation journey

**Task Automation**
- Single box, simple task
- Ex: Port Turnup
- Scope: Single team
- Trigger: Manual
- Metric: Successful Completion

**Device Automation**
- Single box, complex task
- Ex: ZTP
- Scope: Single team
- Trigger: Manual
- Metric: Completion

**Domain Automation**
- Multi-box, Multi-vendor, single domain
- Ex: L3VPN provisioning
- Scope: Single team
- Trigger: Domain-specific tooling
- Metric: Efficiency

**Cross-Domain Automation**
- Ex: Multi-Layer IP+Optical
- Scope: Multiple concurrent teams
- Trigger: Workflow tool chain
- Metric: Speed

**Business Automation**
- Automate full business processes
- Scope: Tech and LoB teams
- Ex: Auto-scaling services
- Trigger: Business process toolchain
- Metric: Flexibility

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State and idempotency

VS

HomeLink®

VS

HomeKit
Intent
CDB: Truth in advertising

CDB: authoritative source of configuration and operational data

- In memory database with journaled backend - runs in main process memory
- Allows a purely programmatic view of the network
- Managed through NSO interfaces and addressable via query API
- Globally scalable
- Single source of truth
ABC: Always be converging

Stateful convergence: NSO strives to ensure infra is in the state apps and services expect

- FastMap
  - Calculates the minimum diff to drive towards intent
- Reactive FastMap
  - Insurance against the unexpected (i.e. VMs started/moved/destroyed or topology changes)
  - Makes changes where it can and continually re-evaluates what still needs to be done

Infra in expected state

Predicable service behavior

Improved CX
Transactions and models = no more “oops”

• Provides a two-phase commit protocol to address distributed network atomicity
• Dry-run and rollback capabilities for changes
• Implements full ACID properties
• Uses YANG as native schema language
Automation is a team sport
Learn more about Cisco NSO

cisco.com/nso

More info on NSO and the ecosystem

developer.cisco.com/nso

Download a free copy of NSO and get access to developer resources

NSO Developer Hub

NSO community for developers and users
Please download the white paper

Available on

Light Reading and
cisco.com/go/ns0
Cisco NSO Developer Days, June 23–24, free virtual event
Register for free at https://cvent.me/VNrYM8
Join service provider and enterprise network automation professionals from around the world, virtually, for two days of learning and collaboration
Questions?
## Automating the Network Operations Lifecycle with Cisco Crosswork and NSO

<table>
<thead>
<tr>
<th>Day 0</th>
<th>Day 1</th>
<th>Day 2/N</th>
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<tbody>
<tr>
<td>Prepare</td>
<td>Plan</td>
<td>Integration</td>
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| **WAN Automation Engine** | **Network Insights** | **Network Service Orchestrator**  
Planning and predictive modelling to analysis potential scenarios  
Provides routing data analytics to significantly reduce mean time to repair  
“always on monitoring” to determine the integrity of infrastructure  
Mass scale intent-based configuration across multi-vendor |
| **Qualification Environment** | **Trust Insights** | **Network Controller**  
Rapid qualification and integration to support new feature and software delivery into production  
“always on monitoring” to determine the integrity of infrastructure  
Turnkey solution to end-to-end provisioning and management intent-based networks |
| **Situation Manager**  
Connect events across multi domains and provide root cause analysis.  
**Health Insights**  
Learn and measure health of network elements.  
**Change Automation**  
Safely execute operational tasks with structured workflows.  
**Optimization Engine**  
Optimize network paths to improve utilization & efficiency (SR-PCE)  
**Evolved Programmable Net Manager**  
Element and network management |

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