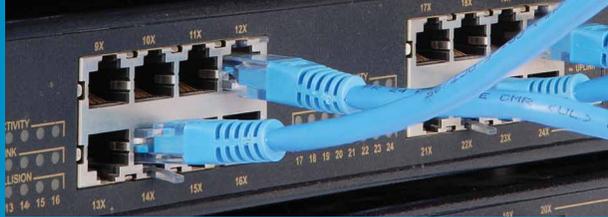# NCS

EMS/NMS Platforms for
Network Equipment Providers

NCS Overview

Tail-f's Network Control System (NCS) is a powerful solution for developing centralized management platforms that configure and monitor many network devices. Developers of element and network management systems (EMS/NMS) use NCS to build new management systems with a full range of fault, performance, and configuration management features, or to add powerful configuration management functionality to existing platforms. With NCS, developers can build first iterations of a management system in weeks rather than in many months.

NCS works with a wide range of network device interfaces including NETCONF, SNMP, and Command Line Interfaces (CLIs). Together, NCS and ConfD (Tail-f's on-device management software) provide network equipment providers with a powerful end-to-end management solution. No further coding is required for NCS to integrate with Cisco and Juniper equipment enabling EMS/NMS platforms to deliver out-of-the-box multi-vendor management capabilities.

Time-to-Market Pressures

Management applications have been traditionally developed using protocol-specific frameworks, such as SNMP. This approach is time consuming and lacks the capability to address complex applications that may span multiple management interfaces across many product lines.

A preferred approach is to use model-driven development where domain experts can immediately experience the effect of changes on a running system. General tools for model-driven deve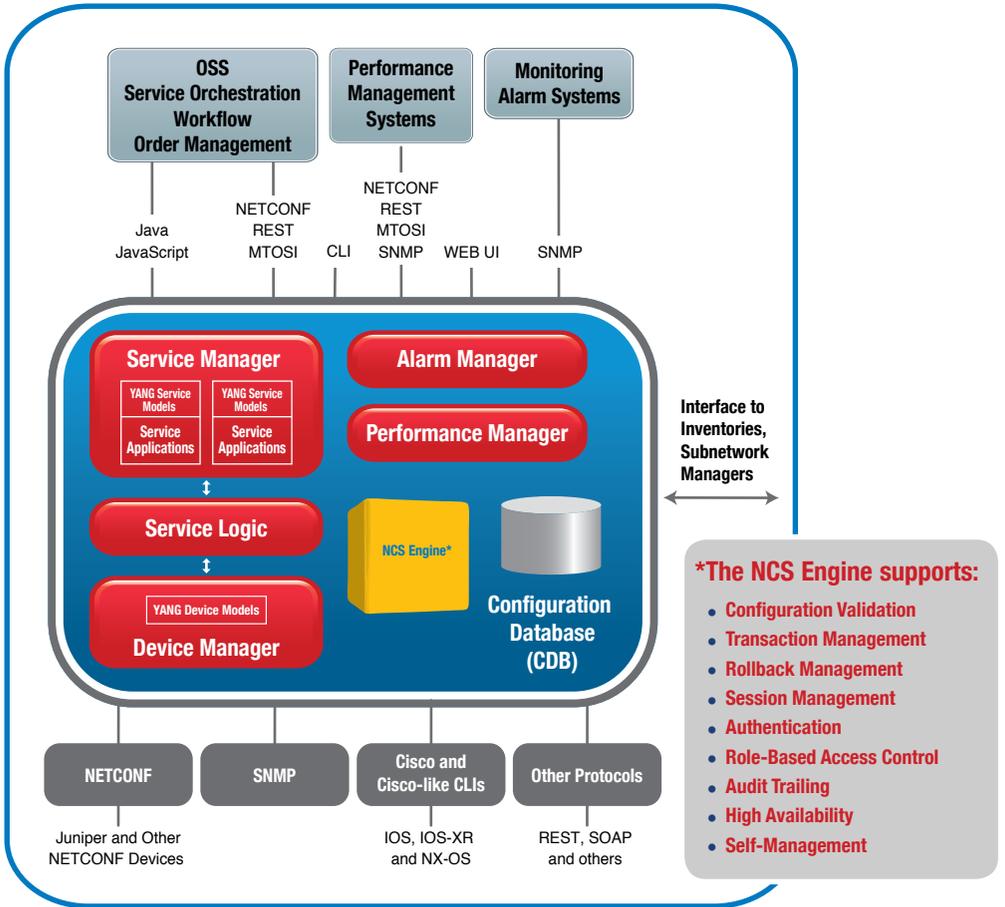lopment fall short in this regard by generating large quantities of stubs that result in considerable programming time between iterations. Tail-f provides a true model-driven solution through a rich runtime platform that can auto-render multiple management interfaces directly into a running system.

New Management Requirements

Modern EMS/NMS platforms are now expected to do more than monitor alerts and provide performance data. Service providers have identified service provisioning and device configuration as priorities for an automated approach. New services such as video transport, LTE backhaul, and Carrier Ethernet are more complex to provision, often requiring changes to multiple devices and large numbers of parameters per device. In addition, distributed changes often need to be made in lockstep as even the failure of a single change can disrupt service and be very difficult to diagnose and recover from.

Existing approaches to configuration management rely on manual processes, proprietary software adapters and ad hoc scripts. These methods are inflexible, prone to error, and lack ability to scale. As a result, network equipment providers are being asked to provide the following capabilities:

- Automated deployment of configuration changes
- Fail-safe transaction management
- Easy integration with multiple vendors' networking equipment
- Efficient mechanisms to map service changes to device changes
- Synchronization between network and inventory views

```
<?xml version '1.0' encoding=
<hello xmlns=urn:ietf:params:
    <capabilities>
        <capability>urn:ietf:
        <capability>urn:ietf:
        <capability>urn:ietf:
        <capability>urn:ietf;
```

**OSS
Service Orchestration
Workflow
Order Management**

**Performance
Management
Systems**

**Monitoring
Alarm Systems**

Java
JavaScript

NETCONF
REST
MTOSI

NETCONF
REST
MTOSI
CLI   SNMP   WEB UI   SNMP

Service Manager

YANG Service Models | YANG Service Models

Service Applications | Service Applications

Alarm Manager

Performance Manager

Service Logic

YANG Device Models

Device Manager

NCS Engine*

Configuration Database (CDB)

**Interface to
Inventories,
Subnetwork
Managers**

*The NCS Engine supports:

- **Configuration Validation**
- **Transaction Management**
- **Rollback Management**
- **Session Management**
- **Authentication**
- **Role-Based Access Control**
- **Audit Trailing**
- **High Availability**
- **Self-Management**

NETCONF

SNMP

**Cisco and
Cisco-like CLIs**

Other Protocols

Juniper and Other
NETCONF Devices

IOS, IOS-XR
and NX-OS

REST, SOAP
and others

NCS Architecture

NCS Functionality

NCS provides a central point of management for the entire network and a framework for rapidly developing EMS/NMS platforms. NCS includes the following core functions:

- Network-wide interfaces (CLI, Web UI, APIs) to access all devices and services
- The Service Manager that models and dynamically maps services to the device layer
- The Fastmap Engine that drastically reduces the amount of code required for bi-directional service-to-device mapping and validation
- The Device Manager that enables fail-safe configuration deployment
- Alarm and Performance Management
- Built-in high performance datastore for configuration and operational data
- Support for high availability operations

Advanced Configuration Management

NCS enables network equipment providers to meet the most rigorous requirements for configuration management. Configuration changes can be initiated through a management interface or flow through from services changes that map to detailed changes at the device level. NCS automatically calculates what device configuration changes correspond to the service operation and then deploys those configuration changes. Service and device definitions share a common datastore and modeling language (the YANG language as defined in IETF RFC 6020). YANG is optimized for configuration management and enables fast turnaround of model changes as well as built-in validation of a model's correctness and completeness.

Fault Management

NCS provides developers with a powerful framework to build fault and alarm management functionality including the ability to process and filter events and traps, drill down on alarms by type, and manage problem resolution. NCS' Alarm Manager includes the following capabilities:

- Mapping states and notifications to an alarm model with alarm raise and clear states, and operator actions like acknowledgements
- Integration to other alarm managers through a dedicated SNMP Alarm MIB interface
- Easy checking of alarm states over multiple device interface types, including Cisco CLI

Performance Management

NCS easily mediates performance data over multiple protocols including SNMP and CLI. The gathered performance data can be exported to reporting tools using the NCS XML northbound interface. A user can configure collection intervals and aggregation functions on the fly. The auto-rendered Web UI displays dashboards with performance diagrams in real-time.

Security

NCS supports full AAA (authentication, authorization and accounting) services needed for robust security. SSH and HTTPS are supported to provide secure remote access to the management interfaces. Role-based Access Control allows developers to build systems that meet the needs of organizations where administrators have different levels and scopes of responsibility.

Faster Time-to-Market

NCS reduces the time to develop first iterations of management systems from months to weeks. This "model and run" approach, which is unique to NCS, enables iterations to management interfaces and features to be immediately available for fine-tuning and testing in a running system.

All management interfaces are auto-rendered from common data models of both network elements and services. In addition to the advantage of rapid development time, this ensures consistent capabilities are exposed across all interfaces. Fastmap, a patent pending mapping engine, largely eliminates the significant coding efforts traditionally associated with the process of translating service modifications or deletions into detailed configuration changes.

NCS includes a built-in device simulator that allows developers to code and test EMS/NMS platforms with any device feature. This eliminates scheduling dependencies between EMS and device management teams and provides added flexibility to distributed development teams.

Zero-code Device Integration

NCS provides fail-safe device configuration for Cisco (IOS, IOS XR, NX-OS), SNMP, Juniper, and NETCONF-based network devices with zero code integration.

NCS-based applications have built-in transaction and rollback management ensuring fail-safe deployment of service and device changes. Configuration changes are made in atomic distributed transactions where either all changes take place or failed partial changes are automatically rolled back.

Broad device support allows network equipment vendors to provide a single management platform that can view and configure other vendor's network devices – a powerful capability when migrating customers from legacy equipment.

Powerful Built-in Operations

NCS provides a range of capabilities and built-in commands that developers can leverage to build applications that streamline the operations of large enterprise and carrier networks. These include:

- Bi-directional synchronization of the NCS datastore and configurations on the devices
- Service impact analysis that determines which services are affected if a device fails or its configuration is changed
- Integrity constraints that prevent configuration changes that result in errors
- Elimination of orphaned configurations resulting from service retirements
- Version management that detects and manages devices running different versions of software
- Pre-provisioning of configuration of devices that have not yet been installed
- Detection of out-of-band configuration states which are a common cause of network and service degradation

Flexible Deployment Options

NCS is a powerful framework that can be used to develop FCAPS-capable EMS/NMS platforms or focused configuration management applications. NCS can be used with a wide variety of existing network element interfaces or as part of an end-to-end solution with Tail-f's industry leading on-device management software - ConfD. Both EMS and on-device developers benefit from using these two seamlessly integrated applications with common functionality and a single modeling language as the formal contract language between the teams.

tail-f

Tail-f Systems is the leading provider of configuration management and network automation software. Seven of the ten largest global networking equipment providers are Tail-f Systems' customers.

Network Equipment Providers use Tail-f's software to build on-device management systems and EMS/NMS platforms in less time and with differentiated capabilities. Service Providers use Tail-f's software to quickly build scalable, agile management systems and benefit by bringing network services to market faster and more reliably. Headquartered in Stockholm, Sweden, Tail-f Systems is a Red Herring Top 100 company and one of Stratecast's Global OSS/BSS 10 to Watch companies.

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