Nokia Event-Driven Automation

Release 25

Nokia Event-Driven Automation (EDA) is an infrastructure automation platform that delivers reliable, simplified and adaptable management to all phases of the data center fabric life cycle, including design, deployment and ongoing operations.

The Nokia EDA platform is a key component of the Nokia Data Center Fabric solution, which includes the Nokia Service Router Linux (SR Linux) network operating system (NOS), the Nokia data center switches and routers, and the Nokia Service Router operating system (SR OS). The solution enables automation and observability for data center gateway routers, extending EDA's capabilities to the critical edge of the data center fabric.

Overview

EDA is a modern infrastructure automation platform that combines speed with reliability and simplicity. It makes network automation more effective and easier to use, from small edge clouds to the largest AI data center fabrics.

EDA builds on the proven Kubernetes platform and leverages a vast open-source ecosystem. This reduces risks for operators and lowers barriers to entry for users.

EDA enables automation of the entire data center network life cycle from Day 0 design to Day 1 deployment and Day 2+ operations. The platform abstracts the complexity of multivendor networks to facilitate its provisioning and monitoring in real time while making sure it always operates as expected:

- For Day 0 design, the data center operator can focus on high-level aspects of the design, identifying the minimal information needed to

build a data center fabric. EDA auto-generates the detailed configuration based on design templates. The configuration can be customized, including the attributes generated by these design templates.

- For Day 1 deployment, EDA discovers the fabric, performs node bootstrap and turns up new leafs and spines. After the new nodes are onboarded, EDA can then push Day 0's validated design to the fabric, thereby completing deployment of the initial network underlay portion of the fabric.

- For Day 2+ operations, EDA constantly monitors the fabric and compares this information with various intents and analyzes the results. Each inconsistency is flagged and presented to the operator as an alarm or as a configuration deviation to be either accepted or rejected.

Features and benefits

- CI/CD[1] methodology embodying DevOps principles applied to the network to ensure reliable operations

- Intent-based, declarative automation simplifies the entire operational life cycle from Day 0 design to Day 1 deployment and Day 2+ operations

- Event-driven, cloud-native microservice design built on Kubernetes foundation that adapts to any data center environment

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1 Continuous Integration /Continuous Deployment

Reliable operations

EDA features key innovations to drive network downtime to zero. It helps validate operations tasks before being applied to the real network, ensures they are completed in a guaranteed manner and ensures that the network operates continually as intended. These capabilities are critical for applying automation to proactively detect and fix network problems with closed loop automation and fault remediation.

Source of truth

EDA maintains a centralized repository of accurate, up-to-date information about the configuration and status of all devices, connections and services within the network.

Network-wide transactions

EDA can combine multiple configuration changes into a single fate-shared transaction. If a transaction fails, all changes are rolled back network wide; preventing a half-deployed policy change from impacting your network.

Revision control

EDA provides revision control of the infrastructure configuration using the DevOps versioning feature. The configuration intents are stored in a Git repository. Any changes are versioned and stored in the repository.

Any intent change can be retrieved from the transaction history, providing an ability to restore system configuration to a known good point in time.

Pre-deployment and post-deployment checkpoints

Pre-deployment checkpoints, or pre-check, determine if the new configuration that is going to be pushed to a device is going to create any conflicts. If there are conflicts, those are clearly displayed to be inspected by the operator. This pre-check prevents any erroneous or unintended configuration from being pushed to a device causing network disruption.

Post-deployment checkpoints, or post-check, confirm if the intended configuration is really configured on the device(s), or if it has been rejected by the device (preventing the wrong assumption that the intended configuration was correct).

Fabric observability

Fabric observability is needed to monitor and provide visibility into the fabric and is achieved by on-change, multidimensional streaming telemetry that collects up-to-date network state directly from the data center fabric.

Multidimensional telemetry includes faults, standard statistics, Link Layer Discovery Protocol/Link Aggregation Control Protocol (LLDP/LACP) state and events, Border Gateway Protocol (BGP) adjacency, BGP routing information base (RIB), forwarding information base (FIB), etc.

EDA constantly receives this information via the gRPC Network Management Interface (gNMI) and leverages a purpose-built acquisition layer to ingest this streaming telemetry while scaling as required.

Simplified operations

EDA is designed to be simple to use, but powerful enough to handle the most complex infrastructure setups. It democratizes network automation by reducing its barrier to entry. It simplifies all phases of data center network operations—Day 0 design, Day 1 deployment and Day 2+ operations—by abstracting the complexity of the multivendor network and making automation easier to use.

Intent-based automation

EDA provides automation for configuration management in a declarative way via high-level abstractions. These abstractions are "intents" that hide the device-specific commands.

With this approach, the operations team can focus on what they want to achieve and forget about the implementation of the low-level detailed configurations.

Zero Touch Provisioning (ZTP)

EDA offers a ZTP bootstrap process to bring nodes online for the first time, providing a simple "plug in and power up" approach to onboard new devices into the fabric.

GenAI assistance

EDA is integrated with generative AI tools to deliver a powerful capability of simplifying network operations by using natural language commands. This capability enables the operator to use natural language to interact with the automation platform to easily check device and network states, troubleshoot issues, query configuration examples and much more.

Customized UI

EDA's user interface can be easily customized to match specific needs and preferences. New dashboards can be created to distill system state and allow drill-ins. Any query can be charted and visualized in real time, without programming skills required.

Multivendor support

While the first release focuses on Nokia data center fabric hardware platforms, EDA is architected for multivendor support. Each EDA app can include configuration implementations for multiple vendor operating systems and versions.

Adaptable operations

EDA can be easily customized to address specific automation needs. EDA is compatible with other cloud-native technologies and integrates with a rich ecosystem of tools and clouds. This means EDA can be used with a variety of tools without being restricted to proprietary platforms, and it can speed up the creation and deployment of solutions that will meet evolving end-user demands.

EDA Store

EDA provides a very simple and easy way to automate tasks through automation applications that cater to unique needs and environment. Operators can download the desired apps from the EDA application store. Any new updates to the app are notified and the operator can verify compatibility before downloading the upgraded app. Downloading apps does not cause any disruption to the running of EDA.

Open-source ecosystem

Because EDA builds on the Kubernetes framework, it naturally inherits from its infrastructure-as-code principles and rich ecosystem of tools. It leverages community-stabilized, open-source projects, such as Keycloak, and provides integrations with open-source observability tools like Kafka and Prometheus.

Integrations

EDA integrates with cloud management platforms (VMware, OpenStack and Red Hat OpenShift) allowing virtual machine (VM) or container "spin up" and "tear down" events to drive network change. This capability enables the data center fabric to react to workload and compute connectivity requirements. EDA integrates using REST APIs and a plugin-based model, enabling seamless, modular and simple integration with cloud management platforms.

EDA also integrates with event notification and collaboration tools such as Microsoft Teams and Discord to ease event and fault management.

SaaS-based deployment option

EDA can be deployed as an on-premises platform or a software as a service (SaaS) operated by Nokia. Nokia EDA SaaS is an EDA platform delivered as a service, hosted on leading public cloud providers and managed by Nokia. Businesses can use Nokia EDA SaaS without the burden of infrastructure deployment, as Nokia manages advanced monitoring, cluster upgrades, and pre-upgrade regression testing to provide a reliable and seamless network operations experience.

Features and supported hardware

EDA supports, but is not limited to, the following features and protocols.

EDA core

Platform

- Kubernetes-based cloud-native platform
- Role-based access control (RBAC) with users, groups and roles. Granular permission structure for resources and queries
- OpenAPI v3 REST APIs
- Kubernetes API support
- Web-based UI
- Geo-redundancy support
- Namespace support
- Extend through applications in the EDA Store - Nokia provided or third party

Deployment options

- On-premises
- SaaS-based operated by Nokia

Configuration engine

- Declarative abstraction infrastructure automation
- Kubernetes Custom Resource Definitions (CRDs)
- Label selectors - associate nodes and interfaces to abstract resources
- Configuration blame – annotation of configuration with top-level resources generating config
- Revision control powered by Git
- Efficient change rollback capabilities
- Transactions with network-wide reversion on transaction failure
- Transaction dry runs - validate transactions and view configuration differences
- Configuration deviation handling, with accept and reject actions

- IP address management allocation pools
- Index allocation pools for autonomous system numbers, VLAN IDs, and more

Operations

- EDA Query Language (EQL) with on-change streaming telemetry
- Natural language query support
- "No-code" UI dashboard builder
- Fault management

Workflows

- Apps can introduce workflows
- Execute Workflows as a pipeline of actions

Zero Touch Provisioning (ZTP)

- Auto-generation of ZTP bootstrap and initial configuration files
- Integrated Dynamic Host Configuration Protocol (DHCP) server
- Transport Layer Security (TLS) certificate generation, and rotation using gRPC Network Security Interface (gNSI)

Supported hardware

EDA supports the following hardware platforms running SR Linux Release 24.10.x:

- Nokia 7215 IXS-A1
- Nokia 7215 IXS-D1
- Nokia 7220 IXR-D2L
- Nokia 7220 IXR-D3
- Nokia 7220 IXR-D3L
- Nokia 7220 IXR-D4
- Nokia 7220 IXR-D5
- Nokia 7220 IXR-H2
- Nokia 7220 IXR-H3
- Nokia 7220 IXR-H4
- Nokia 7250 IXR-6e
- Nokia 7250 IXR-10e
- Nokia 7250 IXR-X1B

- Nokia 7250 IXR-X3B

- Nokia 7750 SR-1

- Nokia 7750 SR-1s

- Nokia 7750 SR-2s

- Nokia 7750 SR-7s

EDA apps

Fabric

- Flexible leaf-spine template from small edge locations to multipod, multitier fabrics

- Optional border leaf

- External Border Gateway Protocol (EBGP) and interior BGP (iBGP) based fabrics

Services

- L2 and L3 workloads supported by Ethernet VPN (EVPN) virtual routing and forwarding (VRF) instances

- EVPN IP aliasing

- Automatic Virtual eXtensible Local Area Network (VXLAN) v4, virtual network identifier (VNI) and EVPN instance (EVI) allocation

- Supports Link Aggregation Group (LAG) + LACP

- EVPN L2 multihoming all active with up to four nodes; auto-generation of LAG IDs; Ethernet Segment Identifier (ESI)

- Provider Edge to Customer Edge (PE-CE) BGP

Cloud connect

- End-to-end automation with the following cloud management systems: OpenStack, VMware vSphere, Red Hat OpenShift and Kubernetes

- Application network management from within the cloud management system for L2 and L3 networking

- Advanced use case support through integrated workflow, including BGP PE-CE, QoS, and access control lists (ACLs)

- Integration with OpenStack with VirtIO, single root IO virtualization (SR-IOV) and OVS-DPDK interfaces

- Integration with VMware vSphere with dvSwitch, port groups, and SR-IOV interfaces

- Integration with Red Hat OpenShift and Kubernetes with multiple container network interface (CNI) plugins and SR-IOV

QoS

- Differentiated Services Code Point (DSCP) classifiers

- Dot1p classifier

- DSCP and Dot1p rewrites

- Multifield classifiers

- Policers

- Explicit congestion notification (ECN)

Filters

- IPv4, IPv6 and MAC ACLs

- L3/L4 match criteria

- Permit and deny actions

Exporters

- Kafka exporter

- Prometheus exporter

NOKIA

Notifiers

- Alarms and query notification sources
- Notification destination to Microsoft Teams, Discord, email and more

Learn more

To learn more about EDA, see the web page.