

Network Automation with CloudVision® Studios

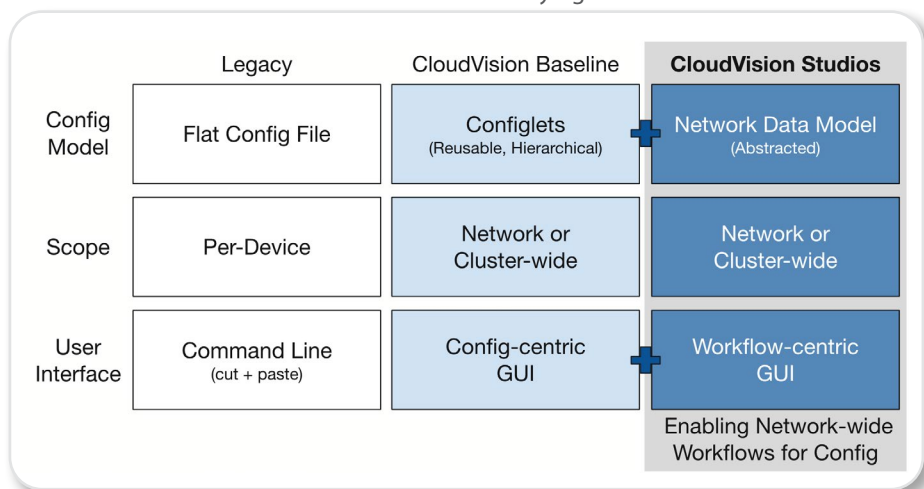
CloudVision network automation designed for all operator types

CloudVision is a modern network management plane built on cloud networking principles for telemetry, analytics and automation. While Arista initially leveraged these principles for data center use-cases, these principles are applicable across multiple network domains, including the enterprise campus. As the foundation for Arista's Cognitive Campus approach, CloudVision can enable the fully-automated enterprise for significant OpEx optimizations and rapid enablement of new services.

Overview

The modern enterprise network operations teams have had to adapt their approach for rolling out new network services to meet changing business needs. To do this in an automated way, the underlying network needs to evolve from legacy models based on brittle, command line device control, to modern, abstracted models providing network-wide control.

CloudVision's existing network configuration management approach delivers streamlined network provisioning through a centralized 'configlet' model that leverages configuration inheritance and re-use principles. Building on this, Arista is introducing CloudVision Studios: new capabilities for automating configuration workflows within CloudVision and providing a flexible abstraction between the business and the underlying network.



CloudVision Studios provides Day-0, Day-1, and Day-2 workflows through an easy to use Point-n-Click user interface, with or without requiring configuration syntax expertise. This expands the administrative scope to include operators at all levels of expertise with the ability to make changes confidently and quickly through the simple GUI-based forms. At the same time, operators have the controls to review, validate and approve the changes for accuracy and deployment assurance. CloudVision Studios provide a flexible workspace approach, starting with built-

in workflows for many of the common configuration-related tasks, including templating for initial data center or campus build-outs, workflows for adding incremental network capacity, and basic day-to-day helpdesk-driven changes. In addition, Studios can be created or customized for any feature set, avoiding the inflexible user-interface approach found in legacy network management systems.

CloudVision Studios delivers an abstraction of the network through modern and network-wide data models. This approach allows enterprises to automate their day-to-day deployment and operational networking tasks through a well-defined and flexible framework by translating their business needs directly into network semantics and ultimately improving the enterprise experience. In doing so, CloudVision delivers a modern take on how an operator manages the network - Workflows are designed to align with role-based permissions, oversight on the work being performed, and reducing risk to the organization.

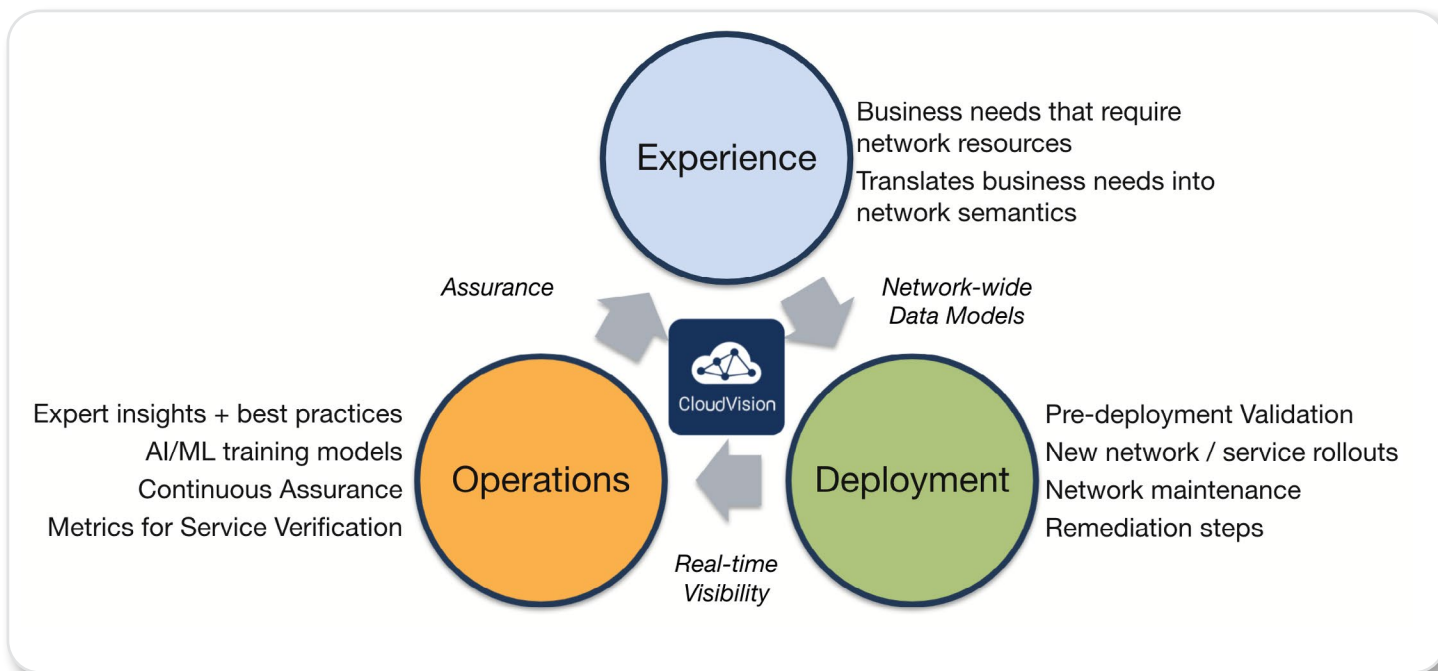
Key Benefits of Studios

CloudVision Studios introduces simplified configuration management with a new declarative model, providing the following key benefits:

- **Point-n-Click Network Automation** - Simple, guided interface, designed to be flexible and enabling the ability to instantly spin-up Arista Validated Network Designs.
- **Flexible Config 'Wizards'** - Traditional wizards and config management are brittle without flexibility. Studios introduces the ability to craft customizable, user-specific workflows which are designed to present the user with adaptable inputs depending on the business requirements.
- **Network-wide Data Models** - Abstractions for simpler automation of network-wide changes. The operator defines the desired network state which is stored within the Studios 'mainline' code. These models represent an aggregate view of the network wide state.

CloudVision features built-in, pre-packaged Studios which have been designed by Arista based on common customer deployment design patterns. These capture Arista Validated Designs, multi-domain NetOps provisioning workflows and common feature set collections packaged in a Point-n-Click interface.

Wizards are common in configuration tools. They often cater for simple workflows, capture a subset of features and are typically hard-coded and inflexible. Studios introduce flexibility in the interface presented to operators. An organization can capture their specific provisioning requirements based on their business needs with full coverage of features available within CloudVision and EOS. All workflows are API-driven enabling an extension from the GUI to user-extensible workflows depending on the desired operational model.



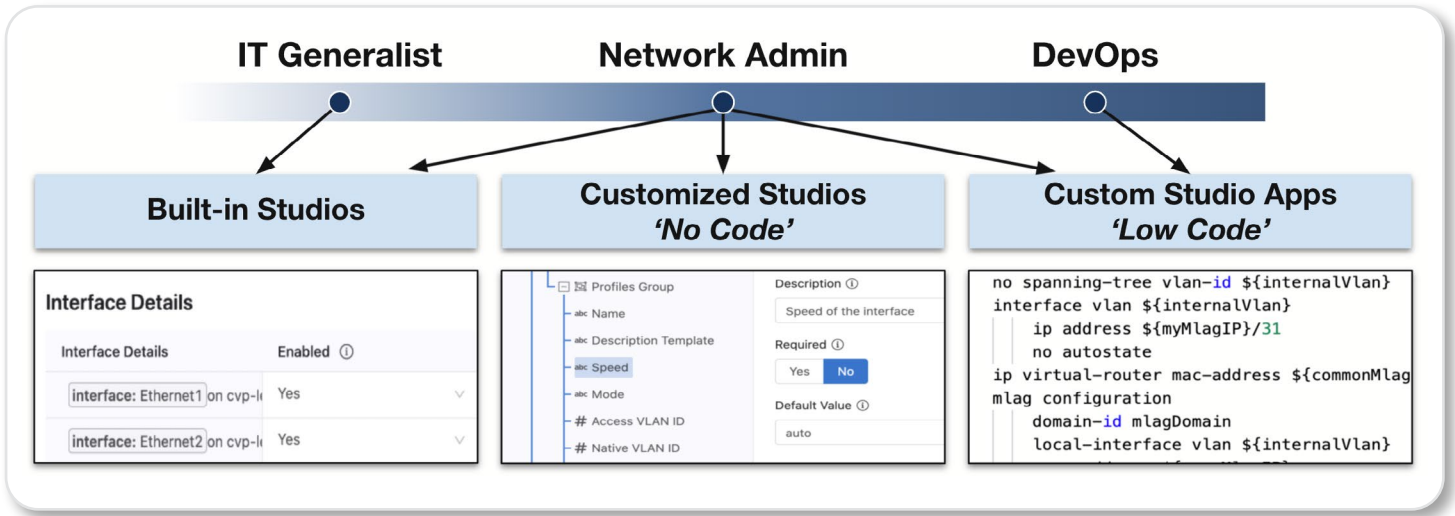
Studios abstracts the per-device configuration to network-wide data models. This allows for the business needs of an organization to be translated into network semantics across the entire network as opposed to box-by-box. The pre-deployment validation for changes in the network provides the operator with confidence that the desired network state that has been modelled, will be deployed. With the real-time streaming of the network state into CloudVision, the continuous assurance enables expert insights and service verification to feed back into the business.

Challenges and Operator Types

The enterprise is grappling with a number of challenges when it comes to bringing agility to the network operations of an organization. The challenges Studios is addressing include:

- **Configuration control** – network device configurations can be complex - there's no abstraction away from the config, and management systems typically provide a subset of functionality. Resulting in a brittle operating model.
- **Operator expertise** – the range of operator types is broad and there is a limited talent pool for network expertise and even more limited for network automation.
- **Feedback loop** – the legacy approach to assurance is a very manual process. Sifting through the noise in monitoring data is burdensome and a more proactive approach is required through real-time insights for alerting on events such as deviations from the normal.

The CloudVision Studios approach attempts to address these challenges with the multi-domain operational model. Depending on the operator type within an organization, there is an operating model with Studios to provide network automation optimizations.



The CloudVision built-in Studios offer guided workflows for Arista Validated Designs, meaning a generalist operator can step through a predefined workflow to achieve a business outcome. The scope of the built-in Studios are well-defined allowing enforcement of role-based views and controls.

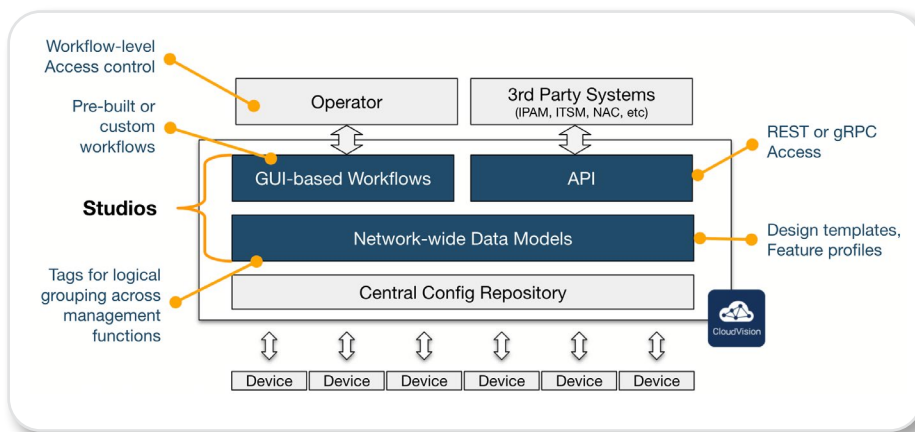
A network admin with a broad scope of change can take advantage of built-in Studios, customize these Studios or develop their own custom Studios. Built-in Studios can be edited to adapt the workflow to the particular organizational needs or features deployed in the network. This “no code” approach

enables modification of the UI through a simple, Point-n-Click interface and is immediately available to the operator.

At the far end of the scale, an operator with DevOps skills can take advantage of creating Custom Studios Apps with a “low code” approach. This capability allows for a full custom Studio to be developed to align with a business workflow. The UI inputs can be defined and custom code developed to produce a desired outcome. These advanced functions can interact with other elements of CloudVision as well as third party systems.

Architectural Components

A high level view of the architectural components of CloudVision Studios is represented below.



Studios forms part of the existing CloudVision provisioning tool set by leveraging inherent seamless configuration changes, change control workflows, and centralized config repository. It then enhances the provisioning experience through new componentry such as network-wide data models, graphical user interface based desired state inputs, and modern APIs for integration with third party systems. This co-existence with existing features enables an organization to adopt these new provisioning workflows without

the need to immediately decommission the CloudVision provisioning processes already embedded into their network operations. Over time, these new workflows can be adopted and a new operational model developed to best align with the business needs.

Key Concepts of Studios

Studio Inputs

As shown below, a Studio allows users to enter the desired network state as guided by the Point-n-Click interface. Each Studio manages the network-wide configuration of a set of features. The example here shows the Campus Studio and the inputs required as part of the Arista Validated Designs.

Campus to configure
Manage per-campus configuration, including all Campus Leafs

Workspace: Campus Update Review Workspace Changes

Workspace created by cypadmin • Studio applied to Campus: 123 ✓ Saved 0 seconds ago

Fabric Type
Type of connection between Campus Spines and Campus PODs
L2 MLAG

MLAG Configuration
Common parameters for all MLAG links in this campus. Device-specific parameters can be configured on the device page.

Channel group number to use for the peer link: 10
VLAN to use for the MLAG peer link: 4094
Virtual Router MAC: 00:c:73:00:00:99

Number of interfaces in the peer link: 2
Speed of the MLAG peer link: 40G
Interfaces in the peer link port channel: >

VLANs

VLAN ID	Name	VLAN Interface Address	Virtual IP	Physical interface on the Leaf devices that is in this VLAN	Ma
31	Type value	Type value		Ethernet11	Yes

Studios reflect the current configuration of the network.

The operator proposes changes to this existing network configuration with their desired network state.

Studios uses Tags to allow variation in a config. For example, switches with “Role: Spine” might get one config while switches with “Role: Leaf” may get another.

As is the case with all elements of CloudVision, everything is API-centric – meaning anything done via the UI can also be scripted via gRPC or REST. This makes the tool incredibly extensible and easy to integrate with third party systems whether it be to drive a workflow within CloudVision or to extract information from an external system to leverage within CloudVision.

Tags

A Tag is a label-value pair applied to a device or interface. For example, “Role: Spine” or “Datacenter: New York”. Tags enable the arbitrary grouping of devices and makes finding devices or interfaces simple through tag queries. A Tag query could be simple such as, “Campus: SF” or more complex such as, “IntfType: Uplink AND Role: Leaf”.

Region: US-East × AND Role: leaf ×

Matches 2 devices

Tags are already used extensively within CloudVision including for event customization, event notifications and dashboard configuration.

Workspace

Workspaces are staging grounds for all changes made via Studios. A Workspace is created when a user is preparing to make a network change and tracks all these changes made within a Studio or to Tags.

Workspace / Set up connectivity monitor for my spine devices Workspace Submitted View Change Control

No description cypadmin Last Modified: Today at 10:57 PM

Modification Summary
Studios affected: Updates
No Studios Edited
Number of Tag Changes: 0

Build Progress
Last built 29 minutes ago
Start Build

Input Validation ✓ — Configlet Compilation ✓ — Config Validation ✓
[View build details...](#)

Proposed Configuration Changes

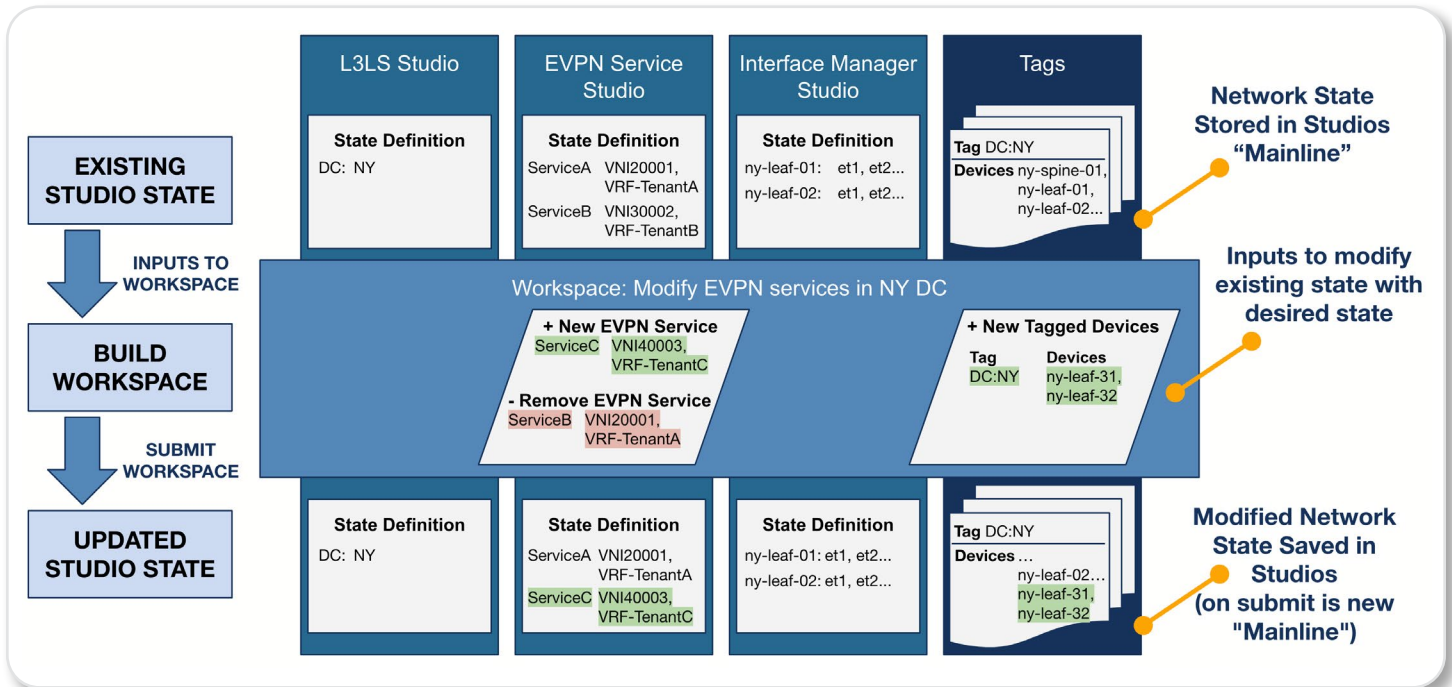
- esx23-v2-vm31 2 Additions
- esx37-v2-vm20 2 Additions
 - Proposed Configuration Running Configuration
 - Expand 55 Lines
 - 57 host NTP 57
 - 58 ip 10.0.2.3 58
 - Expand 22 Lines
- esx38-v2-vm38 2 Additions
 - Proposed Configuration Running Configuration
 - Expand 43 Lines
 - 45 host Phys108 45
 - 46 description 46
 - 47 Internal database used by most servers 47
 - 48 ip 10.188.17.2 48
 - 49 url https://system0/ 49
 - Expand 1 Line

Workspaces allow users to work simultaneously in preparing changes without interfering with each other and to propose these changes before they actually take effect. Only once the Workspace has been built and submitted do the changes get deployed into the network.

On submission of the Workspace, the new changes become part of the “mainline” configuration for the network. Further edits to mainline are created in a new Workspace. This concept of Workspace and mainline code introduce some common software development principles which have not been easily accessible by network administrators in the past.

An example of this modifying network state through Studios is illustrated below. The example shows three different Studios: “L3LS Studio”, “EVPN Service Studio” and “Interface Manager Studio”. It also shows a set of tags defined within the environment.

This network state is copied into the Workspace when created and is available for modification. This could include the removal, change or addition to the existing state configuration. In the example below, we are adding a new EVPN service (ServiceC) within the “EVPN Service Studio” and also removing one (ServiceB). The Workspace is also adding some new device tags to some new leaf switches. A single Workspace can capture changes across multiple Studios.

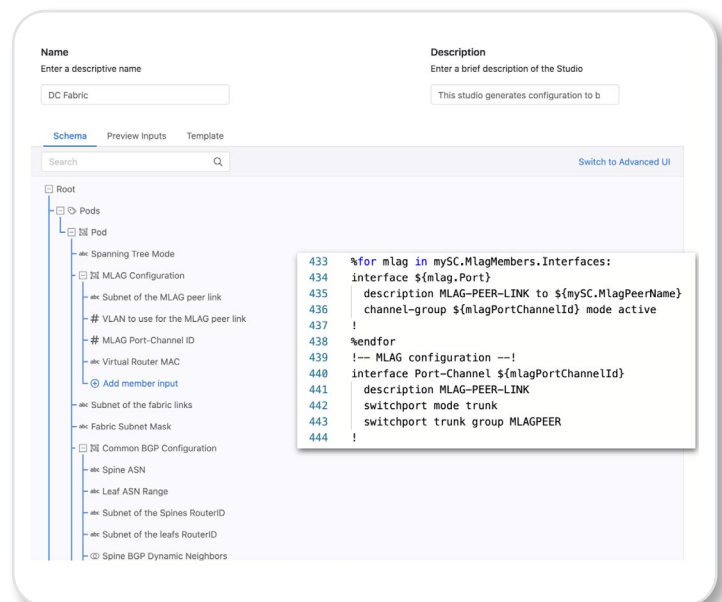


On submission of the Workspace, the resulting changed state is saved back into a new “mainline” incorporating the modifications and is available within the Studios for future reference or modifications. CloudVision will then create a Change Control for the proposed network changes to be deployed through the usual change management process.

Studio Data Models and Templates

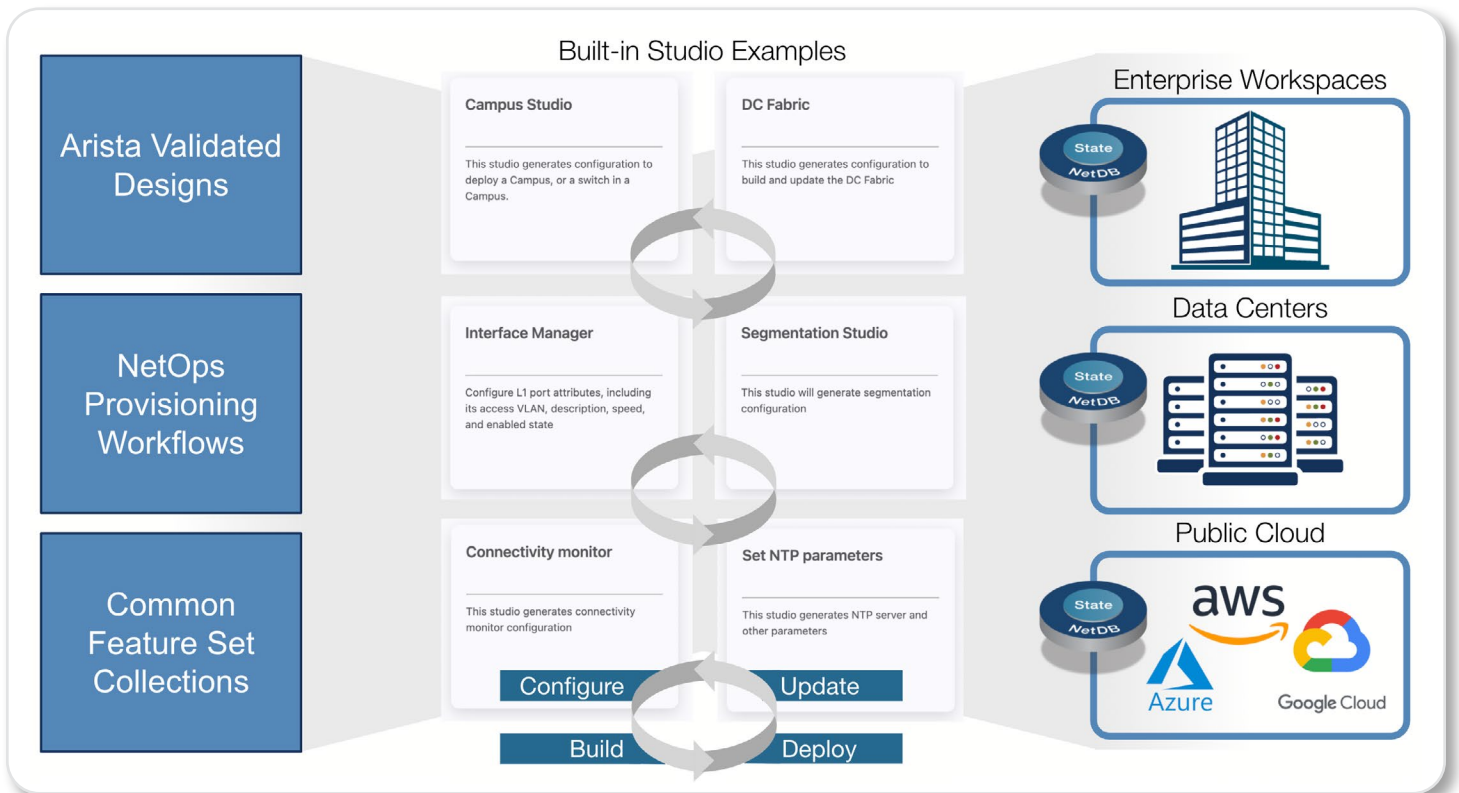
Studios are fully customizable by the user. This is through either modifying existing built-in Studios, or creating a new Studio from scratch. The Studios infrastructure offers a user interface and API backend that is automatically created from the Studio Data Model. Data Models are transformed into EOS CLI through the use of “low code” Python 3 templates. These templates can be written in Jinja2 or Mako allowing the user to easily leverage common scripting constructs and functions in developing an automation workflow.

The built-in editor bundled with Studios guides the user through the creation of a new Studio. Role-based access control allows the administrator to restrict the access rights to modifying Studios data models and templates. Studios can be exported and shared across multiple CloudVision instances allowing an organization to distribute Studios amongst their CloudVision clusters or to share externally through public repositories such as the Arista Github page.



Built-in Studios

Arista has a number of Validated Designs for the most common ways our customers deploy our solutions. Among others, these include campus and data center designs built upon the Arista Universal Cloud Network (UCN) architecture. Built-in Studios are included with CloudVision allowing customers to deploy these validated network designs out-of-the-box. Extending upon this, we've captured some common provisioning workflows incorporating elements such as interface provisioning, segmentation and service provisioning to mention a few; and included these as built-in Studios also. Lastly, we've created some collections of common feature sets that can be managed together. For example, these could be features such as Connectivity Monitor for reachability monitoring to public cloud workloads; or a collection of device management configuration elements, such as NTP, AAA, DNS, etc. Anything configurable on an Arista EOS platform could be handled within a CloudVision Studio.



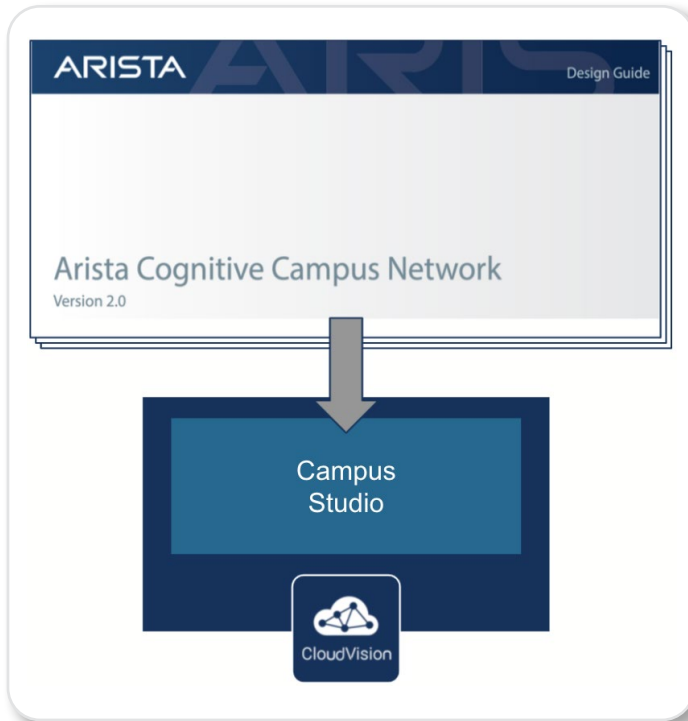
These Studios have been designed to offer ready to use provisioning workflows for deployment across the multi-domain environments of our customers. Whether it's campus, data center or public cloud, these Studios can be leveraged to provide the network-wide automation platform the organization requires.

The following are a few examples of the network fabric built-in Studios.

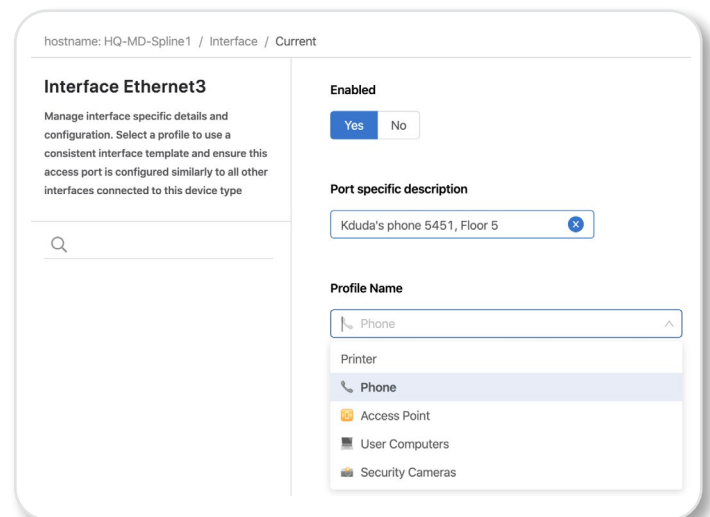
Campus Network Use-Case

In the campus, network designs vary from intra-building to campus wide deployments. There are often physical cabling constraints and sometimes a requirement for Layer 2 extension. The Arista Cognitive Campus Network incorporates design best practices for these varying types of campus deployments. The Campus Studio provided within CloudVision takes these Arista Validated Designs documented in the Cognitive Campus Design Guide and offers the operator an out-of-box provisioning workflow to deploy the solution (Day-0), scale out the campus (Day-1), and provision services and ports in the environment (Day-2).

In some cases, there are multiple switches deployed within a wiring closet for a floor of a building. In the Arista Cognitive Campus design, these switches are a collection of switches all deployed for a common purpose - for endpoint connectivity often with a set of port profiles defined for a set of endpoint types. For example, one profile might represent IP phones, another may be printers, another may be guest users. These profiles define the configuration necessary for the logical definition of the service and could include segmentation, 802.1X policy, QoS parameters or other logical service configuration.



With CloudVision Studios, we are providing a highly customizable and flexible way in which to define these logical sets of switches and profiles within the network. This means that the Day-2 provisioning operator does not need to be concerned about how the switches are deployed, but can simply identify the switch which needs to be configured and the built-in Studios will handle the required configuration on the relevant switch.



Data Center Network Use-Case

Similar to the campus use-case, the Arista Validated Designs for the data center are captured by a built-in Studio. This Studio enables the operator to deploy and manage a Layer 3 Leaf Spine network with or without an EVPN VXLAN overlay. The inputs and resulting

templates for this Studio are based on best practices learned from the deployment of the Arista UCN across many thousands of customers worldwide. Leaf switches may be deployed as single or multi-homed leaves configured with BGP as the underlay towards the spine.

The Studio handles the underlying allocation of IP addressing for the Leaf Spine network, as well as the necessary configuration for MLAG domains. The result is a simplified workflow presented to the operator to deploy the data center network and to use for the on-going management of the environment.

Day-2 operations of the data center are handled by a Service Provisioning Studio which allows the organization to separate control of the initial data center provisioning versus the on-going Day-2 service provisioning responsibilities. The user is presented with a simple interface through which to define or provision an EVPN service across the data center.



The screenshot displays the Arista L3 Leaf-Spine Studio interface. At the top, it shows a workspace named 'Add DC2-LF20' with a 'Create Workspace' button and a 'Review Workspace Changes' button. Below this is a table of 'Service Profiles' with columns for Name, IP VRFs, VLAN Aware Bundles, VLANs, and Pod. The table lists Profile1 and Profile2, each with a 'View' link. A 'Build Progress' section shows three steps: 'Input Validation', 'Configlet Compilation', and 'Config Validation', all marked with green checkmarks. To the right, a table lists VLAN configurations:

VLAN ID	Name	VNI	VRF
5	five	10005	PROD
6	six	10006	PROD
7	Type v...	10007	PROD
10	ten	10010	DEV

Additional interface elements include a 'Modification Summary' table, a 'Build Progress' status bar, and a 'Submit Workspace' button.

Summary

CloudVision Studios has been developed to address real problems encountered by organizations when it comes to introducing business agility to their network automation. This approach provides the ability to closely align with the business logic and requirements, through defining the proposed state in network-wide data models, to assure that changes to the network have the desired effect.

Offering Built-in Studios, “no code” customizations and full custom “low code” options, CloudVision is broadening the automation options available to businesses addressing challenges of brittle configuration, limited expertise, and lack of visibility and assurance.

CloudVision Studios is available with Arista CloudVision and does not require any additional licensing or cost. The Studios feature set is available now.

Santa Clara—Corporate Headquarters

5453 Great America Parkway,
Santa Clara, CA 95054

Phone: +1-408-547-5500

Fax: +1-408-538-8920

Email: info@arista.com

Ireland—International Headquarters

3130 Atlantic Avenue
Westpark Business Campus
Shannon, Co. Clare
Ireland

Vancouver—R&D Office

9200 Glenlyon Pkwy, Unit 300
Burnaby, British Columbia
Canada V5J 5J8

San Francisco—R&D and Sales Office 1390

Market Street, Suite 800
San Francisco, CA 94102

India—R&D Office

Global Tech Park, Tower A 11th Floor
Marathahalli Outer Ring Road
Devarabeesanahalli Village, Varthur Hobli
Bangalore, India 560103

Singapore—APAC Administrative Office

9 Temasek Boulevard
#29-01, Suntec Tower Two
Singapore 038989

Nashua—R&D Office

10 Tara Boulevard
Nashua, NH 03062



Copyright © 2021 Arista Networks, Inc. All rights reserved. CloudVision, and EOS are registered trademarks and Arista Networks is a trademark of Arista Networks, Inc. All other company names are trademarks of their respective holders. Information in this document is subject to change without notice. Certain features may not yet be available. Arista Networks, Inc. assumes no responsibility for any errors that may appear in this document. 7/21 02-0095-01