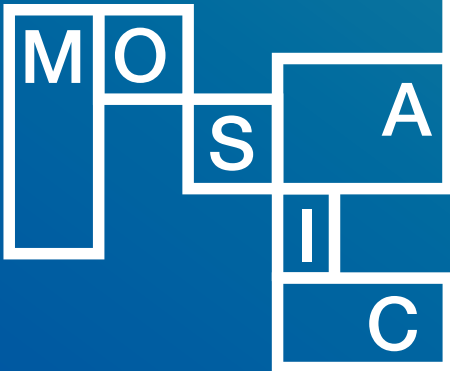


**Open.  
Programmable.  
Scalable.**

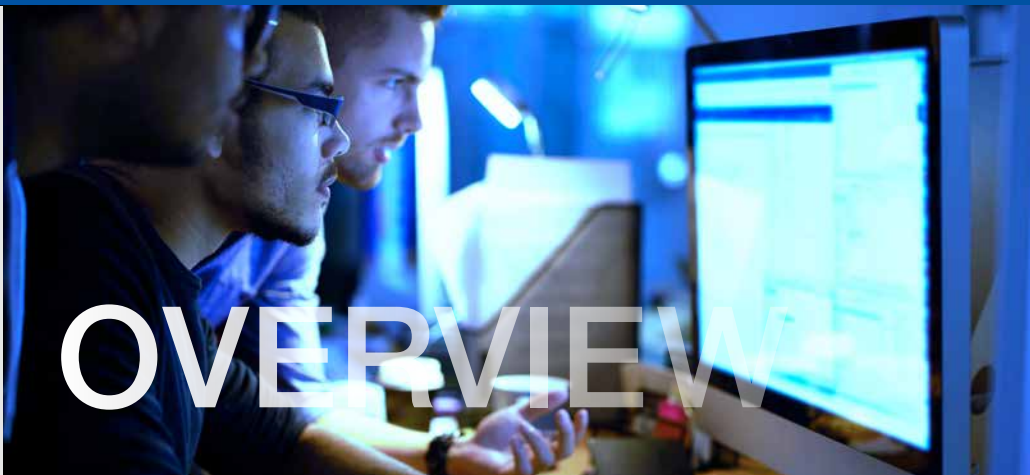


As telecom and cable operators look to optimize their networks, they are applying lessons learned from data center networks. Therefore, they are looking to build modular, component-based network architectures that are open, programmable and scalable. This approach represents a major shift from closed, monolithic systems controlled by multiple misaligned vendor-specific management systems. This evolution enables operators to support rapid creation of new revenue-generating services while vastly lowering the cost to build, operate, innovate and maintain their networks.

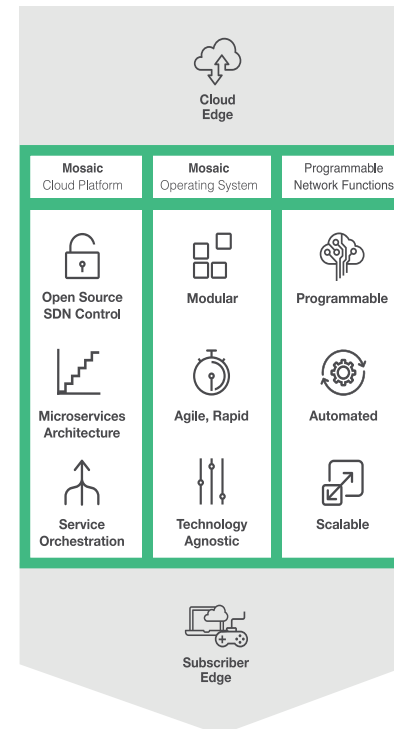
ADTRAN Mosaic™ is the industry's most open and complete Software Defined Access (SD-Access) solution that natively integrates a complete FTTx portfolio with an open source SDN controller whether ONOS or ODL. This breakthrough innovation is the first to market and will support the rapid service creation and delivery of broadband and business services at Web-scale. This provides a framework to support user-driven service models.

# MOSAIC ARCHITECTURE

The Mosaic architecture consists of three major components:

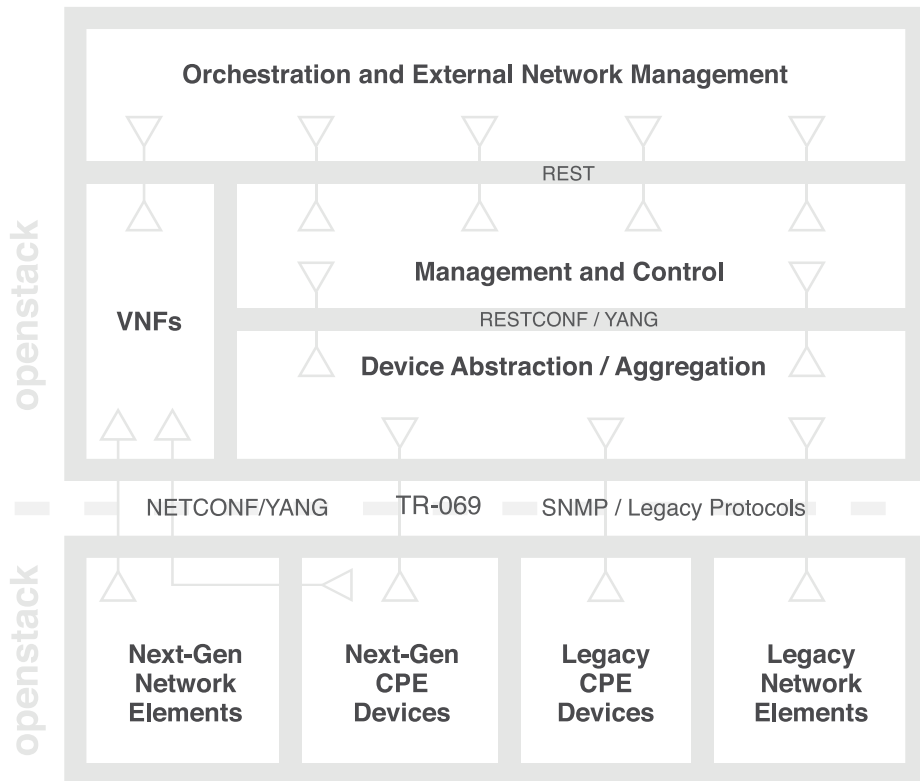


Mosaic will dynamically change the traditional operational environment from equipment configuration and provisioning to an open, programmable and scalable services architecture, ultimately delivering a modern, user-driven experience for your customers. It provides an alternative to monolithic, chassis-based systems allowing for true horizontal scale.



- Mosaic Cloud Platform**  
 An open microservices architecture providing network management and SDN control for the entire access network.
- Mosaic Operating System**  
 This modular, component-based operating system (OS) supports the creation of operational applications and features not only at the network management/control and service orchestration layers, but also at the hardware abstraction layer, fully supporting open and modern interfaces and protocols.
- Programmable Network Functions**  
 The Mosaic Cloud Platform and OS are complemented by a full line of SDN-optimized programmable network functions ranging from the data center to the customer premises.

# NETWORK MANAGEMENT AND SDN CONTROL



The Mosaic Cloud Platform unlocks control and management functions from the underlying network elements, enabling a more flexible, agile services delivery framework. The Mosaic Cloud Platform uses a multi-layered approach and consists of:

## Orchestration Layer:

Provides the business logic for creation and provisioning of services or applications. The orchestration layer consists of a collection of network management system (NMS) applications, built on open-source software, which are interconnected via Application Programming Interfaces (APIs) that can scale independently without impacting the system.

## Management and Control Layer:

This includes a core, open, Software-Defined Network (SDN) controller (ONOS) and embedded applications

that separate the underlying network complexity from the orchestration layer. The orchestration layer interacts with the SDN controller, over a REST interface, to execute the provisioning of services and applications.

## Device Abstraction/Aggregation Layer:

This includes device adapters and aggregators that connect the underlying physical and virtual network functions to the SDN controller. The device adapters and aggregators connect over a REST interface with the SDN controller. The SDN controller also interacts with legacy network elements using SNMP or legacy protocols.



Inventory Manager



SLA Manager



Software Update Manager

The Mosaic Cloud Platform orchestrates on-demand provisioning of services, applications and resources, from cloud-edge to subscriber-edge. It is based on the following logical functions:

**Design:** Service creation functions allow service providers to define reusable end-to-end services.

**Orchestrate:** Apply the predesigned service definition and automate turn up of end-to-end services. The orchestration process abstracts the creation of all intermediate resources including any virtual functions.

**Assure:** Provides service assurance functions to monitor, test, troubleshoot and repair services. This includes tools to perform analytics on collected data.

**Manage:** Resource management functions to manage inventory, software and firmware versions, users and user groups, security/passwords, etc.

**View:** A common graphical user interface for all of the above functions. The cloud platform can be accessed from any device anytime, anywhere.



# AN AGILE, AGNOSTIC OS

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Next-generation networks will no longer be controlled by closed, vendor-specific ecosystems that force operators to move in tandem with their release schedules. SDN-controlled networks roll out new services and applications at the speed of their DevOps teams, reducing the concept-to-cash development interval from calendar quarters to weeks or even days. This improves operator profitability, revenue, and market share, while creating the ability to out-innovate the competition and capitalize quickly on new revenue-generating ideas.

The Mosaic Operating System (OS) enables service providers to rapidly on-board new access technologies and introduce disruptive operational efficiencies while creating revenue-generating on-demand applications across their entire access network. As an open, modular, component-based operating system, ADTRAN Mosaic OS™ supports rapid service creation, automated/zero-touch provisioning, cloud delivery and hitless upgrade of both residential and business services. It is access technology and chipset agnostic providing support for all physical access media whether fiber, copper, coax, or wireless. This flexibility enables service providers to address the greatest potential market for their imaginative subscriber-directed applications.

Mosaic OS is a modular OS that has been optimized for SDN-programmability, virtualization, high availability, and multi-vendor app integration. It complements the Mosaic Cloud Platform as it supports component-based, multi-domain applications that can be deployed and upgraded on programmable access devices in a hitless, operationally friendly model.



ADTRAN is focused on building next-generation access components with open, programmable APIs to allow them to be natively integrated into any leading open source SDN control and orchestration system. To facilitate this approach, ADTRAN is co-chairing the Broadband Forum's SDN and NFV Work Area which is in the process of defining a common set of APIs for broadband access equipment.

# PROGRAM- MABLE NETWORK FUNCTIONS

Disaggregated hardware components will accompany next-generation architectures delivering infinite bandwidth and customer expansion. An open, software-defined network architecture views network elements as abstracted switching elements, all of which support a common service API, no matter which vendor produced them.

Natively integrated ADTRAN Programmable Network functions eliminate the issues highlighted above, and leaf-spine switching architectures are created to achieve the massive scalability required to meet the growing bandwidth demand on access networks. A key characteristic of these disaggregated, component-based

switching networks is that all leaf switches, also referred to as Top of Rack (TOR) switches, have fully meshed connectivity to spine switches. This creates a data center type resiliency that will enable higher service level agreements than were previously achievable in legacy networks.

# THE ADTRAN APPROACH



Accelerates  
Revenue



Automates the  
Network



Best-of-Breed  
Networks

ADTRAN has a unique understanding of the transition facing operators today. For over three decades, ADTRAN has been enabling service providers to deliver the services their customers need when they need it. Today is no different. ADTRAN is defining the future network with the most complete and open portfolio of SD-Access solutions on the market. These solutions are based on three principles:



## Open

With an open architecture approach, service providers have the freedom to choose best-of-breed elements and control the introduction and rollout of new customer applications and broadband technologies. This is accomplished by implementing management and control features as software applications created on top of open-source network control and service orchestration systems.



## Programmable

Orchestration and automation enable service providers to simplify network and back-office operations, streamlining new subscriber adds and upgrades while reducing truck rolls.



## Scalable

Highly elastic networks offer service providers the advantage to quickly and efficiently scale services to any customer base. This also streamlines service innovation, allowing operators to capture subscriber mindshare.

ADTRAN SD-Access solutions are natively integrated into an open microservices architecture that spans the entire network from cloud edge to subscriber edge – from data center to device. And, most importantly, they provide drastically improved operator competitiveness.



# MOSAIC<sup>®</sup>

Open. Programmable. Scalable.

Software-Defined Access by **ADTRAN**

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## ADTRAN, Inc.

901 Explorer Boulevard  
Huntsville, AL 35806  
256 963 8000

## General Information

800 9ADTRAN  
info@adtran.com  
www.adtran.com

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## Canada Headquarters— Toronto, Ontario

+1 877 923 8726  
+1 905 625 2515  
sales.canada@adtran.com

## Canada—Montreal, Quebec

+1 877 923 8726  
+1 514 940 2888  
sales.canada@adtran.com

## Mexico and Central America

+1 256 963 3321  
+1 52 55 5280 0265 Mexico  
sales.cala@adtran.com

## South America

+1 256 963 3185  
sales.brazil@adtran.com  
sales.latam@adtran.com

ADTRAN is an ISO 9001,  
ISO 14001, and a TL 9000  
certified supplier.

**TL9000**  
TL19.1270



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