Customer Success Story

America's Largest Freight Railway Improves Track Safety with State-of-the-Art Internet of Things Edge Infrastructure

How Technologies from Dell EMC, VMware, and Arista Created One of the Largest, Most Reliable IIoT Networks

The railway freight industry, as in nearly every other industry, is becoming more efficient, customer focused, and safer as they leverage a greater number of information technologies in the core of their business. Track safety, track switching, and scheduling intelligence is the heart and soul of keeping trains safe, on time, and cost efficient. With these requirements in mind, this railway IT team worked out of the box in incorporating IoT safety data into the day to day operations management of their trains.

A Massive Dynamic IIoT Networking Challenge

At one of the largest freight railways in North America, nearly 10,000 locomotives rely on more than 30,000 miles of track to move freight across 28 states. The automated collection of trackcondition data by embedded sensors provides massive amounts of mission-crtical data. The network must support a highly dynamic environment where more than 100,000 IP addresses are in motion, making it one of the largest industrial IoT (IIoT) deployments in the world. Furthermore, if the network goes down, it takes two weeks to get all of the trains moving again; an outage of this magnitude is unacceptable for all parties concerned. High availability is of utmost importance.

The railway's leaders understood the need for better IIoT safety intelligence, modernized data analysis to optimize scheduling and resource utlization, and improved customer experience. To deliver them, the company's development teams recommended new technologies.

The railway IT team needed to ensure its network could provide a variety of compute and storage platform choices to accommodate many new application technologies requested by the developers. The infrastructure planners wanted to be able to add platforms on-demand—not months in advance—with auto provisioning of both the physical connections and the tenant resource pools. Flexibility and orchestration integration would be critical to the solution.

The Solution

IT quickly concluded that its legacy data center infrastructure would negatively impact any efforts by its application developers to quickly on-board new applications, especially those leveraging track safety data. Given the requirements, the legacy infrastructure's box-by-box manual network provisioning was not sufficiently agile, cost-effective, or scalable.

The required flexibility led to a plug-and-play, rack-centric equipment approach: any rack with open slots and networking ports could be used for almost any type of server or app the railway decided to deploy.

As with compute and storage, networking looked as if it would benefit from a software-defined approach to transform the legacy network into a cloud-enabled, agile, and efficient environment.

After several months of evaluating software-driven networking approaches, the company selected Converged Cloud Fabric

(CCF), a data center network switching fabric that offers a virtual private cloud (VPC) on-premises cloud approach. CCF enables network as- a-service in a zero-touch cloud operational model, with scale-out VPC automation for virtualization, HCI, and container environments. Converged Cloud Fabric is fully qualified to run on multiple Dell EMC Open Networking switch hardware platforms.

What sets CCF apart from other solutions considered? The ease and speed of physically auto-configuring many different server form factors impressed the evaluation team, as did the logical partitioning of tenant pools and workloads via prepackaged plugins for Nutanix HCI, VMware vSAN, and Dell EMC VxRail nodes. Moreover, the ability to quickly add a new rack, especially in the locations where the IIoT data is being collected and analyzed. This require a mini POD approach, with the ability to manage and troubleshoot centrally. Again, Arista was able to deliver on this.
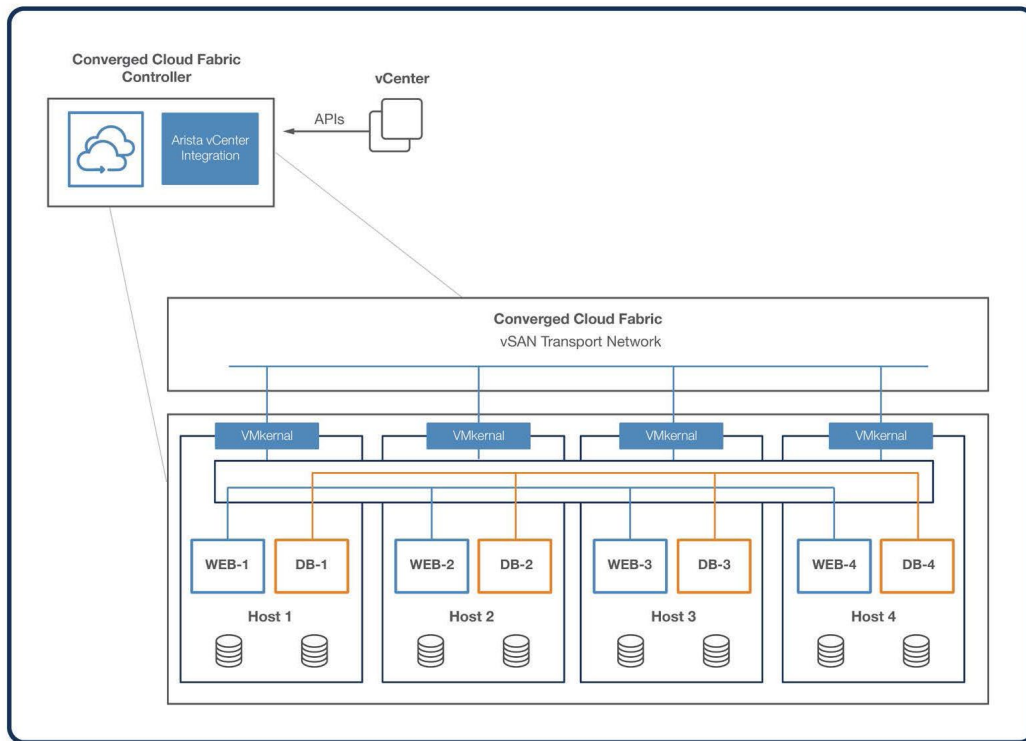
Figure 1: An overview of the Converged Cloud Fabric with plugins for auto-configuring vSAN hyperconverged infrastructure network interfaces.

Fast Forward to Today

Since adopting the Converged Cloud Fabric solution, the railway has benefited immensely from a more nimble, flexible, plug-and-play data center infrastructure.

Flexible, Agile, Easy-to-Configure Infrastructure

The company has deployed more than 3000 virtual machines (VMs) in production to date. Many of the VMs receive and analyze track-condition data, a key element of railway safety intelligence. Moreover, IT can choose from a variety of different VxRail nodes and add new HCI capacity into Converged Cloud Fabric without manual provisioning by a network administrator.

Speedy App Rollout

The railway deployed its next-generation applications exponentially faster than it could have with a traditional network infrastructure. Without having to purchase network capacity long before it was needed.

Scale-Out Capacity

The railway network has scaled out across a common CCF fabric. As needed, IT mixes Nutanix HCI nodes with Dell EMC VxRail nodes, auto provisioning the tenant pools based on the CCF integration with Prism and vCenter respectively. The railway deployed CCF in two data centers, which enjoy the flexibility of scale-out capacity via the CCF leaf-and-spine design, zero-touch fabric provisioning, and hitless upgrades.

Resilient High Availability

A high-availability design provides the reliability needed to keep the trains rolling.

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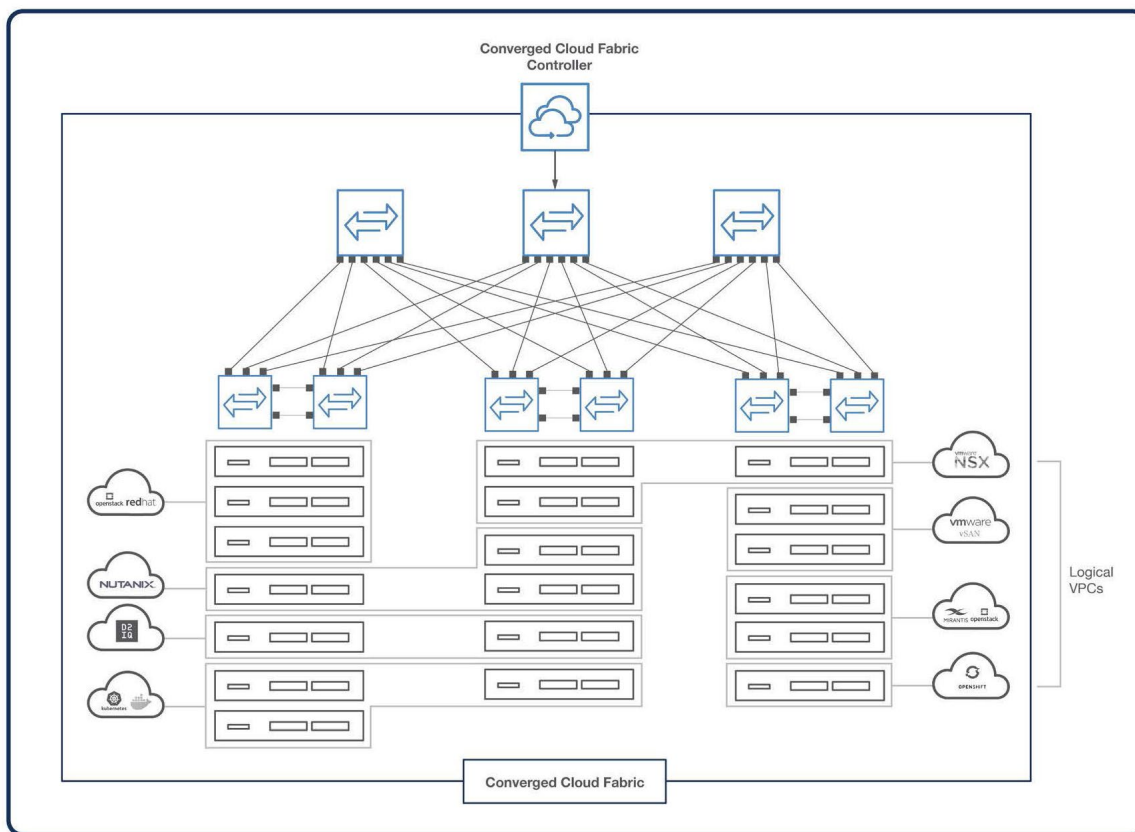
Figure 2: Converged Cloud Fabric provides a single physical fabric for multi-tenant, multi-orchestration deployments.

Converged Cloud Fabric offered the ideal solution, which enabled the railway company to meet its objective of application modernization. CCF automatically scales out as the DevOps teams require more VxRail capacity. CCF also offers the flexibility of mixing different cloud platforms together within the same fabric, based on the broad selection of CCF plug-ins available.

With added safety intelligence and better logistics management, the railway can focus on its core business: moving goods across the United States.

Objective

- Support mission-critical industrial IoT data acquisition system with more than 100,000 IP addresses in motion
- Maintain high availability. A network outage sidelines trains for up to two weeks.
- Modernize apps to ensure safety, operations efficiency, and competitive edge
- Identify cost-effective, scalable infrastructure to support agile app development
- Evaluate whether traditional networking legacy infrastructure will suffice

Solution

- Converged Cloud Fabric
- Nutanix HCI and Dell VxRail nodes
- VMware vSAN
- Nutanix Prism and VMware vCenter orchestration

Results

- Speedy app rollout for added safety intelligence and better logistics management
- Reliable, flexible, scale-out solution for two key data centers
- More capacity as needed
- Simplified zero-touch provisioning

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 & B, 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