

# Bare Metal Orchestrator

## Bare Metal Orchestrator: The easy way to manage hardware

Automate and orchestrate a fleet of hundreds of thousands of bare-metal servers (and more) to workload readiness with one simple solution

The virtualization and, increasingly, the cloudification of telecommunications networks are a response to changing market economics and opportunities. On the one hand, communication service providers (CSPs) need to run their networks more efficiently, even as they scale out those networks to meet increased demands for data, video, and rich-media services. On the other hand, new services such as those being promised by 5G will require CSPs to run their business with agility, flexibility, and openness to innovation. Moving to virtual and cloud-native network functions (VNFs/CNFs) allows CSPs to both reduce costs and improve business agility for the future.

The upside to a virtualized, cloud-native network infrastructure is the flexibility it brings by combining best-in-class software and hardware from multiple vendors. In essence, CSPs are no longer locked into a single vendor's vision of the future, but can bring together high-performance servers, switches, storage, advanced software, and composable cloud solutions from industry leaders to build the best network for their business. Yet there is a potential downside to this model too, in the form of added management complexity. Specifically, managing thousands or even tens of thousands of servers, switches, and storage appliances in distributed locations can be daunting, time-consuming, and prone to human error.

Infrastructure automation offers a solution to the challenge of managing a massive, disaggregated, virtualized network. Dell Technologies' Bare Metal Orchestrator provides powerful automation tools in a single, simple solution that is designed to help CSPs manage hundreds of thousands of compute, network, and storage nodes across core, edge, and RAN environments in any geographic location.

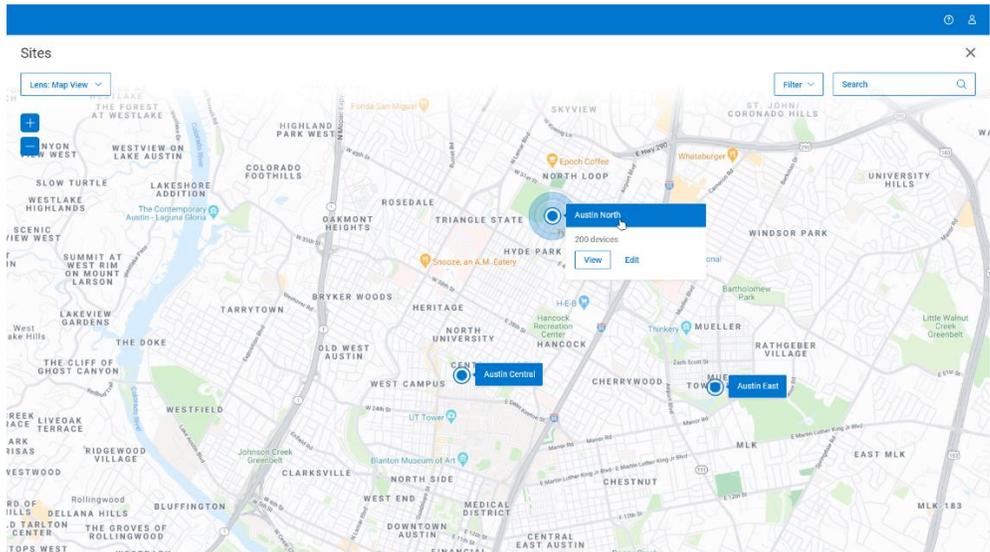


Figure 1. A graphical, intuitive interface makes it simple to identify and manage infrastructure by site location

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### Key Features

Reduce OpEx by orchestrating lifecycle management across your entire multivendor infrastructure through Redfish

Deploy, manage, and monitor 100s of thousands of bare metal servers

Fully define your desired virtual infrastructure stack outcomes including virtual infrastructure manager (VIM), OS/hypervisor, compute, network, and storage through declarative automation

Gain deep insights into the underlying infrastructure of your core, RAN, and edge workloads through centralized telemetry

Upgrade BIOS, RAID, firmware, drivers, OS, and more with a single click

## One solution manages the entire lifecycle for compute, network, and storage nodes

For years, CSPs have embraced virtualization in the core network in order to accelerate service creation and deliver better service experiences to their customers. More recently, virtualization has moved to the network edge and into the radio access network (RAN). Virtualized RAN (vRAN) solutions are particularly attractive because of the deployment flexibility they offer and the substantial cost savings that can be achieved by disaggregating RAN functions (e.g., the centralized unit, distribution unit, and radio unit) through VNFs/CNFs and commercial off-the-shelf (COTS) servers.

Dell Technologies' Bare Metal Orchestrator enables CSPs to manage all their bare metal servers today—up to hundreds of thousands of servers—through a single consolidated and centralized view that shows all hardware infrastructure at a glance. Dell Technologies plans to extend these lifecycle management capabilities to network and storage nodes as well, providing a complete end-to-end infrastructure management framework. This greatly simplifies the task of managing the lifecycle of hardware in a dynamic, disaggregated network by allowing network teams to easily discover, deploy, and update hardware anywhere. Instead of manual configurations and regional management teams, CSPs can remotely and centrally manage every server in their network with Bare Metal Orchestrator using standards-based Redfish APIs for maximum efficiency, resiliency, and agility across multivendor networks.

The screenshot shows the Bare Metal Orchestrator interface for the 'Austin North' location, displaying an inventory of 200 compute servers. The interface includes a navigation sidebar on the left, a top navigation bar with the location 'Austin North' and 'Inventory: Compute', and a main content area with a table of server details. The table has columns for Status, IP Address, Service Tag, Device Name, Flavor, Tenant, and Configuration Profile. The servers listed include various models like HL6B7Y1, SJPTC21, FC53DV2, MSM0010, SM4T326, ULY67Y1, HL6B79Q, SM7R827, STP3881, and ULY67Y1, with flavors ranging from L to XXL and tags like 'Tag Flavor'.

Status	IP Address	Service Tag	Device Name	Flavor	Tenant	Configuration Profile
●	10.255.2.00	HL6B7Y1	server-2	Flavor L	Austin.Edge1	Config 1
●	10.255.2.14	SJPTC21	server-4	Flavor XL	Austin.Edge2	Config 1
●	10.255.2.05	FC53DV2	server-5	Flavor XXL	Austin.Edge3	Config 1
●	10.255.2.17	MSM0010	server-15	Tag Flavor		Config 2
●	10.255.2.01	SM4T326	server-20	Flavor L	Austin.Edge5	Config 1
●	10.255.2.30	ULY67Y1	server-26		Austin.Edge1	Config 1
●	10.255.2.07	HL6B79Q	server-30	Flavor XL	Austin.Edge1	Config 4
●	10.255.2.19	SM7R827	server-31	Flavor L	Austin.Edge3	Config 4
●	10.255.2.09	STP3881	server-33	Tag Flavor	Austin.Edge4	Config 3
●	10.255.2.73	HL6B7Y1	server-35	Flavor XXL	Austin.Edge1	Config 1
●	10.255.2.76	ULY67Y1	server-37	Flavor L	Austin.Edge1	Config 1
●	10.255.2.07	HL6B79Q	server-39	Flavor XL	Austin.Edge1	Config 5
●	10.255.2.19	SM7R827	server-44	Flavor L	Austin.Edge3	Config 1
●	10.255.2.09	STP3881	server-47	Tag Flavor	Austin.Edge4	Config 1
●	10.255.2.73	HL6B7Y1	server-52	Flavor XXL	Austin.Edge1	Config 1
●	10.255.2.76	ULY67Y1	server-57	Flavor L	Austin.Edge1	Config 4

Figure 2. Inventory of all servers at a specific location for better management capabilities

## Bare Metal Orchestrator is the right software for hardware

Managing thousands of hardware devices is hard work... but it can be much easier with Bare Metal Orchestrator:

- ❖ Quickly deploy and manage thousands of compute, network, and storage nodes anywhere in your network using open, industry-standard Redfish APIs
- ❖ Eliminate hardware configuration errors with simple, declarative automation tools
- ❖ Declaratively deploy workload-ready, virtualized infrastructure stacks
- ❖ Collect rich network insights in one place and use those insights to create new services and improve customer experiences

## Focus on outcomes, let automation do the rest

Bare Metal Orchestrator uses *declarative* automation, which means that CSPs only need to define the desired outcome of their infrastructure environment and Bare Metal Orchestrator does the rest, determining which commands will achieve those desired states based on workload requirements and current network service demands. Declarative automation allows CSPs to get the best results from their network without requiring highly specialized domain expertise to program and configure their hardware. The ability to consistently test, validate, and deploy telco infrastructure greatly reduces the risk and accelerates the time to market for new services.

With declarative automation, CSPs declare their virtual infrastructure deployment as an outcome. Bare Metal Orchestrator then translates that outcome into the steps needed to compose and deploy all necessary elements of the stack. This includes:

- Boot-strapping the compute with BIOS configurations, firmware, and host OS/hypervisor
- Connecting the hosts via the selected network topology
- Attaching storage volumes, and
- Deploying the VIM into a workload-ready state

## Monitoring and health

Dell Technologies' bare metal infrastructure automation solution also delivers rich telemetry and underlying infrastructure utilization statistics that can be used to improve network performance, plan network capacity, and identify new service opportunities for the future. With Bare Metal Orchestrator, CSPs can manage the network of tomorrow with the skills and resources they have today using simple, intuitive, unified automation controls that ensure every single server is working hard in their network.

The screenshot displays the Bare Metal Orchestrator interface for a server in the 'Austin North' region. The top navigation bar shows 'Austin North' and 'Inventory : Compute'. Below this, a status bar includes '0 New Alerts', 'Health' (green), 'Power On' (green), 'Active' (green), 'Flavor L', 'Config Profile: Austin.Edge1' (green), and 'Service Tag: HL6B7Y1'. The main content area is divided into several sections: 'Identification' (BMC IP: 192.168.110.102, Device Name: server-2, Device ID: Device 740, Manufacturer: Dell Inc., Model: PowerEdge R650, Service Tag: 6F667F45, Serial Number: ABC123@#), 'Flavor and Tenant' (Flavor Name: Flavor L, Tenant Name: Austin.Edge1, Cost Center: Engineering, Org Admin: Dell, Provisioned: 12/6/11, 12:00 AM), 'Hardware' (Total Cores: 2, Total Threads: 4, Processors: 3, Memory: 256.0 GB, Available DIMMS: 0, Storage: 2,235.17 GB, NIC: 2x25 Gbps, 1x1 Gbps, PSU: 3), 'Monitoring' (CPU Usage: 10%, Memory Usage: 30%, CPU Temp: 20 °C, System Power: 400 W), and 'Configuration' (Data Center: Datacenter 2, Room: Room 1, Aisle: Aisle 1, Rack: Rack 22, Slot: Slot 8). A photograph of a server rack is shown at the bottom left of the main content area.

Figure 3. A graphical intuitive interface makes it simple to manage individual servers and more

In v 1.0 of Bare Metal Orchestrator, the following features are available:

### Scope

- Open architecture
- Redfish multi-vendor support
- Compute
- Multi-tenant
- Environmental awareness

### Metering and Chargeback

- Usage based billing

### Automation

- Auto-Discovery
- Inventory reconciliation
- Zero touch deployment
- Provisioning
- Upgrade
- Config personality management
- VIM/Stack deployment

## Hardware Management

- Firmware management
- Health and utilization
- Out of band management

## Security

- Certificate Management
- Secure data erasure

## Self Service

- Common portal

## Composability

- By location, workload, platform

## Programmability

- Declarative automation
- API first strategies
- Infrastructure as code

## Federation

- Entire fleet under one umbrella
- User interface
- Single API entry point

## Scale

- Tens of thousands of sites
- Globally distributed
- Single node to multi-rack

## Log management

- Detailed logging
- Event monitoring – some (telemetry, compute status)

## Back-up / Restore

- Configuration
- Firmware back-up and rollback

You can find a comprehensive list of documentation for this solution at the [Info Hub](#).

Dell Technologies welcomes your feedback on the solution and the solution documentation. Contact the Dell Technologies Solutions team by [email](#) or provide your comments by completing our [documentation survey](#).

### Contact us

To learn more, contact your local representative or authorized reseller.



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