

Element Management System For Transport Devices

AI-Powered Unified Network Platform

Unified management and control across IP/MPLS routers and clients through a single pane of glass, driven by AI-based analytics to detect problems and performance bottlenecks, identify anomalies, and faster RCA for reducing the Mean-Time-to-Resolution (MTTR).

Deployment-Ready at Any Scale

From small offices to large, distributed campuses, HFCL EMS scales flexibly with multiple deployment models, to match your growth and control needs.

Secure, Standards-based Integrations

Enable third-party integrations—including Captive Portals, AAA servers, Syslog server. Seamlessly integrate with external applications via northbound REST APIs supporting secure data exchange.

Client-Centric Issue Intelligence

Go beyond basic KPIs with deep visibility into client-specific issues encompassing connectivity failures, network-layer anomalies, application experience disruptions.

Issue Detection & Recommendations

Enable third-party integrations—including Captive Portals, AAA servers, Syslog server. Seamlessly integrate with external applications via northbound REST APIs supporting secure data exchange.

Zero-Touch Provisioning

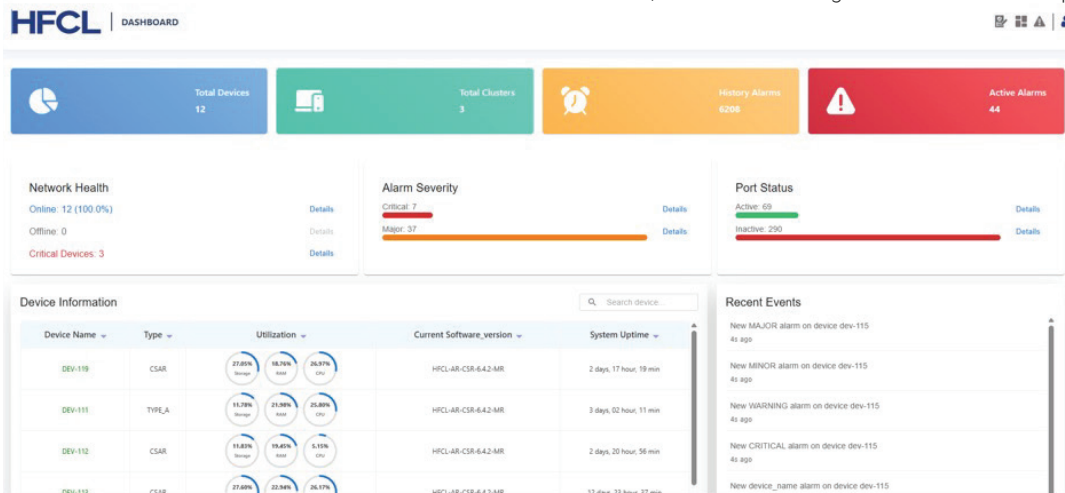
Onboard hundreds of devices in minutes with bulk provisioning, apply network and device-level policies automatically using hierarchy-based configurations, and reusable templates.

Always-On Analytics at Every Level

AI-driven analytics engine runs 24x7x365 across sites, devices, and clients and is available across all license tiers ensuring no blind spots in network performance

High-Availability Cloud-Native Architecture

Ensure uninterrupted operations with containerized microservices running in active-active or N+1 configurations across Kubernetes clusters, offering built-in load balancing, failover, and elastic scaling for mission-critical deployments.



EMS System Overview

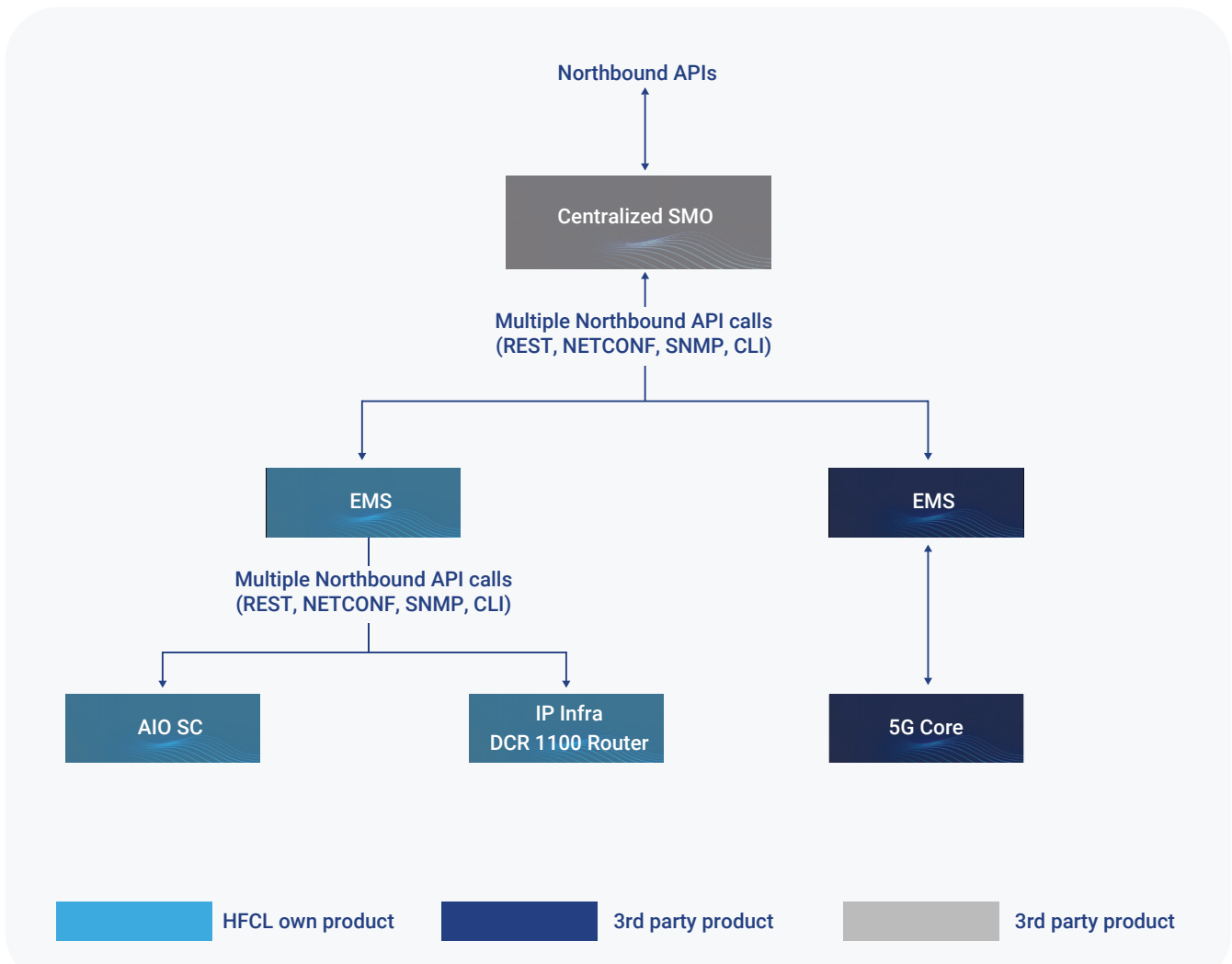
HFCL EMS is a next-generation, cloud-native Element Management System designed for multi-technology networks. It enables centralized operations and maintenance of both physical and virtual network elements across radio and transport domains.

Built on a microservices architecture, the EMS supports deployment on public cloud platforms (e.g., AWS, Microsoft Azure) or on-premises infrastructure. It offers unified monitoring, fault management, and service visibility from a single interface.

The solution is Open API-based, supporting industry-standard interfaces:

- **Northbound:** REST, TMF, Netconf/YANG, Syslog
- **Southbound:** REST, TMF, CLI (SSH/Telnet), Netconf/YANG, SNMP, S/FTP, TCP Socket

HFCL EMS is designed to scale with network growth, offering seamless integration with existing OSS and NMS frameworks.



EMS System Overview

HFCL EMS supports third-party SMO solution to offer end to end (E2E) Closed Loop Automation solution that maximizes operational excellence with the End-to-end network management functionality. The key value proposition of the solution:

- Increase E2E mobile backhaul deployment agility through automation, accelerate service provisioning.
- E2E visibility of mobile backhaul domain within one network management system.
- Real-time Fault Management with common monitoring applications & processes.
- Real time fault monitoring through common notification platform.
- Preventive Care - proactively monitor and manage mobile transport.
- Enable integration with existing BSS/OSS system through flexible NBI open APIs.
- Ease of mass scale configuration changes / version upgrades
- Less manual intervention results in fewer human errors.

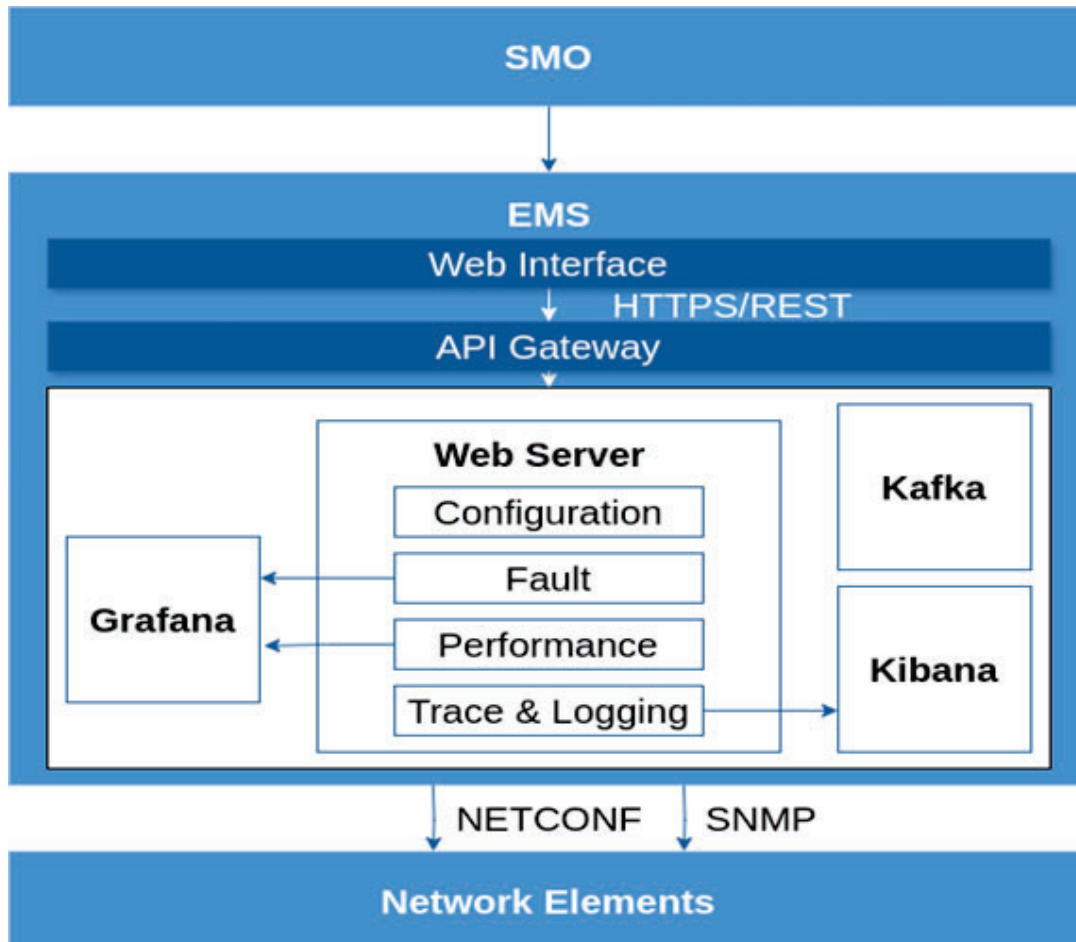
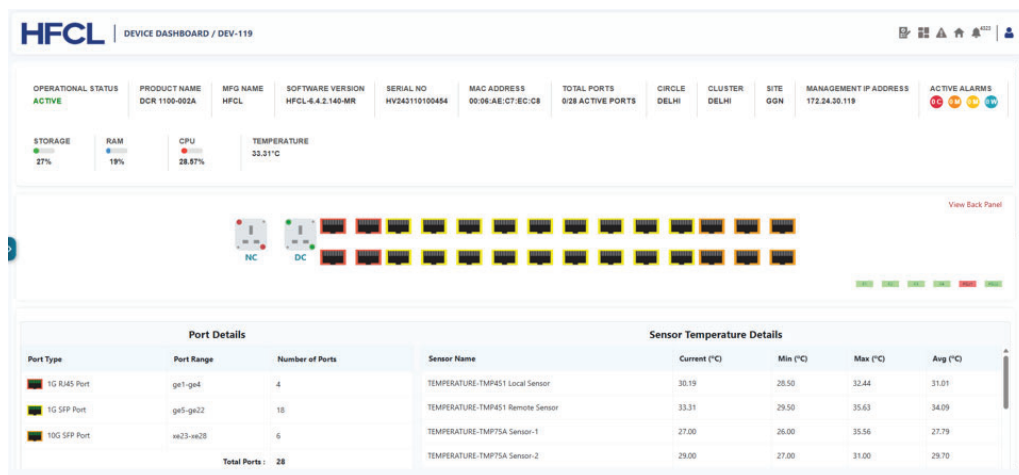
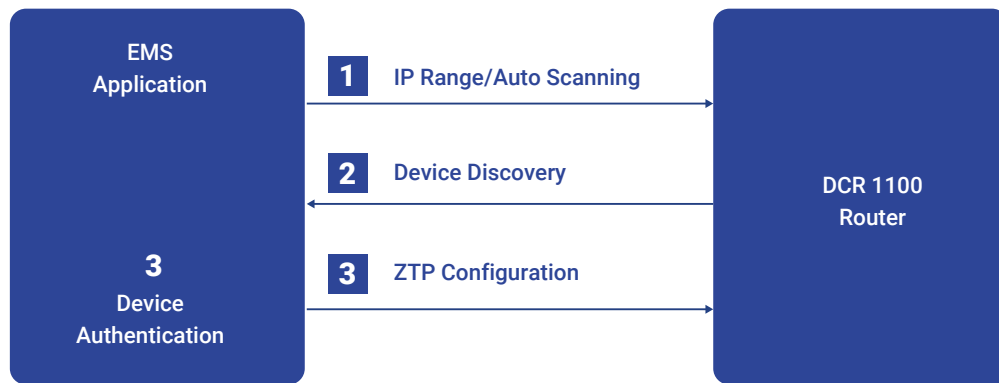


Figure 2: Software Architecture of EMS

Zero Touch Provisioning (ZTP)

EMS can automatically configure devices leveraging its Zero-touch provisioning (ZTP) feature. Manual configuration takes time and is prone to human error -- especially if many devices must be configured at scale. ZTP helps deployment teams quickly deploy network devices in a large-scale environment, eliminating most of the human efforts as well as human errors. This section of this document describes the process flow for HFCL EMS ZTP functionality.



Feature Overview

EMS supports the following features for the Routers -

- **Fault management.**

- Immediate fault detection via polling & traps
- Multi-level severity with color-coded display
- Adaptable multi-level thresholds
- Status propagation to all levels of network
- Email alert mechanisms for alarms based on severity
- Alarm suppression and shelving mechanisms
- Alarm management with extensive filtering and sorting
- Organize devices by attributes such as group, type, location, Service, and topology for efficient fault management
- View individual alerts with detailed information

- **Configuration management**

- Configuration of all routing protocols and services
- Backup/Restore using configuration templates
- Scheduled Backup of device configuration
- Download startup and running configuration
- Configuration change comparison with color-coded highlighting
- Comparison of configurations across devices / versions
- Baseline tagging of stable configurations
- Notifications on configuration changes
- Option to upload configuration files

- **Accounting management**

- Displays detailed and summary subscriber profiles as accounting triggers via GUI/web.
- Shows service type details for accounting and management use.
- Monitors bandwidth utilization and subscription activity (total, new, upgrade, etc.).
- Tracks traffic origination and termination points.
- Reports real-time and historical traffic statistics.
- Logs connectivity time metrics (average, total, peak, etc.).
- Records active user logins with login and logout timestamps on the management GUI.
- Enables role-based access control with configurable, granular user permissions.
- Integrates with external authentication systems like TACACS+, RADIUS, SecurID, Active Directory, and LDAP.

- **Performance management.**

- **Multi-aspect performance tracking for proactive management**
 - Network performance
 - Device performance
 - Application performance
- **Maintenance of historical data for in-depth analysis**
- **Flexible dashboards for multi-angle information**
- **Multilevel data aggregation of network**
- **Extensive performance-based reports**
- **SLA Tracking with alerts and escalation support**

Feature Overview

EMS supports the following features for the Routers -

- **Security management.**

- Security by design
- Password management
- Role-based access privilege
- AES encryption
- Sha256 one way hashing
- Secured way of Monitoring using snmpv3, SSH
- Supports compliance with Regulations with data archival.

- **Inventory management.**

- Software management
- License management
- Hardware management
- Inventory audit reporting

- **User management.**

- Password policy
- RBAC – Role Based Access Control
- Password change/forgot/reset
- Group edit resource and threshold settings
- User preferences
- User groups
- Logged in users

- **SLA Management**

- Enable customers to verify SLA online
- Monitor real-time and historical service quality
- Generate SLA violation alerts and reports
- Model and assess overall SLA compliance
- Define metrics using KQIs and KPIs
- Configure thresholds and detect anomalies
- Support future services and scalability

- **Traffic Flow Analytics**

- Packet capture based flow analysis
- Congestion detection via User-based, Application-based traffic analysis

- **Flexible & Customizable Reports**

- Highly Informational pre-configured reports
- Strong, fully configurable, reporting module
- Option of generating multiple reports in parallel for comparison and analysis
- User specific access to reports
- Scheduled automatic reports sent directly by the systems
- Multiple graph support (Trend, Bar, Pie etc.)
- Top-N & summary reports – both timewise & site-wise
- Reports extrapolation to support capacity planning
- Export to multiple formats like PDF, Excel, CSV etc.

Feature Overview

EMS supports the following features for the Routers -

- **Graphical User Interface**

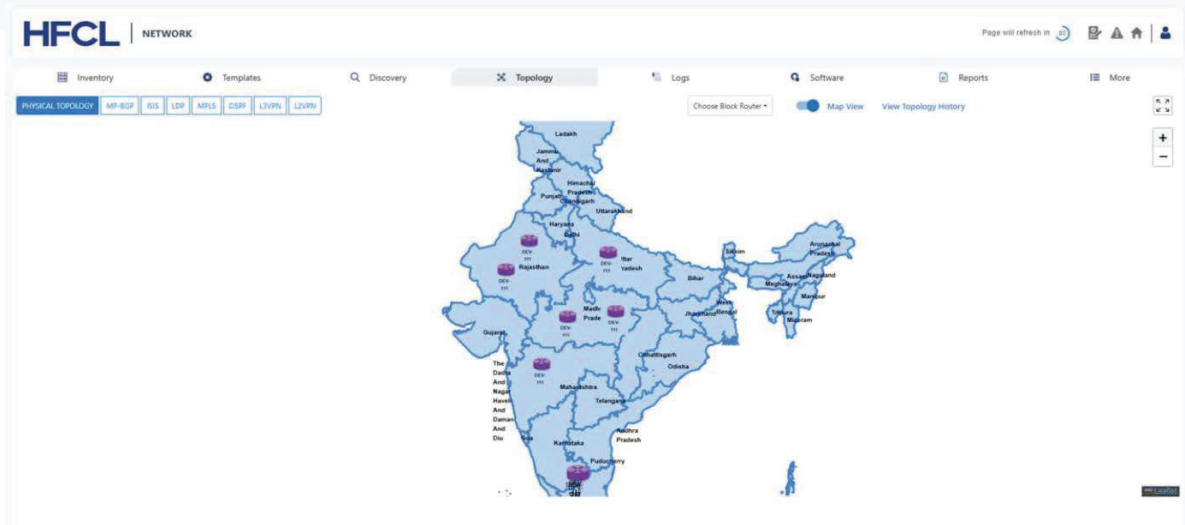
- Network dashboard
- Map view
- Topology / flat view
- Network diagram as a service
- Alarm Dashboard
- Device dashboard
- Device view
- Node view
- Router Front/Back Panel

- **Notification & Escalation**

- Multi-mode notification
- Rule based alerts
- SMS, e-mail, etc.
- Multi-level escalation support
- Support for bulk notifications by grouping based on:
 - Time periods
 - Nodes/Devices

- **Self-Monitoring Capability**

- Automated health checks
- Real-time status updates
- Historical data storage
- Event logging
- Scalability
- Seamless integration
- Security measures for data protection



Hardware Configuration & Deployment Options for EMS

Engineered with microservices, Kubernetes, and NoSQL to deliver high availability, flexibility, and seamless cloud deployment.

- Run on cloud-native microservices architecture
- Deploy using containers and Kubernetes
- Scale dynamically from 100+ elements
- Operate across public, private, hybrid clouds
- Ensure high availability with N+1 redundancy
- Use NoSQL, ELK, and Grafana stack
- Allocate resources via infrastructure layer
- OS (Operating System): Ubuntu 20.04 or above

- **Minimum Hardware requirements:**
 - Cloud Deployment - 1TB Hard Disk, 128GB RAM, 64vCPU
 - Bare Metal Deployment- 1TB Hard Disk, 128GB RAM, 64vCPU

Ordering Information

Model No.	Description
EMS Base Software Application	HRMS DCR_SW
EMS Device License	HRMS LIC