

# Converged Network Management for 5G

Automating FCAPS Monitoring & Management for 5G Core & RAN

## Business Challenges

Networks are changing and so is the way we manage them. 5G represents a complete revolution of mobile networks for accommodating the over-growing demands of users, services and application. In contrast to previous transitions between mobile networks generations, 5G requires a much complex management system based on the softwarization of network resources. One of the most important requirements for assuring the timely delivery of services without interruption is a network management system that is flexible enough to provide visibility within a complex network while anticipating network issues before customers become aware of them. This ultimately will lead to a system that requires real time management based on a hierarchy of complex decision making techniques that analyze historical, temporal and frequency network data.

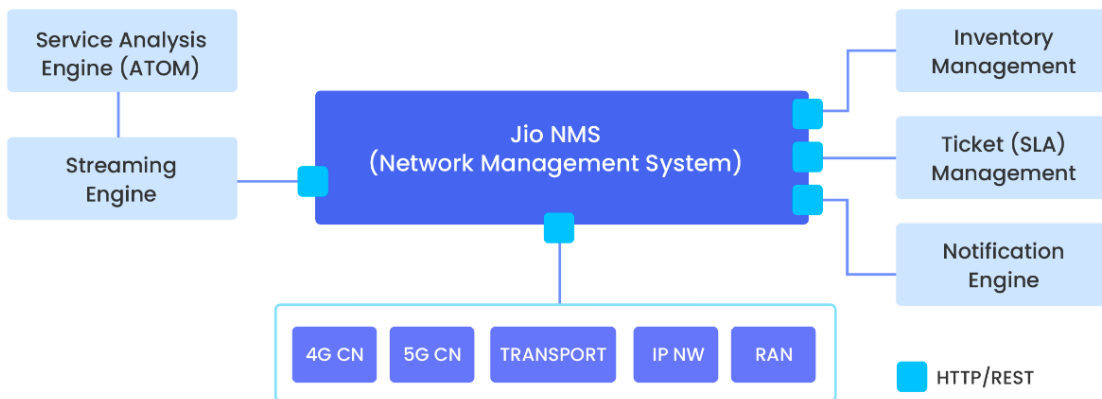
## HIGHLIGHTS

- (F) Fault: Collects and manages alarms from network devices.
- (C) Configuration: Manages the network topology layouts and (get/set) configuration of network element instances.
- (A) Accounting: Accounts the resource utilization of all the instances of a network element and its service up/down times.
- (P) Performance: Fetches counters and calculates KPIs on a configurable time interval.
- (S) Security: Supports definitions of user roles and groups for security management of NMS

To manage these flexible, programmable, evolving hybrid networks, service providers will need to employ network management covering radio, transport, and core network technologies in an end-to-end manner. Converged network management has been proposed as the solution for this problem, in which the use of machine learning to develop self-aware, self-configuring, self-optimization, self-healing and self-protecting systems will enable cognitive network management. It is designed and built to improve operational productivity and deliver the best user experience in networks where content delivery, IoT, M2M and enterprise services underpin a new business reality.

## Network Management System

The Network Management System (NMS) is a critical piece in the overall telecommunications-management solution. It is the sole mediator for monitoring and managing the FCAPS data of the network elements and provides a single pane of glass for the Network Operations Centre. JPL's NMS is fully integrated with AI and ML capabilities, leading to "light touch" operations.



The JPL's NMS platform is capable of effectively monitoring and managing the FCAPS information of network elements and provides comprehensive dashboards for easy visualisation. The NMS can provide more than thousands of customized reports out of the box for current & historic data. This enables greater visibility during operations and management of network elements. It is integrated to a Notification Engine, a global utility deployed as service used to send email / SMS notification to a set of desired recipients / group of recipients. It is also integrated with a Ticket Management System so that on-call members of resolver teams can take direct action on incident tickets in real time from any mobile device. Alarm Notifications is presented to recipients via multiple communication channels, allowing updates, assignments, or status changes to be actioned remotely. The solution abstracts relevant aspects of the network elements it is managing, into an information model. The abstracted information is further communicated to next level of analytics platform with easy northbound integrations.

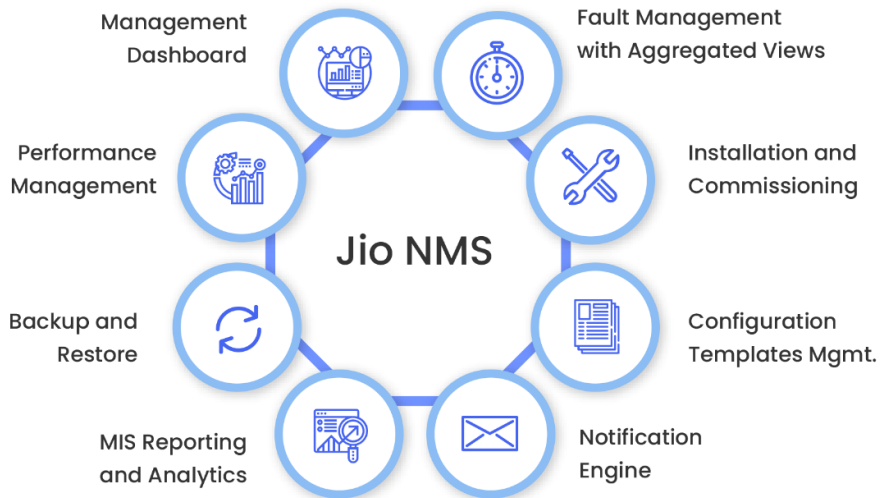
It is designed to support ETSI NFV architecture by managing network elements both in the form of virtualized network functions (VNFs) , cloud native functions (CNFs) and physical network functions (PNFs). In addition, it supports a broad array of features to ease the operations and management of the nodes. The platform also provides a foundation to implement Operations Support System (OSS) architectures that enable service providers to meet stringent quality of service (QoS) requirements and meet customer needs for rapid deployment of new services.

*"Single Pane of Glass for FCAPS for All Network Functions. Fully Integrated with AI and ML capabilities, made for "Light touch" operations."*

## FCAPS Management for 5G Core

5G networks represent a shift in networking paradigms: a transition from today’s “network of entities” to a “network of functions”. With the advancements of the infrastructure technology for accommodating the next generation of network functions, the next level of network management has to incorporate the flexible manipulation of network resources and leverage it with the number of users, the network traffic, the SLAs, and the demanded system performance.

The virtualized management functions fit in a modular software architecture with stateless and state-efficient designs, for both centralized and distributed deployments. The micro services can be deployed on VMs, Docker Containers, Microsoft Azure, Google Cloud Platform or any other cloud platform. The Jio NMS is fault tolerant by design, this means it stays operational 99.999% of the time. ML techniques are employed for the FCAPS management areas to provide some degree of autonomy. Service providers can rely on JPL’s NMS to provide information that allows the following:



### Key Capabilities

**Fault Management**

Alarm monitoring for all network elements subscribed to NMS, Network topological view for easily locating faulty devices.

**Performance Management functions**

Node wise, category wise value of the counters, Define and monitor KPIs, etc

**Configuration and Template Management**

Gathering and storing configurations from network elements, to plan for future expansion and scaling.

**Backup and Restore**

Backup profiles management, Backup history, Zero touch backup restore, Restoration history

**Identity and Access Management**

User management, Trace management, Role management

**Installation and Commissioning**

Step by step installation wizard, OS installation on a blank node, Installation history, Manual and Automatic Installation

**MIS Reporting and Analytics**

View generated reports, send them on email and encrypt the report, Online/offline reporting

**Notification (Email / IM) Engine**

Define notification groups, Email templates for a specific network element and its configured event

## FCAPS Management for RAN

Radio Access Network NMS platform is capable of effectively monitoring and managing the FCAPS information of RAN elements as well and provides comprehensive dashboards for easy visualisation of the summary of the RAN products (i.e., No of ODSCs, gNodeB etc.). The platform supports smooth accessibility and visualization of NMS functions through an interactive web based User Interface. It can also provide more than thousand customized reports out of the box for current & historic data. This enables greater visibility during operations and management of network elements and help minimize costs by allowing faster network roll-out, identification and restoration of network and service issues.

### Salient Features

- Interactive User Interface
- Configuration Management
- Performance Management
- Fault Management
- SW Management
- Smooth Administration
- System Monitoring
- Backup & Restore
- Notifications

JPL’s Converged NMS is based on microservices that can be upgraded and scaled up independently. This ensures inline upgrades with zero downtime and gives the whole solution great resilience. The Jio RAN NMS can upgrade gNodeB in a time and geographically separated window to cause minimum service disruption, specify upgrade pre-conditions and post checks. It provides the provision to roll back, provision to download and activate a specific release on board at a scheduled time. Jio RAN NMS is also responsible for collecting notifications from RAN elements and provide it as a summary to the user. Backup & Restore functionality is also available using GUI as well as CLI.

#### Supplementary Modules

##### Login and Supplementary Operations

Provides login, logout, forgot password, change password operations.

##### Central Dashboard

Real time dashboard indicates each network function details

##### User Management:

Provides support to add user with details, Grouping of users with expiry date.

##### Role Management

Helps to keep location specific information secure.

##### Trace Management

Supports logging of activities/actions performed after logging by the user which are beneficial while auditing.

##### Node Provisioning

The NMS has capability to provision any network function. Only provisioned network function can communicate with NMS.

##### Vendor Topology Management

Supports trap reception over SNMP & vendor wise trap severity mapping & runtime management

## Business Outcome

Converged network management paves the way as a key enabler of 5G performance expectations. The number of devices, the demanding services traffic, the performance requirements of the network, require a more optimized yet specialized network management solution, capable of dealing with flexibility of resources and maximization of the network efficiency. This requires learning algorithms, which can analyze and quantify the current traffic in the network precisely, allowing for improved efficiency, dynamic scaling, resilience and reliable and secure network slicing. The solution is elevating the level of cognitive abilities using machine learning that has the capability of adapting an entire system based on historic data, which means that in 5G, the network management will monitor key metrics with the network, understand the configurable parameters and optimally adjust their values for achieving a superior network configuration, indicated through a set of key performance indicators.

## BUSINESS BENEFITS

- Seamless Operation
- Real Time Intelligence
- Automated Optimization of Complex Networks
- Advanced Troubleshooting
- Superior Network Performance
- ETSI Compliant
- High Capacity
- Zero Touch Activation
- Upgrades with Zero Downtime
- Ease of Scaling
- Enhanced Data Security
- Interactive User Interface
- Enhanced User Experience
- Simplified Integration with Third party systems

JPL's Converged NMS is the key driver for 5G success, aligned with concepts such as self-awareness, self-configuration, self-healing, self-optimization and self-protection. It is capable of managing the FCAPs for both Core and RAN Network elements. It is a carrier grade management solution capable of scaling as the network grows, maintaining high performance levels as the number of network elements increases, and providing simplified integration with third-party systems. With the cloud ready architecture supporting standard ETSI interfaces, the platform meets the service providers' expectations for an integrated and fault tolerant operational support system that paves the way for 5G and also future mobile network generations.

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