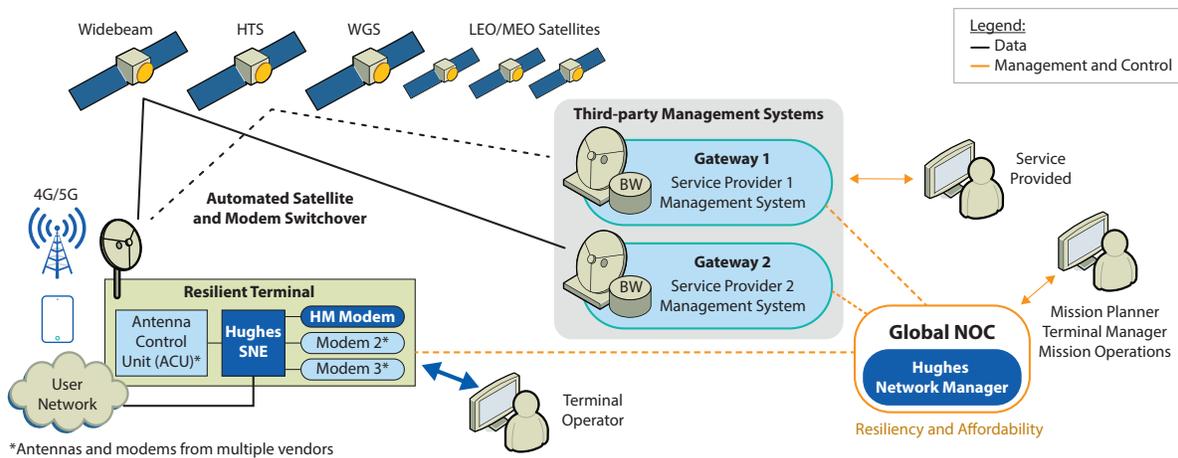


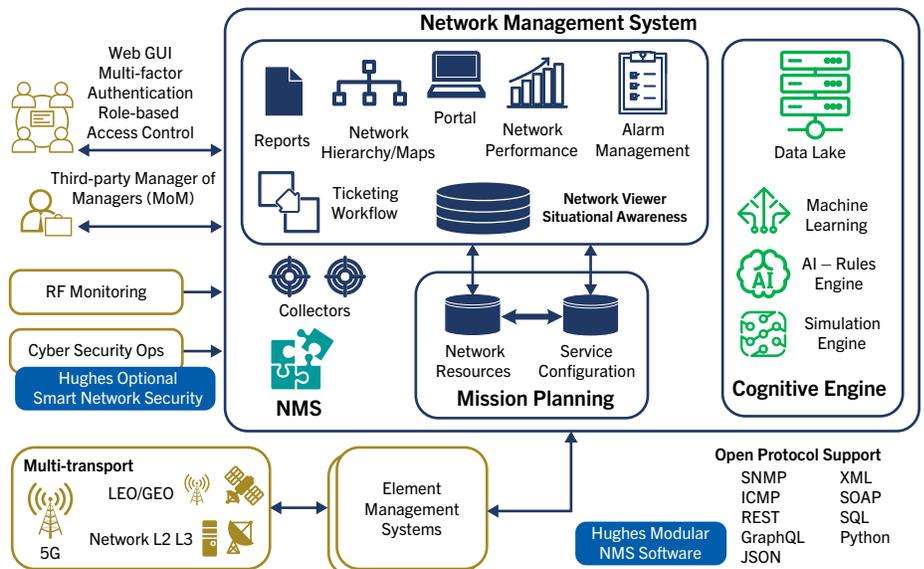
Secure Network Management System (NMS) for LEO/MEO/GEO/5G Resilient Communications

Introducing the Hughes Network Management System (NMS), a key enabler for state-of-the-art resilient communications utilizing multiple diverse transports including GEO, MEO, LEO and 5G systems. NMS is based on modern modular software design and can run on a single server or scalable public or private cloud configurations. NMS software can be utilized to automate global network operations that leverages existing transport systems and their respective element managers. The Global NOC can thus provide automated Enterprise Monitoring and Coordination (EMC) capabilities. With standards-based northbound and southbound application programming interfaces (APIs), NMS software can fit in a variety of federated management frameworks at any level for tactical and enterprise applications.

Situational Awareness: The NMS Network Viewer module provides comprehensive viewing, filtering, and logging capabilities for multi-dimensional situational awareness data including network, cyber, and RF information that are all key for secure and robust network operations.



Mission Planning: The NMS Mission Planner manages detailed resource configuration attributes, including coverage areas, capacity, QoS, pool type (Mbps or MHz) and various time/space-based resource commitments. New service requests can be processed using a configurable rules-engine to automatically create mission resource and service plans comprised of terminals, time, coverage area, capacity, service type and set of terminals used for a mission. These plans can be automatically distributed to terminals equipped with Hughes' Smart Network Edge (SNE).



Cognitive Engine: The NMS includes a scalable data lake module to store all network-related information that can be analyzed and learned with a suite of simulation, machine learning (ML), rules-engine, visualization and analytics toolkits.

The NMS supports all major open protocols for its APIs, including SNMP and REST/HTTP, for interfacing with various LEO/MEO/GEO/5G elements, element managers and third-party management systems. Customizable to meet capacity, security, price, and performance criteria, Hughes NMS scales from a single transportable server to a scalable, virtualized, private and public cloud using x86 computing servers, containers, and VMs.

Applications: Managing LEO, GEO, 5G and terrestrial networks and components, Hughes NMS enables applications spanning tactical, regional, and enterprise level network management with a flexible licensing scheme for one or more modules. Developed using agile DevSecOps, NMS supports resiliency standards, such as Flexible Terminal Interface (FTI), that are needed for contemporary resilient networks using diverse and redundant transports.

			
<p>Flexible</p> <ul style="list-style-type: none"> • Server-based for tactical networks • Scalable private/public cloud • Modular with flexible licensing • Configurable mission planning rules for Primary, Alternate, Contingency, Emergency (PACE) • Northbound API for third-party manager-of-managers • Southbound API for third-party element managers 	<p>Interoperable</p> <ul style="list-style-type: none"> • Leverages all major open management protocols • Out-of-the-box management of routers, servers, firewalls and switches • Validated with multiple LEO and GEO satellite systems • Validated for 5G RAN, Core and MEC • Scripting facility for agile integration of new devices 	<p>Comprehensive Features</p> <ul style="list-style-type: none"> • Automated PACE mission planning • Dynamic planning • Common operations picture for Situational Awareness (SA) • Alarm and log management • Configurable report writer • Web GUI with RBAC • Data lake with AI/ML tools • Simulation engine • Scalable data collectors 	<p>Cutting Edge Software</p> <ul style="list-style-type: none"> • Modular architecture • Modern web interface • Northbound and southbound APIs • Configurable rules-engine for mission plans • Features and capabilities continuously enhanced • Agile DevSecOps • Containers and VMs • Artificial Intelligence (AI) • Machine Learning (ML)

NMS Technology Features

- Scales from tactical to 10,000+ terminal networks
- Designed with Zero Trust Architecture (ZTA) security
- Flexible configuration for federated management
- SA data collection over FTI
- PACE planning
- Automated PACE plan distribution over FTI
- Automated mission plan distribution over FTI
- Integration with element managers (SB API)
- Management of IP-based Layer 3 devices
- Management of Ethernet-based Layer 2 devices
- Flexible Terminal Interface (FTI) for resiliency
- SNMP and REST/HTTP
- Orchestrates multiple LEO satellite transports
- Orchestrates multiple GEO satellite transports
- 5G Core, 5G Radio Access Network (RAN)
- 5G Multi-Access Edge Compute (MEC)
- Integrated with (optional) Hughes Smart Network Edge
- Integrated with (optional) Hughes Smart Network Security
- Multi-factor authentication
- Role-Based Access Control (RBAC)

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