GIS, FNMS, and BSS/OSS: The Unsung Heroes of Fiber Optics

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In the complex world of telecommunication networks, the seamless operation and efficient management of fiber optic networks relies on the support of digital systems including Geographic Information Systems (GIS), Fiber Network Management Systems (FNMS), and OSS/BSS for the integration of Operational Support Systems (OSS) and Business Support Systems (BSS). In a nutshell, these technologies enable the documentation and creation of digital representations of the networks in text and graphical interfaces, that allow visualization and end-to-end implementation and lifecycle management of telecom networks. While these technologies may both differ and overlap in functionalities, they each play a unique and critical role in the lifecycle of fiber networks, from planning and deployment to operation and customer service. This article will explore at a high level the functions of GIS, FNMS, and OSS/BSS, looking at some of their distinctive features, overlaps, and integrated functionalities impacting every technology aspect of telecommunication networks' lifecycle management.

GIS (Geographic Information Systems)

Geographic Information Systems (GIS) integrate the gathering, storing, analyzing, and displaying of geographic data, melding the specifics of physical locations with their contextual details. This integration is vital for documenting and managing utility and telecommunication networks, among various applications. GIS captures spatial information from diverse sources, including satellite imagery, GPS data, surveys, and traditional maps, consolidating this data within readily accessible databases with graphical interfaces. Its analytical tools enable the in-depth exploration of this data, such as by layering different datasets or performing spatial queries to reveal the status quo or elements and analyses for planning and risk management. Furthermore, the capacity of GIS to graphically present this information through maps, 3D models, graphs, or charts greatly enhances decision-making and problem-solving capabilities. In the context of fiber optic network design, GIS is instrumental in identifying existing utilities and telecom infrastructures and in devising optimal routes for new cable installations to avoid or circumvent potential obstacles. Additionally, GIS supports network management and maintenance by offering precise spatial insights for rapid issue identification and resolution.

FNMS (Fiber Network Management Systems)

Integrating geographic insights from GIS and various other network and construction management software applications through software connectors and Application Programming

Interfaces (APIs), Fiber Network Management Systems (FNMS) provide single and unified platforms for the design, implementation, and management of fiber network distribution elements as well as workflow automation and governance. While FNMS utilize GIS to provide location and geospatial information of network elements, they also manage network assets, including naming and inventory, facility capacity, and hierarchical relationships among network elements. These systems also enable the simulation of various design scenarios during network planning stages, facilitating efficient planning and design of networks with built-in redundancy to ensure network uptime and reliability, and strategically positioning elements to support future growth and scalability. Some FNMS also support integration with network monitoring systems. The integration of GIS and FNMS technologies offers network management a spatial perspective, significantly benefiting strategic planning and operational efficiency.

OSS/BSS (Operational Support Systems/Business Support Systems)

OSS and BSS are largely the backbone and used as the main system of records for network and business operations of large telecommunication companies today, serving as a master system of records and integrating databases for information including topological and logical network information spanning from network elements, circuits, WDM channels, OTDR traces, and others, to facility management, as well as workflows, work orders, and customer information. OSS and BSS were initially aimed at the management of trunks and circuits for legacy telecom and have evolved since to cater to next-generation systems. Nonetheless, OSS/BSS are being increasingly replaced with more modern and agile digital solutions and approaches to network management. While the OSS part is more focused on the operational side, supporting network management, service provisioning, resource inventory, and configuration management to ensure technical efficiency and reliability, the BSS part focuses on the customer-facing and business aspects, including billing, customer relationship management, order processing, and product management. The integration of OSS and BSS is critical for aligning network operations with business objectives and customer needs, ensuring a seamless flow from network resources and service provisioning to customer billing and support.

Differences, Overlaps, and Integration

In essence, while Geographic Information Systems (GIS), Fiber Network Management Systems (FNMS), and Operational Support Systems/Business Support Systems (OSS/BSS) each serve distinct purposes, their integrated functionality enables efficient, reliable, and customer-focused fiber optic network deployment and operations. Understanding their roles, differences, and synergies provides a comprehensive view of the technological orchestration behind the scenes of our interconnected world.

GIS and FNMS serve distinct yet complementary roles in the management of fiber optic networks. GIS specializes in the documentation and handling of geographically referenced data, offering detailed analysis and visualization of physical locations crucial for the initial planning and deployment stages of fiber networks. It aids in mapping out terrain, identifying optimal routing paths, and navigating potential obstacles, thereby laying the groundwork for network infrastructure planning, design, and documentation. Examples of GIS platforms mainly focused on managing georeferenced or geospatial data include ArcGIS and QGIS. Some consider Google Maps a user-friendly GIS tool, often used by smaller service companies for network mapping.

FNMS, on the other hand, leverage data from GIS platforms and integrate other layers of services and information management for efficient network operations support. FNMS focus not only on geospatial referencing but also on the detailed management of the network's physical assets, such as cables and connectors, and the hierarchical relationships of network elements, ensuring that every component is accurately inventoried, mapped, configured, and managed for efficient network operation. Examples of FNMS type platforms include IQGeo, OZmap, 1Spatial, and VETRO. It's noteworthy that although some of these platforms offer various levels of functionality and integration possibilities with other applications, in practice, for these systems to work effectively, they require that the data from integrated systems highly organized and reliable.

While GIS and FNMS are closely integrated, forming a cohesive system for the physical planning and management of fiber networks, their relationship with OSS/BSS is less direct. These systems were initially designed to support legacy telecom frameworks that focused on switched circuits and telephone lines, which might not be as agile as the information and network management approaches offered by modern systems. A notably enduring legacy system is the TIRKS platform from Telcordia, now part of Ericsson, alongside alternatives provided by companies like NetCracker. These systems are geared towards the operational and business facets of telecom service providers, covering areas such as network management, service provisioning, customer relations, and billing.

While in large telecom companies, OSS/BSS have traditionally formed the core of operational and business workflows, with evolving technologies, next-generation users are starting to view these platforms as outdated, prompting a transition to more dynamic and integrated solutions. This shift is part of a broader trend towards digital transformation, focusing on streamlined operations, improved customer experiences, and the incorporation of cutting-edge technologies to maintain competitiveness in a rapidly evolving digital environment.

Closing

The efficiency and effectiveness of planning, implementation, and management of fiber optic networks heavily depend on leveraging digital network management tools such as GIS, FNMS, and OSS/BSS. While GIS provides essential management and visualization of georeferenced data for network planning and documentation, with reliable and organized data inputs from various software platforms, FNMS can offer centralized digital management of network elements for operational efficiency. OSS/BSS, largely still the digital management backbone of telecom infrastructure today, are quickly evolving or even being replaced by more integrated, agile systems. Understanding and effectively using these digital tools is crucial for maintaining network operations that are dependable, streamlined, and focused on customer satisfaction, ensuring that companies in telecommunications and fiber optics can effectively strategize, construct, implement, manage, and maintain their networks with optimal efficiency.

About the Author
This article was crafted by Jerry Morla, an FOA Master Instructor, consultant, and founder of the FiberWizards training school, who draws from nearly three decades of experience in the global telecom industry. While the author provided the primary inputs, insights, and conclusions in the article, AI tools were used in the drafting process.