



Cable Management

Stay in control – full insight into inside & outside plant management ensures that you stay on top of cable management.

“Global mobile data traffic will increase nearly 11-fold between 2013 and 2018. Mobile data traffic will grow at a compound annual growth rate (CAGR) of 61% from 2013 to 2018, reaching 15.9 Exabytes per month by 2018.”

Cisco® Visual Networking Index™: Global Mobile Data Traffic Forecast Update, 2013–2018

With the increase in mobile computing, rise of social networks and spread of IT into virtually all areas of private and work life, data volumes have grown exponentially.

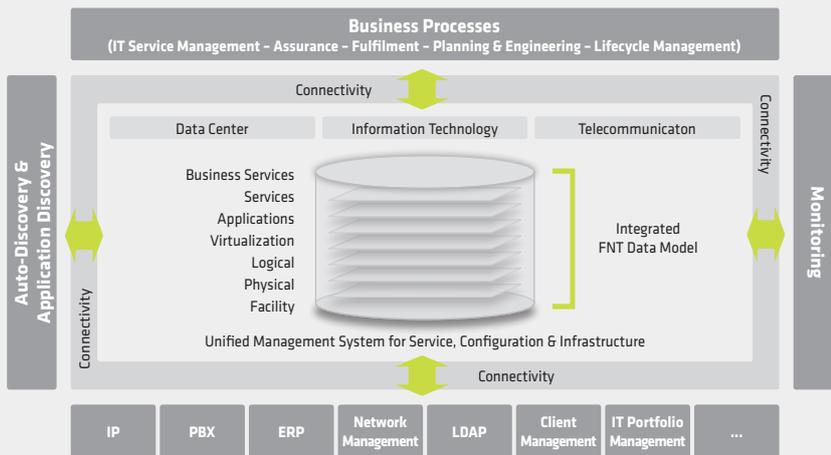
This massive growth of global data traffic means that operators of fixed and cellular networks face the urgent task of rolling out, expanding, transforming, or upgrading networks across a wide range of different technologies and topologies. This affects fiber-optic networks in the transport and mobile backhaul arena, as well as the corresponding FTTx infrastructures in access networks, plus the fiber-optic expansion associated with bandwidth upgrading of HFC networks. In addition, new technologies, such as VDSL and VDSL vectoring, are being used on copper infrastructures, which significantly increases the bandwidth on copper pairs.

For network operators, the implications are two-fold: First, they require optimum management of available network capacities as well as efficient analysis and implementation of ongoing capacity expansion. Second, it is necessary to create an end-to-end model and management system for all of the technologies and resources used in the production of services.

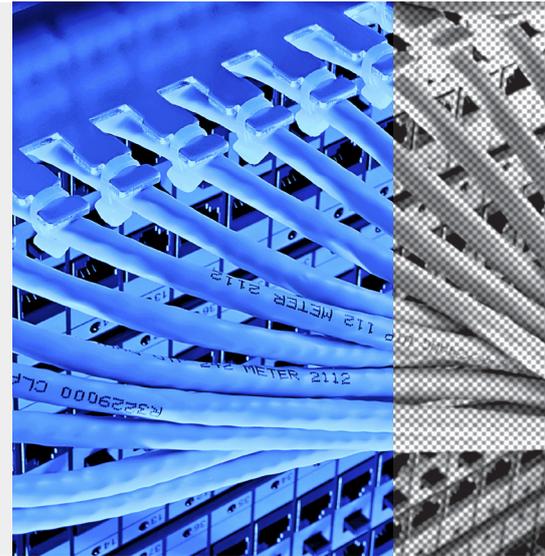
The network operator's OSS/BSS (operations support systems/business support systems) landscape plays a crucial role here in terms of operational performance, cost efficiency across all business processes, the quality of the services delivered, and launch times for new products. The basis of any modern OSS/BSS architecture is integrated management of network and service resources. This central source of network and service data includes all relevant resource information, from the fiber-optic infrastructure used for inside and outside plant to

services and the related applications. It forms the foundation for all planning and engineering, service fulfillment, and service assurance processes.

Geo-referenced representations are likewise vital for seamless documentation and planning of network resources in outside plant and cable management. Access to up-to-date, correct resource information, combined with geo-referencing, provides an important competitive advantage in terms of both network operation and planning. Accordingly, the quality and accuracy of this data is of crucial importance for improving operational efficiency, optimizing costs, automating services, boosting service quality, and increasing customer satisfaction.



FNT's integrated management approach for services, configuration management and infrastructure



Overview of the FNT Solution

The FNT Cable Management solution allows you to document, plan, and manage all types of cable and network infrastructures. Management of internal IT networks is supported (inside plant management), as is planning and documentation of extensive telecommunications or broadband networks in a wide area network, city, or local loop using outside plant management. All types of network topologies based on fiber-optic/FTTx, HFC, and copper networks can be visualized, using geo-referenced representation in WebGIS or schematic network plans, plus all the associated technologies.

By deploying the FNT Cable Management solution, network operators and planners benefit from complete transparency of their network infrastructure. This transparency is a precondition for efficient management and operation of complex infrastructures.

The FNT Cable Management solution supports wiring of patch and configuration cables in inside and outside plant management. To enable this, the underlying database of the FNT Command software suite contains all the standard cable types. It is therefore possible to create a fully featured representation of the entire cable route between two devices, including configuration cables, patch cables, distributors, junction boxes, splice trays, and splices.

FNT Command provides extensive functions for outside plant management, covering planning and management of all facilities and infrastructures in the field, from trays, ducts, duct bundles, and cables to nodes and shaft images with the associated junction boxes.

In the inside plant management arena, active and passive equipment and components can be managed conveniently via

a graphical editor. FNT Command provides a comprehensive CI/component library with over 50,000 network components from many different vendors for this purpose. Plausibility checks on both equipment and cabling prevent incorrect entries.

All FNT solutions are based on the integrated FNT data model, which contains analyzable information on all infrastructure dependencies from the building level through physical, logical, and virtual assets to applications and services, including business services. The result is total insight into all the relevant resources and levels of the associated telecommunications, data center, and IT landscape

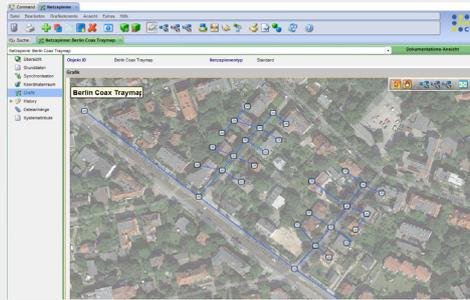
The extensive capabilities described above allow network operators who deploy the FNT Cable Management solution to boost the efficiency of their day-to-day operations, optimize costs, and cut process times while simultaneously reducing OPEX. Fault repair is also accelerated, leading ultimately to greater customer satisfaction.

By delivering complete transparency across all cable and network infrastructures from inside plant management through to outside plant management, FNT Command enables:

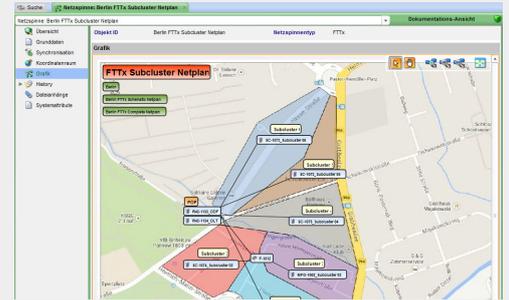
- Continuous end-to-end signal tracing across the entire cable infrastructure in both actual and planning views, based on the relevant geo-referenced nodes and routes in the GIS representation
- Faster fault analysis and repair, based on seamless integration between the physical network infrastructure and supported services at the logical and service level. To allow this, all cable, network, and service information is linked in the integrated FNT data model



Cable routes, nodes and trays using schematic network representations



Cluster as schematic network representation



Trays and nodes in WebGIS

Variants of the graphical representations using FNT Command schematic networks or FNT Command WebGIS

- Efficient planning and analysis of redundant circuits, because redundant services need to be managed separately at the physical level, not just logically
- Efficient fault repair and structured planning of replacement cycles for outdated components by generating work orders from within the system, based on the relevant infrastructure data

As part of capacity management and network expansion planning, the FNT Cable Management solution allows optimal use of network capacity and leads to reduced/optimized CAPEX while simultaneously accelerating and simplifying the necessary planning measures:

- Extensive planning functions in FNT Command allow end-to-end, efficient planning of network infrastructure
- Auto-routing functionality for trays and duct infrastructures enables optimal planning of connections
- Auto-routing functionality for the cable infrastructure allows optimal automated routing, with work orders for the required patches and splices being created for the route automatically
- Geo-referencing of the entire network infrastructure is available out of the box thanks to FNT Command WebGIS and can be used for expansion planning purposes. The actual activity relating to ducts, duct bundles, junction boxes and splice plans, distributor assignment, and cable and fiber management, as well as equipment and component management, takes place via dedicated, task-specific graphical and schematic applications
- Cable, network, and service information is all contained in a comprehensive data model, providing a complete and consistent picture of the current situation as a basis for decision making. Planning of network expansion or

modification work can take account of all the relevant parameters. All network resources and costs remain under control at all times

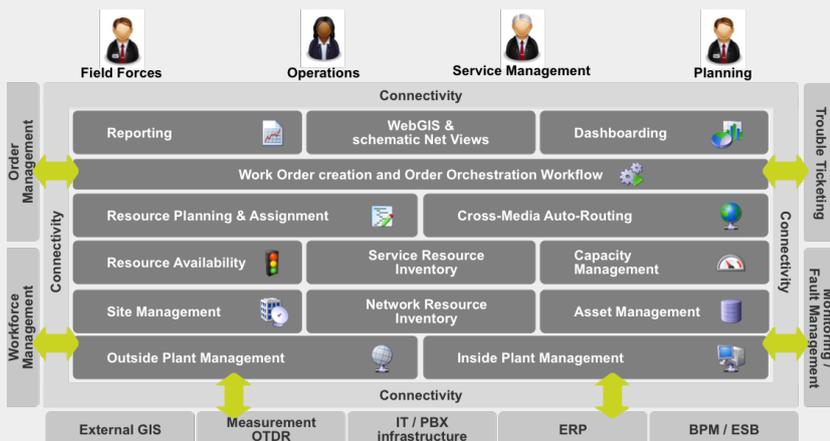
FNT Command Software

The standardized FNT Command software suite is user-friendly, Web-based, multilingual, multi-user, and multi-client. Thanks to its sophisticated modular software architecture, FNT Command has a 20-year track record of successful deployment by enterprises, network operators, service providers, cell phone operators, colocation service providers, and governmental organizations across all key areas of managing telecommunications, IT, and data center infrastructure. The modular design allows organizations to start with the main challenges, focusing on current shortcomings and the most beneficial improvements. In addition, customers have the security of a comprehensive and expandable solution that covers every aspect of infrastructure management.

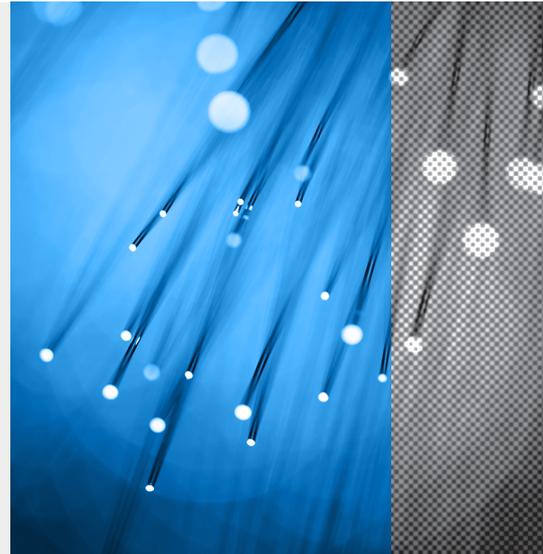
Cable management with inside and outside plant management via FNT Command means seamless and transparent planning and documentation of cable and network infrastructures, regardless of medium, technology, and topology.

Outside Plant Management

The FNT Cable Management solution features full support for outside plant management, i.e., planning and management of all facilities and infrastructures in the field. The available functionality covers trays, tray sections, ducts, duct bundles, and nodes, including shaft images and the associated junction boxes and splice trays. All types of patch and configuration



Overview of the functional areas of FNT's cable management solution



cables (fiber optic, copper, coax) can also be mapped for media-independent cable documentation and planning down to the level of individual optical fibers and their signal paths. All types of equipment and wireless links can also be mapped. If required, the graphical representation of the network can be geo-referenced using FNT Command WebGIS or displayed in the form of schematic network plans.

This enables efficient planning and management of modern FTTx networks down to the level of individual fibers. In addition to the cable infrastructure, trays and duct bundles play an important role here. FNT Command supports management of empty conduits and takes into account the different characteristics of the trays.

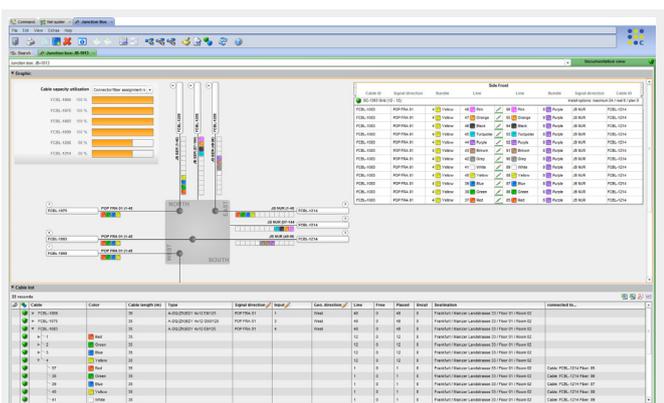


Fig.: Junction box view and splice planning for precision capacity planning and assignment of services

In addition, the software allows plausibility checks, which are carried out on the medium and on connectors as a means of preventing input errors. Functions contained in the basic function set include bundled cabling for simultaneous insertion of multi-pair cables into multiple cabinets and the use of junction boxes.

Signal tracing is an important and highly valuable instrument when managing network operations. All the connected equipment and cables on the physical layer are displayed in a convenient overview, together with key related information. Signal tracing can be carried out from any physical port for every link, in both actual and planning views. Key data for each route section is displayed in the route information. Details include start and end points, the number of configuration and patch cables, total cable length, and total attenuation.

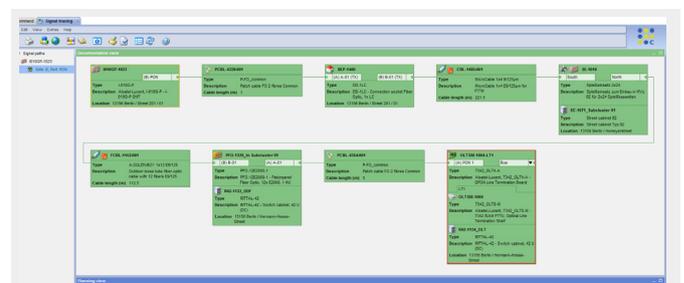


Fig.: Signal tracing allows detailed analysis of all connected active and passive components

Tray management supports management and documentation of all aspects of a tray infrastructure. This includes both in-house infrastructures, such as sill channels, raised floors, and cable racks, as well as outside plant infrastructures, e.g., trenches, micro-ducts, and standard ducts. The cable infrastructure is assigned to the tray routes, i.e., the duct bundles and ducts in the trays. Tray sections are linked in FNT Command via nodes, which can be of various types (shaft, mast, opening, building service entrance, etc.). Shafts can be displayed and edited from all sides with the aid of a graphical editor. All nodes and trays can be geo-referenced and visualized in FNT Command WebGIS.

Inside Plant Management

With FNT Command, the various network devices at the physical level can be associated with the respective locations or buildings. The FNT Command package includes an extensive configuration item (CI) or component library, with more than 50,000 devices and components from many different vendors. This library can be used to assign all relevant physical and logical resource information to each network node in the Network Resource Inventory. A graphical rack/switch cabinet editor provides extensive functions for network node management. Plausibility checks based on card slot relationships, connectors, or device dimensions in the rack help prevent input errors. The racks in turn can be positioned via footprints, enabling management of used and unused floor space. It is also possible to combine multiple devices to create single network elements that represent more complex pieces of hardware. In addition to active devices, all kinds of passive components, such as distributors, junction boxes, patch cables, configuration cables, trays, ducts, etc., can be managed.

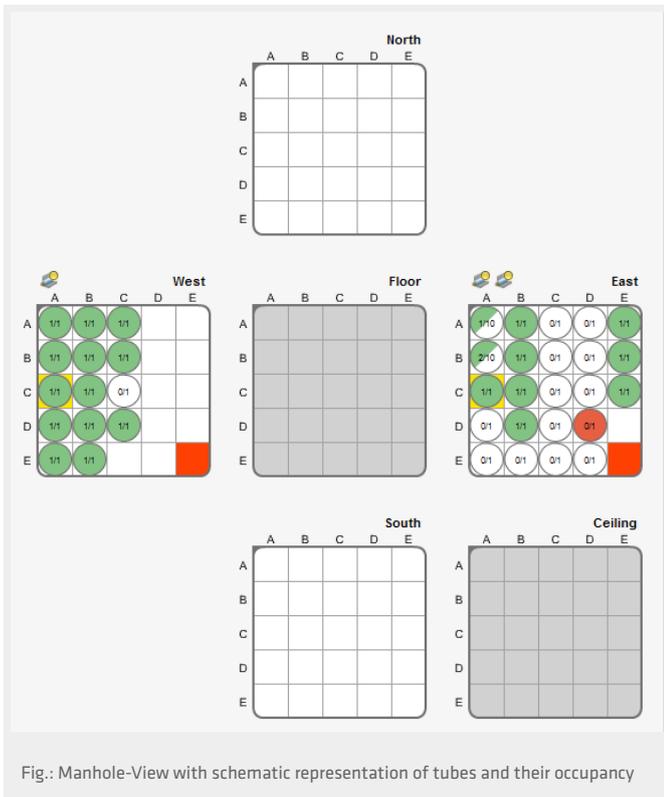


Fig.: Manhole-View with schematic representation of tubes and their occupancy

Asset Management

It is also possible to store a range of data for use in asset management. The integrated Inventory Management function in FNT Command supports creation and management of an inventory.

Site-Management

FNT Command enables management of physical locations in a hierarchical system, e.g., documentation of cities, streets, buildings, and parts of buildings within a geographical structure. Similarly, geo-referenced positions of junction boxes and masts can be mapped, for example. It is also possible to

group locations logically, for example by category (e.g., all service connections in a city, all fiber-optic junction boxes in a cable section, etc.).

Service Resources

Based on the network and infrastructure resources described above, other tasks can now be performed, such as creating cable routes and adding the associated service information. The services may be LAN, voice, or VoIP services in the IT arena or services and service bundles like those supplied to a customer in a GPON access network via a fiber-optic infrastructure.

This data can be used to provide the information required by service fulfillment processes relating to service availability of a particular network or client site, e.g., a GPON-based service portfolio delivered over a fiber-optic connection or xDSL service portfolio delivered via a copper connection. Similarly, capacity assessments of the underlying network infrastructure are possible, enabling expansion planning as necessary.

The FNT Telecommunication Resource Inventory solution can be deployed in conjunction with the FNT Cable Management solution to document and manage transport technologies. The dependencies between different network and service levels are mapped across the corresponding hierarchy levels from physical to service. Whether it's OTN, DWDM or MPLS technology, TDM or packet data - FNT Command supports all network and communication technologies.

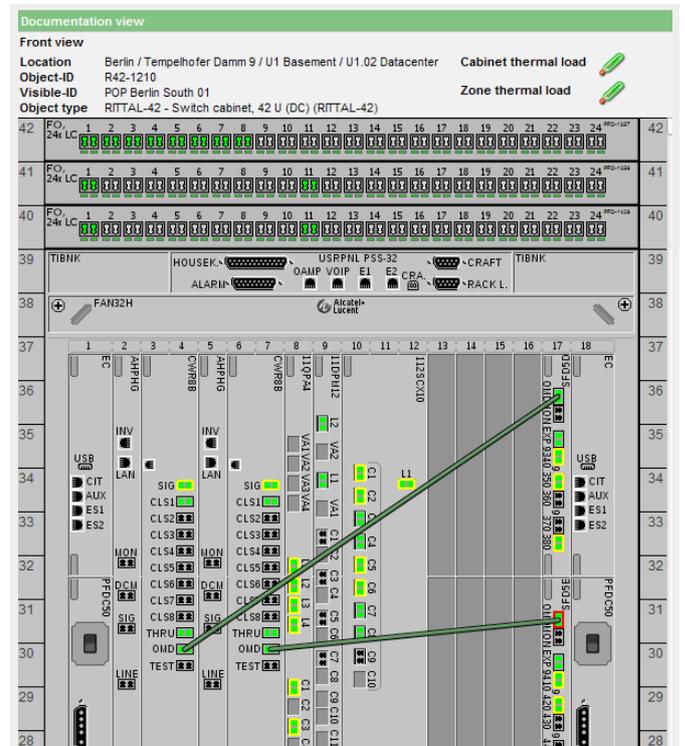


Fig.: Graphical rack view in FNT Command

Resource Planning and Assignment

In addition to documentation of network and service resources, FNT Command also supports planning activities. All resources and infrastructure components can be managed in both the actual and planned state. The functionality provided enables end-to-end planning of network and service resources, allowing changes to be handled in accordance with a controlled change management process.

Work orders can be generated on the basis of this planning activity and used to implement the changes in the network. This work can either be done manually or the relevant data can be passed to an activation platform for automatic processing.

Where activities are performed manually, work orders are automatically generated for field staff according to these plans, which contain all details of the necessary steps. These work orders can then be forwarded to an external workforce management system for scheduling. As changes are implemented, their status is amended via the integrated order orchestration workflow.

Cross-Media Auto-Routing

FNT Command offers a cross-media auto-routing capability that takes into account both the passive network resources and the active transport technologies. All kinds of physical and logical connections can be automatically routed through the entire network.

The auto-routing function enables optimal routing of tray runs and cables. When creating a cable route, extensive routing criteria, such as locations, trays, nodes, the number of switching points, and cable length, can be specified. The additional patches and splices required are also considered and the necessary work orders automatically generated.

Interfaces, Process Automation, Data Synchronization and Reconciliation

FNT Command provides interfaces to a wide range of solutions from multiple vendors, e.g., trouble ticketing and fault management systems, order management, and workforce management. ERP systems, BPM and ESB engines, IT and PBX management systems, external GIS applications, and measuring tools (e.g., OTDR) are also supported.

Command offers an API for process integration. This Web service API is SOAP-based. The API Web service is defined as a WSDL (Web Service Description Language), allowing XML messages to be exchanged, regardless of platform, programming language, and protocol. This provides the basis for orchestrating and automating processes.

One of the most important aspects of network and service resource management is having data that is accurate and current. Data synchronization and reconciliation in FNT Command is based on integration of the corresponding element

and network management systems via the FNT staging area. This only applies to active components and services, of course. For passive components, especially in the cable management domain, process integration is crucial to ensuring the accuracy and timeliness of data.

Reporting, Dashboarding, WebGIS, and Schematic Network Views

FNT Command features an extremely flexible, integrated reporting engine, which provides a simple way of creating your own analyses and reports. Data from FNT Command can also be provided to external reporting applications, such as Crystal Report or other dashboard solutions.

Graphical network views can be generated in schematic form, e.g., as a cable netspider. This kind of representation is very helpful when it comes to activities, such as power level calculation in an HFC network based on a graphical overview of the situation in the network.

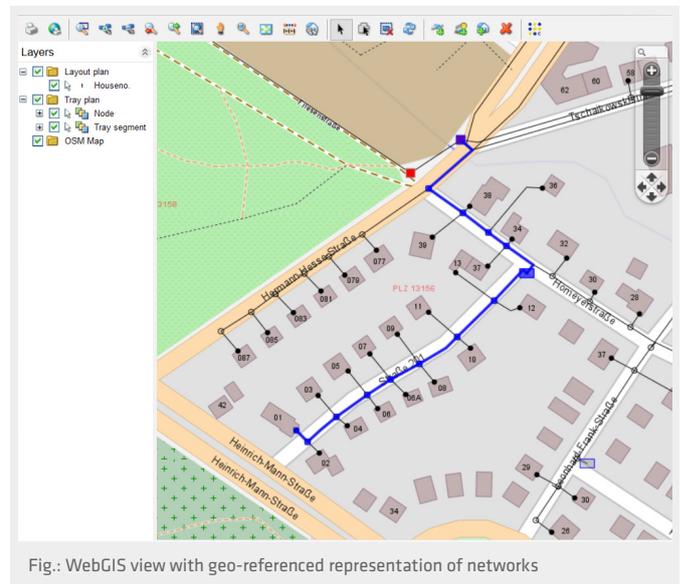


Fig.: WebGIS view with geo-referenced representation of networks

As an additional option, FNT Command offers an integrated WebGIS application that can be used to create graphical network displays in a geo-referenced form. As such, the managed network infrastructure can be mapped in FNT Command out of the box without additional integration effort via a 100% Web-based, geo-referenced GIS application. A large number of navigation options are available between the GIS interface and the application-specific modules for cable management, outside plant management, and inside plant management contained in FNT Command.

Conclusion

The FNT Cable Management solution allows full transparency across all network and service resources, including:

- Entire active and passive network infrastructure in inside and outside plant management
- Integrated, 100% Web-based WebGIS application
- Asset management with inventory creation and management
- All physical and logical network and service resources
- Comprehensive auto-routing functionality for infrastructure and service resources
- Data center capacities and associated DCIM functionalities
- Management of server and storage IT infrastructures, from virtualization to applications and licenses, as well as management of VPN and IP networks

Benefits of deploying the FNT Cable Management solution:

- Full transparency across all active and passive inside and outside plant resources
- Centralized management of all physical and logical network and service resources
- 100% Web-based solution
- Seamless navigation across all levels and task-oriented user interfaces ensure maximum user-friendliness
- Improved efficiency in day-to-day operations
- Accelerated fault repair and greater customer satisfaction
- Reduced OPEX, plus optimized costs and process times
- Consistent documentation and planning based on up-to-date, coherent data by means of integrated processes from planning through to implementation in the network
- Optimized use of infrastructure capacities and reduction of CAPEX

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