Telecommunication Resource Inventory

Insights that allow best-in-class performance – excellent telecommunications services thanks to efficient and transparent use of your network resources in OSS and BSS systems.

"There is a huge need and a huge opportunity to get everyone in the world connected, to give everyone a voice and to help transform society for the future. The scale of the technology and infrastructure that must be built is unprecedented, and we believe this is the most important problem we can focus on."

Marc Zuckerberg, Chairman and CEO of Facebook

Network operators and service providers face an extremely dynamic market environment and tough competition. Key business parameters include optimizing time-to-market for new products, achieving maximum cost efficiency across all business processes, providing excellent services, and delivering the best possible business performance via efficient provisioning, monitoring, and planning processes. The OSS/BSS (operations support systems/business support systems) environment plays a decisive role in this context.

Integrated network and service resource management is fundamental to a modern OSS/BSS architecture. This central source of network and service data includes all relevant resource information and forms the foundation for all planning and engineering, service fulfillment, and service assurance processes. 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.

With the increase in mobile computing, rise of social networking, and spread of IT into virtually all areas of private and working life, data volumes are growing exponentially.

The transmission of this data over fixed and cellular networks is creating a huge and continuing increase in load. In order to provide the necessary bandwidth, network operators need to invest in new infrastructure and constantly adapt their networks to meet growing user demands. Current network strategies are influenced by a range of factors that include mobility, social networking, big data, and cloud technologies as well as changing working practices and lifestyles.

The result is an expansion of network technologies across all areas:

- Expansion of VDSL technology into new areas, plus migration of existing ADSL technology
- Expansion of fiber-optic networks as part of FTTx rollout projects with GPON or Active Ethernet technology
- Transformation of cellular networks from 3G UMTS to 4G LTE
- All-IP network transformation

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. This includes both network and service resources in fixed-line and cellular communications, as well as IT resources, such as data center capacity, servers, virtualizations and applications.

Without this end to-end approach, it is impossible to ensure the highest quality of service and best possible customer experience within the framework of service assurance processes. In addition, operators need accurate information on the availability of all resources in order to maximize the automation and efficiency of their service fulfillment processes.
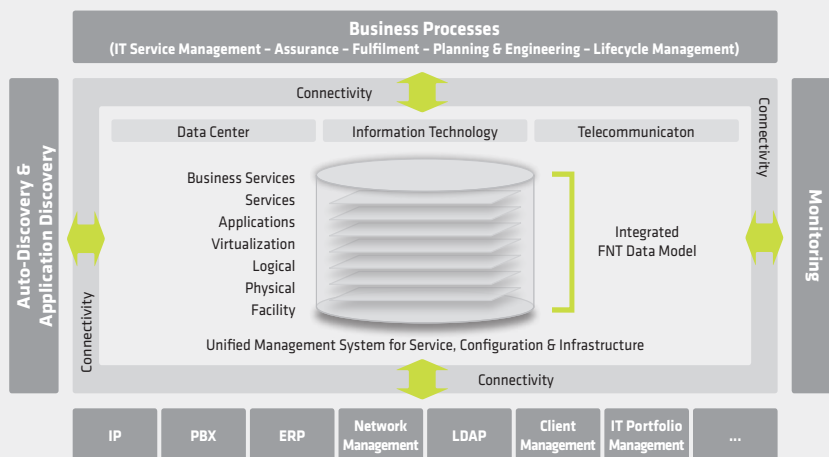
FNT offers an integrated approach to services, configuration management, and infrastructure.

Business impact and effects on day-to-day operations

As a result of the changes described above, service providers are faced with numerous challenges:

- Shorter time-to-market for new products and services
- Achieving lower costs and faster product roll-out through greater automation
- Adaptation of existing business models and/or introduction of new business models to improve competitiveness in hard-fought markets
- Increasingly complex products and services
- In order to keep pace with rapidly developing markets, service providers are creating complex products and service bundles that are partly produced and provided through their own infrastructure and partly with the aid of partners in a multi-cloud environment

In order to meet these demands and ensure maximum efficiency in all fulfillment, assurance, and planning processes, service providers require full transparency across the entire service chain.

Delivering that transparency requires centralized collection, analysis, planning, and management of the following information:

- Details of all participating partners
- Details of all physical and logical network and service resources, including:
  - All necessary data center capacities
  - All available IT resources

FNT provides the required transparency in all these areas via integrated software solutions for documentation and management of IT and telecommunications systems as well as data centers. The FNT solutions are based on a single, overarching data model in which all of the areas described above and the associated telecommunications, data center, and IT resources are seamlessly integrated and made available in a central repository.
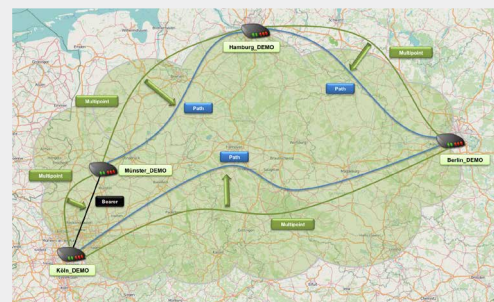
The result is full transparency across all resources and layers. This resource inventory provides the ideal basis for a modern, future-proof OSS/IT system landscape.
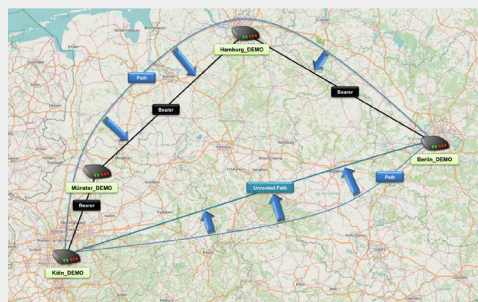
Bearer & Path & Unrouted Path
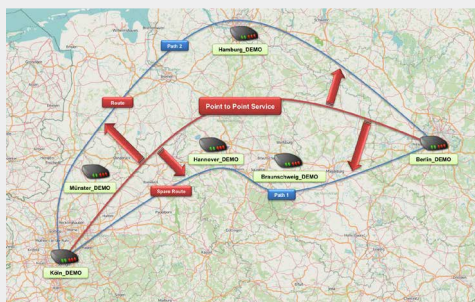
Path & Point-to-Point Service

Multipoint over Bearer & Paths

All types of network technology and network topology used in telecommunications infrastructures – from the physical layer to services

Overview of the FNT Solution

The Telecommunication Resource Inventory solution from FNT enables centralized, integrated management of all network and service resources in the telecommunications environment. This central source of network and service data includes all relevant resource information for planning and engineering, service fulfillment, and service assurance processes as used by network operators and service providers. It therefore provides the foundation for a modern OSS/BSS architecture.
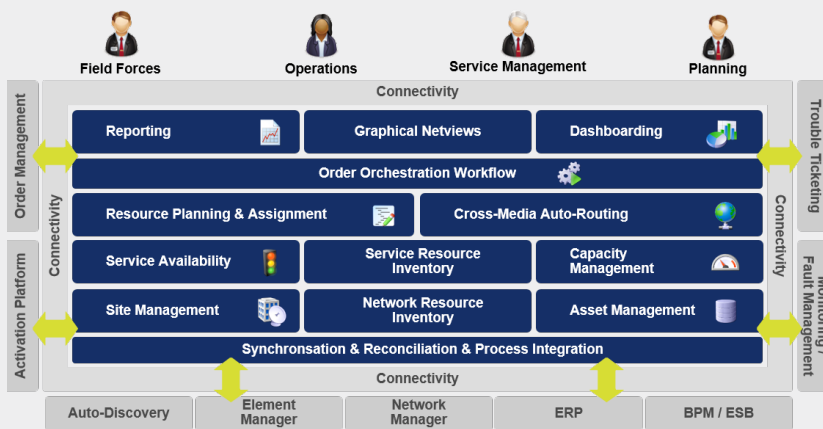
The Telecommunication Resource Inventory solution is based on the standardized FNT Command software suite. Using an integrated data model, FNT Command presents all information relating to physical, logical, and service resources in the form of a single, centralized database. This enables end-to-end querying of relationships between services, their underlying physical and logical network resources, associated applications, customers, and other assigned information.

In addition, the Telecommunication Resource Inventory solution supports all types of line-based and wireless network technologies for transmission, access, cell phone, and cable networks as well as for satellite and radio/TV broadcast networks, such as OTN, SDH, PDH, SONET, WDM, ATM, MPLS, Ethernet, IP, VPN, xPON, FTTx, xDSL, HFC, WiFi, radio relay systems, and others. FNT Command enables transparent and clearly structured documentation and management of connections and services throughout the entire network. It also provides auto-routing functionality with comprehensive routing criteria.

Thanks to the integrated data model, it is possible to navigate seamlessly between layers and create associated queries. This means that in the event of a cable break or a card or node failure, for example, it is easy to identify the services and customers affected.

The FNT Telecommunication Resource Inventory solution increases efficiency in day-to-day operations, optimizes costs and process times while reducing OPEX, shortens fault repair times, improves service quality, and enhances the customer experience and customer satisfaction. For example:

- FNT Command facilitates and accelerates troubleshooting by providing data to monitoring and ticketing systems
- Topology-dependent root-cause analysis and alarm dependency reporting can be used to prioritize tasks based on affected services, customers, and SLAs in the context of incident and problem management
- Data can be made available to field service technicians during repair, replacement, and reconfiguration assignments

Overview of functional areas within the FNT Telecommunication Resource Inventory solution
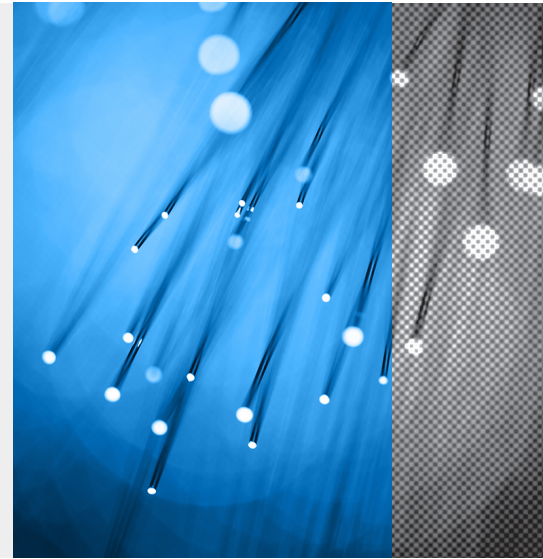
Automation of service fulfillment processes is one of the most important ways of increasing efficiency, reducing operational expenditure, and improving competitiveness (time-to-market). In particular, the Telecommunication Resource Inventory solution from FNT is indispensable in the context of OSS and IT process automation. For any form of automation, it is essential to have accurate information on all available network and service resources based on an up-to-date network inventory. It is also crucial that this data is vendor and technology-independent.

The FNT solution improves capacity management by using FNT Command to prevent "stranded assets" and thus enables optimum utilization of network capacities. Benefits include lower CAPEX and more effective investment:

- Network operators can identify the precise extent to which individual capacities are used/unused

- This enables more accurate planning of network expansion to meet user and market demands

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.

The Telecommunication Resource Inventory solution from FNT enables network operators and service providers to document and manage the transport technologies they use in their

networks. Whether it's OTN, DWDM or MPLS technology, TDM or packet data – FNT Command supports all network and communication technologies.

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. It is also possible to group locations logically, for example by category (e.g., all POP locations, all core network locations, etc.).

Network Resource Inventory
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 IT and telecom 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 a wide range of functions for managing network nodes. Plausibility checks based on card slot relationships, connectors, or device dimensions in the rack help prevent input errors. The individual racks can be positioned using 2D or 3D 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.

Asset Management

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

Logical Layer with Service Inventory, Availability Analysis, and Capacity Management

The FNT Command data model uses a hierarchical structure for network and service resources at the physical, logical, and service level. The model is also extremely flexible and easy to expand. As a result, FNT Command supports all current and future wired and wireless network technologies.
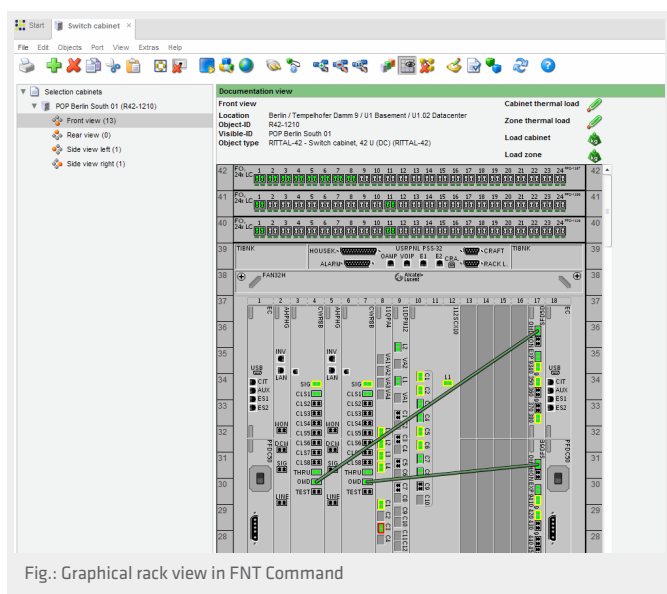

Fig.: Graphical rack view in FNT Command

The Service Resource Inventory supports circuit switched, packet data, and WDM technologies as well as other special items. Accordingly, these services can offer or use time slots, bandwidths, or lambdas. The lowest links in the hierarchy are bearers, i.e., logical connections that run directly on the physical medium. By documenting cabling, the physical connections in FNT Command can be used to auto-route logical connections on the bearer layer. Dark fibers and leased lines can also be documented with the relevant parameters in FNT Command.

Services run on bearers or other services and can represent single-path, point-to-point, multipoint, or concatenated path connections. It is therefore possible to map a wide range of network topologies. In addition, the network operator can create end-customer services, which represent the uppermost layer in the network hierarchy. FNT Command enables seamless navigation through all hierarchies and provides end-to-end information on the structure and routing of services on heterogeneous network technologies in a multi-vendor environment. If the routing is unknown or not relevant, the connections can be documented as "unrouted paths."
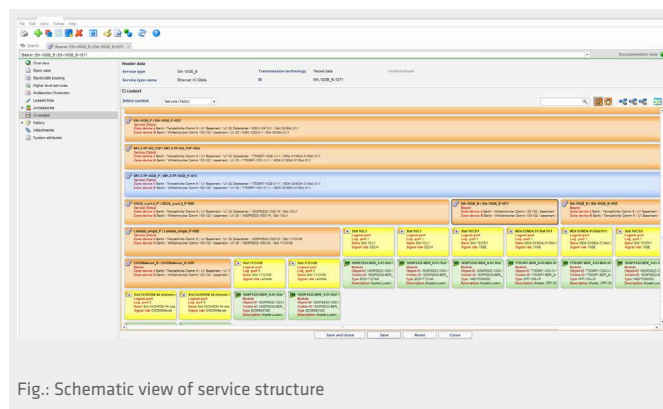

Fig.: Schematic view of service structure

It is also easy to model regular and spare routes. This enables network operators and service providers to document their redundancy and elasticity mechanisms. FNT Command supports a variety of spare circuits on the path layer (1+1, 1:1, 1:n, n:1) and on the bearer layer.

Documentation of network SAPs (service access points) is also supported. This is particularly important for fault management in MPLS or other service networks.

The information stored in the Service and Network Resource Inventory can now be utilized wherever required. It is available for use in capacity management or, for example, as part of service fulfillment processes where it provides the necessary data on service availability for a particular network or customer location.

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. This enables all kinds of physical and logical connections to be routed automatically through the entire network, subject to a range of routing parameters and other restrictions.

Resource Planning and Assignment

FNT Command supports not only the documentation, but also the planning of physical and logical resources and services. It is therefore possible to plan the creation of new resources and services as well as deletions and modifications. This capability can be used for automatic generation of work
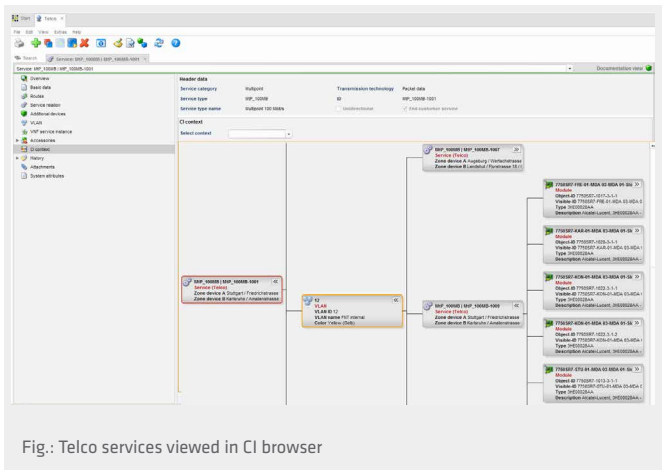
Fig.: Telco services viewed in CI browser

orders and corresponding workflows to implement planning in the network. This information can be made available to an activation platform for automatic processing. Where activities are performed manually, the work orders contain all the information required. The orders can then be forwarded to external workforce management systems, where they can be used to coordinate field service activities. As changes are implemented, their status is amended via the order management function in FNT Command.

Network Expansion and Transformation

When upgrading and expanding networks or introducing new services, operators require detailed information on the configuration, topology, capacities, and nodes of the respective network(s), on the relationships between network resources on the various layers, as well as on a range of related items, e.g., contracts. All of this data and the associated relationships are stored in the central Network & Service Inventory in FNT Command. The planning functionality in FNT Command can then be used to create detailed network expansion and modification tasks.

Cabling and Inside/Outside Plant Management

In order to map physical cable connections, the FNT Cable Management solution can be deployed in conjunction with the Telecommunication Resource Inventory solution.

This enables planning and documentation of patch and configuration cabling in both inside and outside plant management. To facilitate this, the FNT Command database 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, patch panels, junction boxes, splice trays, and splices.

In addition, FNT Command allows plausibility checks on the medium (copper and glass) and connectors as a means of preventing input errors. This enables functions such as bundled cabling for simultaneous insertion of multi-pair cables into multiple cabinets and the use of junction boxes.

The signal tracing function in FNT Command presents all connected devices and cables on the physical layer along with their respective key data. Signal tracing can be performed 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.

Complementing this is the extensive functionality of FNT Command Outside Plant Management, which encompasses planning and management of all field facilities and infrastructure, from trays, ducts, duct bundles, and cables to shafts and the junction boxes they contain. If required, the graphical representation of the network can be geo-referenced using the FNT Command WebGIS module.

Synchronization, Reconciliation, Process Integration, and Connectivity

FNT Command provides interfaces to a wide range of solutions from multiple vendors, e.g., trouble ticketing and fault management systems, order management solutions and activation platforms, as well as ERP systems, BPM and ESB engines, auto-discovery solutions, and element/network managers.

One of the most important aspects of network and service resource management is having data that is accurate and current. On the one hand, synchronization and reconciliation of data in FNT Command is based on the integration of the relevant element and network management systems via the FNT staging area. On the other, FNT Command provides an Autodiscovery Gateway for interfacing with external autodiscovery tools.

In addition, FNT Command has an API for integrating with process management, ESB, and workflow tools. Integrations of this kind can then be used to automate other processes. For example, they enable extensive automation in service fulfillment processes, thereby accelerating service delivery, minimizing manual inputs and post-processing, and increasing efficiency and productivity.

Reporting, Dashboarding, and Graphical Network Mapping

FNT Command features an extremely flexible reporting engine that works in conjunction with the database metaschema in FNT Command to provide a wealth of options for generating reports. It is also possible to integrate external reporting applications, such as Crystal Reports or other dashboard solutions.

Graphical network maps can be geo-referenced using FNT Command WebGIS. In addition, operators can create graphical network views in schematic form, both on the physical connection layer as well as on the bearer and services layer.
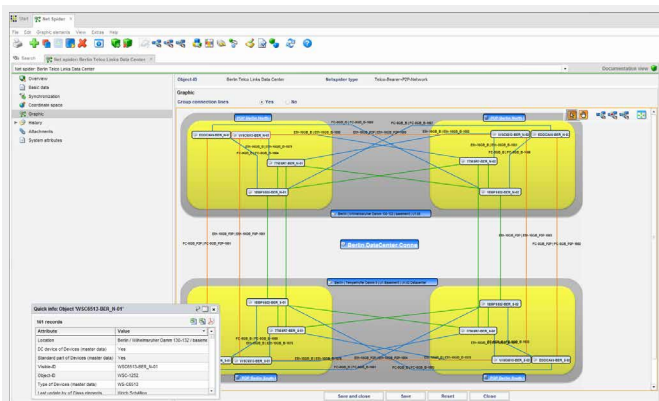

Fig.: Netspider with graphical network view

Conclusion

The FNT Telecommunication Resource Inventory solution based on FNT Command delivers full transparency throughout the entire service chain for network and service providers across all physical and logical network and service resources, including:

- Comprehensive auto-routing functionality for infrastructure and service resources
- Integrated management of data center capacities and associated data center infrastructure management functionalities
- Management of server and storage IT infrastructures, from virtualization to applications and licenses
- VPN and IP management
- Asset management of all active and passive components
- Comprehensive cable management, as well as inside/ outside plant management including integrated, Web-based WebGIS functionality

Benefits of deploying the FNT Telecommunication Resource Inventory solution:

- Centralized management of network and service resources
- Full transparency across all physical and logical network and service resources
- 100% Web-based solution
- Improved efficiency in day-to-day operations
- Basis for OSS and IT process automation
- Reduced OPEX, plus optimized costs and process times
- Optimization of network capacities and CAPEX
- Avoidance of stranded assets
- Better service quality and shorter fault times
- Enhanced customer experience and greater customer satisfaction