SunVizion Network Inventory v. 13.1

solution description
1. Introduction

SunVizion Network Inventory is a state-of-the-art, scalable and proven network resources inventory system for ICT and telecommunications networks. The solution can store all information on physical and logical network infrastructure, its configuration, status and functionality, as well as help manage this information.

With SunVizion Network Inventory, data on devices in the operator’s network can be accessed quickly, including information on the device’s configuration, parameters, utilization, and connections between individual devices.

SunVizion Network Inventory not only stores network information, but also offers intelligent information management capabilities.

- network design and expansion
- service sale, delivery, and provisioning
- fault management
- network maintenance

2. Architecture

SunVizion Network Inventory v. 13.1 employs Loosely Coupled Architecture of flexibly interconnected elements that can be combined into a solution tailored to the project’s requirements and provide a path for future growth. The suite is designed to deliver business processes related to telecommunications network construction and maintenance. It can also be used to inventory network resources for other network types, including road networks, railroad networks, natural gas pipeline networks, and water pipeline networks.
SunVizion Network Inventory suite includes eight systems. Each is a stand-alone system that is released, sized, and installed independently. Each system has its own data repository and a set of modules that deliver its business functionality, exposing the functionality to users via applications and to other external systems via service interfaces. Business processes are executed when a user interacts with relevant systems through applications, or when relevant systems work together over service interfaces as a part of Business Process Management (BPM) process controlled by a Workflow system\(^1\).

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\(^1\) We recommend SunVizion’s Workflow but any other workflow solution can be used.
SunVizion Network Inventory includes the following systems:

- **Resource Inventory** is used to collect, process, and provide information about physical and logical network resources. The system stores data about infrastructure (such as buildings, rooms, room equipment, cable routes, duct segments, cable chambers (manholes), cabinets, utility poles, cables, etc.) and its physical usage (card distribution within shelves, cables occupying ducts, physical ports on devices used by attached cables). Devices can be deployed using advanced compatibility control features to match device types and technologies as well as available bandwidth. The system supports logical resource inventory, recording the resource’s functionality, bandwidth, and relationships with other physical and logical resources. The system provides information on network topology and utilization, and features for searching and reserving network connections.

- **Service Inventory** can be used to collect, process, and share information about services provided by the operator. The solution enables service modeling in compliance with TM Forum recommendations so that the telecommunications operator can record all aspects and parameters of its services (both in terms of clients and hardware). Service Inventory is an utility designed to support service sale and maintenance processes.

- **Numbering Inventory** is used to collect, process, and provide information about numbering ranges and component numbers. The solution can be used to create numbering pools, designate special numbers, reserve number groups for a specific purpose, allocate numbers, and control number utilization, and to manage records for numbers ported from and to other operators. The flexible model it offers enables various types of numbering ranges to be created, such as telephone number ranges, IP address ranges, frequency ranges, and others.

- **Logistics Management** is used to manage operator’s resources under fixed asset account. The solution supports processes for purchasing and registering new assets in the warehouse, moving assets between the operator’s warehouses, transferring assets to the customer through sale, and installing assets at network locations as a part of network expansion or maintenance process. Logistics Management provides information on the network element’s location and properties, controls asset transfer authorizations, and can be used to record information on physical network components and all types of construction materials. Moreover, the solution provides data inputs for periodic reports on current inventory levels, and can be used to model storage facility chain structure tailored to operator’s needs and subsequently control the flow of goods through that chain.

- **Spatial Services** provides addressing information in the right format. This solution is the source of address information for other systems included in the product.

- **Documents** enables efficient retention of electronic documents that can be easily retrieved for browsing. This system acts as the document database for other SunVizion Network Inventory systems. Various document retention formats are available, either
using the system’s own server file system or through integration with third party solutions.

- **Workforce** helps manage personnel and their tasks that are created in the course of business processes launched in other SunVizion Network Inventory systems (such as the device installation process, repair process, network expansion process, service activation process etc.)

- **Users** is used to manage SunVizion Network Inventory users and their privilege profiles. The system authenticates each user that logs in to one of the suite’s applications. Once the user’s identity is confirmed, the system determines the user’s privileges which are used by individual SunVizion Network Inventory applications to control the user’s access to the right scope of data and functionality. Users system is compatible with Active Directory class subsystems.

SunVizion Network Inventory is designed for integration with other systems. Data can be exchanged over Web services (invoked directly by external system services, or invoked indirectly through BPM process delivery), or over a data exchange bus (such as Event/Data Bus).

![Figure 2 Resource Inventory Integration example](image)
3. Features

3.1 FUNCTIONAL MODULES

SunVizion Network Inventory supports physical and logical resources inventory, service registration, and record-keeping of telecommunications operators’ fixed assets. The suite comprises functional modules that can be mixed and matched to make a solution tailored to the project.

SunVizion Network Inventory offers the following functional modules:

- **Device Inventory**: used to record data that describe network elements and their parameters.

- **Infrastructure Inventory**: used to record the operator’s infrastructure (buildings, cable chambers, cable ducts), and to manage its utilization (distribution of devices and cables deployed within the infrastructure).

- **Cable Inventory**: used to record fiber optics and copper wire cables, their structure, parameters, and connections within cable boxes and distribution boxes.

- **Cable Connections Inventory**: records information about optical and copper connections set up in the network. Can be used to record connections on logical cables that simplify the management of a large number of physical cables.

- **Passive Optical Network Analysis**: used to analyze optical signal attenuation for a passive optical network.

- **Radio Assets Inventory**: used to manage information about radio systems, antennas, antenna ranges, and radiolines.

- **Logical Network Structure Inventory**: records logical network structure such as WDM, SDH/PDH, IP, and ATM nodes and lines.

- **Logical Connections Inventory**: records connections set up in the WDM and SDH/PDH network.

- **Inter-Layer Associations Inventory**: can be used to define transport associations between resources based on different technologies and analyze dependencies between resources.

- **Service Inventory**: enables creation of an inventory of services delivered over the operator’s logical and physical network resources in compliance with TM Forum recommendations.

- **Event Inventory**: records events that occur within the operator’s network resources (failures, outages, technical inspections, measurements etc.) and analyze their impact on the network and on services provided to users.
Inventory Logistics: supports warehouse structure management and transfer of assets inventoried within that structure between storage locations and network/customer locations.

Numbering Inventory: used to manage the utilization of numbers available to the operator, to allocate the numbers through sale and activation processes (for gold, silver, bronze, and regular numbers), and to manage numbers ported from other operators.

Digital Map: enables operator’s resources to be shown on digital vector maps, bitmap maps, and maps available on the Internet. This feature uses the Esri GIS environment.

Google Earth Map: enables operator’s resources visualization on Google Earth map.

Resource import from CAD: facilitates data entry to system, in particular with regards to data migration processes.

Reporting Services Reports: enables execution and browsing Reporting Services reports from within applications available in the system.

### 3.2 Physical Resources

**Physical Resource Inventory** application provides modules related to recording information about physical resources.

![Figure 3 Physical Resource Inventory – sample main window layout adjusted for FTTH](image-url)
3.2.1 Device Inventory

Records network elements using a number of information aspects, from information on asset deployment/storage location (storage facility, building, room within the building, cabinet, cable chamber (manhole) etc.) to network element structure data (rack, rack shelves, cards within a slot, port of a given type provided by a specific card etc.)

![Figure 4 Physical Resource Inventory – device structure, shelf view](image)

In SunVizion Network Inventory, individual network elements are modeled as object classes with their descriptive attributes. The attributes may describe physical and logical properties, such as manufacturer information, device parameters used to design and operate the network (e.g. cable attenuation, number of modes, number of output ports, frequency characteristics, optical receiver sensitivity), measurement values for individual parameters (e.g. reflectometry measurements on individual optical paths), network element status, date of purchase and date of warranty expiration, factory number, fixed asset allocation, and so on. Object attribute values can also contain links to electronic documentation such as user manuals, technical specifications, measurement results, pictures or links to Webcams that monitor the operator’s buildings.

The module can gather data on network elements distribution in individual structures (buildings, cabinets, cable chambers). The data can be presented as device views where the devices are shown against the backdrop of underlying room plans, manhole cross-sections, rack views etc.

The module supports inventory of hybrid devices, functions of which are configurable and depend on the installed equipment and the configuration of connections. A hybrid device is modelled as a "Black box", with external ports and internal equipment modules connected for the purpose of realizing the assigned functions. The system enables presentation of modifiable logical schema for this type of equipment, which can be subject to editing, adding and removing resources, changing position, modification of connection configuration (e.g. adding inserts with adjustable output attenuation level) and configuration of external ports connections. In addition, hybrid sub devices can be inserted and edited on the schema and a raster background can be configured for the schema.
Figure 5 Physical Resources Inventory - Hybrid device example schema, amplifier with attenuation correction

Logic schemas can be used to create diagrams, which show in a simplified manner the connection of devices or resources in various types of networks, e.g., telecommunication, electric, water, gas, etc. System users can enhance the information models with new technology, device type, and parameter definitions. New properties can also be added to models for devices inventoried in the system. The module enables system user to define value dictionaries, device templates, and device structure component templates, such as specific shelves with equipment, or specific device systems. Value dictionaries make information entry more efficient and prevent errors caused by the user entering an incorrect or invalid value. The database stores full history for each object and all changes to its parameter values. Users can browse information on network element creation date, locations where the network element was stored or installed, change dates for individual attributes, and users who made the changes.

The reporting feature provides information on free and utilized ports on individual devices and fiber utilization for individual cables.

3.2.2 Infrastructure Inventory

This module can be used to record information about infrastructure objects such as buildings, cabinets, cable chambers, manholes, utility poles, and cable duct segments. The database stores information on objects that are internal assets and on foreign objects, including cable duct systems built for the operator and leased from other operators. The module records all essential parameters such as cable duct segment lengths, duct profiles at the entrance to individual manholes, conduit dimensions and utilization, and cable reserve (cable slack) length in individual manholes or on poles in case of aerial cables.
The module can show elevation views (vertical projections — a cross-section of all floors) for buildings, as well as horizontal projections (plans for rooms, corridors, cable chamber walls).

3.2.3 Cable Inventory

The primary function of this module is to record and process information on owned or leased cables. The module stores information on optical fiber, coaxial, and copper pair cables. Each cable can be assigned parameters such as type, manufacturer, attenuation constant, and structure data: size, number and color of fibers or pairs, division into tubes.
The module gathers information on cable location in individual conduits placed in duct segments, on overhead cables spanning utility poles, on cable reserve in manholes and rooms, cable boxes and junctions, types of connector boots that terminate cables, and devices connected with specific cables or fibers. For optical splices, the module records information on fusion splicing, mechanical splicing, and fiber pigtails.

Presentation of junctions where a cable or its selected tubes “pass through” without splitting is possible. The module provides information on attenuation properties of individual junction types.

### 3.2.4 Cable Connections Inventory

This module stores information on optical fiber and copper connections set up for the operator’s own needs, connections leased to customers, and connections reserved for specific purposes. Each connection is associated with route information, fibers and cables used, status (available, reserved, leased, defective), and duration for which the connection has been set up. The module can show connection route on digital maps and dynamically generated logical connection diagrams.

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*Figure 8 Connection diagrams within an optical distribution frame*
Connections can be set up manually, by specifying a route, or automatically, using algorithms that can, for example, find the shortest path, or the least expensive path between selected network nodes, or a path that is alternate to the selected path.

The same functionality is available for copper pair connections. Additionally, for copper cables, system user can model and create “logical cables” that simplify connection management for service delivery. With copper cables, individual cable segments are much shorter than with optical fiber cables. Therefore, the number of cable segments and junctions for a copper-based network is generally greater by an order of magnitude than the number of segments and junctions in an optical network. To simplify management of these resources the system uses “Logical cables”, which model relationships between service nodes on a copper network. Once the relationships have been defined, service registration processes can be started. For network maintenance, each logical cable can be associated with its underlying line of physical cables. That way, it is easy to discover how physical cable defects may affect services.

The system enables generating extended diagrams of the cable network for specific infrastructure objects it follows. Figure 8 shows an example of such a diagram; the route of the optical network is shown in the context of a railroad route. Similar diagrams can be generated for other types of routes, such as roads, power lines, gas pipelines, water supply pipelines etc.

Figure 9 Connections shown on an optical network expansion diagram following the selected segment of a railroad route
3.2.5 Radio Resources Inventory

This module collects information on radio sources used in the operator’s network. Masts, antennas, and radiolines can be shown on a digital map. Antennas and their transceivers are associated with information on radio characteristics such as height, azimuth, tilt, supported frequencies. Antennas can also be associated with information on antenna coverage (the range coverage can be shown on a digital map as well), and dominant areas (for areas where the ranges of coverage from multiple neighboring antennas overlap).

Optionally, Suntech portfolio includes a feature for drawing dominant ranges or areas of coverage for antennas based on measurement data.

The module stores logical relationships between individual network elements; for example, for cellular systems, the relationships would be MSC / BSC / BTS / MS.

![Physical Resources Inventory: records of radio systems and radio coverage](image)
3.2.6 Passive Optical Network Analysis

The system supports optical signal loss analysis for passive optical network (PON). The analysis can start from a selected point in the network, including the initial OLT (Optical Line Termination) point, and end on ONTs (Optical Network Terminations) located on subscriber premises. This feature provides support for:

- Calculating optical length for individual network segments.
- Monitoring attenuation introduced by individual elements of the optical network (fiber segments and splices, optical splitters).
- Calculating signal strength at individual points in the network based on the specified strength at any point within the network.
- Attenuation analysis based on wavelength (three predefined wavelengths for PONs).
- Exporting calculation results to project documentation.

Figure 11 View of sample attenuation analysis for a selected PON fragment
3.2.7 Coax network analysis

Triple Play Network Inventory System provides a set of functionalities dedicated to HFC based triple play networks. Based on these functionalities it is possible to perform Radio Frequency Analysis, Low Voltage Analysis, control power budget, verify service availability and predict behavior of the network in case of failures or outages.

![Connection diagram related to coaxial segment of the network](image)

**Figure 12 Connection diagram related to coaxial segment of the network**

3.2.7.1 Forward channel

The System provides transmitted signal flow tracking capabilities from an optical node up to distribution boxes. In particular, it is possible to highlight the network segment provided in signal by particular optical node. It is also possible to display a signal path from given element to the optical node. The System allows also for ‘on the fly’ generation of diagrams of connections (including information about device ports and signal levels).
3.2.7.2 Reverse channel

Triple Play Network Inventory System is capable of storing information describing signal transmitted in the reverse direction (reverse channel). The System allows for modeling active network elements capable of amplifying the reverse and determining which ports are currently supporting the reverse channel. Based on this capability it is possible to highlight network segments with available Broadband and VoIP services (network segments with reverse channel transmission enabled).

3.2.7.3 Signal analysis

The System allows for modeling of typical features of passive and active network elements of the coaxial network, including, but not limited to: port type (input, output, and taps), attenuation and amplification characteristics of each port, power consumption, and permissible signal levels.

![Figure 13 Coaxial network signal analysis results](image)

The System provides also capabilities allowing for calculating signal levels in forward and reverse direction on ports of particular network elements. It is also possible to detect situations where permissible signal levels on particular ports are exceeded. Calculated values may be presented in tabular form and on dynamically generated connection diagrams.

3.2.7.4 Bandwidth allocation

The System keeps record of services assigned to particular frequencies distributed over the coaxial part of the network. The System allows for introducing information about low-, up- and band pass
filters located in the network. The system takes this information into account by calculating the channel plan available in particular parts of the network.

3.2.7.5 Low voltage analysis

The Triple Play Network Inventory System allows for modeling Power Supplies and electrical parameters of passive and active network elements. In particular, the system registers information about power cut-offs separating electrically segments of the coaxial network. Based on this information, it is possible to visualize the part of the network supplied by a given power supply, detect power supplies conflicts, and calculate power consumed from a given power supply and current and voltage levels on ports of particular network elements.

3.2.8 Resource Inventory with Google Earth map

An interesting option for users who do not require the advanced map interface is a version of Resource Inventory with Google Earth map. Compared to the version using ESRI GIS environment graphical data editing functions (position change, drawing new objects) and business functions requiring interaction with the map (e.g., assigning cables to ducts selected on the map) have been reduced. Resources shown on the Google Earth map can be retrieved through an external service that provides data in KML format or can be exported to the map. The application is suited for users dealing with recording data located inside infrastructure facilities, such as manholes, cabinets, and Inside Plant. In such cases, use of this application simply helps with locating resources on the map.
Figure 15 Resource Inventory with Google Earth map
3.3 **LOGICAL RESOURCES**

**Logical Resource Inventory** application provides modules related to recording information about logical resources.

This application can be used to inventory logical assets within the operator’s network, for technologies such as:

- D WDM
- SDH/PDH
- Ethernet
- IP/MPLS backbone
- ATM

Various network segments can be inventoried (e.g. backbone network, access network) delivered in different topologies (e.g. mesh, ring, tree).

3.4 **LOGICAL NETWORK STRUCTURE INVENTORY**

Different transmission technology resources are grouped into logical layers. Network structure for each layer is stored in the database as a graph of nodes and links set up between the nodes. Nodes correspond to actual transmission equipment with ports that provide the right signal. Links represent basic connections created within the layer, for example a 2 Mbps link between transport network nodes. For each link, information on its utilization and total bandwidth is added. Users may edit the
network structure by adding, modifying, and deleting nodes and links. System user can drill down from logical objects (nodes and links) to their underlying physical devices.

Logical Network Structure Inventory can be used to display a network graph against a digital map to show actual locations of individual nodes in the field. It is also possible to show a specific layer’s resources in the context of other network layers.

Additionally, network resources can be shown as a logical drawing of the network’s topology to present the network structure detached from any geographical context while showing a number of relevant information, including total/available bandwidth, cost (taken into account by connection setup support algorithms), port usage etc. Such presentation format is especially useful for wide area network.

![Logical Resource Inventory](image)

*Figure 17 Logical Resource Inventory showing a selected SDH network fragment diagram. STM-16 spans are visible. Selected fragments are expanded and show occupied transport containers. The system highlights in color containers belonging to the same connection.*

3.4.1 Logical Connections Inventory
This module stores information on logical connections set up in individual network layers, including:

- connections set up for the operator’s own needs (for example, to provide transport for higher layers)
- connections leased to customers (including other operators)
- connections leased from other vendors; in this case, the network graph includes selected elements of the third-party infrastructure (interconnect nodes and links that simulate the leased bandwidth)
A connection is considered to be a sequence of links (for example, VC-12 containers) used to transport a signal or service from the higher layer (for example, 64 kbps) between service nodes. Each connection is associated with information on connection route (sequence of links), channels (containers, time slots), nodes and ports of termination, duration, and status (such as operational, reserved, leased, defective), and information on the customer who uses the connection, on its underlying contract, SLAs etc. As a result, a single feature can be used to store information on existing connections and information on reservations placed on resources needed to set up new connections. Each logical connection can be associated with information on its backup connection (if any). The module can show connection routes on digital maps and on dynamically generated connection diagrams. The system also enables automated diagram generation with optimized distribution of information on nodes and connections passing through them.

![Figure 18 Logical Resource Inventory: diagram showing WDM connection route on a network node. Each connection is associated with information on status, usage, and services delivered. This information is used to generate connection presentation. Connection properties are highlighted with color and line styles.](image)

Connections can be set up manually, by specifying a route, or automatically, using algorithms that can, for example, find the shortest or least cost path between selected network nodes, or find a path that has no common elements with the selected path. Additionally, users can filter out data during the pathfinding, for example to specify nodes the connections must pass, specify the number of connections to find, or specify transmission parameters of component links (such as wavelengths for WDM links). Algorithms are used to ensure faster connection setup and optimize network resource utilization.

### 3.4.2 Inter-Layer Associations Inventory

This module is used to store information on transport relations between different technology resources, such as the association between connections set up in the fiber layer with relevant links in the WDM layer, association between WDM layer connections and relevant resources in the SDH/PDH transport layers etc., up to client connections built on underlying transport links. The inter-layer associations create a layer stack that can be analyzed using features provided by the software suite.
Data on inter-layer associations can be used to run failure impact analysis and see how defects in lower layer resources (such as faulty fiber optics cable) can affect services delivered over the SDH or IP network. This information can also be used to study the separation of resources in lower layers, for example for setting up backup connections in the WDM layer.

The inter-layer associations module can be used to freely follow resources both up and down (to infrastructure layers), and to present the resources as tables or show them on digital maps.

3.5 EVENTS INVENTORY

This module is used to record event data, such as: event date, duration, impact, and type (for example, BTS failure), cable or fiber failure, failure of an active element (such as optical transmitter or receiver) or passive element (such as a splitter), planned resource downtime.

The module enables users to determine the event’s area of effect and show it visually on a digital map. Additionally, the module shows event consequences for example by generating a list of non-operational service connections or other resources which were switched off as a result of a failure.

This information can be sent to CRM or ERP systems. The module can report data on current failures, historical failure percentage ratio for network elements, and failures that affected specific subscriber ports.
3.6 INVENTORY LOGISTICS

This module ensures that consistent information is kept for a device throughout its entire lifecycle. All devices deployed in the network are registered in the inventory system from their warehouse based on the defined sequence of transfers between storage facilities, including the transfer from the deployment team’s storage to the deployment location. Similarly, removal of a device from its location means that the device is uninstalled and then transferred to the right storage location (such as repairs facility storage location).

The module retains full history for each device, which is primarily the history of the device’s deployment at individual locations. Each inventory item recorded in the system is assigned a price value to enable value calculation for fixed assets composed of different network resources.

![Image of Inventory Logistics: deploying inventory items in the central office](image)

**Figure 20 Inventory Logistics: deploying inventory items in the central office**

3.7 SERVICE INVENTORY

This module supports business processes for service sale, activation, and maintenance. Its functionality has been designed in compliance with TM Forum’s service information model recommendations. The service model employed in SunVizion enables precise inventory of Customer Facing Service (CFS) parameters and Resource Facing Service (RFS) parameters.
Sales support features include the ability to verify if the service can be provided at the specified location, the ability to register services sold to a customer, and to block resources used for the service.

In the processes of service activation the module ensures delivery of the required technical parameters needed to activate the service. The data is provided by a service interface.

In the processes of service maintenance the module enables tracking service availability in the event of network resources failure. For example, a customer service employee can quickly determine if information regarding service unavailability cause is present in the system and thus respond appropriately to customer requests. At each service level, the information on its availability is stored in history. It is also possible to prepare reports on the quality of services.

The module’s service interface enables integration with other systems, including CRM and Workflow solutions, which allows for the enterprise customer-specific process to be delivered or for automatization of reservation and service activation processes.

### 3.8 NUMBERING INVENTORY

This module is used to manage the numbers available to the operator. Additionally, the module can be used to define numbering rules, associate and maintain information on numbering ranges assigned to individual objects and control their utilization, as well as provide support for selling numbers. The module is a link between customer care support systems and telecommunications network inventory systems. The module supports numbering for Public switched telephone network, cellphone network and other telecommunication networks. Additionally it allows for managing IPv4 and IPv6 numbering.
Numbers can be grouped into ranges, and number instances can be defined and assigned the relevant status. Numbering ranges can be hierarchically assigned to their underlying devices or other objects (such as operator’s branch offices).

Numbering Inventory module supports device identification by their assigned logical numbers, and shifting logical number ranges between devices. Number status can be changed when they are reserved, activated, or released. Users can expand the statuses as necessary.

![Numbering Inventory: main window](image)

Numbering Inventory module adds timeframes to the number pool management functionality. These can be number instances and numbering range validity dates, durations of numbering range assignments to devices, and timeframes for number allocations to specific Customer Care Offices or vendors. This enables seamless network upgrade planning, and allows for limiting the number availability period at a specific vendor. Additionally, this functionality can be used to flexibly allocate attractive hotline numbers for a limited time period; for example, the same number can be assigned for promotions to different customers, if there is no time conflict between such promotions. Expiration checks for such validity periods are performed automatically. Once the defined period expires, numbers return to the pool allocated to the device.

Users can define importance levels for numbers, e.g.: gold, silver, bronze, and regular. Number importance can be assigned manually (where a user enters the number and assigns the relevant priority to the number in the system), or automatically (using a specified template). System user can also specify which vendor is able to access which number priority level and pool of numbers within that priority.

The module enables rational assignment of numbers from a pool, e.g. suggests the closest available number to prevent excessive pool fragmentation. This function can be overridden both to manually provide a specific number and to automatically select a number from the pool of available numbers.
3.9 **Workflow**

Through integration with Workflow, Network Inventory can support and automate business processes using data about network resources.

These are, for example processes related to network maintenance, network planning and development monitoring, service related resources availability verification. The use of a process approach in the latter case enables, among others, modification of service offer and configuration procedures for activation or deactivation of services without having to modify the functionality of the system.

In the Network Inventory system, thanks to the modular internal structure, internal workflow is used to implement the system’s business logic. With this solution it is possible to change the logic of the system without changing the functionality.

![Diagram of internal workflow concept in Network Inventory system](image)

*Figure 23 Internal workflow concept in Network Inventory system*
3.10 REPORTS

SunVizion Network Inventory provides built-in Business Intelligence reports, and additionally allows for creation of simple queries and complex data sets. Reports are created from pre-defined templates, which define the scope and type of collected data, their processing and formatting of output data. Reports are made available through a web browser and all applications of the system.

Reporting tools include:

- **Report Editor** for defining report templates.
- **Report Viewer** to display the results of the report.
- Dedicated report templates for users.
- Mechanisms for matching report templates to specific users (system user dedicated reports).
- Mechanisms for controlling automatic report execution.

4. New features in version 13.1

**RESOURCE INVENTORY**

- Functional enhancements in Logical Resource Inventory
  - Modernisation of inventory of IP / MPLS / Ethernet logical resources (connection topology, improved windowed interface ergonomics, vertical schema for paths and IP links)
  - Modernization of inventory of PDH resources (simplification by introducing one layer with sublayers)
  - The introduction of a dedicated GUI to manage capacity in IP network links
  - The introduction of a dedicated GUI for VLAN network parameters inventory
  - Organizing logical object naming schema by introducing naming masks on system model level
  - A possibility to manually correct route of connections set up automatically.
  - Support for SDH transmission resources in SONET variant

- Functional enhancements in Physical Resource Inventory
  - Automatic resource reservation release mechanism after reservation expiry date
  - Enhancements in managing documentation creating from schemas (new configuration options, preview functionality)
  - Building schemas
    - new FTTH network wizard
    - improvements in CATV network wizard
    - improvements in logical building structure wizard
  - Cable along infrastructure schema - presentation of marking and marking-measuring posts
  - Infrastructure node schema - presentation of cables, cable reserves.
SUNVIZION NETWORK INVENTORY

SOLUTION DESCRIPTION

- New straightened connection topology schema for a given connection or cable route.
- Connection topology schema - presentation and support of cross connection states (planned, existing, planned disconnection)
- Physical schema - improvements in slot names and installed devices presentation
- Support for domaining in events and failures inventory

Allowing the installation and operation of the system without ESRI maps functionality

Improving ergonomics, performance, and reliability of the system
- New features for navigating back and forth in contextual views
- Quick physical resources creation - beginning with template selection
- Notes on schemas: infrastructure nodes, cable along infrastructure, logical schema
- Network topology
  - Easier loading of neighboring nodes
  - Ability to mark nodes with symbols
  - Simultaneous nodes and links selection
  - Displaying nodes description with the ability to control their visibility and format
- Connection topology
  - clear indication of connection paths on the diagram
  - locating connections from selection on the diagram
- Faster, asynchronous creation of physical resources
- Faster, asynchronous removal of physical resources

New services Resource Inventory subsystem interface
- Registration of a fiber optic network failure events using data from the OTDR devices plugged into measuring ports
- Registration of a fiber optic network failure with providing data on distance from the failure to a given fiber termination

NETWORK PLANNING

- Functional enhancements in network planning
  - Improvements in creation of project documentation for network cable installation projects
  - Improvements in accounting for harmonic distortions in signal analysis
  - Improving the efficiency and reliability of the process of applying changes between projects
  - Improved ergonomics in the configuration of technical parameters of signal attenuation of the as related to frequencies
  - Improvements in planning system scaling (installation of dedicated services that support the planning process, regardless of the inventory in the main project)

SERVICE INVENTORY
Functional enhancements in Service Inventory

- Support for customer hierarchy (primary customer and secondary customers dependant on him)
- Integration of service editor with numbering management - allows for selecting, reserving and assigning numbers to selected services.
- Search services in Resource Inventory using the map filter.

LOGISTICS MANAGEMENT

- Simple graphical interface for management of warehouses configuration and management of relations between warehouses

5. Technologies

The system is based on a layered architecture and object-oriented data model. Object-oriented modeling, in line with the recommendations of the TMN enables creation of a complex information model that can be flexibly modified and expanded by system users. This applies both to the introduction of new definitions as well as expansion of existing ones by adding new parameters (attributes) describing the modeled objects. Thanks to the open architecture, the database platform can be run under Windows or Unix, and using SQL Server or Oracle.

Network Inventory v. 13.1 uses the following technology:

- Esri ArcGis 10.2 as the GIS platform
- Microsoft SQL Server 2012 as the database (alternatively, Oracle Database can be used)