



TECHNICAL OPERATIONAL  
AND MAINTENANCE SYSTEM



OVERVIEW



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Technical Operational and Maintenance System

## System Characteristics

TOMS is an integrated **Technical Operational and Maintenance System** designed primarily for distribution companies.

The corporate IS's focus particularly on the support for the main corporate processes that usually cover production, sales, economy, personnel policy and supplies.

A wide range of standard SW products is available regarding categories such as ERP (Enterprise Resource Planning), CRM (Customer Relationship Management), EAM (Enterprise Assets Management), EIS (Executive Information System) and others supporting the basic processes in different branches of enterprise. The applications form an indispensable part of all the corporate IS but do not provide users with any special strategic advantage in the area of supporting the processes of management and control of a distribution network. An offer of a purposefully oriented, integrated IS designed with the aim to support the main production activities of distribution companies, thus satisfying the strategic goals of a company in the area of distribution, is still missing on the market.

Based on detailed analyses and experience with the IS development in several electric power, gas, water, and heat and power distribution companies, **TOMS** (Technical Operational and Maintenance System) has been developed. The system is targeted at supporting the satisfaction of the primary subject of distribution company activities, which is media distribution (e.g. electric power, water, gas, heat). TOMS provides tools and information resources supporting the accomplishing of the **strategic goals** of a company.

TOMS provides for **information needs of a distribution company in the area of distribution control** and it also ensures interconnection with the other systems for managing the company. Thus, it creates prerequisites for integration into the corporate system of management as its integral and indispensable component. The integration is implemented via an interface to the basic modules of the standard ERP, CRM and EAM products (by SAP, ORACLE, etc.).



TOMS can be included in the class of systems referred to as Network Information Systems (NIS) designed to meet the needs of energy distributors (electricity, gas, heat) or public networks administrators (water supplies, sewerage, transport, telecommunications, etc.)

Primarily, TOMS serves the purposes of the technical departments of distribution companies, provides information for the top and middle corporate management and, of course, for the executive staff of the development, construction, maintenance and operation departments.

The implementation of TOMS accompanied with efficient organization of work creates prerequisites to continuously bring down costs for development, construction and maintenance, reduce the waiting time for repairs and outage duration, minimize losses caused by termination of power supply, and gives possibilities to optimize corporate resources and reserves.

## TOMS Structure

The system is divided into system **modules** broken down into the user and administrator modules; it contains *common objects* and *supporting tools* utilized by several modules.

The user modules provide the following **main system functions**:

- Technical documentation and management of data on a distribution network (DN) – FM, GIS.

- Controlling and ensuring the DN operability - Operations, Maintenance.
- Planning, standardization, design and realization of DN development – Planning, Design, Construction.

The core of TOMS is formed by the technical records of distribution network facilities managed by the **Facilities Management** module (FM). The FM module uses the spatial data and functions of a geographic information system (GIS). The **spatial data** enables location and visualization of objects and is stored in the ORACLE database (see the GIS module below). Digital drawings/maps are generated dynamically, directly from the database store. The digital documentation managed in a unified way then enables effective information support for development, operation, maintenance and repairs during the entire life cycle of distribution network items. It is the properties and potential of GIS that increase considerably the utility value and quality of the resulting system and represent its major competitive advantage.

The philosophy of TOMS is outlined so that the system is able to promote the control of the basic distribution processes and their relationships.

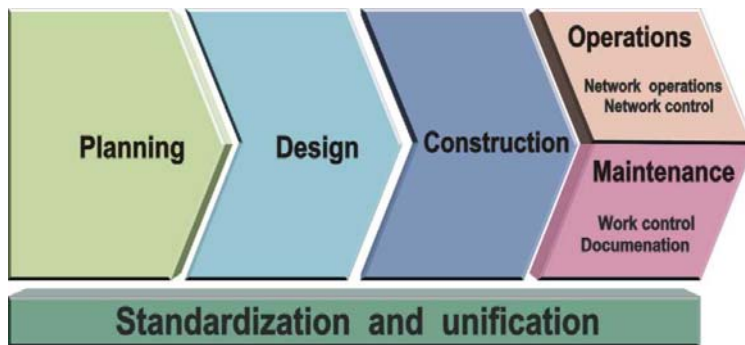


latest knowledge of information technologies and has been localized into several languages (Czech, German, English).

The concepts of the TOMS solution fully meet the requirements for a modern information system at the beginning of the third millennium.

## TOMS User Modules

### Facilities Management and GIS (FM/GIS)



Thus, the TOMS modules support the basic distribution processes, are mutually interconnected and operate on a unified database. The database provides applications with central access to information essential for controlling the individual processes. These pieces of information cover the entire life cycle of facilities in a distribution network.

The database also contains a so-called history of technical records items, i.e. maintains the records of what service actions, when and why, were performed on a particular facility in the past or records of the changing states, facility location, etc.

TOMS is a system with multi-tier architecture designed for working in extensive LAN and WAN networks. The part of the system concerned with the integration relationships is, on principle, handled in the middle tier. TOMS is based on the

The basic prerequisites for optimizing the control of the distribution processes are impeccable technical records and accurate, up-to-date documentation of the distribution network facilities. The technical records must be able to provide an overview of the technical properties of the individual facilities, the

facility condition regarding its operational state and the location and relationships of facilities in space. The technical records based on the above concepts form the fundamental database component of the technical-operational information system of a distribution company.

The records of facilities are managed by the **Facilities Management** module (FM) and the registered facilities are referred to as **technical records items** (TRI). The FM module provides tools for creation, maintenance and utilization of a unified and consistent database of distribution network objects.

The database can be used to store the descriptive information for the individual objects such as the class, type and technical properties of each object.



The **FM** module can be, at any time, easily interconnected with the **GIS** module (to form FM/GIS), which enables adding a spatial component to the basic attribute data on the network items.

Thus, a **spatial database** is formed providing complex information on facilities and the possibility of working with both the attribute and spatial data component. The **spatial data** enables the user to display objects in a map or in form of a drawing or schema and to locate objects in terrain. The spatial data is utilized by the **GIS** functions such as **spatial analysis, tracing, position relationships**, etc.

Compared to the “traditional” information systems, the above-listed capabilities are based on the spatial nature of data and introduce a new quality to the whole philosophy of TOMS – allow the user to work on an equal basis with both the spatial and attribute data component.

**GIS** on its own provides tools for creation, maintenance and utilization of a unified and consistent database of distribution network objects. The benefits of the module become especially apparent when integrated into TOMS. If so, **GIS** extends substantially the **FM** module functionality. In practice, this dissolves the boundary between the technical records and the documentation – the spatial data and the related functions provided by the **GIS** module appear as an integral part of the data and functions of the **FM** module.

The **GIS** module ideally associates advantages of traditional registration methods with tools for the creation of maps and computer graphics. An ordinary database registration provides for optimum management of the attribute data of the DN objects. Nonetheless, it is not able to provide users with information on the shape of an object, its location and relationships to other objects in space. To give an example, keeping records of the linking of individual line sections characterized in their course by different physical and technical properties can only be done with great difficulties. **GIS**, however, provides plentiful tools for working with these specific objects.

GIS allows creating mutual and logical links between:

- Background maps (vector, raster).
- Technical maps of networks.
- Schemas of networks and technological units.
- Photographs, orthophotomaps.
- Technical-operational information.

The accurate digital documentation of distribution networks and distribution network objects can be

linked to the imported map sources or, possibly, to some other resources obtained from the state administration bodies or other institutions. This is helpful in creating indispensable information sources for internal work-related communication and management of operational processes. Data export enables creating documents essential for communication with other legal entities, such as the documentation required for administration procedures, rendering statements, handing technical documentation over to other network administrators, etc.

The spatial database is available both for the purposes of the technical documentation in the **FM** module and for all the other modules of TOMS.

### GIS on LIDS Basis

The client and server part of **GIS** is realized in the **LIDS V6** system environment. The core of the server part of GIS is **LIDS Server**. The individual modules of TOMS access data using functions of the LIDS Server application interface (API).

**In the version of TOMS being prepared for the year 2005 the linking of other GIS systems with the Facilities Management module (FM) will be realized.**

### Operations

The **Operations** module provides the information support for the “Network Management” part of the distribution process referred to as “Network Operation and Maintenance”. Namely, the module specializes in controlling work on clearing faults and supply failures occurring in a distribution network. The module covers the following functionality:

- Registering and managing faults.
- Planning and managing outages.
- Fault reports.
- Network connections database management.
- Statistics.

The main objective of the system is to enable the dispatcher to **detect the fault location in the network as soon as possible** by evaluating phone calls received from the affected customers, depending on how the individual customers are supplied from the network. Using information stored in the database of network connections it is possible e.g. to identify customers affected by the fault and simplify the process of searching for the location of the occurring fault based on the customer calls. In the power distribution branch the module contains supporting tools for **reducing**

**the supply failure duration** if a fault occurs and tools for evaluating the reliability of the electric power supply.

Providing the customers with a complex and timely notification of planned activities related to an outage or cut-off of a part of a network is no less important. **The module provides general tools for planning and managing outages.**

## Maintenance

The Maintenance module represents one of the key components of the Technical Operational and Maintenance System (TOMS). The objective of the module is to give the information support for **planning and controlling maintenance** of a distribution network in the scope of the "Network Operation and Maintenance" process of distribution. The Maintenance module utilizes the technical records and covers the support to the entire cycle of work related to maintenance and repairs of distribution network items. The cycle begins with the phase of planning the maintenance activities and covers the different steps of the work control starting with preparation of planned activities and work orders up to creation of materials for evaluation of work expenditure and maintenance costs. The module also enables registering defects and planning work for clearing the defects, and creating requests for an outage in the scope of the planned activities preparation.

Significant benefits can be expected due to the cooperation with the other modules. Convenient organization of work, with the support of an information system, may help **reduce the duration of outages necessary for repairs, thus decreasing the losses caused due to media cut-off, bring down maintenance costs and optimize corporate resources and reserves.**

## Planning

The **Planning** module designed for the distribution network development meets the information needs of the "Network Development" part of the distribution process. The module provides **support for development departments** of distribution companies in the area of working out studies and proposals for network development, planning investments targets regarding network development or refurbishment, and assessing and settling customer requests and complaints (concerning new extraction point connection, increasing power input, claims, etc.).

The **Planning** module represents a significant integration component of a system that cooperates

with all the other TOMS modules and utilizes nearly the whole database of the system intensively. The benefits of implementing the module consist in direct support for DN development processes when:

- Processing data for the technical strategy.
- Handling the development studies related to regions.
- Taking decisions regarding the investment planning.
- Rendering statements of requests.
- Giving economic appraisal before starting and after completing a construction.
- Preparing constructions prior to project designing.

The principal competitive advantage of the solution is the utilization of the technical records data including the spatial data and functions of GIS. This allows working with a unified database including the cartographic and schematic documentation. The enhanced user-specific quality is the presentation of results of the individual tasks using the GIS tools.

## Construction

The module provides tools for controlling the "Construction Realization" part of the distribution process in all phases of the **construction life cycle**, beginning with making a request for construction and investment planning, through designing, budgeting, concluding contracts with providers and implementing a construction, up to registering a construction as-built in the technical records and the records of tangible fixed assets (TFA), and evaluation and economic settlement of a construction. The module enables monitoring the specific process of construction, comparing the planned costs against the as-built costs and evaluating constructions of the distribution network development, customer constructions and rated repairs. Requests for construction may be supplied with an initial cost estimate and centralized and, subsequently, decentralized **investment plans** can be set up. It is possible to register the specific breakdown of construction into projects, construction groups and construction objects, and to **monitor the development of as-built costs** of a construction in progress. Besides recording the technical data on construction, the module provides functions for maintaining all the paper documents related to construction, preparing data for accounting a construction to TFA, and for **planning and monitoring construction milestones**, payment deadlines and other events.

The Construction module provides tools for the so-called construction engineering. It lies in supporting



those processes that must always be undertaken by a distribution company internally and that cannot be handled by means of outsourcing.

## Design

The module brings significant **benefits** to the "Project Design" and "Construction Realization" distribution processes **when submitting a tender for project and construction delivery contractors** and for the cooperation with the contractors.

The module provides the user with tools for administration of the **corporate norm base (NB)**, and enables designing the **technical-constructional solution of construction**, calculating the **construction budget** and specifying **material requests**. The norm base is created based on the constructional and technological standardization of constructions and is used in designing the technical-constructional solution of construction and for evaluation of the construction. NB is updated continuously and the updated NB version is distributed on regular basis to the external users. Thus, in an essential and unique way, the Design module also contributes to supporting the process of "standardization and unification" and provides resources for a normative base of the DN technical items.

Apart from the support for tendering, the implemented Design module provides the user with capabilities the utilization of which directly impacts the **reduction of construction costs**:

- Drawing up a budget and evaluating constructions based on the updated norm base.
- Possibility of comparing the price and the technical-constructional solution of different versions of the same construction in order to evaluate the providers' bids.
- Checking the construction as-built against the project, checking the quality of the outcome according to the corporate norms and materials.
- Unifying the user procedures.

## Integration with Neighboring IS

The standard form of TOMS also contains integration relationships to the neighboring ERP systems. A simplified "customization" enables modifying the relationships in compliance with the current needs of the neighboring IS. To communicate with the neighborhood, TOMS utilizes both the off-line and on-line interfaces. The off-line means of communication are implemented on the XML format basis, the on-line interface works on

the transactional basis. In specific solutions, the off-line interface is preferred as it is considerably simpler and safer. The on-line interface application can be perceived as a way of handling special requirements.

## TOMS and SAP Integration

A part of TOMS is formed by standard interfaces to the SAP system ensuring the essential relationships between **TOMS and SAP/R3, SAP IS-U and SAP CRM**.



## Benefits of TOMS

- Providing information support for the basic processes/activities regarding distribution (network development, project designing, construction realization, operation and control of networks, network maintenance).
- Giving support for the setting up of standards in the area of distribution.
- Unifying and optimizing working procedures.
- Enhancing coordination and communication.
- Complying with demands imposed by legislation on the power industry branch (statements for the regulatory office, reports on power cuts, monitoring the supply termination duration, ensuring customer connection to the network, ...).
- Significantly improving customer services (notifying of power cuts and outages, giving support to the Call Center – information on faults, outages...).
- Supplying data for the technical controlling (keeping records of the history of service actions carried out on distribution network objects).
- Reducing costs of maintenance and fault clearance (optimizing work, optimizing dispatches according to spatial conditions, optimizing the preventive maintenance code based on monitoring the history of service actions on facilities, data for reliability maintenance, ...).
- Reducing costs of DN construction (drawing up a budget according to the updated corporate norm base, comparing the price and the technical-constructional solutions of construction offered by different providers, standardization of constructions, checking the construction as-built against a project, ...).
- Minimizing the volume of lost energy (minimizing the penalization).
- Providing data for the financial controlling.
- Unifying data regarding the distribution branch (unified, spatial and consistent technical records of distribution network facilities for both TOMS and other applications (calculations, SCADA, ...) as well as for the neighboring IS (ERP, CIS, CRM), no object duplicity).
- Notable utilization of spatial data and functions (GIS) in activities and processes regarding the distribution.
- Integration platform for specialized technical software (calculations, project-design SW, SCADA, network measurements).
- Collecting data for strategic planning and development of DN.

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