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Computer Engineering And Consulting Company

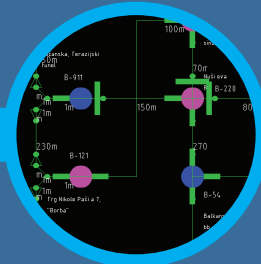
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Distribution Management System

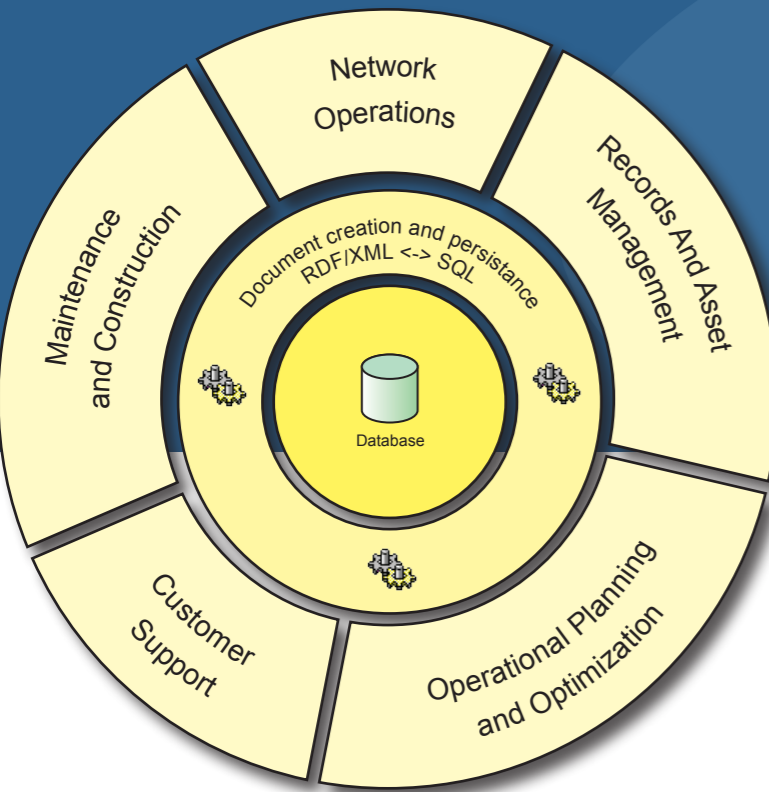
SCADA / DMS / NMS
for electric utilities



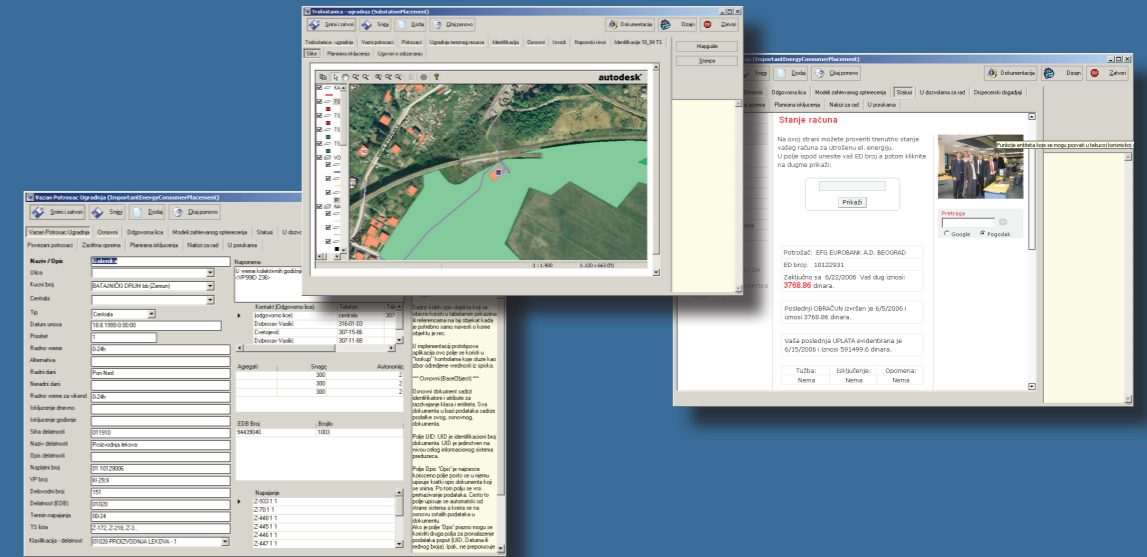
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Based on CIM and ERP data models, ISS is highly customizable software for high level, extended real-time power grid management.



ISS

(SCADA, DMS, NMS)

Information SCADA Subsystem is an information system that binds together other systems in electric utility.

It is running in extended real-time context and with SCADA real-time system it ensures monitoring and analysis over all business processes on the highest level.

ISS uses IEC 61968 and 61970 series of standards as connecting platform for network operations, management and planning systems, ERP (Enterprise Resource Planning), CRM (Customer Relationship Management) and GIS (Geographic Information System).

ISS gathers most of electric utility's data into one database organized as a repository of objects, documents and their interactions.

Simplified software architecture and usage of single enterprise communication bus creates most efficient and productive environment. This architecture allows ISS to bypass many technical problems and store most of the utility's information into one place.

ISS applications can easily share data using common information model and connecting almost every process in the electric utility.

Distribution Management System

Organize and manage data for power system resources (substations, power transformers, conductors, switches ...), network, consumers, outages, trouble tickets and other resources.

ISS actively communicates with SCADA in order to maintain active network topology status and calculations.

ISS is processing trouble tickets, network events and alarms with real-time topology calculations and spatial analysis.

Planned outage management keeps track of affected consumers grouping them by their priority and type. Generated reports are available to other systems using Web services and Web pages.



IEC Standards For Energy Management And Distribution Systems

("interoperability through industry standards")

Since 2002, Diginaut has successfully designed and implemented IEC 61968 based data models.

Efficient deployment

ISS deployment is done in six main phases:

- 1) Verification of class diagrams and use cases with the client
- 2) Application prototypes deployment and data model finalization - user interface and business logic customization
- 3) Importing existing data into the new system (network resources, topology, customer database, workforce data, equipment catalogs ...)
- 4) Making the new system operational and introducing it to the users
- 5) Deployment to following departments: control centers, call centers, energy management and planning, developments, customer support, workforce management, network analysis
- 6) Integration with external applications (GIS, ERP, Call center ...)



GIS Integration

("network element properties and runtime status information")

Main characteristic of energy distribution systems is their spatial orientation. Utility users waited for a long time for final integration with visual presentation that will introduce much better network view.

Diginaut case studies demonstrated that this integration is straightforward and does not need many changes on existing applications to coexist and interact.

Although ISS is successfully linked to ESRI and AutoCAD GIS solutions many new features are requested as users become familiar with powerful tools they now have.

Diginaut has chosen to further extend ISS functionality by:

- continuing to implement IEC 61968 interoperability standards
- connecting to and using existing GIS, ERP and CRM solutions
- continuing interoperability tests while connecting to new systems
- using ZORA technology for fast development and integration of custom applications (see below)

Business Functions

Energy distribution management is a dynamic and ever-changing process that involves numerous systems from different vendors. Nowadays when utility's requirements are focusing on improving asset utilization and efficiency, ISS successfully balances between availability, wider coverage of business functions and detailed coverage of every single process.

Currently ISS covers following modules:

- Network operation
- Records and Asset Management
- Customer Relationship Management
- Workflow and document Management
- Operational Planning and Optimization
- Maintenance and Construction
- Customer Support

Customer Relationship Management

In order to keep consumers satisfied utilities need extensive customer relationship management system that keeps track of:

- Important and high priority consumers
- Call center support (trouble ticket system, network planning)
- Address database (spatial and graphic data, street name history ...)
- Energy consumption metering and reporting mechanisms

According to customer records and active topology, system generates detailed reports about important consumers supplied from any low and middle voltage feeders. ISS keeps track of incidental and selective consumer groups that are prepared in cases of power shortage or incidental power outage.

Operational Planning

ISS group "Operational Planning" maintains data for substations, transformers, feeders and power supply lines for low voltage consumers.

Operational Planning Department creates planned outages according to orders prepared in the group for grid planning. After planned outage is processed, system identifies affected consumers according to the current grid topology and generates reports and warning messages for customers.

Maintenance Coordination

ISS's Maintenance Coordination User Group schedules planned outages. These users can access planned outages that are created by Operational Planning, so they should update only the time of the planned outage.

Based on the period of the planned outage, ISS web services generate reports about affected customers. These reports are accessed through ISS intranet web pages and other services and reports.

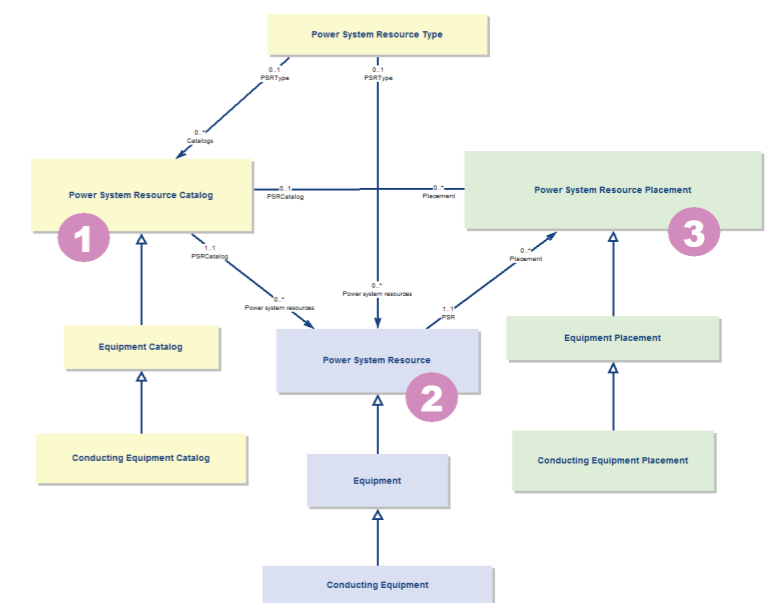
Call center operators may inform consumers about incoming power outage according to these lists.

Assets and Network Equipment

ISS has inherited and expanded CIM model from IEC 61970 standards in order to create common information base for every subsystem in the electric utility.

With the same hierarchy throughout catalogs, resources and placements, ISS can successfully maintain any business function from technical information system, asset management, to network operation and maintenance.

ISS model not only does support grouping through resource membership but it keeps changes in time. This allows network planning departments to go back in time to run network topology calculations and analyze network load peaks.



Core classes of ISS model

Advanced Integration Techniques For Command And Control

("ISS can leverage existing CAD, GIS and ERP applications")

Upgrade existing systems without interruption

When time comes for upgrading large information systems, ISS offers compact and proven process. With "ISS Common Company Data Model" it is possible to replace one module at a time in a controlled process. If a legacy application supports Windows scripting, COM Interop or add-ins, then integration is seamless as user environment can be gradually changed and customized with ISS functions.

CONTROL CENTER JOURNAL RECORDS

BOOKMARK ELEMENTS AND ADD LINKS INTO DOCUMENTS

ACCESS COMPLETE TECHNICAL AND WORKFLOW DOCUMENTATION

INTEGRATE WITH EXISTING APPLICATIONS AND DATA.

GIVE LIFE TO CAD, MS OFFICE OR GIS IMAGES WITH REAL-TIME LINKS TO NETWORK ELEMENTS AND SIGNALS.

Control center journal

3 - Dispatcher Risa Reeves - CC-10kV
 2 - Work shift 06.02.11 Dayshift Journal:10kV Control Center
 1 - Event 158/2011: 21. May - 324 10LineC19

ISLAND

040 10LINEF16, Sava Centar, First Avenue 14
 Z-684, 10 S1, Z-684, Third Boulevard 50
 Z-685, 10 S1, Z-685, Third Boulevard 58
 Z-280, 10 S1, Z-280, Mihail Pupin St. 22
 Z-1359 10 S1, Z-1359, Mihail Pupin St 85a

Record ID	Journal document	Start	End	Crews
158/2011	10kV NETWORK MALFUNCTION	06.02.11	06.02.11	Sector 1 (Brennan V. Barton, Katell L. Pierce, Charissa Y. Stein)
TS 35/10kV Belgrade 7, F-19	Crew dispatched. Fault located. AR-324 opened. Network part grounded towards V-1879.	11:35	12:20	
158/2011	Switch states and network topology changes are recorded in the command table.		06.02.11	12:20
TS 35/10kV Belgrade 7, F-19				
158/2011	EVENT REPORT No. 11/10001 generated.		06.02.11	

ISS Message Bus: User group 10 - Risa Reeves

ISS Network Info: 10kV Network Diagram - Main view - Risa Reeves

Z-684 10 S1 (TS10_04)
 Z-684, Third Boulevard 50
 New Belgrade

EDB - INSIDE BUILDING
 Jurisdiction: Sector 3
 Total Power: 630VA
 Transformers: 1
 Important Consumers: 1
 Min. Priority: 3
 Consumers: 196
 Consumers With Heating Power: 190
 Activated: 04.10.92

Island: 222 elements
 T1: '10LINE.SWITCH(Z-684 10 S1 R3)',
 '10LINE.SWITCH(Z-684 10 S1 R2)',
 '10LINE.SWITCH(Z-684 10 S1 R1)'

3D Modeling

SAVA CENTAR 040

Topological Island

Private consumers	Important consumers	Total Power	Important Consumers	Minimal Priority	Consumers	With Heating Power		
13.04.11 01:25	13.04.11 01:25	3890	0	0	343	286		
Delete interruption Save "without power" journal record								
Feeder	Address	Element Type	Ownership	Total Power	Important Consumers	Minimal Priority	Consumers	With Heating Power
040 10LINEF16, Sava Centar, First Avenue 14				7	0		343	286
Z-439	6957 Integer Ave	In building	EDB	630	0	0	140	125
Z-751	6962 Integer Ave	In building	EDB	630	0	0	182	161
Z-199	8609 Scelerisque Road	In building	EDB	1000	5	1	20	0
Z-1202	9661 Ultrices Ave	In building	FDB	630	2	4	1	0

REAL-TIME SCADA SIGNALS

VIEW RTU AND SUBSTATION STATES

VIEW DETAILED DATA BY POINTING ON THE GRAPHIC ELEMENTS

USE REAL-TIME NETWORK STATE CALCULATIONS ON ALL VOLTAGE LEVELS.

VIEW TOPOLOGY CALCULATIONS ON SELECTED ELEMENTS WITH INSTALLED POWER AND AFFECTED CONSUMERS REPORTS.

AUTOMATICALLY GENERATE DOCUMENTS AND INSTRUCTIONS FROM SCADA SIGNALS

PROCESS TROUBLE TICKETS FROM CALL CENTERS

ACCESS COMPANY NEWS FEEDS

BE INFORMED ABOUT AFFECTED CONSUMERS AT ALL TIMES.

ZORA - Model Driven Environment

Service Oriented Architecture

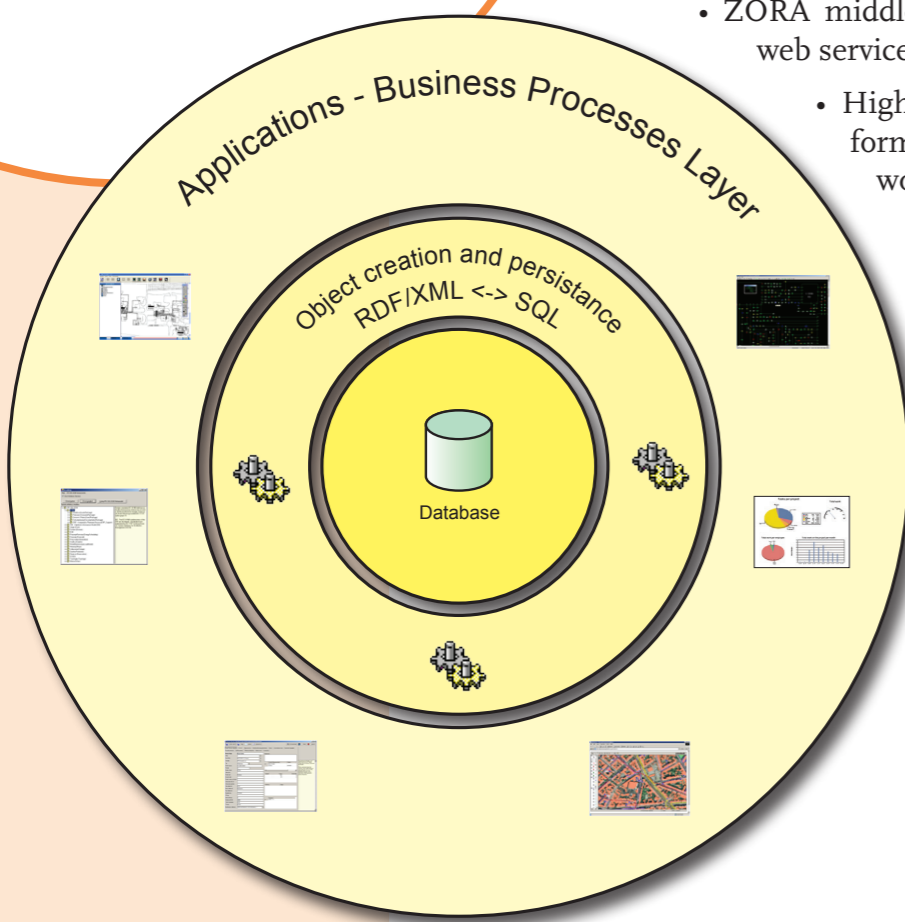
ZORA services are publishing data about every network object in XML format through several web services. Those XML messages are routed to ZORA presentation layer, other web services, message bus or to orchestration software.

By giving the knowledge of structure and dependencies between objects to ISS services, it is possible to easily develop interfaces for almost any interoperability standard.

These features make ISS a safe investment with a long period of exploitation.

Using ZORA 3, the latest version of Diginaut Model Driven Environment (MDE) development engine, ISS provides following:

- UML class-diagrams as meta-model for ZORA applications
- ZORA Object-Relational database mapping
 - ZORA middleware .Net remote objects and web services
 - Highly customizable client objects, forms and business logic defined in working context (users group)
 - Object availability through automation (COM interop)
 - Model-driven data import/export using XML (schemas are generated using meta-model)

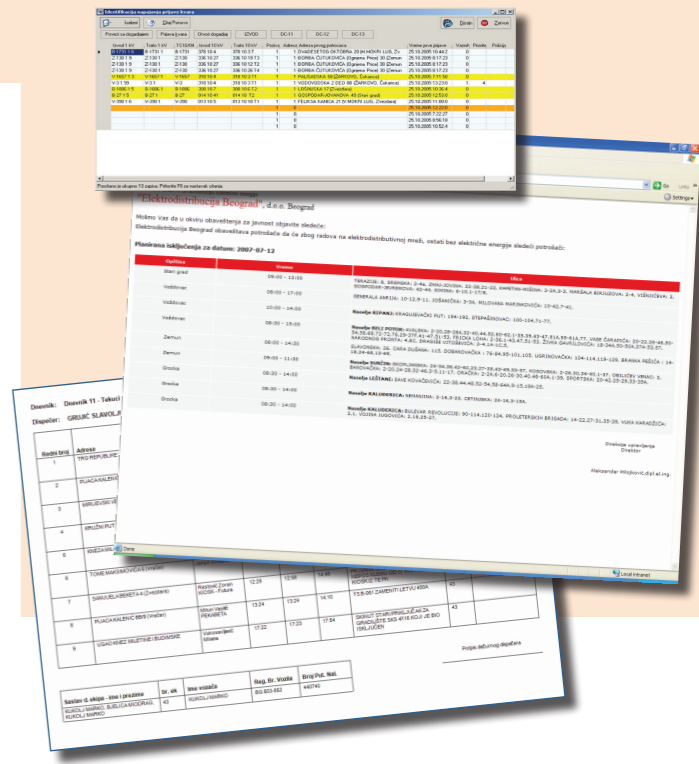


“It’s time to change the ways of development and system integration.”

Customization

High level of customization for different groups of users provides users with data they need.

Administrators can define security parameters for data access and modification.

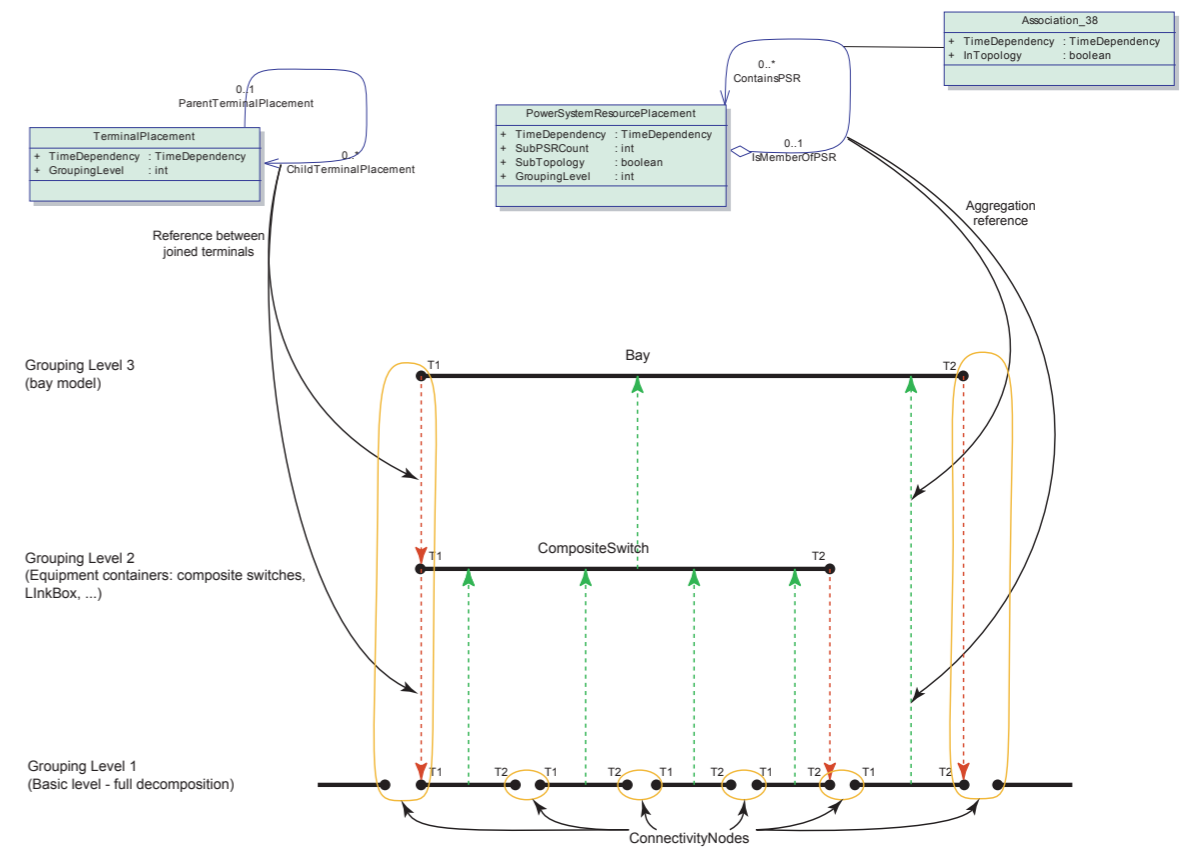


Messaging and alarms

ISS message bus gives real-time information about time critical events. It also enables sending various messages between users and subsystems.

Reporting

ISS generates network reports, resource technical tables, business documents, work permits and other correspondence.



Fast Prototyping And Integration

("eye catching results on the fast track")

Thanks to the ISSs special architecture that exposes all objects via standardized interface, results of integration can be seen in a matter of hours.

Carefully imported and processed data gives us ability to access any information by just entering its identifier. System recognises proper data category and object class that is used to present it. Without any complex programming system automatically activates proper form. This allows users to instantly access all object data and control functions.

- Users were excited by the results: they could open forms, execute commands using familiar interface that was activated from aerial images or vectorized distribution network. -

The key strength of Diginaut development process is its ability to instantly generate software modules.

Business Process Integration

There are several key parts of electric utility's processes where integration is crucial:

- **Network Topology:** Consumer's power supply records are maintained in two ways:
 - 1) If low voltage network is not fully acquired, ISS users can directly enter feeder code in the consumer form. ISS will then use this information in calculation of power supply from middle and high voltage networks.
 - 2) If network topology is available for all voltage levels, ISS will use this to calculate power supply.
- **Network State:** analysis of connection statuses and current topology. It is also used in outage planning.
- **Trouble Ticket Management:** in a Call center it is used for a faster fault identification during.
- **Control Center Journal:** work orders, planning and organizing interventions, team management, maintenance orders and journal management.

ISS main user groups:

1. Operational planning
2. Viewers
3. Important Consumers
4. Maintenance Coordination
5. Call centers
6. Control Centers
7. Protection
8. Measurements and Quality Control

How ISS works?

ISS main feature is a common storage of all utility's data specifications which are stored in the common metamodel. By maintaining all data for asset management, network elements, topology and business documentation, ISS can give a unique overview and control of the entire utility.

The Presentation Layer

In order to work for different departments, ISS services have presentation layer that adapts to the context and business location in which they are running. For example, a same object is presented differently to users in control center than to users in call centers. However, in the background of every application is common data storage and network analyzer.

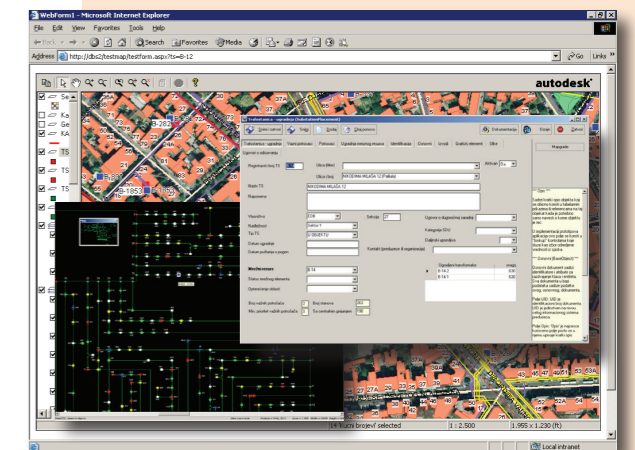
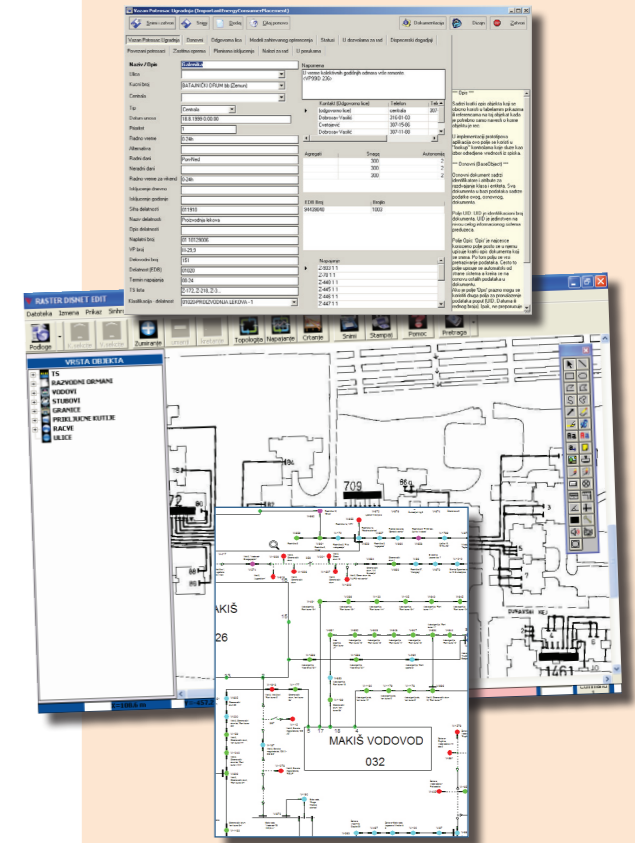
Backbone of ISS is ZORA: a multi-tier, model-driven software architecture.

ZORA is specially designed software development and runtime environment that creates all tiers of one information system with minimal coding. It generates presentation layer in the runtime. User interface is based on a metamodel and business rules which are stored in the company's model repository.

Multi directional data browsing

Multi directional data browsing provides users with the sophisticated way of reviewing data. Users can easily navigate across data by accessing through embedded tables and referenced documents.

- No data is hidden unless it is under security restriction -



Intelligent Integration

Long term benefits

With ZORA client objects, users may redesign ISS forms and business logic for their primary application (GIS, ERP, CRM client). Application configuration is saved in that working-context. That means that users who activate objects from GIS applications might be presented with different data forms and business logic than users who activated forms individually or through other applications.

Object-relational mapping, common business logic and meta-model constraints are still maintained by ZORA. There's no need for programming and most of the tasks are transferred to administrators and experts from different fields.

By creating special read-only ISS user group just for data viewing, ISS reaches every department in the utility.

ZORA - Intelligent interface for digital age.

