How GDF SUEZ built a countrywide gas distribution system with AutoCAD® Map 3D Enterprise

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Agenda

- GDF Suez Energy Romania, company profile
- Business challenges
- The Map 3D Enterprise application
  - Project scope and history
  - System architecture
  - Business processes
- Benefits
- Challenges
- Roadmap
- Summary

Who is Autodesk Consulting?

- Worldwide delivery presence with process, project, and technical expertise across all Autodesk verticals

- 250 direct delivery resources and an extensive “virtual bench” ecosystem consultants

- Dedicated Industry Expert Consultants that understand your business
  - Architects
  - Structural, Civil, MEP Engineers
  - Construction Managers
  - Animators
  - Manufacturing
  - Developers
  - Business Analysts
  - Change Management Experts

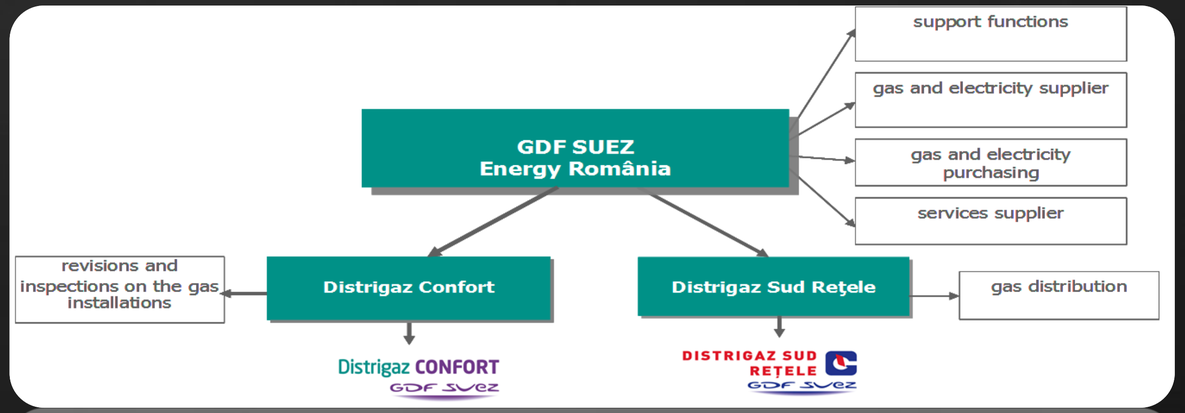
- Business Consulting
- Implementation Services
- Customization & System Integration
- Education Services
- Managed Services

GDF Suez Energy Romania

Company profile

GDF Suez Energy Romania, company profile

- GDF Suez
  - 1st group for gas transportation and distribution in Europe
  - 2010 revenue : 84,5 billion €
- GDF Suez Energy România / Distrigaz Sud Retele
  - Belongs to GDF Suez group since 2009
  - 1st gas operator in Romania
  - 17.300 km distribution network managed
  - 1,4 million customers
  - 600,000 house connections
  - 19 counties
  - 34,8 TWh gas sold
  - 2010 revenue : 810 million €



Business challenges

Business challenges

Situation in 2007 :

- Heterogeneous data sources (paper, drawings…)
- Heterogeneous data quality and accuracy
- No centralized data
- Difficult to monitor the network and take decisions
- Difficult to get the most relevant data for field operations
- Difficult to maintain the network

Business challenges

Realistic targets :

- Complete network in a centralized database
- To minimize the data conversions
- A secured and opened architecture (web)
- Easy data quality checks and improvements
- Easy updates on network information and maintenance
- Easy access to the right information for the field operations
- Easy access to a network status overview for a fast decision making
- Improve efficiency of client oriented services

The Map 3D Enterprise application

Project scope and history

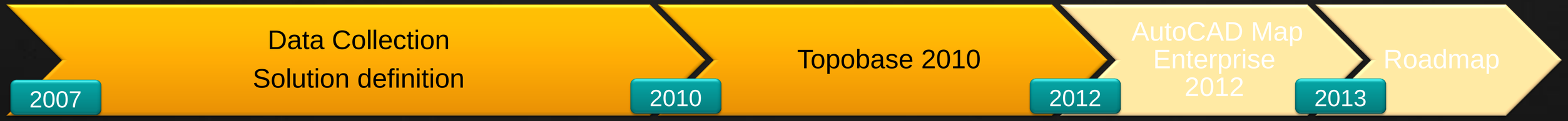
Project scope and history

- Data Collection
  - started in 2007
  - all the distribution network
  - using internal resources, GPS and total stations
  - 40 people involved, field measurement and GIS operators
  - Using paper scanning, dwg’s, separate databases
- Solution definition
  - Topobase 2010
  - 30 Topobase client + 250 Topobase Web

2007 — Data Collection, Solution definition — 2010 — Topobase 2010 — 2012 — AutoCAD Map Enterprise 2012 — 2013 — Roadmap

Project scope and history

- Topobase 2010 implementation
  - 10 months, live in January 2010
  - 5 people involved from GDF
  - 1 consultant from Autodesk Consulting and 3 consultant from a local partner
  - Phases :
    - Business requirements analysis
    - Development of hardware and software architecture
    - Customization of the gas network data model
    - Installation of the application and data migration
    - Testing and training



Project scope and history

- AutoCAD Map Enterprise 2012 migration
  - 3 months, live in February 2012
  - 8 people involved from GDF
  - Autodesk Consulting
  - Phases :
    - Assessment
    - Migration
    - Validation
    - Deployment
    - Tuning

2007 — Data Collection, Solution definition

2010 — Topobase 2010

2012 — AutoCAD Map Enterprise 2012

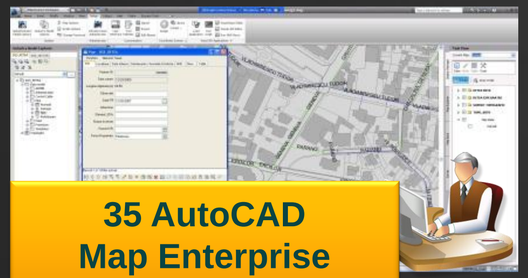
2013 — Roadmap

The Map 3D Enterprise application

System architecture

System architecture

General



35 AutoCAD
Map Enterprise
(10 regional offices)

Network management

Spatial Database

Autodesk Infrastructure
Map Server (AIMS)

Network / Damages synchronization

SAP ERP
PM Module
AA Module

Investment plan

Maintenance plan

Field operations

Emergency plan

Web application for
500-1000 users

System architecture

Business

35 AutoCAD Map Enterprise (10 regional offices)

- Data acquisition
- Editing
- Analysis
- Viewing
- Reporting

Network management

Spatial Database

- Data model (Gas+ Survey)
- Geometry & Attribute
- Metadata
- User management
- Security rules
- Business rules

Network / Damages synchronization

SAP ERP
PM Module
AA Module

Autodesk Infrastructure Map Server (AIMS)

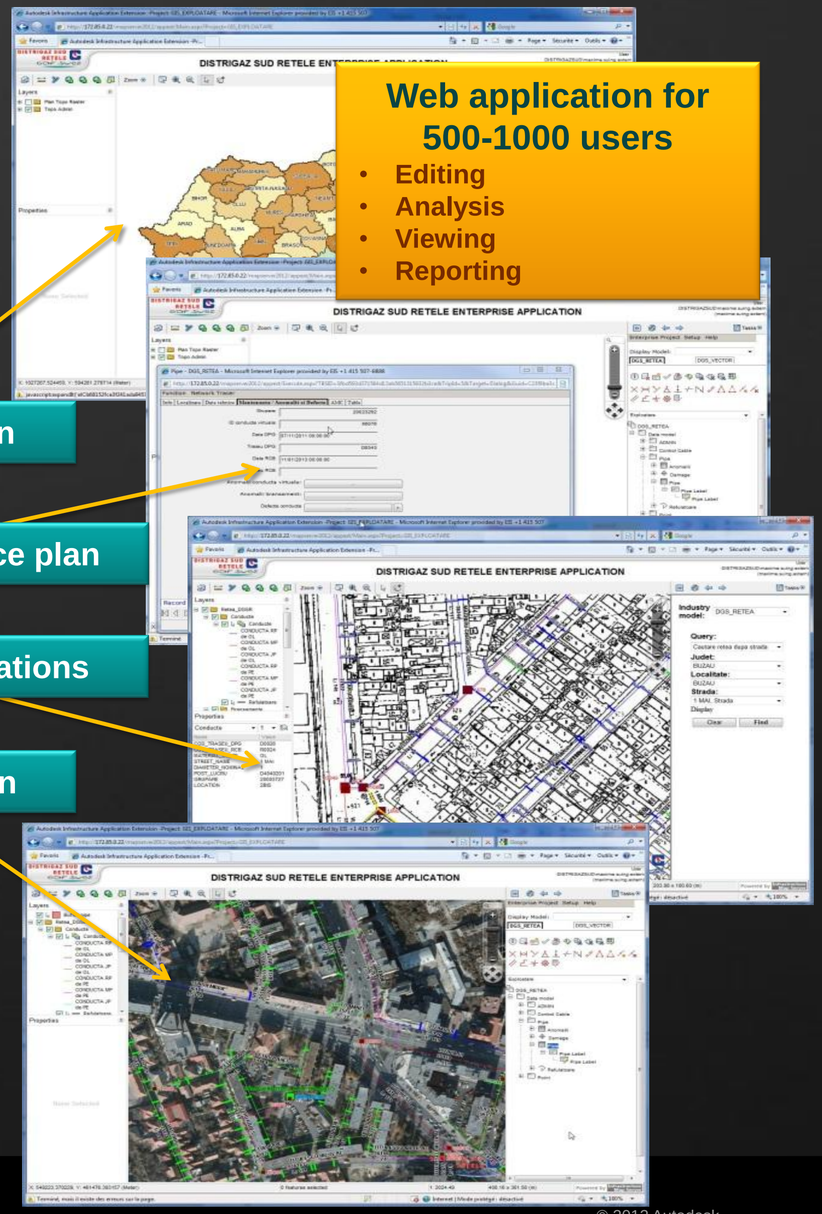
Investment plan

Maintenance plan

Field operations

Emergency plan

Windows Server Active Directory

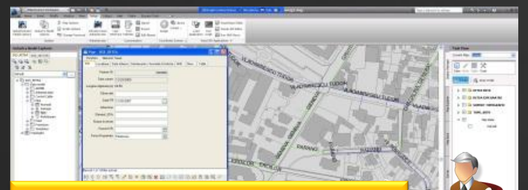


Web application for 500-1000 users

- Editing
- Analysis
- Viewing
- Reporting

System architecture

Technical

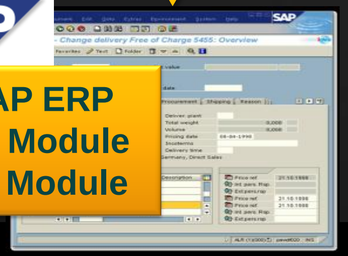


35 AutoCAD Map Enterprise (10 regional offices)
- 18 Plugins
- Oracle Client 11gR2
- Windows XP SP3 32 bits

Network management

Spatial Database *
- Oracle 10gR2
- Real App. Cluster (3 nodes)
- Active Disaster Recovery server distant from ~300km
- RH Linux

Network / Damages synchronization
SAP XI + web service



SAP ERP
PM Module
AA Module

Autodesk Infrastructure Map Server (AIMS)
- IIS7
- Connection to the Active Directory
- Oracle Client 11gR2
- 4 servers (8 cores / 16 Gb RAM)
- Windows Server 2008 R2 64 bits

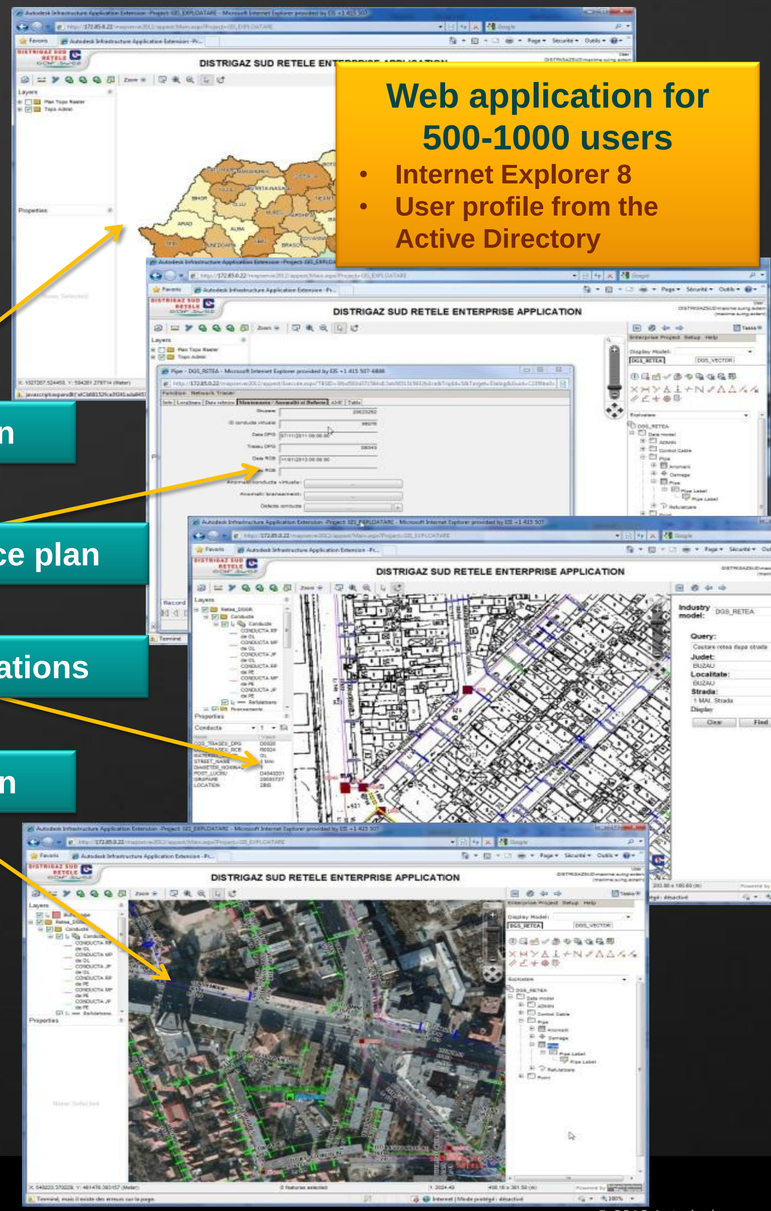
Investment plan

Maintenance plan

Field operations

Emergency plan

Windows Server Active Directory



Web application for 500-1000 users
- Internet Explorer 8
- User profile from the Active Directory

The Map 3D Enterprise application

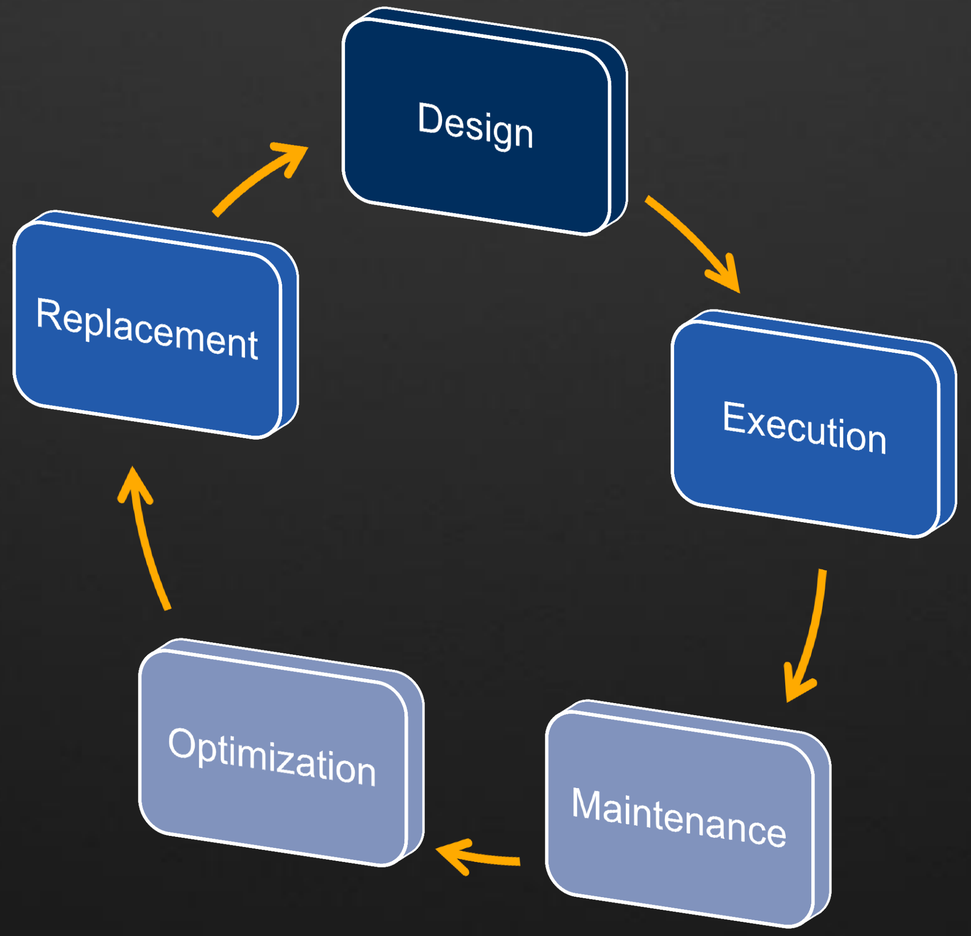
Business processes

Business processes

Manage the complete equipment life cycle

Standardize and secure the business processes

- Locate an area of interest
- Import field measurements
- View technical geometry and attributes
- Concurrent edition
- Network Topology
  - Increase data integrity
  - Minimize update errors
- Graphic and tabular reports
- Distance / buffers



- Sketch drawing / redlining
  - submit a draft proposal for the supplier
- Completion status
  - Work progress
- Multi criteria analysis
  - Used for investment plans
- Cost of network deployment estimation
  - For new areas
- Network status reports
  - For any user-defined area

Business processes

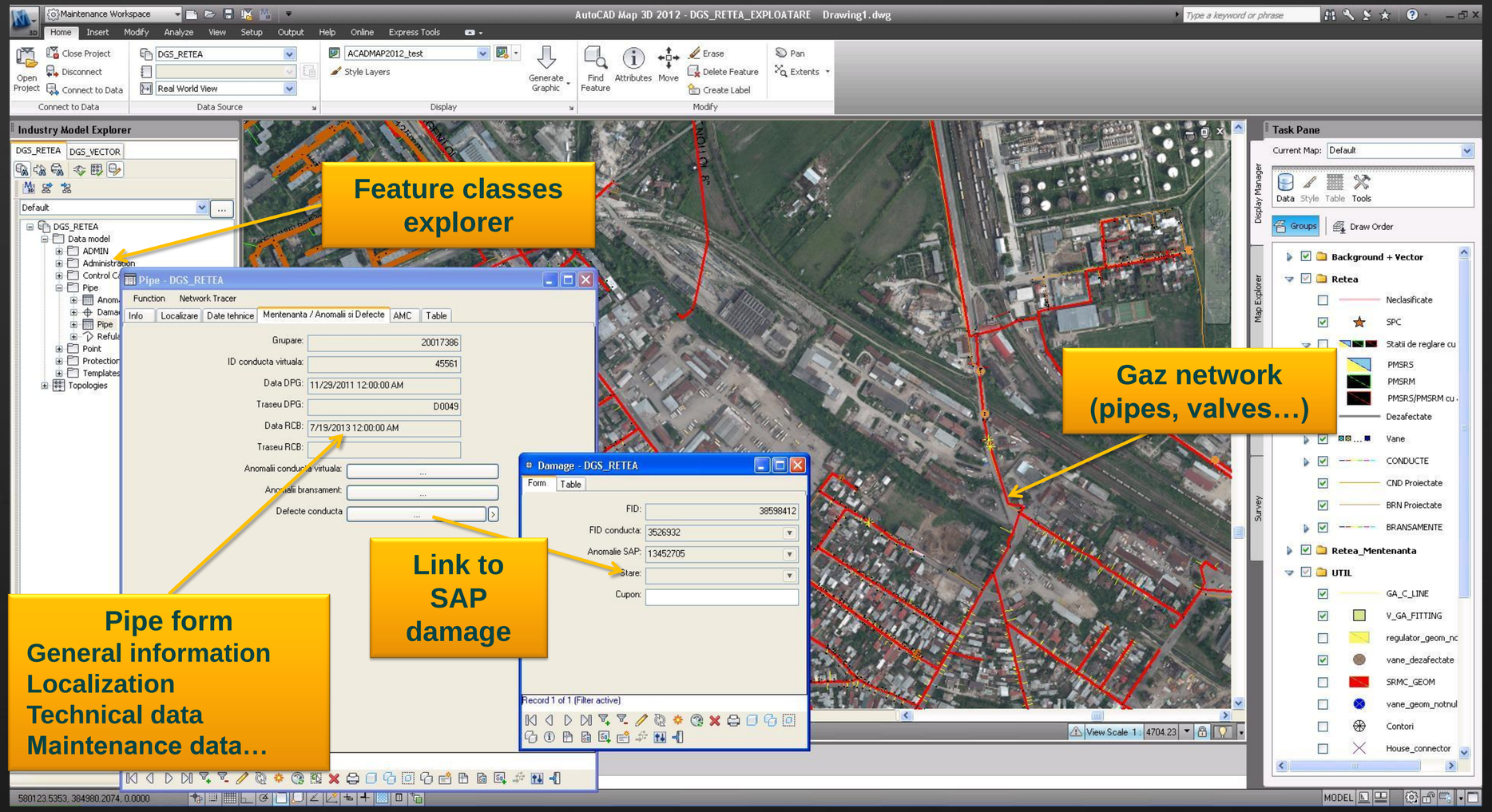
AutoCAD Map

Users :

- 35 advanced GIS users
- From 10 regional offices

Main operations :

- Import field data
- Create new equipment
- Update geometries and attributes
- Generate reports
- Analyze network state

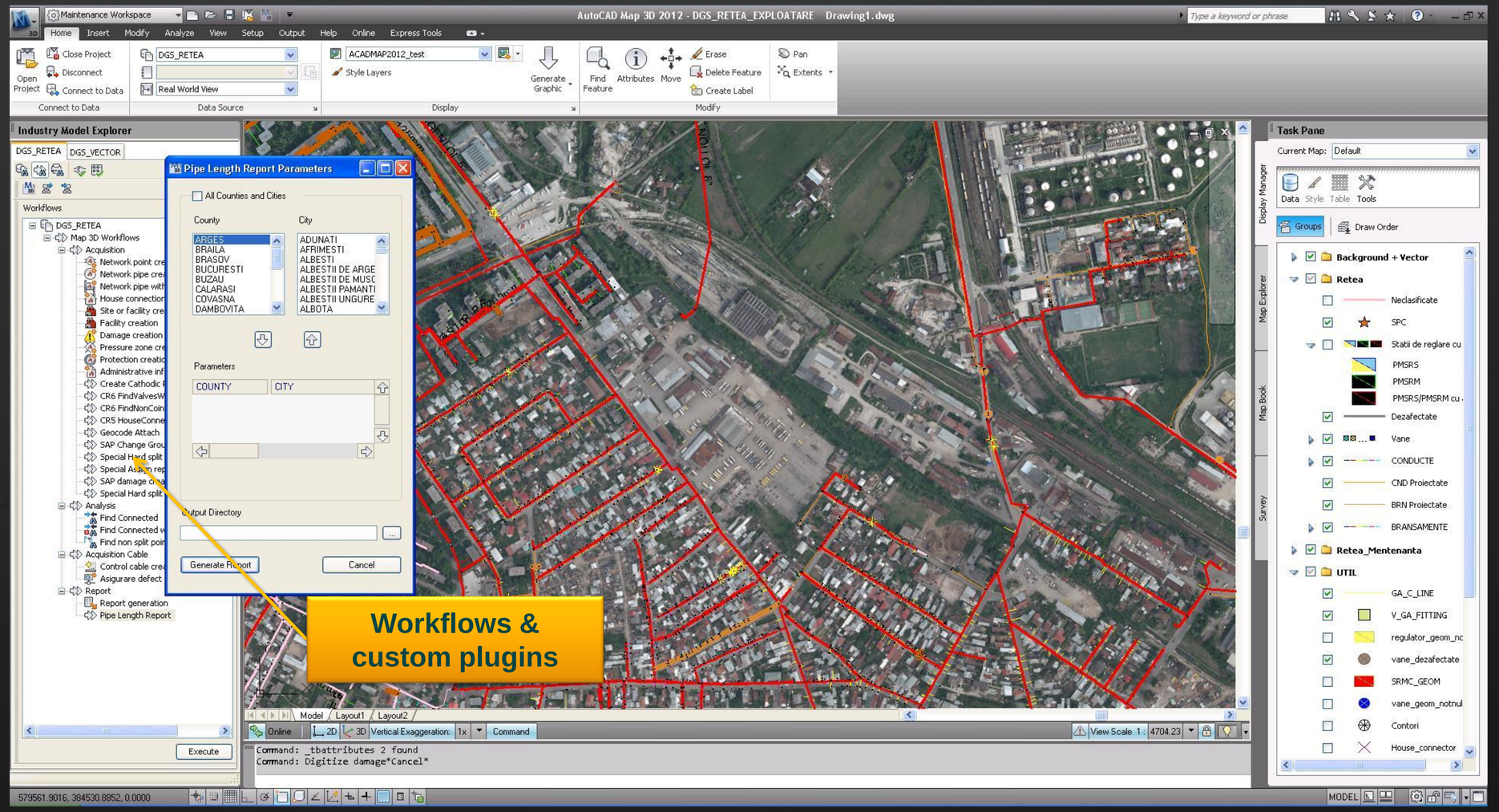


Business processes

AutoCAD Map

Customizations :

- 18 non standard plugins
  - Very simple digitizing
  - Updates after pipes splits
  - Update links
    - To SAP
    - To SCADA (regulator)
  - Shape file export
  - Pipe length reports



Business processes

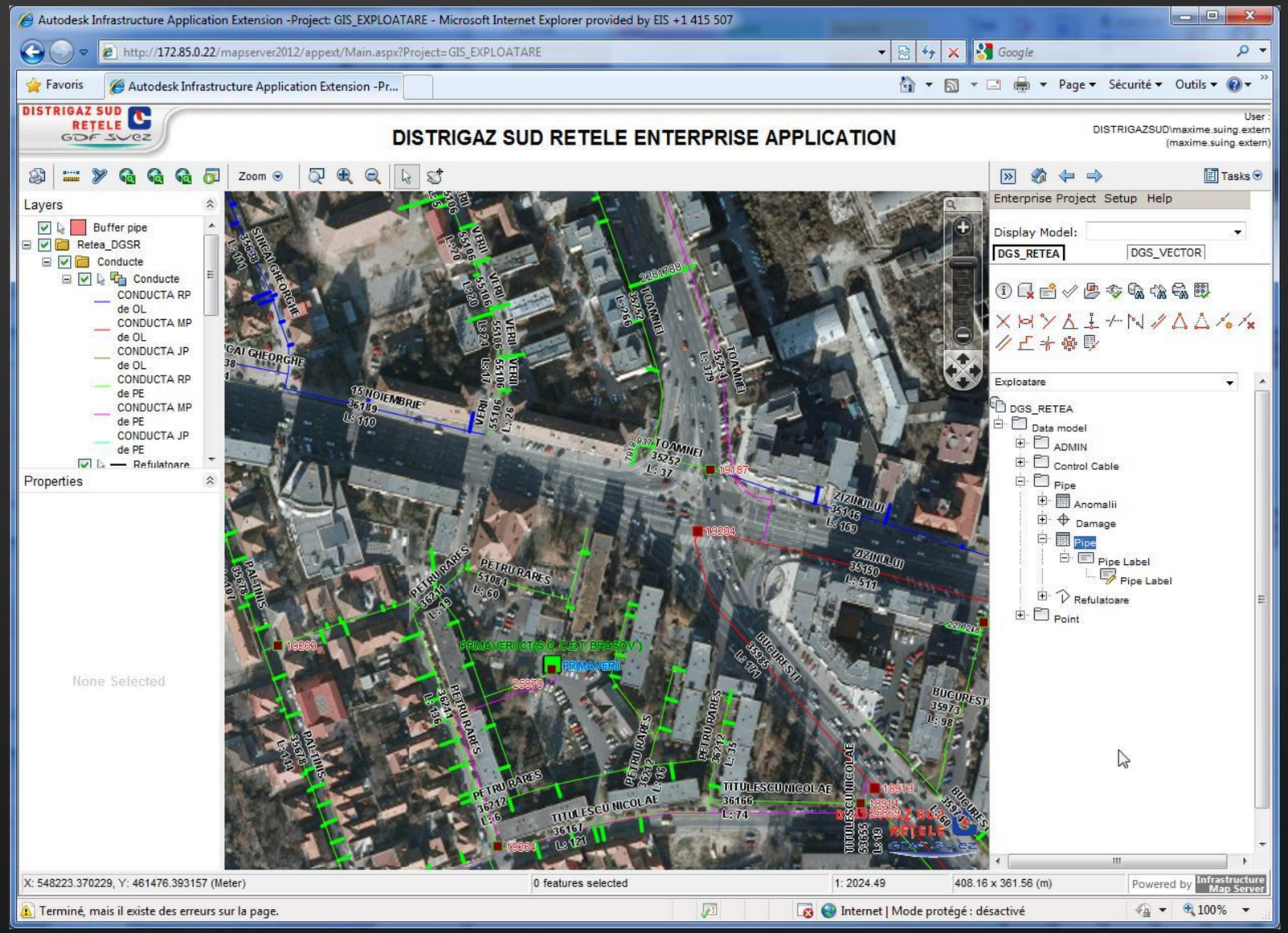
Web Application (AIMS)

Users :

- 600 / 1000 users
- 200 / 300 simultaneous
- Anyone in the company

Technical constraints :

- Internet Explorer 8 and above
- Works on Firefox and Chrome but not deployed

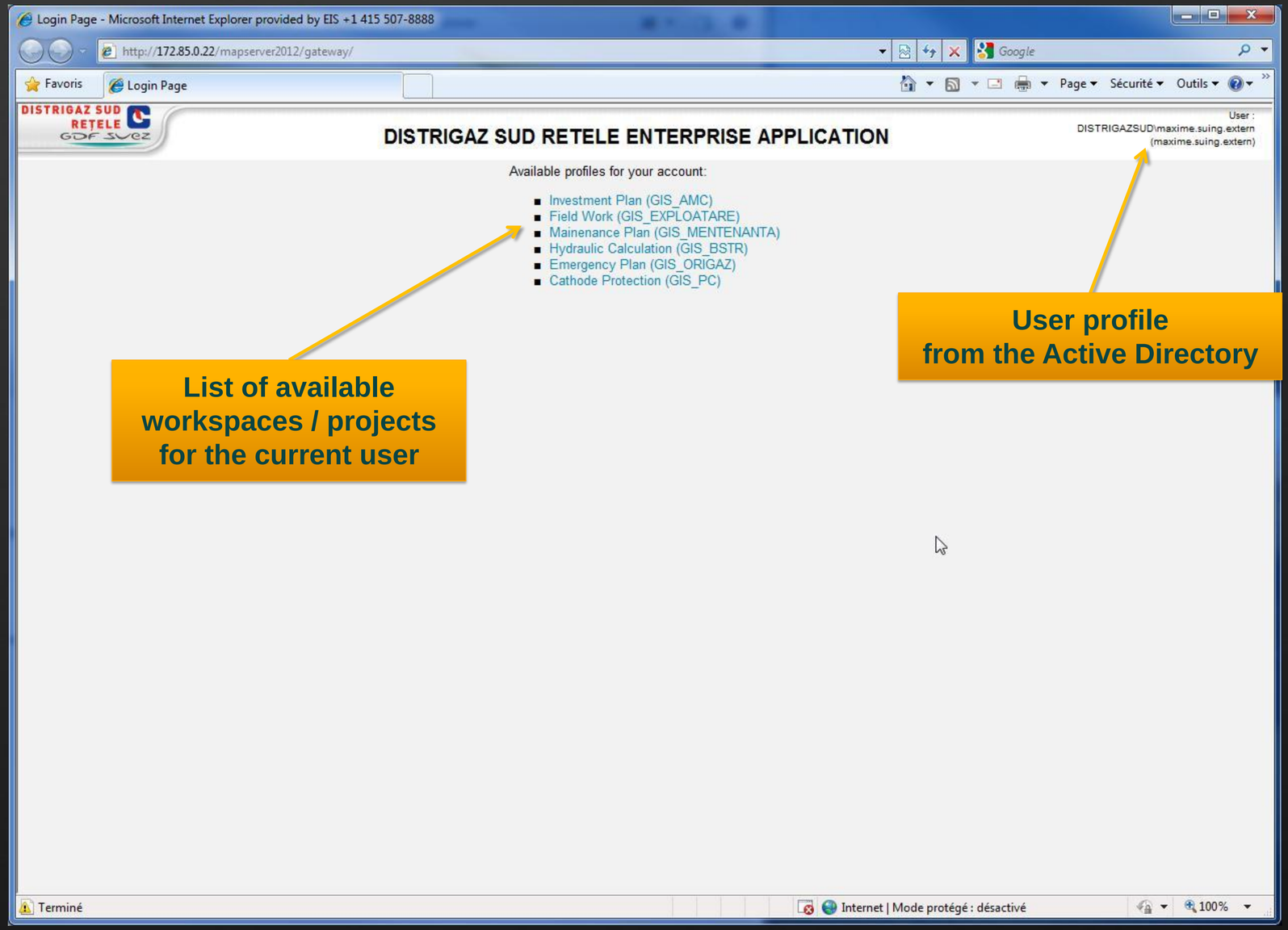


Business processes

Web Application (AIMS)

Application credential :

- No password required
- Any user belongs to 1 or many groups in the Active Directory
- Any group in the AD is linked to 1 workspace / project :
  - Field work
  - Investment plan
  - Maintenance plan
  - Emergency plan
  - Hydraulic calculation
  - Cathodic protection

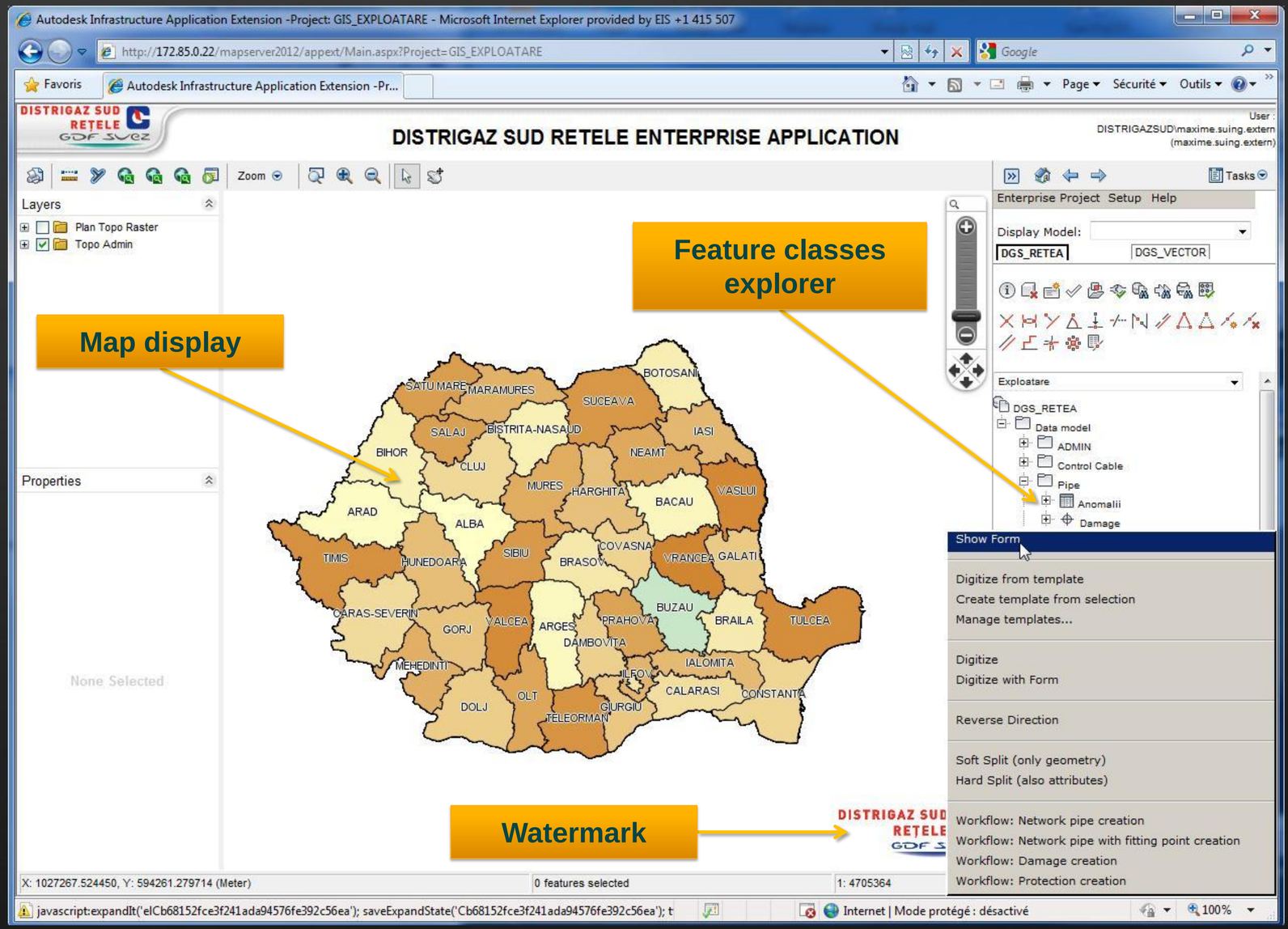


Business processes

Web Application (AIMS)

View graphic data on the map :

- Background layers
  - Using MapGuide tiling capability
  - Tiles served directly through IIS
  - Include many raster files (900 Gb ecw/sid)
    - Aerial photographs
    - Cadaster scans
    - Satellite image
- “Dynamic” layers
  - Equipment (pipes, valves…)
  - Events (damages, anomalies…)
  - Thematic layers

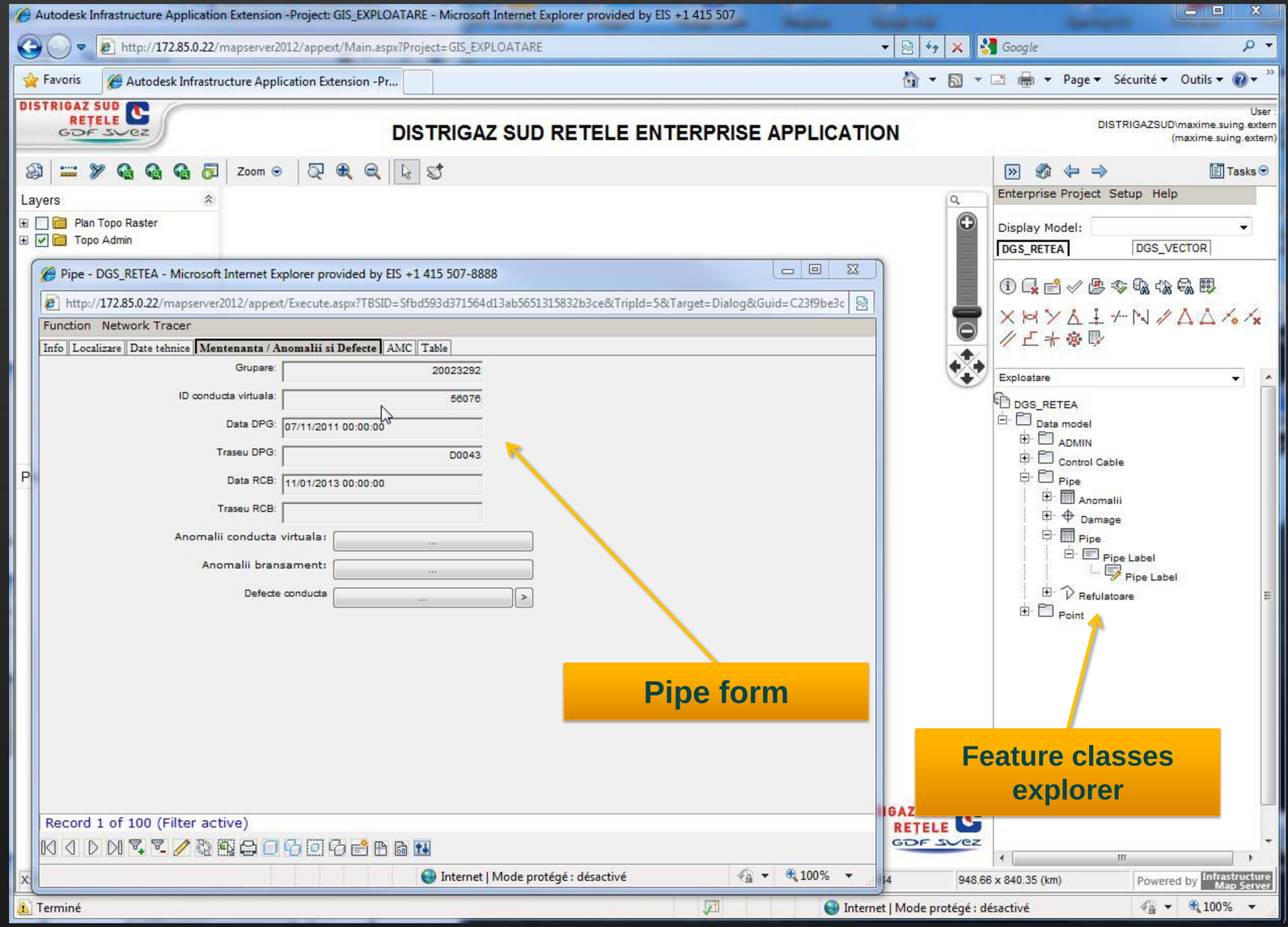


Business processes

Web Application (AIMS)

View attributes in the forms :

- General information
- Location (city, street…)
- Technical data (material, length…)
- Maintenance data (defects, anomalies…)

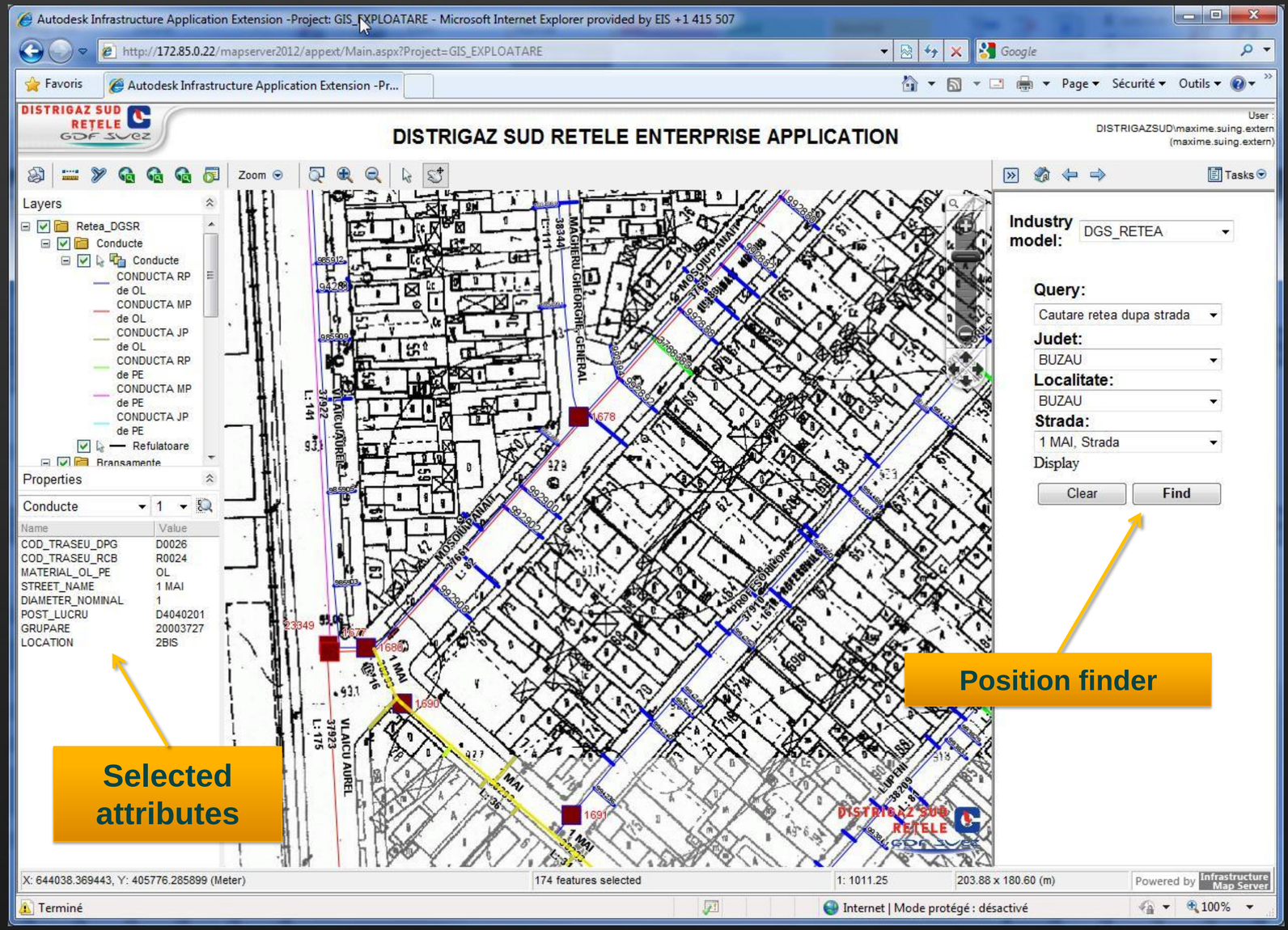


Business processes

Web Application (AIMS)

Search area of interest :

- Use the map toolbar
- Position finder
  - Locate an equipment in a street
  - Locate an equipment by id
  - Locate an maintenance route
  - Identify equipments planned for maintenance in next months
  - Locate an incident

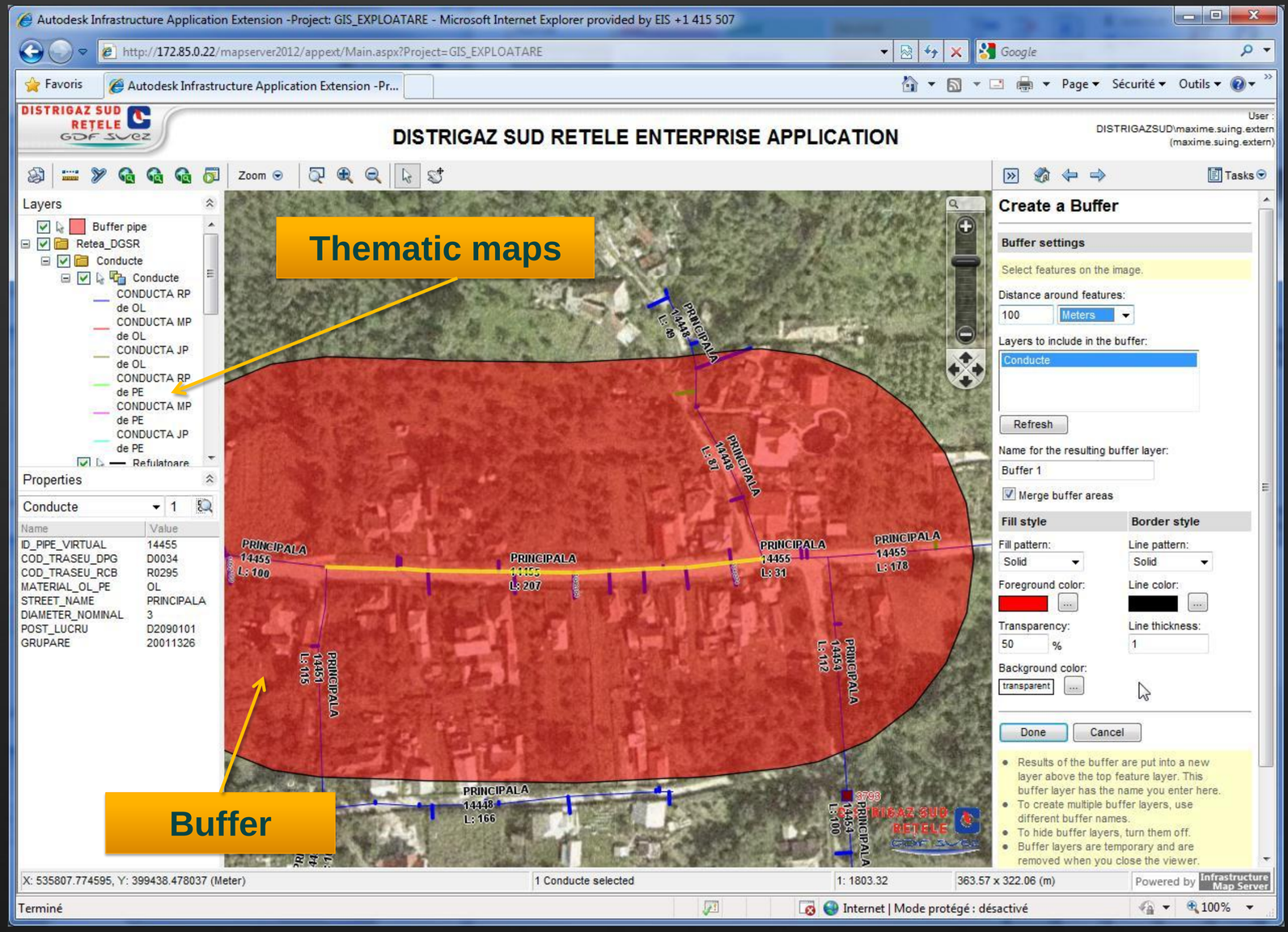


Business processes

Web Application (AIMS)

Analyze data :

- Thematic maps
- Measure / buffers

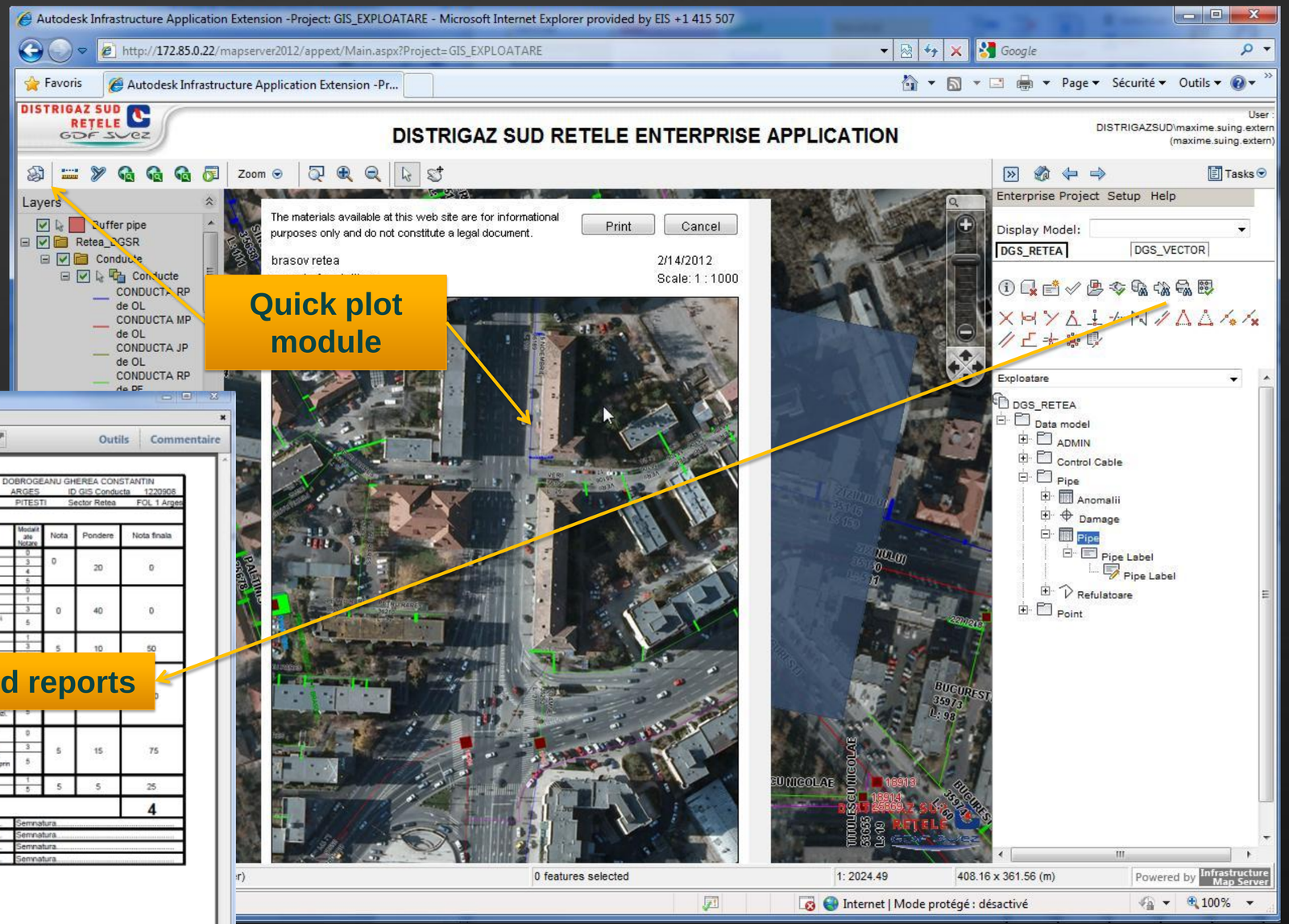


Business processes

Web Application (AIMS)

Extract information :

- Quick plot, including rotation
- Generate reports

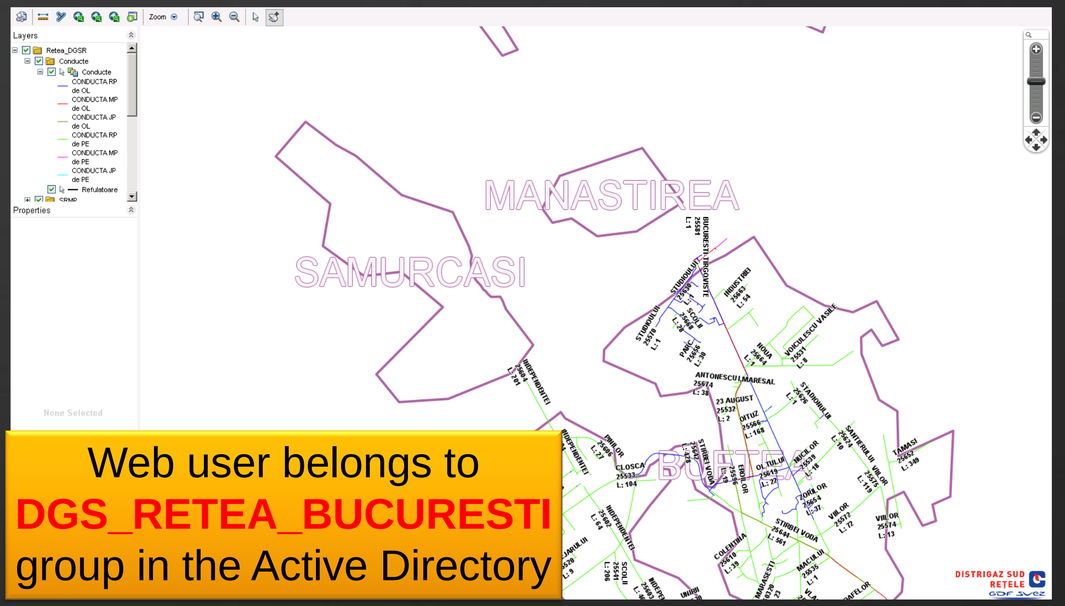


Business processes

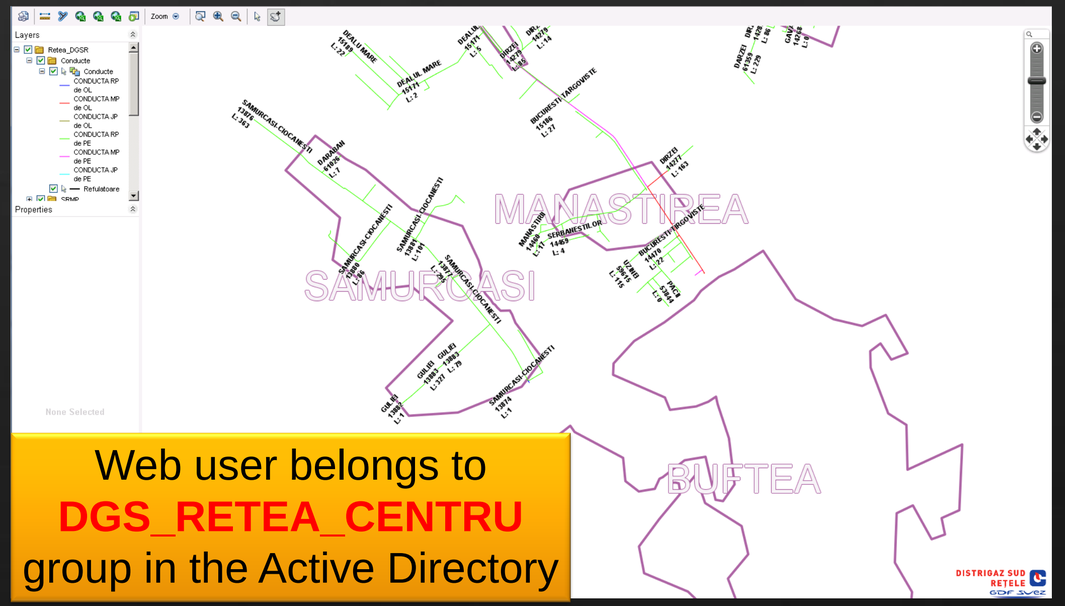
Web Application (AIMS)

Data split into 4 regions (Vest, Est, Centru, Bucuresti) :

- Every web user belongs to a group in the AD
- Every group in the AD is linked to a region
- Every group is linked to an Oracle schema created with the security administrator
  DGS_RETEA_BUCURESTI, DGS_RETEA_CENTRU…
- Data filtered accordingly
  - Through Oracle VPD (Virtual Private Database)
  - VPD applies extra filtering conditions to any SQL query issued by the database user ***where region = 'xxx'***
  - Those dynamic filters are applied to any request
    - Maps, forms, position finder, property panel
- No data replication, no impact on the data model



Web user belongs to **DGS_RETEA_BUCURESTI** group in the Active Directory



Web user belongs to **DGS_RETEA_CENTRU** group in the Active Directory

Business processes

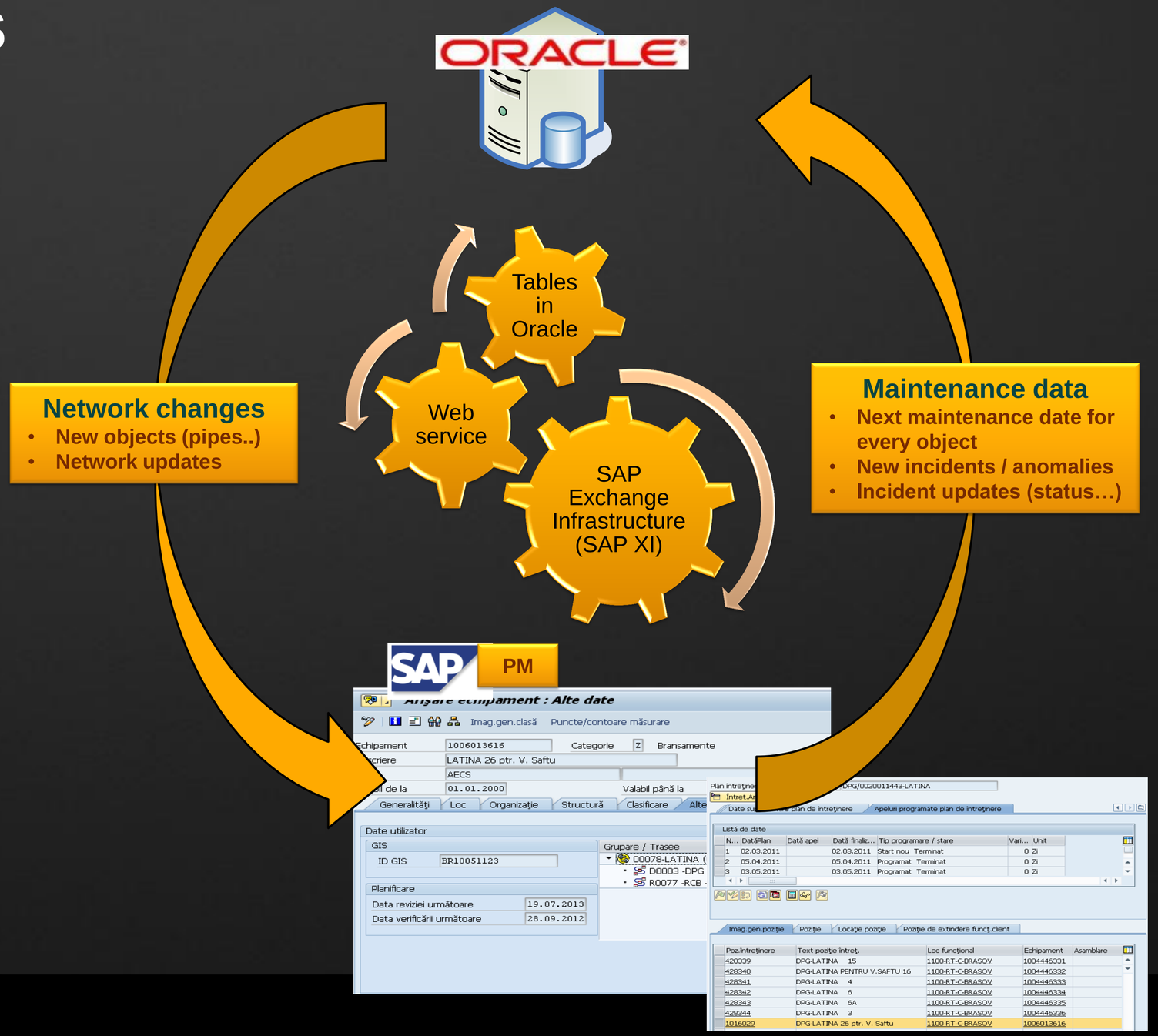
SAP Plant Maintenance

Process :

- Automatic mechanism between SAP XI and the Web Service
- Asynchronous, once/day

Purposes :

- create preventive and corrective maintenance plan for every equipment :
  - pipe
  - house connection valve
  - regulation station
- Synchronize constantly
  - the network in Map Enterprise
  - the maintenance plan and events in SAP-PM



Business processes

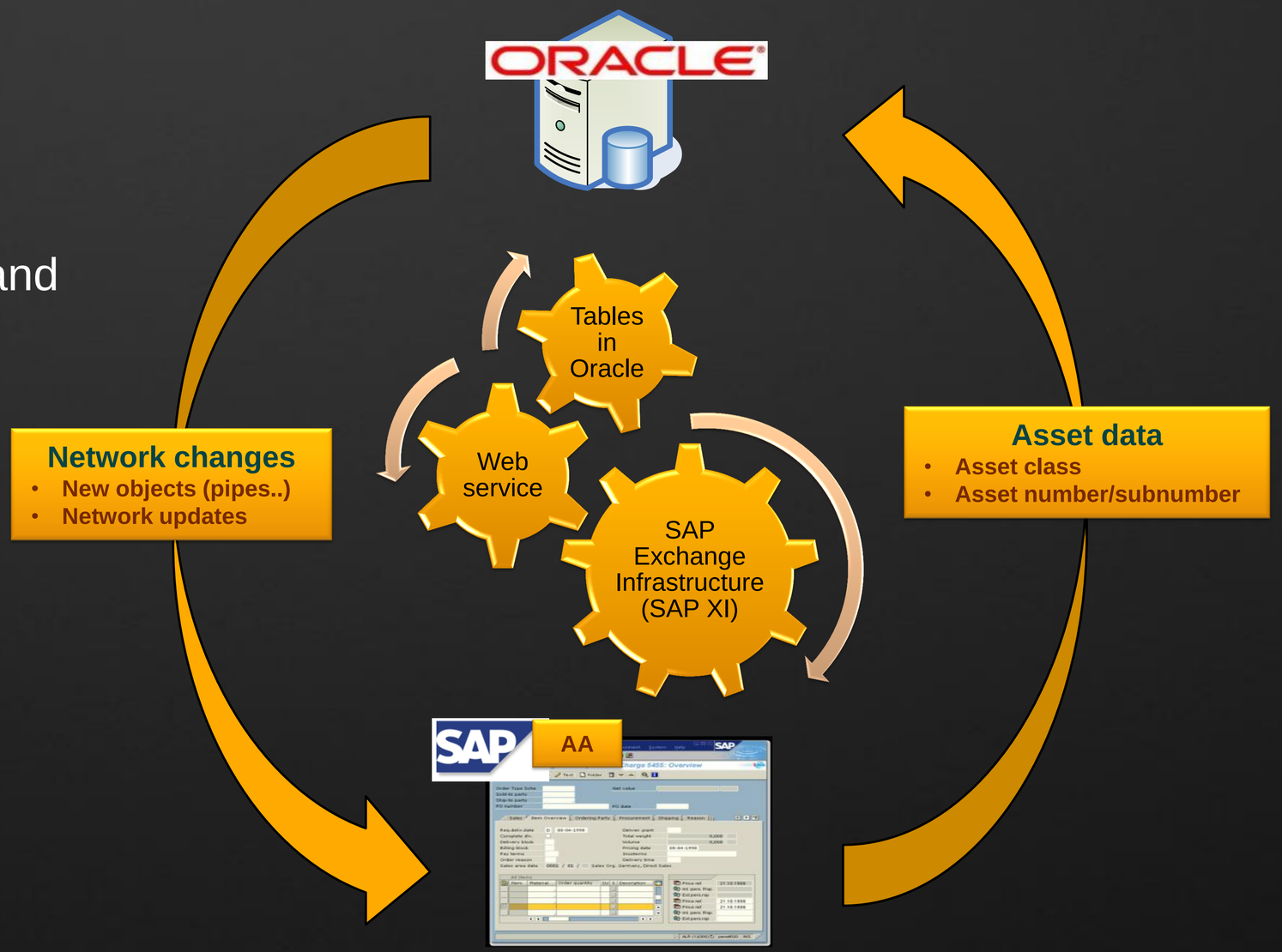
SAP Asset accounting

Process :

- Automatic mechanism between SAP XI and the Web Service
- Asynchronous, once/day

Purposes :

- Correlation between physical asset and financial asset
- Legal regulation
- Optimize process for pipe replacement



Business processes

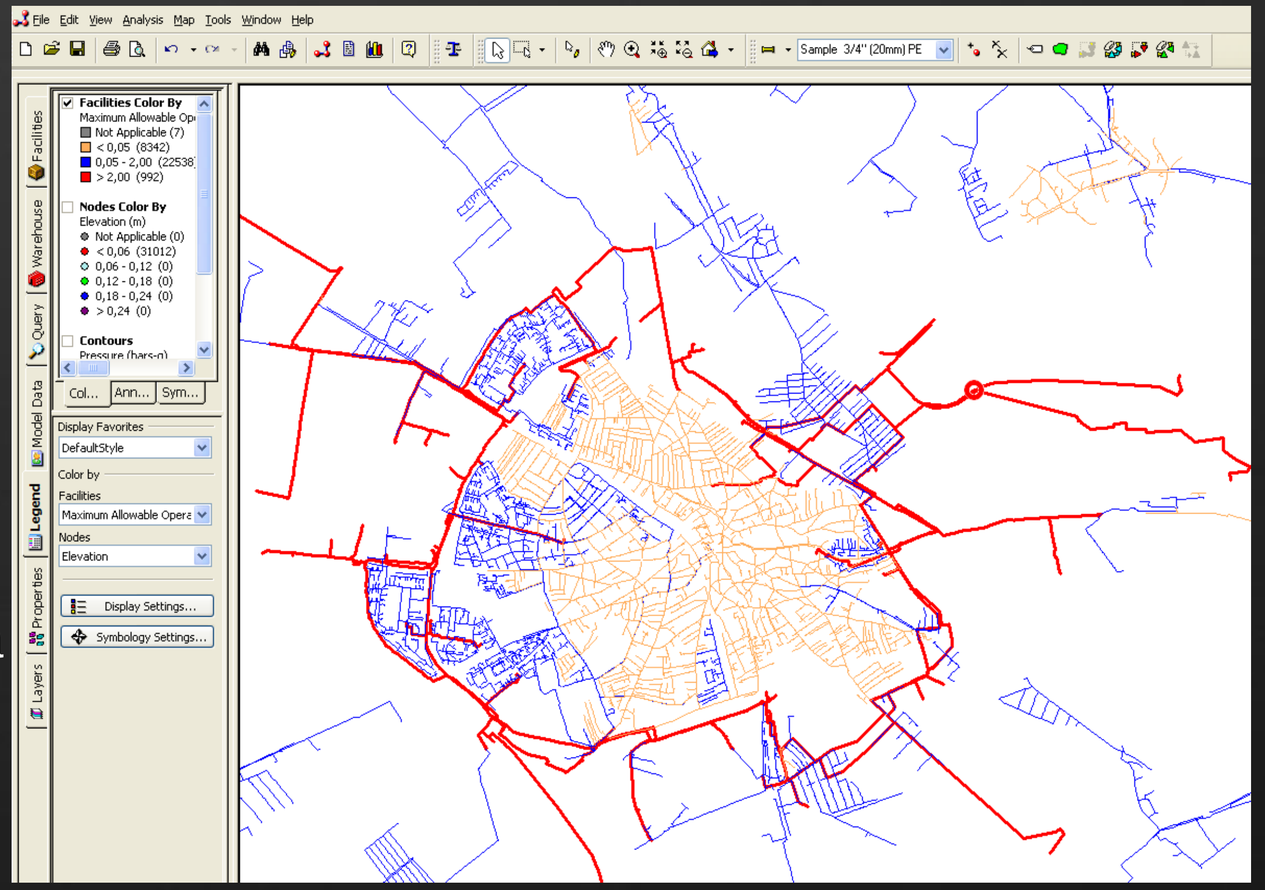
Network modeling and analysis (Synergee gas)

Process :

- Extraction of the network with an ETL
- Automatic process
- Once/day

Purposes :

- Simulate network isolation on a user-defined area
- Simulate a closure of a valve or a regulation station
- Pipe size options assessment according to specific loading conditions : pipes models, material cost, installation cost and best location



Benefits

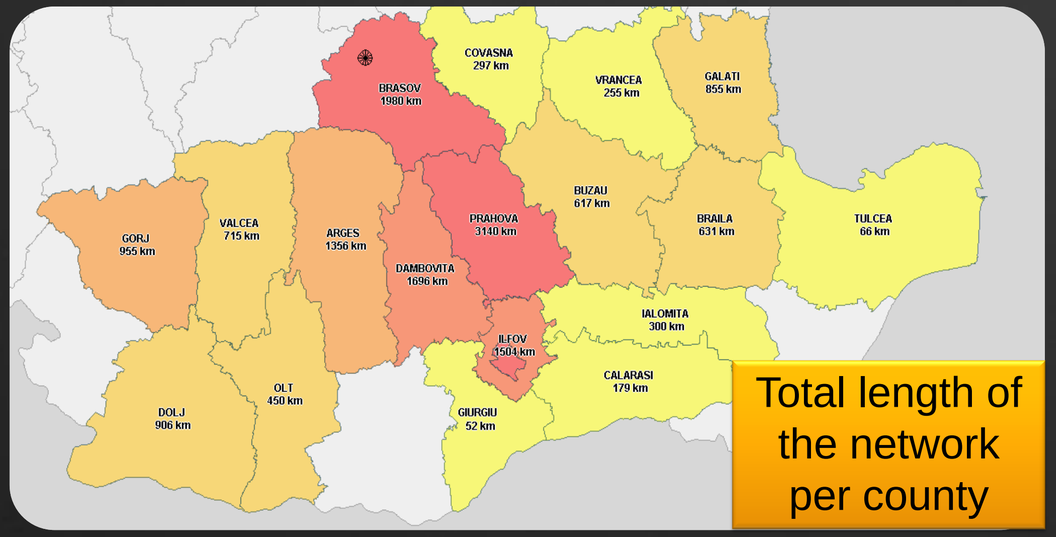
Business challenges

Realistic targets :

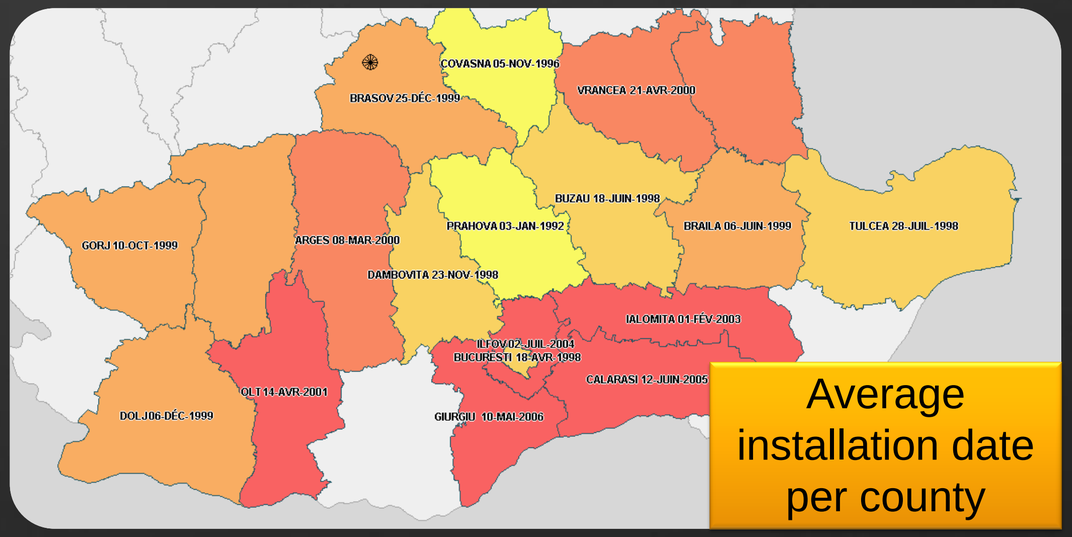
- ✓ Complete network in a centralized database
- ✓ To minimize the data conversions
- ✓ A secured and opened architecture (web)
- ✓ Easy data quality checks and improvements
- ✓ Easy updates on network information and maintenance
- ✓ Easy access to the right information for the field operations
- ✓ Easy access to a network status overview for a fast decision making
- ✓ Improve efficiency of client oriented services

Benefits

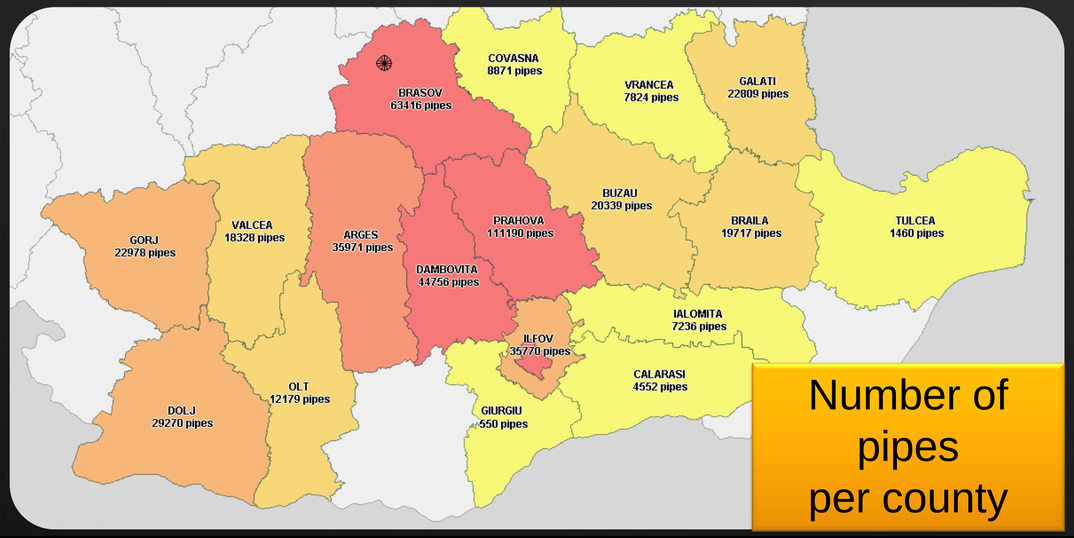
Network overview



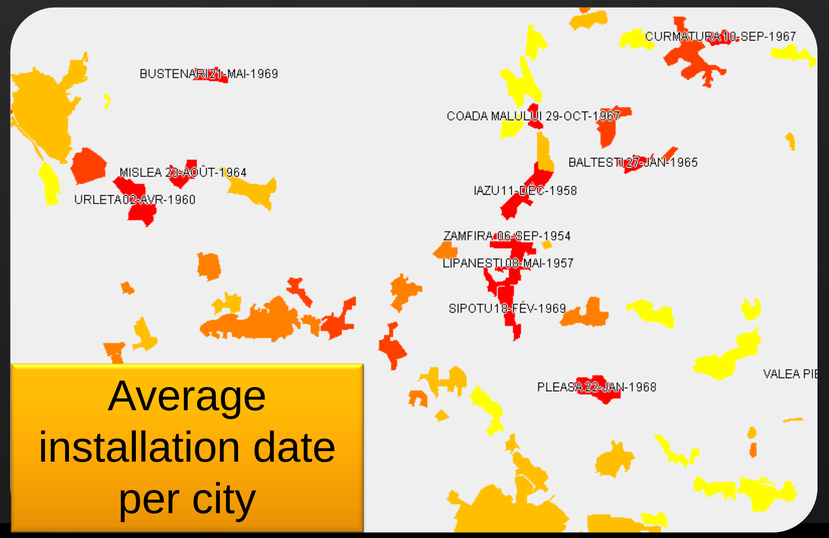
Total length of the network per county



Average installation date per county



Number of pipes per county



Average installation date per city

Challenges

Challenges

- Performance and stability of the web application

  - **Database** tuning
    - Check SQL hints, indexes and statistics
    - Use EXISTS instead of IN statements
    - Limit the number of attributes
    - Reduce optimizer_index_cost_adj parameter

  - **Web Application** tuning and stabilization
    - Create dedicated IIS Application Pools (MapServerAppPool, AppExtAppPool…)
    - Restart IIS 2 or 3 times a day
    - .Net configuration *<legacyUnhandledExceptionPolicy enabled="true" />*
    - Reduce web session length

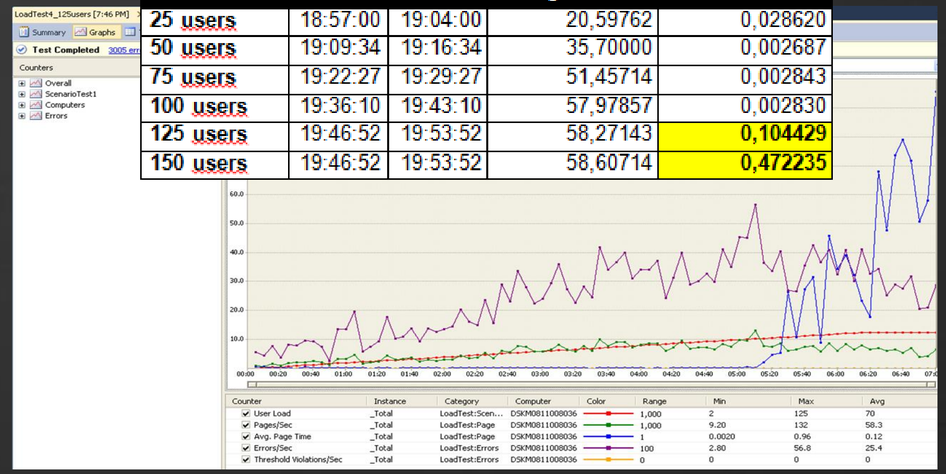
Challenges

- **Map Server** tuning and stabilization
  - serverconfig.ini optimization *(MaxConnections, QueueSize, CacheSize, DataCacheSize…)*
  - Serve tiles directly through a web application for map background
    - Access http:///server/TileCache/xxx instead of http://server/mapserver2012/mapagent/xxx
    - Existing tile → served by IIS
    - New tile → error 404 redirects to http://server/mapserver2012/mapagent/xxx
    - Easy to manage tiles expiration
    - Really faster
  - Cleanup AIMS repository (remove temporary AdoNet_xxx.FeatureSource)
  - 5 hotfixes delivered by product development team
  - Automatic restart of windows service

Challenges

- Stress test / system sizing
  - Performed with Visual Studio 2010 Ultimate
  - 4 scenarios
  - 25-50-75-100-125-150 users for 1 server
  - Analysis
    - Windows perfmon, event viewer
    - AIMS, AppExt, Oracle logfiles
    - Visual Studio reports
  - Recommendations

	start	end	Avg. Pages/Sec	Avg. Page Time
25 users	18:57:00	19:04:00	20,59762	0,028620
50 users	19:09:34	19:16:34	35,70000	0,002687
75 users	19:22:27	19:29:27	51,45714	0,002843
100 users	19:36:10	19:43:10	57,97857	0,002830
125 users	19:46:52	19:53:52	58,27143	0,104429
150 users	19:46:52	19:53:52	58,60714	0,472235



< 70 users • performance and memory OK

70 to 105 users • performance decreases

> 105 users • avg response time drop

Add a new server

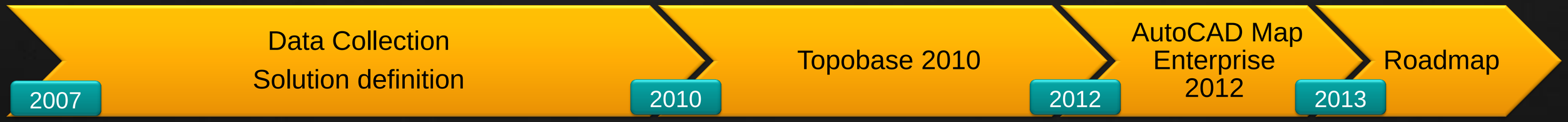
Setup load balancing

Reduce session length

Roadmap

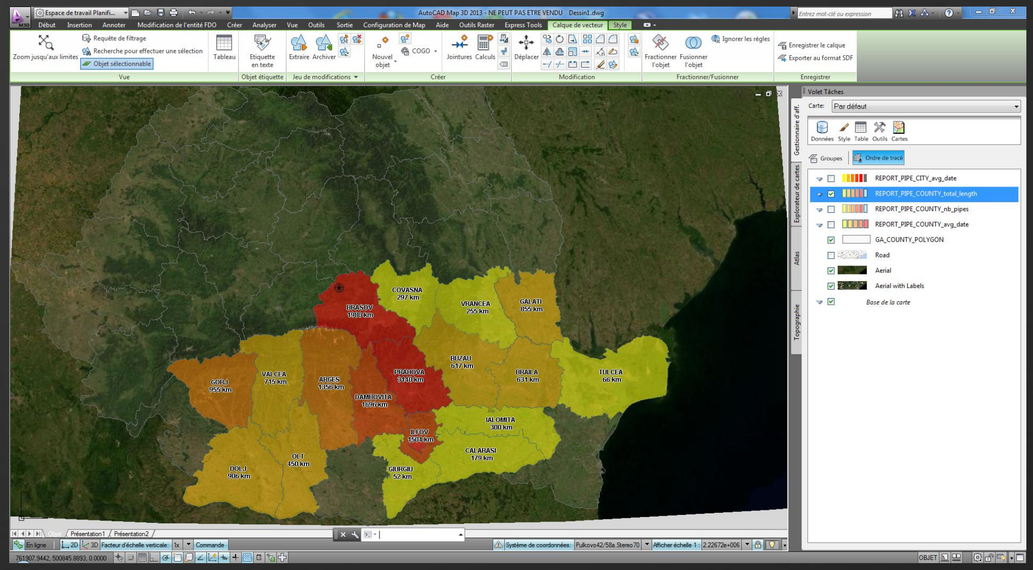
Roadmap (business)

- “Simple” AIMS viewer
  - → Company-wide application, fast and intuitive
- Tracking tools for new investments
- SCADA integration (Supervisory Control and Data Acquisition)
  - → Real time measurements from field devices, displayed in Map3D and AIMS
- SAP ISU integration (Industry Specific Solution for Utilities / Customer Care System)
  - → Customer and meter positioning available for spatial analysis
- Develop routing and proximity modules
  - → Routing for network detection cars and mapping of the pipes covered
  - → Proximity analysis of the network
- Work force management integration
- 3D imagery on desktops (Earthmine)

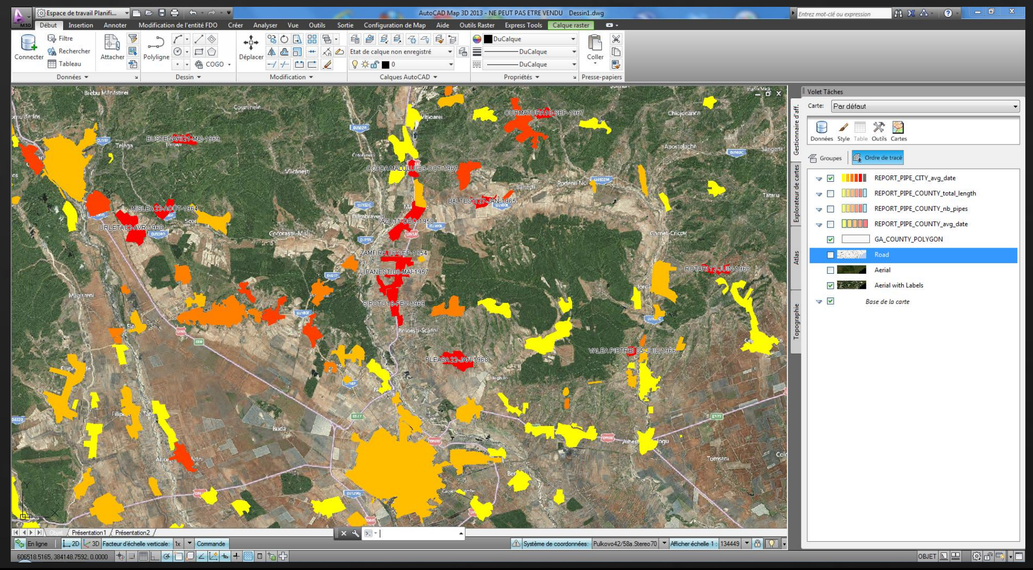


Roadmap (technical)

- Enterprise system evolutions
  - Change requests
  - New thematic maps (financial or technical)



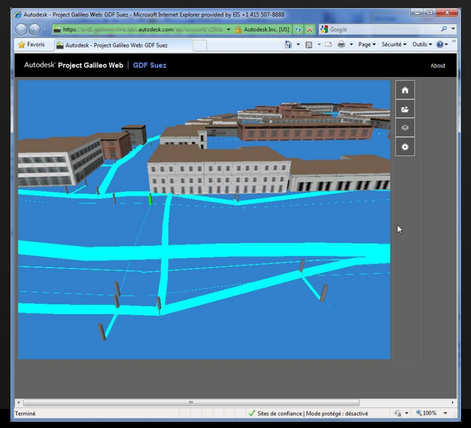
- Project basejump, from the labs
  - Bing® WMS in AutoCAD Map
  - http://labs.autodesk.com/utilities/basejump



Roadmap (technical)

- AIMS Mobile viewer
  - Mobile solution
  - Identified for field operations

- Autodesk Infrastructure Modeler®
  - 3D view of the assets + collaboration
  - Web plugin to browse in a scene
  - Mobile application / augmented reality



Summary

Summary

- 5 years since the beginning
  - 2 years data collection
  - 13 months in “project” mode

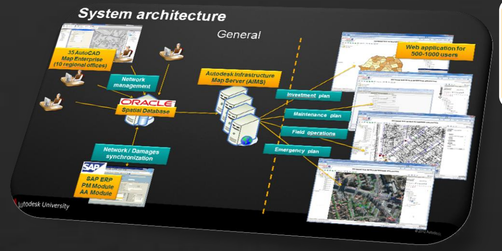
DISTRIGAZ SUD REȚELE GDF SUEZ

Stable and motivated project team

Ready to innovate

Consistent strategy

- System built step by step
  - Database
  - AutoCAD® Map 3D customization
  - AIMS + Active Directory + Tuning
  - SAP integration



Autodesk® Consulting

Product expertise

Link with the product development team

Secured implementation

Maximize value of investment

- Centralized and flexible architecture
  - Helpful to address new challenges
  - Stimulates new ideas