

Romanian Energy Network Turns Up the Heat to Improve Efficiency

Termoficare Oradea manages the transmission and distribution of the heating energy network in the city of Oradea, Romania. The company manages 219.5 km of heating infrastructure that supports over 63,000 households, 226 public institutions, and approximately 1937 economic agents such as banks and production facilities in the area.

This heating network of Oradea, with its long history and complex design, was subject to shutting down unless significant modifications were implemented. In order to meet environmental legislation and energy efficiency goals, as well as to improve customer service, Termoficare Oradea had to take measures that included modernizing 17.5 km of the heating transport network by replacing many existing pipelines with more efficient, pre-insulated pipelines.



Termoficare Oradea management knew that a geospatial software solution would ensure that their energy network would be optimized for how it operated, how outages were managed, and how the company interfaced with customers. Without it, and without making upgrades to its physical energy network, the company risked shutting down like the more than 200 local companies from large Romanian cities. With all these shutdowns, the Romanian sector of centralized heating systems had registered a strong decline within the past five years.

Wanting instead to move toward a sustainable future, the company chose Intergraph Computer Services, a Hexagon's Geospatial division Platinum Partner, to implement a customized geospatial software solution for managing the infrastructure of the heating network. With one central enterprise database for its data models, outage records, and customer information, they could improve collaboration within the organization, with field operations, and especially, by using a new notification app with their customers.

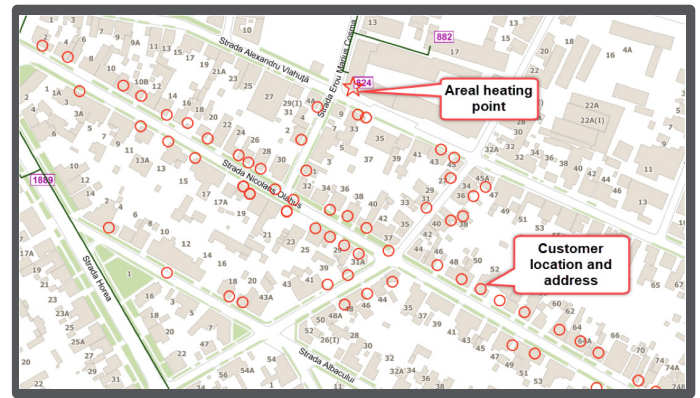
Electronic Notification System Applauded by City, Property Associations, and Citizens

The geospatial solution includes an app on Termoficare Oradea's website that displays a map showing the status of the heating transport system in real time. By entering an address or thermal substation number, the residents of Oradea can see if there are any incidents that will affect their households.

When this system was unveiled in mid-2018, it was well received by network customers. "The app also has a notification system that sends alerts both via SMS and email," said Dan Cretu, a spokesman for Termoficare Oradea. "When an incident takes place in their area, the contract holders that have submitted their email addresses will receive notifications via SMS and email regarding the dates and reasons of interruption and the estimated times of restart."

Those in the community are pleased with this new communication service. Before, citizens and leaders of property owners' associations heard about incidents or interruptions from press announcements.

"Now we receive an SMS that we immediately forward to the tenants. The staff at the association center also has access to these notifications," said Alexandru Butiri, president of a local owners' association. "If the owners or the tenants call us, we can give them the official news."



Customer's View on company website – Affected locations are shown on a map.

The notification system was needed immediately, since numerous heating rehabilitation projects are still under development, according to Deputy Mayor of Oradea Mircea Malan.

"Each of the steps that must be taken towards a heating system management strategy must have only one goal, and that is the overall satisfaction of the citizens," said Stanel Necula, Principal of Termoficare Oradea. The app helps to facilitate this goal by allowing customers to plan around outages rather than being surprised by them.

A Single Source for All Data Models, Outage Records, and Customer Information

The geospatial solution integrates all data and workflows in a centralized enterprise database, allowing controlled concurrent access for multiple users. Based on products from Hexagon Geospatial division's Power Portfolio®, the solution facilitates communication with the network's stakeholders, from regulatory authorities to their customers, the citizens of Oradea.

The administrator configures the software according to user roles so that each type of user sees their own view of the data, including the map content, forms, and reports that they need or can create to perform their specific tasks. For this geospatial solution, and including the Customer's role as described above, the user roles include:

- Network Developers
- Topographic (Survey) Team
- Network Operators
- Network Dispatchers and Maintenance Teams (Outages)
- Management

Summaries of example tasks for these user roles, including example views they might see of the enterprise data, are included below.

User Role: Network Developer

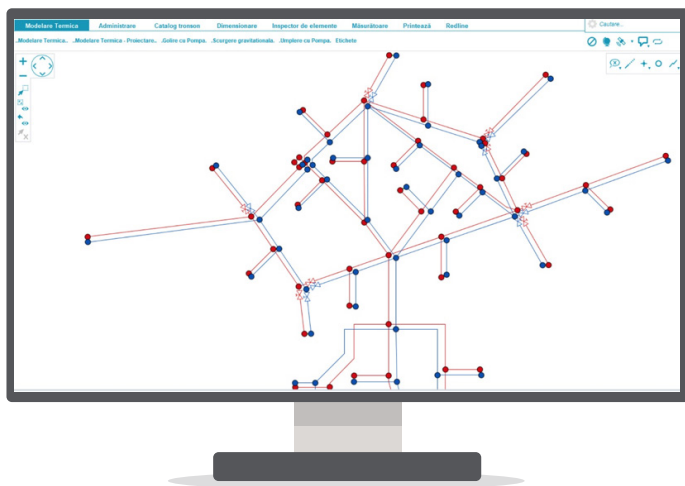
Tasks: Create Thermodynamic Models and Simulations

The Network Developer might create a software simulation whenever a modification to the network is needed, such as partial replacement of pipeline routes or a network extension.

The Network Developer's view of the data includes the pipeline features as well as the capabilities to perform thermodynamic modelling on the features. In addition, when the physical network is connected to a Supervisory Control and Data Acquisition (SCADA) system to access the real-time status of the network components, that information can be used for the thermodynamic modelling in this system. By performing modelling, the Network Developer can identify the minimum parameters required for an operation or visualize the results of calculations for scenarios including "What if..." such as to identify the optimum diameters of the pipes.

Other capabilities include using pressure diagrams and creating piezometric charts that show the evolution of pressures along the pipeline network and measure the liquid pressure within the system. The Network Developer can also customize the element labels to directly view the results that interest them most.

Using the results of the modelling, the Network Developer can create a schematic view of the entire network or a portion of it. This diagram can be used by technical management or field crews in surveying that area.



Network Developer's View - Thermodynamic modelling of the heating network (red lines are feed paths and blue lines are return paths).

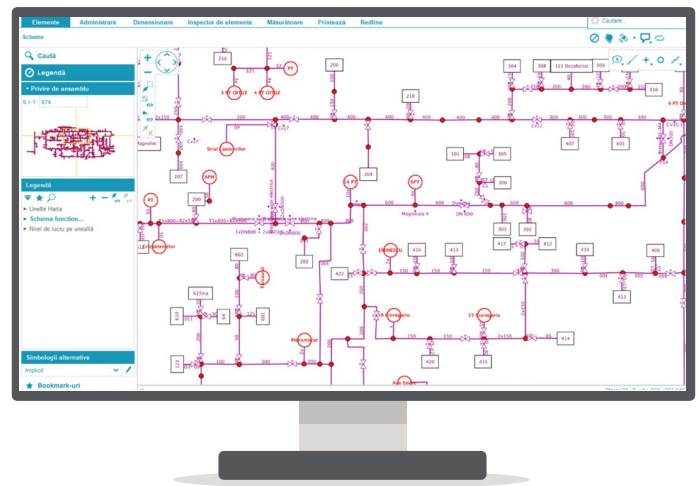
User Role: Topographic Team

Tasks: Collect Survey Data from the Field and Update the System

The schematic diagram is passed from the Network Developer to the Topographic Team to collect survey data at the proposed location in the field and see if there are any concerns. If so, their feedback goes back to the Network Developer, who uses it as input for a revised or alternative solution.

The Topographic Team uses the schematic diagram in the field to collect dimensions and other information, for example for a pipeline replacement or network extension.

The system also enables the import of elements and data collected in the field. After returning from the field, the team can also upload collected data in CSV or DXF format or update alphanumeric data (for example, attributes for network components). This data could include network placement (pipeline route, position of major network components), or other graphical objects such as street lines, buildings, and so forth.



Topographic Team's View - This schematic diagram presents a full view of the network with only the essential components shown.

User Role: Network Operator

Tasks: Update Technical Information, Run Simulations

Network Operators oversee the energy network, which transports hot water and industrial steam by pipelines to areal heating points (substations) for further processing, and from those substations distributes the heat to customers.

The geospatial solution does not directly operate the physical energy network but can access some of the same information. For example, the physical network includes instrumentation that records the status (pressure, heat, flow, velocity, temperature, and so forth) of the various components of the network into a SCADA system. The Network Operators view real-time remote instrumentation data from the SCADA systems as values to parameters such as temperature, flow, and pressure that they monitor in their dashboard. These values can also be input into the geospatial solution for thermodynamic modelling, as mentioned above.

The Network Operator may optionally have full access to the geospatial solution, including the ability to run the models. If the Operator has any concerns, additional simulations may be performed based on this feedback.

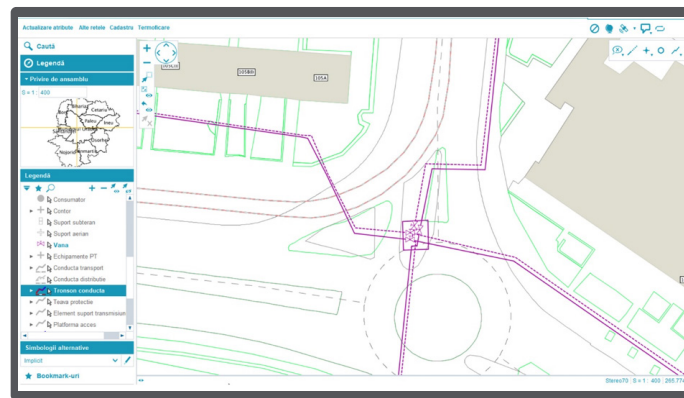
User Role: Network Dispatcher

Tasks: Schedule Repairs and Deploy Maintenance Teams

The Network Dispatcher can schedule an outage within an area of the network by registering the specific repair and including information such as the purpose, date, affected network elements, and expected date of completion.

The dispatcher's view of the data in this system includes outage records management and the ability to see the effects of changing the routes by controlling the valves. In addition, both the dispatchers and the maintenance staff can display the location of the repair, consumer information, areal heating points, current service problems, and network and valve placement.

Finally, the dispatcher notifies the affected customers of the date, cause, and purpose of the service interruption.



Network Dispatcher's View - Displaying the area to isolate for a repair.

User Role: Management

Tasks: Get System Status by Running Analytics

Termoficare Oradea management can now make better and faster strategic decisions with up-to-date dashboards, translating to better managed outages and faster reinstatement of service for customers.

Types of analysis/reports that management can retrieve from the system include:

- Summary of planned vs. actual network work
- Summary of number of plug-in requests
- Outage management summary (outage status, number of outages in a specific area or date range, outage displacement heat map)
- Estimation of the amount of non-delivered energy due to planned repairs
- Summary of critical areas such as schools or hospitals. For these critical areas, alternative routes can be calculated by thermodynamic modeling of the heating path. In the event of a network failure, identified valves can be closed to reroute the flow to alternate pipelines to ensure continuation of service.
- List of affected customers to be notified of network work
- Node Operations Register - A list of customers, by thermal point, who were receiving service within a specified timeframe, including customers who terminated their service during that time and the reason for the termination.

Customizations by Intergraph Computer Services

Using GeoMedia® Professional and GeoMedia® Smart Client products, and by customizing portions of the WebGIS products for web reporting, Intergraph Computer Services developed the following custom capabilities for this solution:

- GeoMedia Professional can be used for integrating different data sources into a single map view without the need to import existing data. However, ICS chose to create the Termoficare Oradea enterprise database by importing the company's CAD and text data into GeoMedia so that GeoMedia's analysis and correction functions could be used to correct any errors in the data.
- GeoMedia Smart Client is used to visualize the elements and specific technical features of Oradea's heating network, including:
 - Thermodynamic modelling of the heating network
 - Registering repairs or intervention work (including purpose, data, affected network elements, and work completed date)
 - Creation of the scheme feature that enables the developer or operator to draw schematic diagrams that can be used by dispatchers or developers to analyze performance issues or help the team to collect survey data
 - Importing data collected in the field (text files or simple DXF)
- WebGIS products are used for web reporting of malfunctioning areal heating points and the affected clients.



Management's View - Heat maps analysis of customer density.

Conclusion

For Termoficare Oradea, the geospatial solution implemented by Intergraph Computer Services helps the company meet its environmental and energy efficiency goals by preparing the work of the needed repairs and replacements to its network as efficiently and transparently as possible. The solution helps Termoficare Oradea meet its business objectives by improving the operational activities of the heating energy transport and distribution, streamlining field operations and collaboration within the organization, reinstating service more quickly, and improving customer satisfaction and data exchange with stakeholders.

All parties, from network operators and developers to dispatchers and field teams to management, have access to the same enterprise database but with their own views of the data to enable them to work efficiently within their specific user roles. Equally importantly, citizens are now notified proactively when an outage near them is planned. With this system in place to help facilitate the required physical network rehabilitation projects, Termoficare Oradea is moving quickly toward a sustainable future.

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Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous — ensuring a scalable, sustainable future.

Hexagon's Geospatial division creates solutions that deliver a 5D smart digital reality with insight into what was, what is, what could be, what should be, and ultimately, what will be.

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