Tibbo TECHNOLOGY

Case Study

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Centralized incident monitoring and management in a multi-service SDH/PDH data transmission network

Industry

Power Engineering

Customer

United Energy Company JSC

Partner

Unitel Engineering LLC

Unitel Engineering Company Profile

Unitel Engineering LLC is a Russian developer of engineering communications, automation and protective relay systems designed to increase performance of delivered solutions.

United Energy Company Profile

United Energy Company JSC is one of the largest electric grid companies in Moscow performing development, operation and reconstruction of the city electric networks. UEC JSC provides electricity transmission and distribution, technological connection and new networks building.

The UEC JSC property complex includes 11 feeding centers (installed capacity of 3578 MVA), 2815 transformer stations and more than 12 000 km of various power transmission lines located in Moscow.

Hardware

The project involved equipment by the world's leading brands, such as Cisco switches and routers by Cisco Systems, multi-service OME 6500 SDH platform by Ciena Communications, multi-service UMUX 1500 PDH/SDH/ATM platform by KeyMile, as well as HP servers.

Information Systems

Apart from hardware, there were other monitoring systems presented, like Ciscoworks LMS 4.0 by Cisco Systems, Optical Manager Element Adapter (OMEA) by Ciena Communications, MileGate device monitoring system, UMUX, MUSIC, TUNOR, LineRunner DTM-UNEM by KeyMile, and FNT Command which is a record-keeping system of fibre-optic connections by FNT Gmbh.

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Challenges

One of the most critical tasks in every energy company is supplying reliable communication channels for supervisory and remote control. For this purpose the UEC JSC uses a multi-service data-transmission network built on UMUX 1500 and OME 6500 multiplexers forming two redundant and completely independent SDH rings. Each ring allows transmitting data even when equipment is out of order or optical sections get broken. When one of the rings is unable to send data, in the event of nasty and multiple incidents, the traffic moves along the backup route with no need for operators to interfere. Along with reliability, SDH/PDH networks still need failure diagnosis and analysis of their effect on provided services.

The existing monitoring systems are targeted at one vendor or even one vendor equipment type, therefore a multi-vendor network requires multiple monitoring systems, different for SDH/PDH and IP networks. Hence, it's difficult to overview the overall data-transmission network state as each system performs limited monitoring and isn't connected with others. Moreover, defining an accident cause gets even harder. SDH technology performs total control over communication channels and equipment, but messages received from EMS systems do not contain any information on incident causes. The current system doesn't allow checking state and quality of provided services so operators are supposed to do that instead. Furthermore, data needed for building a resource and service model aren't accessible by EMS type systems, so only the FNT Command system keeps track of communication channels and equipment.

However, even having a reliable and redundant network the maintenance staff faces a complicated task of defining faults in communication channels and, more importantly, services. Excessive and unstructured information coming from EMS doesn't let quickly check service availability, which affects the service level and increases troubleshooting time.

There was no off-the-shelf solution able to solve the problem of EMS systems unification, IP network monitoring and integration with record-keeping system, so Tibbo and Unitel engineers were supposed to create such a solution. Having system requirements and a target specification in hand, the team got down to work.

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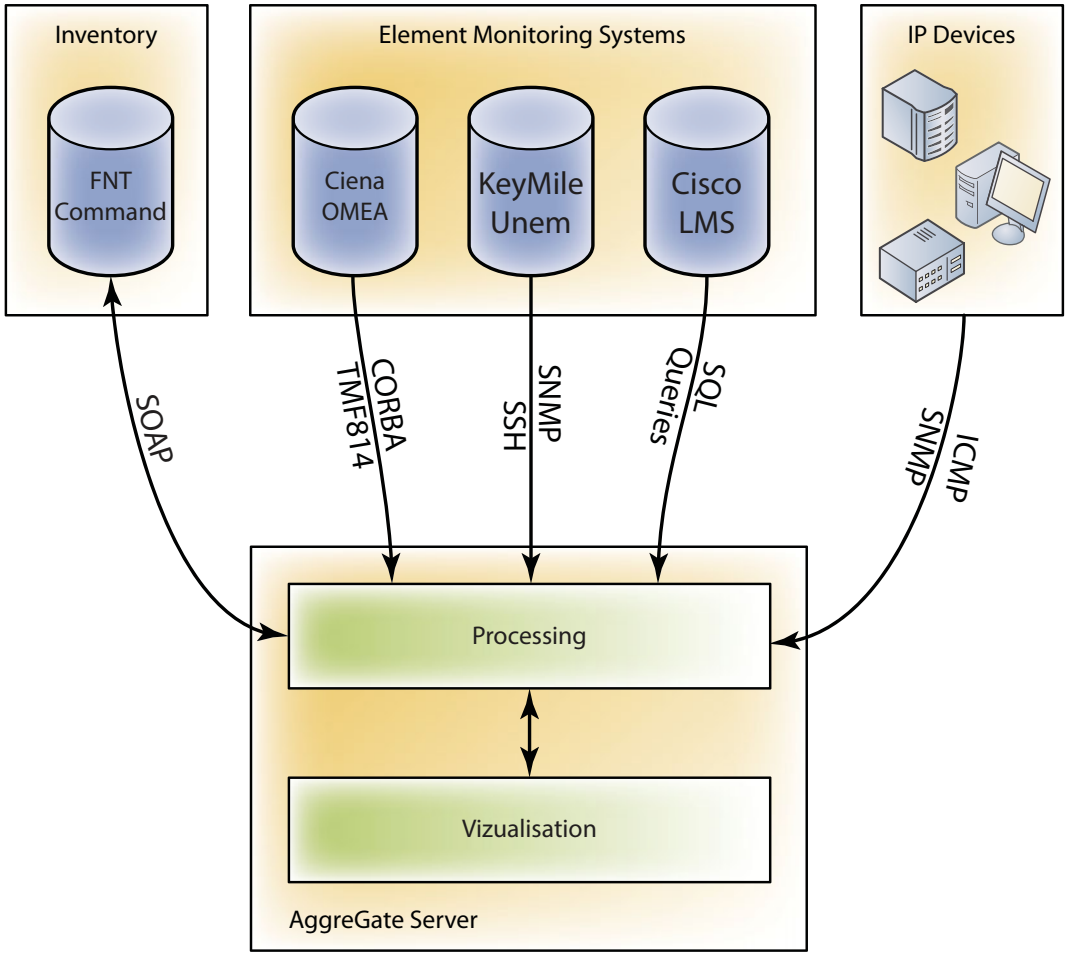
Solution

For solving the original task, they chose Tibbo AggreGate Platform, flexible enough to fulfill the customer requirements. It was extremely important to provide system availability and reliability. For this purpose, a failover cluster was implemented in Oracle for a database part with Tibbo AggreGate failover cluster technology for application part.

At the very early project stage the team defined and described necessary modules, their intercommunications with one another as well as data sources. This made it possible to consider all data flows as well as properly plan connections between different system components.



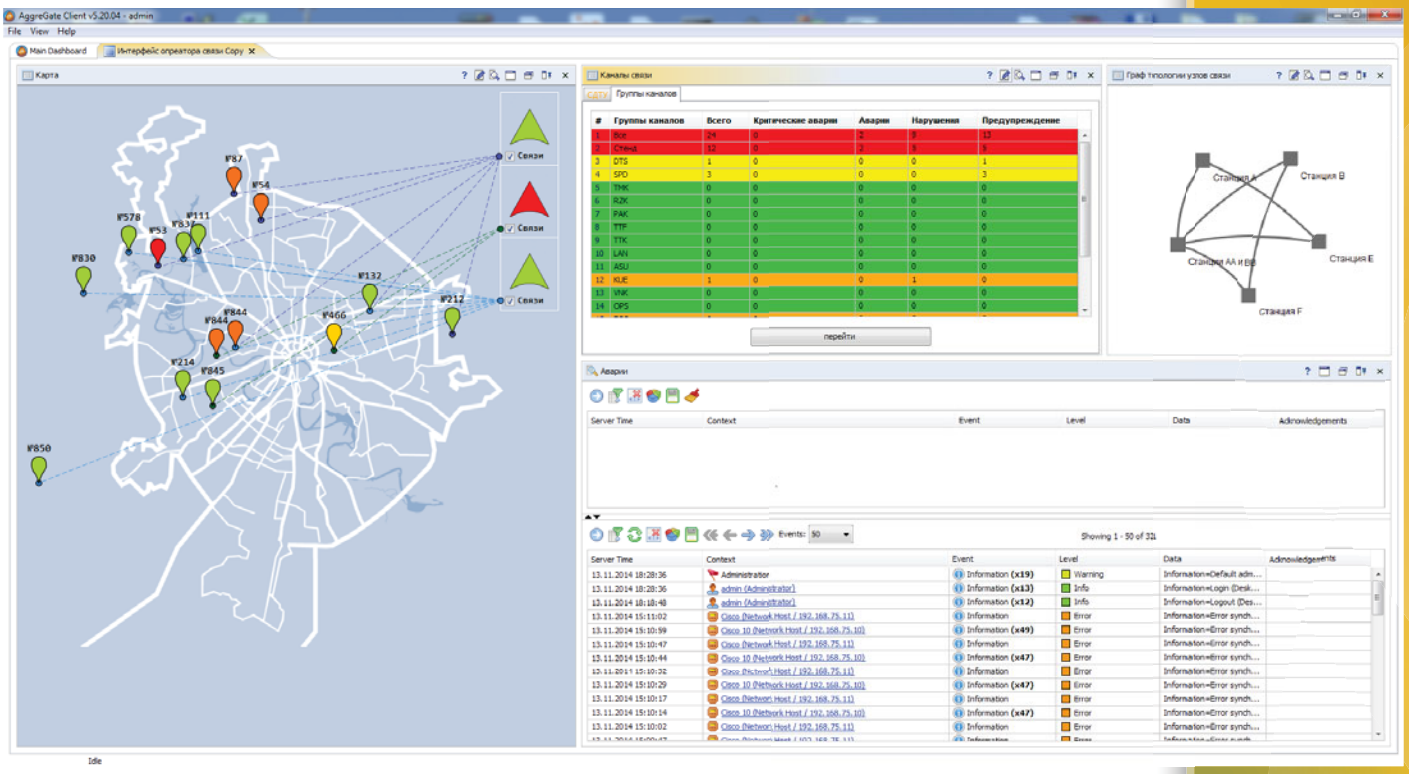
The following stage included the task to integrate with record-keeping FNT system and three EMS systems: Ciscoworks LMS, OMEA and UNEM.

Tibbo AggreGate accessed data stored in FNT Command via web services. Thanks to unparalleled SOAP driver bundled with Tibbo AggreGate, there was no need to write a code for method calling and result processing. All parameters included in SOAP requests were written in UI by filling out the parameter list. Tibbo AggreGate authorizes in the FNT system and gets a unique session ID which is used for any further calls, while the session is kept under continuous monitoring. Other requests load all data for building resource and service models from FNT, as well as SDH/PDH network topology graph and inventory information. Those requests are performed at the system initialization stage but can be also repeated periodically, on schedule or request. Next, the data are normalized and unified.

Despite the fact that available FNT documentation didn't contain all necessary information, Tibbo and Unitel engineers managed to quickly understand the data structure and create needed data models. After that, they implemented a mechanism which made it possible to switch directly from Tibbo AggreGate interface to FNT interface using a single sign-on method.

It's no less interesting to look at integration with OMEA EMS system. The system provides monitoring and management of an SDH network on OME6500 equipment. Similarly to FNT, data retrieving from OMEA is performed by calling a method which authorizes in the system and returns the session ID. Then other methods are called to get data on multiplexers, modules, ports and channels configured on equipment. In addition, a list of current incidents is sometimes called. The only difference is that CORBA driver is used to get data and connect to TMF 814 interface. This is quite unique for monitoring systems.

UNEM was the other system to integrate with. It required more than just one protocol to get data from. Data on incidents, communication channels and optical sessions could be received via SNMP, however, data on network configuration, equipment, ports and channels could be received by an inventory query via Telnet. Thus, different data items are received via different protocols. To get the data via Telnet, the deployment team configured simple Expect scripts that launched on the UNEM management server via SSH. When executing the scripts, Tibbo AggreGate transforms their XML output format into its own tabular format. After that, it unifies received data making them available for other modules.



There was one more Ciscoworks LMS system left for integration. With luck, a detailed system manual was available so integration didn't cause any trouble and took just a few days to implement. The integration was performed through a SQL database interface with objects kept in different databases. Luckily, that didn't seem to be a problem for Tibbo AggreGate, and after writing a few simple SQL queries, we received all required data, while a special model aggregated the data from various devices representing it in a proper way.

At the next stage the overall incident processing algorithm was implemented. Incidents from various systems obtained a common format and were put into groups, which helped define incident reasons and form a knowledge base that could be further extended. The algorithm collected information on current equipment and communication channel problems of the whole network applying resulting data to network, service and equipment graphs. This made it possible to receive technical messages and build a global picture indicating status of all services as well as specifying incident locations and reasons.

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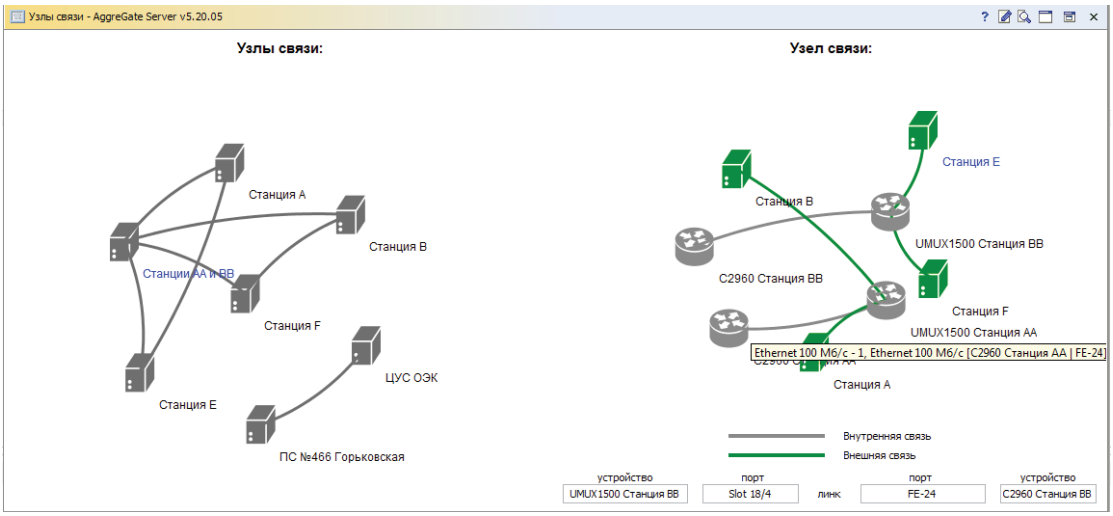
Thus, there was no problem to display full information in the UI having all data about devices, channels, services and their current parameters. Operator interface is split up into several functional parts: the left-hand side displays a map of all nodes and their connections, whereas the right-hand side locates channel groups and directions with their statuses. Separate tabs show an SDH network topology graph, incident history and inventory as well as underlying Element Management Systems' configuration and synchronization parameters.



Outcome

Once the project was finished, United Energy Company has got a unique SDH/PDH networks monitoring tool that improved quality and stability of network services. Communication channels and equipment troubleshooting time has been dramatically reduced. Timely information sharing on hardware status, power supply specifications, cooling system state has cut down incident count. The system has been justly appreciated and accepted into service.

Conclusion

Tibbo has successfully designed and deployed the system for a multi-service SDH/PDH network monitoring. The project was covered by Tibbo deployment team along with Unitel engineers within the established deadline.

About Tibbo

Located in Taipei, Taiwan, Tibbo Technology Inc. brings simplicity to the automation world defined by enormous complexity of operating systems, programming languages, and design tools. Tibbo's programmable hardware and the AggreGate Platform offer a complete solution for delivering robust, distributed automation and monitoring systems.

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