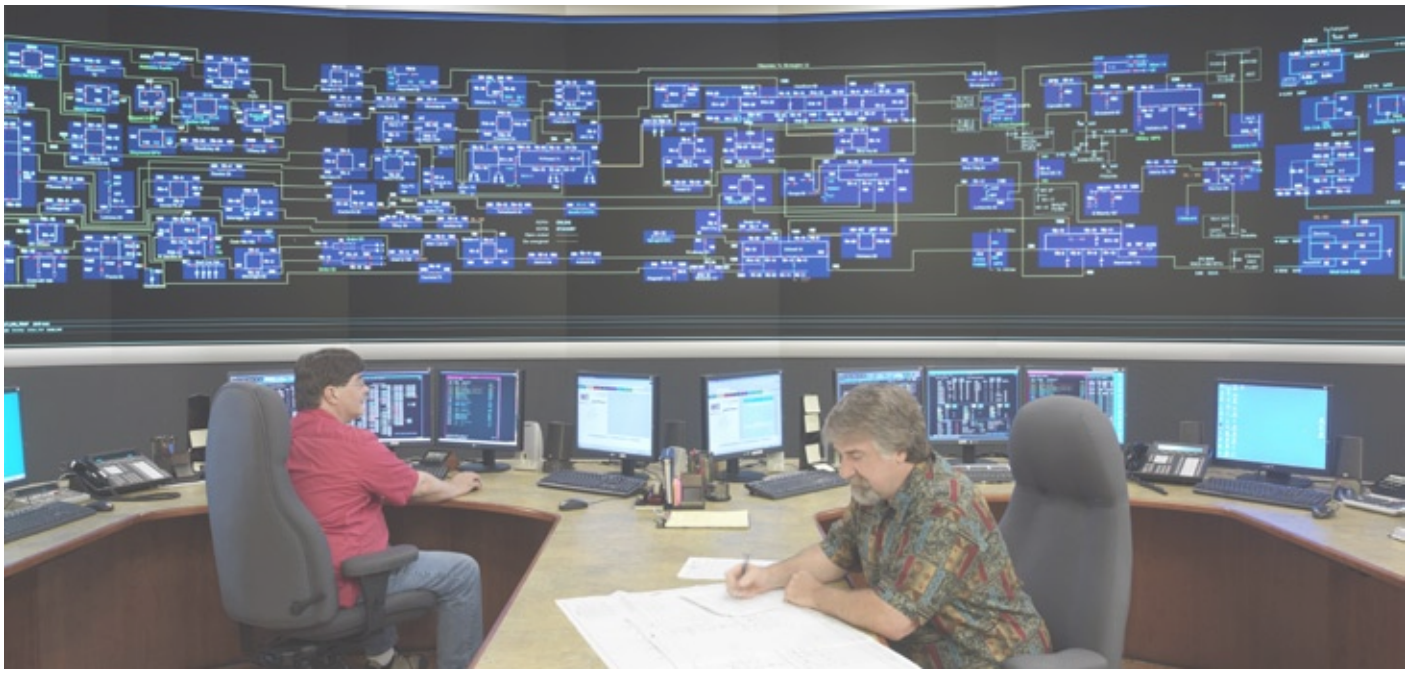
Newsletter of the Business Unit Network Management

Network Management Newsletter
Issue 2/2009



Dear readers,

As the head of the business unit Network Management, I am proud to have you as customers and to announce that the new Network Manager Release 4 is now ready. In June of 2009, Network Management reached an important milestone with the global market launch of Network Manager Release 4.

Three years ago, ABB kicked off a major R&D initiative to combine and enhance both of our existing SCADA platforms into one global product. Release 4 is the culmination of the efforts of our R&D team worldwide and is our first truly global product offering. Having been submitted to unprecedented levels of rigorous testing, the product has now been released for use on customer projects in all markets, and is already being integrated with ongoing projects in North America and Europe. You can read more about the improved functionality and benefits of Network Manager Release 4 in this newsletter.

Also in this issue of our newsletter, you will find an article describing a research project on visualization, which is one of our many projects to further enhance Network Manager. In the area of communications, one article describes a project utilizing our new Power Line Carrier (PLC) solution. A second article describes a recent project in Germany utilizing ultra-high frequency (UHF) radios for utility communication. This is in response to the new general European directives in the area of leased lines. Finally you can read about recent user group meetings for Network Manager around the world - the Scandinavian meeting in Copenhagen, Denmark; the North American meeting in Napa Valley, California US; and the meeting in South Africa which focused on our communications solution.

I trust that you will find this issue interesting and informative, as we continue in our efforts to meet your needs, and I would be happy to receive your feedback.

Jens Birgersson
BU Manager Network Management

Power and productivity
for a better world™

ABB installs a new generation of power line carrier communication in the Sultanate of Oman

ABB upgrades the existing communication system at Petroleum Development Oman (PDO) with digital PLC (Power Line Carrier) technology

Petroleum Development Oman (PDO) is the foremost exploration and production company in the Sultanate of Oman. It accounts for more than 80% of the country's crude oil production and nearly all of its natural gas supply.

PDO is owned by the government of Oman (which has a 60% interest), Royal Dutch Shell (which has a 34% interest), Total (which has a 4% interest), and Partex (which has a 2% interest). The first economic find of oil was made in 1962,

FAT in Baden, Switzerland

Petroleum Development Oman crude-oil production

Installation of Line Traps

and oil was first exported in 1967. PDO finds, develops, and operates natural gas fields, as well as the associated production systems, all on behalf of the government of Oman. The company delivers gas to the Government Gas System, which supplies fuel for most of Oman's power stations and some of its industries, and to the Oman Liquefied Natural Gas (OLNG) and Qalhat Liquefied Natural Gas (QLNG) plants near Sur. In addition, PDO produces condensate (liquid hydrocarbons that condense out of natural gas) and liquefied petroleum gas, which is chiefly used for cooking.

The prior PDO communication system had been in operation for more than a decade. It used an earlier generation of communications equipment and had to be replaced in order to enhance the communications services and fulfill the demanding customer needs for transmission of teleprotection, SCADA data, and voice communications.

In the communications system upgrade, ABB established a Voice over IP (VoIP) system using Digital PLC technology as communications media, and a Network Management System for remote monitoring and configuration of the PLC system. The Network Management system will provide the benefits of easy maintenance and operation of the communications network.

"The new PLC communications network is based on digital technology, which enables the use of VoIP and data on the same channel," said Mr. Ali Lawati, Manager of Telecom Networks at PDO. "It improves the capacity and performance of SCADA and voice communications, and also provides the functionality of remote monitoring and control of the new PLC communications and voice network."

System installation, commissioning, and testing were a challenging experience because of the project's overall size. Thanks to close cooperation and the pioneering spirit between PDO, ABB offices in Switzerland, Dubai, and Oman, and the local installation subcontractor, the project was carried out to PDO's utmost satisfaction and can be viewed as a milestone in power line carrier communication.

ABB makes a splash at WETEX and MEED summit

Hundreds of key decision-makers stopped at ABB's booths at two regional exhibitions to learn more about our company's innovative products and solutions and how these can better serve the Middle East power and water industry.

ABB successfully positioned itself as an industry leader at two key Middle East exhibitions in March 2009: the MEED Arabian Power and Water Summit and Water Energy Technology and Environment Exhibition (WETEX), both of which were held in the United Arab Emirates (UAE).

MEED Arabian Power and Water Summit

Hosted by the business intelligence firm MEED, the Arabian Power and Water Summit kicked off with over 300 high-level delegates from various industries, including power generation, water, and EPCs attending the event at the Emirates Palace in Abu Dhabi. The main aim of the MEED event was to address various industry challenges in light of current economic conditions, such as a shortage of resources for current projects and resulting project delays.

WETEX 2009 (Water Energy Technology & Environment Exhibition)

Dr. Mostafa AlGuezeri, ABB's local business unit manager for power generation, was on the contractor panel, and also participated in the event press conference as a representative for ABB. Dr. AlGuezeri was also later interviewed by Mega-What, a leading power trade publication in the region.

WETEX Showcase

Meanwhile, at the WETEX exhibition, of which ABB was a sponsor, approximately 300 visitors stopped by ABB's booth. Visitors were able to learn about ABB substation automation solutions, including ABB's SAS 600 series, which is designed for safety and reliability in local and remote substation monitoring. FOX515, a high-performance telecommunication platform for utilities, was also on display at the booth.

On WETEX's first day, Hrvoje Krip, ABB's area sales manager for substation automation and protection, participated in WETEX's Energy, Water and Environment conference to speak about ABB's substation automation solutions. On the third day of WETEX, Tomas Lindqvist, vice president of ABB Network Management, participated in the WETEX 2009 Conference to present key topics such as the transition to smart grids, central and distributed power generation, and Network Management advances.

Tomas Lindqvist, Local Business Unit Manager Network Management, Sweden

Mr. Lindqvist pointed out especially the importance of a secure and reliable SCADA system with advanced applications for the operational control of the emerging smart grids that will be built around the world. Network Manager is the ABB flagship product for network control applications and starting with its newly launched Release 4 version it will be one of the first true global systems fulfilling the market requirements for a safe, reliable and yet flexible SCADA system targeted for the new and smarter grid systems.

During the exhibition, Noaman Amjad, ABB's head of Power Systems, was interviewed exclusively by Utilities Middle East magazine regarding the future of the Middle East power industry, the challenges ahead, and ABB's activities in the transformer industry.

ABB installs 5,000th MicroSCADA system in Delhi Metro

ABB is providing electrification solutions and a range of cutting-edge power technologies including power supply, distribution equipment, and Supervisory Control and Data Acquisition (SCADA) systems to what is considered an historic project in India.

ABB has a long history of supplying network control and substation automation worldwide, including thousands of ABB MicroSCADA systems. The 5,000th such license was sold in May 2007 to the Delhi Metro Rail Corporation (DMRC).

ABB won this order after an international competitive bidding process with several other well-known vendors. The order includes supply, installation, testing, and commissioning of 25KV AC flexible OHEs, sectioning posts, 33KV cable networks, ASS, and a SCADA system for elevated sections of the Delhi Mass Rail Transit System (MRTS) Phase-II Project.

TDMRC/CEE/Tr. Mr. V. Jha

DMRC Chief Electrical Engineer/Tr Mr. V. Jha commented that ABB's MicroSCADA installations enhance performance by monitoring the rail system's field equipment and networks and flagging potential faults in time to avoid major repairs and service interruptions. He also expressed great confidence in ABB's project team for the after-sales service provided over the last decade, and in the ABB SCADA system's functional capabilities.

As a part of the project ABB replaced the SCADA system commissioned by M/S Eliop Spain during the "Phase-1 Underground" part of the project in 2005.

Two control centers will be set up to act as independent backups to each other: one at Metro Bhawan, and the other at Shastri Park. The ABB SCADA system will control and supervise around 320 new RTU 560Ds, 198 Old RTU 232s supplied by ABB during Phase 1, and Bay controller units in seven new receiving substations being set up in Phase 2. The total new system I/O count will be around 170,000. The provisioning of large 12m _ 2.5m and 6m _ 2.5m video screens at Shastri Park and Metro Bhawan control centers respectively is in progress. These screens will provide a bird's-eye view of the complete DMRC Phase-I and Phase-II auxiliary and traction power systems. And the system will also be integrated to thousands of CCTV cameras installed throughout DMRC stations. This will further help the DMRC improve response times during power interruptions, thereby improving train operation punctuality and maintaining the headway already begun.

Shastri Park Operation Control Center

Both the elevated and underground sections of Delhi's metro system are powered by ABB substations and switchgear to ensure a reliable supply of electricity. ABB's MicroSCADA installations monitor the rail system's field equipment and networks, thereby warning operators of potential faults and giving them time to avoid major repairs and service interruptions. This enhances performance and assists in keeping costs down.

The MicroSCADA system interconnects all 33KV auxiliary substations and 25KV traction switching posts, and ties the main receiving and traction substations to both a central and a backup control center. Local control centers at receiving substations are also there for local monitoring and emergency situations. Provision of an emergency tripping system has been set up in underground locations to facilitate emergency shut-down of the 25KV traction supply by the station controllers at the control center and by passengers at platforms and cross passages in the tunnel.

The Metro transportation concept is generating huge interest in India. Similar projects are currently underway in bustling cities like Bangalore, Hyderabad, Kolkata, and Kochi. The Mumbai Metro Project has also been awarded to ABB recently.

Network Manager Release 4

Network Manager Release 4 is a global product offering that reflects decades of ABB leadership in solutions for monitoring, control, and analysis around the world. Network Manager is not only a control center solution that ensures secure and efficient energy system operation, it is also a vital energy information system, providing reliable process information to decision makers. It facilitates and promotes secure, reliable and efficient grid operation, not only for managing today's power networks but also for emerging Smart Grids, which feature greatly expanded sources of renewable energy and active demand participation at both commercial and residential levels.

As shown in Figure 1, the design of Network Manager supports modular functionality that can be tailored to the needs of particular organizations. This design permits ABB to provide its customers with industry-leading technology expertise at lower costs, while leveraging the experience gained in serving multiple segments. A critical part of this modular architecture is provided by the Infrastructure functionality shown at the bottom of the figure. The Communications Front End and the External Adapters and Data Exchange functionality provide an open and versatile platform based on the latest industry standards. This results in easy integration with other utility information systems, an essential requirement in today's interconnected utility. Graphical Data Engineering consists of comprehensive maintenance tools for smooth system maintenance and expansion. The flexible Historian and Data Warehouse enables users to access and report on accumulated operating data and events.

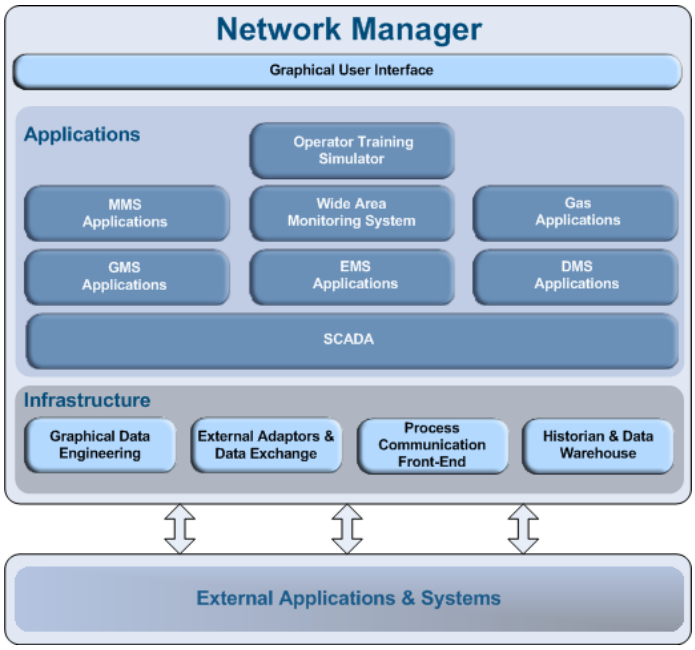


Figure 1: Network Manager Architecture

As shown in the center of Figure 1, Network Manager contains a family of applications targeted for different segments of the electric and gas utility market. It provides applications tailored specifically for distribution utilities (Network Manager SCADA/DMS), transmission utilities (Network Manager SCADA/EMS), and generation utilities (Network Manager SCADA/GMS). Applications are also provided for market operation systems used in electricity markets worldwide (Network Manager MMS), and for other purposes such as wide-area monitoring systems, operator training simulators, and gas applications.

As shown on the top of the figure, the Network Manager Graphical User Interface provides a consistent user interface across the operational functional in an organization. The result is improved operator effectiveness and flexibility, as well as reduced maintenance and training costs.

While segment requirements result in different functionality across the Network Manager family, there are six (6) dimensions that are common to all products, and which are the focus of Release 4 and upcoming releases. These are shown in Figure 2, and are described below.

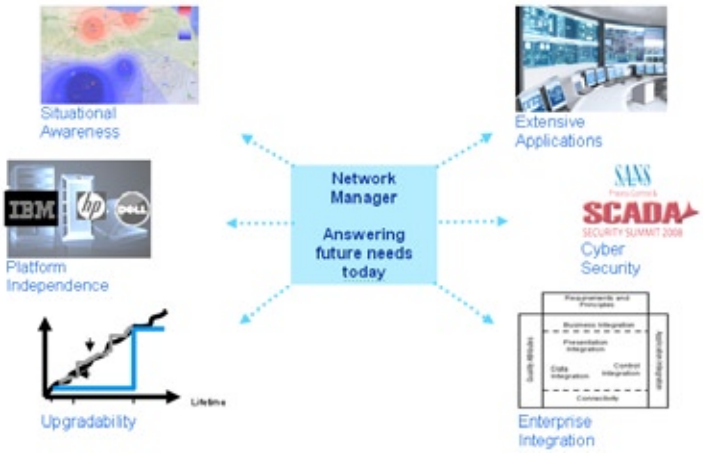


Figure 2: Focus Areas

Situational Awareness

Network Manager Release 4 introduces contour coloring on overview displays, giving operators a way to view voltages and energy prices in the same way that TV viewers view temperatures on weather maps. In addition, the new release offers numerous enhancements in the graphical presentation of symbols, pie charts, and bar charts. Context-sensitive information can be presented using a powerful new method that is highly configurable by users. Situational awareness and visualization continue as an area of emphasis for ABB; more exciting features are planned for Release 5.

Platform Independence

Network Manager Release 4 is available on two different operating systems (LINUX and HP UX) running on a variety of hardware choices. Network Manager Release 4 scales effectively from the smallest distribution SCADA customer to the largest national control centers requiring advanced multi-site deployments.

Extensive Applications

For many years ABB has pioneered advanced power system application development. New features to enhance network control in Release 4 applications include:

- Network Manager MMS: A powerful, configurable outage scheduling system for energy market operation;
- Network Manager DMS: Power flow analysis for unbalanced distribution networks;
- Network Manager SCADA/GMS: Enhanced automatic generation control (AGC) supporting generation portfolios operating in multiple regions and electricity markets, and simultaneous optimization of hydro and thermal generation;
- Network Manager SCADA/EMS: Improvements in demand forecasting utilizing neural networks.

Cyber Security

ABB was first among its peers to seek and conduct independent cyber security testing when ABB began its collaboration with the Idaho National Laboratory (INL), operated by the US Department of Energy, in 2003. The lessons learned from this continuing collaboration have resulted in numerous cyber security enhancements to Network Manager Release 4.These enhancements support utilities in their efforts to be compliant with security regulations like the Critical Infrastructure Protection (CIP) standards developed by NERC (North American Electric Reliability Corporation).

Enterprise Integration

While ensuring information security for network control, Release 4 contains enhanced functionality for its interfaces and data exchange methods that allow Network Manager to interoperate with other systems. This is accomplished by two means - first, by providing interface support for industry standards (such as CIM/XML for network model exchange and new protocols for international electricity market operations), and second, through the selective adoption of third-party technology to support application integration based on service-oriented architecture (SOA) principles.

Upgradability

ABB strongly believes in supporting its installed customer base with multi-year maintenance contracts including periodic upgrades. ABB has developed migration tools (e.g. data base and display conversion tools) that assist the users around the world to quickly and reliably upgrade their systems to the latest version of Network Manager.

The advent of a global release has also allowed ABB to consolidate and streamline its worldwide development, testing and release processes. For Release 4, the result is a more tested product that addresses global requirements, and gives ABB and our customers a foundation for future functionality and enhancements.

In summary, Network Manager Release 4 is the culmination of experience gained from supplying more than 400 network control installations worldwide. ABB forms a long-term partnership with its customers by delivering state-of-the-art applications and high quality customer service. With ABB solutions and support, users are able to increase profitability through improved energy supply and business processes, enhance customer service, and minimize environmental impact.

Annual Nordic User Group (NUG) Meeting in Copenhagen, Denmark

The annual Nordic User Group (NUG) meeting was held May 26–28, 2009 at the Admiral Hotel in central Copenhagen, Denmark. Approximately 90 participants attended, and almost all Network Manager users in Scandinavia were represented. The participants enjoyed a comprehensive agenda as well as evening tours around beautiful, springtime Copenhagen.

Odd Håkon Hoelsæter was the event's keynote speaker. He is currently retired after many years as CEO for Statnett SF in Norway, and has also been engaged in Nordel for many years. His presentation called "Nordel Power Balance – Production Control, Power and Energy Balance for the Nordic Region Until 2012" was very interesting. A number of comments and questions from the audience revealed that the subject was well-chosen.

The participants also got a lot of information on the latest release of Network Manager, as well as some glances of what ABB has in the lab for future development within the HMI area from various presentations and demonstrations.

NUG Reception

ABB's view of the Smart Grid area was presented by Anders Hellkvist, representing Product Management in the meeting. The Smart Grid concept was mentioned and referred to in many of the presentations, and was an underlying theme for the entire conference.

Since the meeting was in Denmark, presentations focusing on the situation and the needs for Danish distribution customers were made.

The working groups had discussion time in three separate forums: Operator (HMI), Power Balance/Production, and DMS Functionality. The work and discussions were presented and discussed by the audience during the last day of the conference.

Interested participants from all over Scandinavia

In addition to the regularly-scheduled agenda, a number of demonstration stations available to attendees throughout the conference:

- ABB Network Manager
- Business Information Systems – presentation of warehouse information
- GoalArt – Root cause analysis of alarms
- CozyViz – future HMI
- Network and Asset Information System, interfacing with SCADA

During the meeting, customer participants filled out a survey designed to gather their thoughts on the service level and their relationships with ABB. Results were presented at the end of the conference and showed improvement over last year. Even if the overall view of ABB services is quite positive, there are still areas in which to improve!

Next year's conference will be held in Sweden (May 25–27, 2010).

For more information about coming user group meetings, please contact Mr. Hans Elven at hans.elven@se.abb.com.

FOX User Group Training

A group of 35 FOX users from South Africa and surrounding countries, municipal electricity departments, national electricity suppliers, and ABB employees recently underwent three days of training on FOX equipment at Club Mykonos in Langebaan.

Attendees included managers, decision makers, and engineers who work with the ABB FOX systems. The training was arranged by Gavin Sadler, who is responsible for new business development in Power Telecommunications within Front End Sales South Africa (far right, bottom).

One purpose of the event was for ABB to present the latest developments on FOX multiplexers for teleprotection, SCADA communications, voice, Internet Protocol, data communications and network management (FOXMAN). A second objective of the event was also to include the impact of the new standard C37.94 and the IEC 61850 protocol on end users, since there is a growing demand in utilities to have access to IT technologies.

The event gave delegates the opportunity to meet with other ABB FOX system customers. It provided a platform from which delegates could give feedback on systems operation and suggestions for future systems improvement and development to ABB.

Top row: Gareth Anderson (Mandela Metro, PE), Volker Wolf (Namibia Power Corp), Thabo Litsili (City Power), Mike Brandt (ABB), Mathias Kranich (ABB Switzerland) , Gert Booysen (Tshwane Municipality), Kibalabala Kibalabala (Copperbelt Energy Corporation), Kevin Schafer (ABB), Francois Venter (ABB), Mike Gittings (Durban Electricity), Andy Hogg (City of Cape Town)

Two rows below: Bond Chirwa (ESCOM), Tyronne Ferndale (Mandela Metro, PE), Andrew Kapula (Copperbelt Energy Corporation),Tony d'Olieviera (ABB), Malerato Mohlala (City Power), Gunther Molzahn (Namibia Power Corp), Hazen Mawela (Tshwane Municipality), Eldred van Straten (ABB),Thabo Mokoene (Tshwane Municipality), Harris Chinguwo (ESCOM), Doctor Hlongwane (Swaziland Electricity Company), Danny Wong (ABB), Sunil Bipraj (Durban Electricity), Mzo Mtshali (ABB), Liteboho Ntlaloe (LEC), Vusi Gama (Swaziland Electricity Company), Lebohang Lillane (LEC), Clement Delport (ABB), Bruce Webster (ABB), Ryno van der Riet (City of Cape Town), Hennie Schoeman (tshwane Municipality), Anthony Gouveia (City of Cape Town), Maarten van Helden (ABB), Gavin Sadler (ABB)

Control System Visualization Research Project

Matching operators' needs with practical visualization methods and easy-to-use Human Machine Interfaces

Visualization and usability are relatively new areas of investigation at ABB Corporate Research. The CozyViz project – Control System Visualization, running in Västerås, Sweden, – is the first large research project that aims to improve the visual representations of abstract data in the WS500 workstation to amplify operators' cognition and to improve usability and navigation.

The setup of the PROTOTYPE demo

The project began with the investigation of Human Machine Interface (HMI) issues in ten control rooms in the United States (US), the United Arab Emirates (UAE), and Oman during October – November 2008. In total, the research team interviewed 51 operators and shift-managers at their workplaces and observed their current ways of working with the set up of the prototype CozyViz demo with various HMI solutions. In the U.S., a total of six control centers in Austin, Houston, Kansas City, San Antonio, and two sites in Illinois were visited by Mr. Dilip Kota (project lead) and Ms. Christine Mikkelsen. In the Middle East, Mr. Kota and Dr. Mikko Rissanen visited four control centers in Abu Dhabi, two in Dubai, and in Muscat. Most of the control centers had Network Manager SCADA EMS/DMS installations, but some control rooms were equipped with (former) Elsag Bailey and Siemens systems. Various cultural regions and systems resulted in a very broad range of findings.

The input from all these various systems end users was used as a starting point for a report for making sense of the challenging usability and visualization. Today the report is being used as a list of problem statements in ABB's business that provides SCADA/EMS/GMS/DMS.

Dr. Rissanen showing the PROTOTYPE for customers in Dubai (EMC and DEWA)

However, the report is just a good start in this project. In January 2009, the research team, led by Mr. Isak Savo, entered the HMI prototyping phase. The prototype addresses those problems the operators talked about through modern visualization methods (e.g. graphical alarm filtering, scalable power grid visualization, and combining overviews along with details) The prototype also addresses usability improvements (e.g. intuitive navigation and searching, rapid breaker switching, and flexible trending).

After four months of Dr. Rissanen showing the CozyViz prototype for customers in Dubai (EMC and DEWA) the prototype was taken back to end-customers in the UAE at the end of April. The operators got to see, test, and give feedback on the prototype and evaluate how well it solves the problems they had reported during the interviews half a year ago. The evaluation resulted in valuable ideas and comments on how to improve it even further.

In addition to the visit to the UAE, similar evaluation sessions will take place in the US with American operators in mid-May. The CozyViz project was represented in User Group Meetings in Napa Valley, CA from May 17 – 20, and in Copenhagen, Denmark from May 26 – 28. The results will act as a guide for ABB to develop further releases of its products.

The project has resulted in several opportunities for spin-off projects to transfer visualization and usability methods to other ABB products. This will provide ABB customers with the latest easy-to-use HMI across multiple products.

Network Manager User's Group Meeting in North America Spring 2009, Napa Valley, California, US

ABB Inc. recently hosted a Network Manager User's Group Meeting in the United States during May 16-20, 2009 at the beautiful Silverado Resort in Napa Valley, California. The property is located in hills of Napa Valley. The meeting was attended by over 200 users from many parts of the world, including the US, Canada, Mexico, Australia, Saudi Arabia, Ecuador and United Arab Emirates.

The three-day meeting consisted of general sessions plus breakout technical sessions for Network Manager SCADA/EMS/GMS/MMS/DMS products. Sessions were conducted by current system users, consultants, and third party vendors in the areas of hardware, Smart Grid, security and applications.

The Sunday evening reception took place on the Fairway Deck, overlooking a championship golf course, as well as the Vendor Demo Room located adjacent to the deck. The reception offered colleagues the opportunity to renew past acquaintances, make new friends, and view the various ABB and 3rd party vendor products on display in the Demo Room.

Brookfield Power, John McDaniel, Staffan Noren

Monday

The conference meetings were kicked off Monday in a general session hosted by UGM President Brian Hursyz and Mr. Hormoz Kazemzadeh, ABB Director of Marketing. They presented updates and guidelines for the three-day meeting. Mr. Salim Khan, V.P. and General Manager of Network Management for North America, welcomed everyone and provided an operations update to the general session. Mr. Salim Khan then introduced Mr. Jens Birgersson, Business Manager Network Management, who also gave a brief welcome to the attendees.

Eric Mscichowski (CAISO), John Wiebe, Heather Storey, Al Eizans (DTE)

Wine Train Event

Following all-day presentations and meeting, Monday evening's social event was held on the Napa Valley Wine Train. It consisted of dinner served on the historic wine train that travels up and down the valley during dinner. Spouses and attendees alike enjoyed the scenery, the lovely dinner prepared on the train, and the conversations with their colleagues.

Wine Train

Tuesday

Technology sessions continued Tuesday with specific sessions conducted in the areas of Operators, Applications, Integrators and Security, DMS and Central Markets. Sessions covered topics such as Smart Grid, wind power, Automatic Generation Control (AGC), market operations, alarming, and visualization.

Markham Winery

Tuesday evening's social event was dinner at the Markham Winery The reception consisted of a tasting of several of the winery's products, a short facilities tour and dinner in the Wine Cellar. The evening provided a lovely respite from the all-day meetings, and were much enjoyed by all the attendees.

Markham Winery

Wednesday

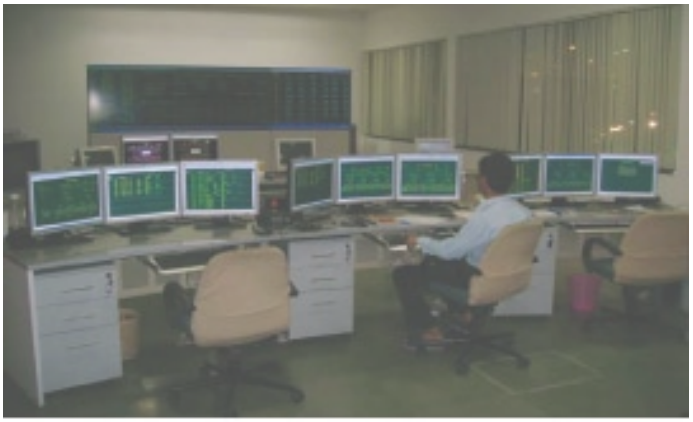
Sessions on Wednesday continued with separate general sessions for EMS users, DMS users and FeederAll users. The EMS session focused on product roadmaps and R&D focus group discussions. The DMS session included a discussion on enhancements and user experiences, and the FeederAll group discussed enhancements and fixes. The afternoon sessions included a Smart Grids workshop and PI training.

Finally, on Wednesday evening a dinner was held on the Fairway Deck as a relaxing way to wind down from an eventful week.

The User Group Committee members in North America are already planning Focus Group meetings in the Fall 2009 and another large event for Spring 2010. We look forward to seeing everyone again in the Fall in Houston for the SCADA/EMS/GMS Focus Group meeting, and in Raleigh, for the DMS Focus Group meeting. For information regarding the Fall 2009 meetings, please contact Hormoz Kazemzadeh at hormoz.kazemzadeh@us.abb.com.

SCADA/EMS System at Torrent Power Surat, India

ABB has successfully completed and commissioned a SCADA/EMS system for Torrent Power Limited (Torrent Power). Torrent Power efficiently distributes over 2.97 billion units of power per annum to its 0.5 million consumers spread over 52 sq kms in Surat. The project was executed in 14 months, and was taken over by Torrent Power in February 2009.



Control Center at Torrent Power Limited, Surat

An RTU 560 has been installed in each of 14 receiving substations. These RTUs are communicating on the IEC-61850 protocol to ABB IEDs, as well as IEDs from other vendors, at five substations of ABB The RTUs the use IEC-60870-5-103 to communicate to the IEDs at other locations. The IEC-60870-5-104 protocol is used to communicate to the Master Control Center. Automation concentrators are located at each substation; these communicate directly with ABB's Network Manager system.

Communication with the Master Control Center and Backup Control Center is through an existing fiber-optic network. Network Manager, which comprises SCADA/EMS/DMS modules, monitors and controls a total of 42,000 data points. Network Manager also collects data from three transmission substations at which ABB's MicroSCADA has been installed.

The system also has the capability of integrating with billing and GIS systems, which is one of the future requirements of Torrent Power.

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