Relion. Thinking beyond the box.

Designed to seamlessly consolidate functions, Relion relays are smarter, more flexible and more adaptable. Easy to integrate and with an extensive function library, the Relion family of protection and control delivers advanced functionality and improved performance.
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Presenters

- Erik Brandstaedter

Erik joined ABB Germany in 2009 after receiving his diploma in Power Engineering and a masters degree in Business Administration. Erik is currently serving as the North America Business Development Manager for RTU products and is located in Los Angeles, CA

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Learning objectives

Remote Terminal Unit's (RTU's) are used in a wide variety of utility applications. This webinar will address the basic functions of RTU's and how they are applied in utility applications.
RTU Fundamentals

Agenda

- What is a RTU?
- Challenges in the market
- Requirements for modern RTUs
- Typical applications
- Differences between RTUs and PLCs
- Application examples
- Questions and answers
RTU Fundamentals
What is a RTU?

- Remote Terminal Unit including
  - Remote monitoring and control functions
  - Process monitor for collection and visualization of data signals (hard-wired, serial, Ethernet)
  - Communication gateway communicating via several protocols at the same time (e.g. Modbus, DNP3.0, IEC 61850, etc.)
  - Programmable Logic Controller (PLC), able to control industry processes automatically
  - Human Machine Interface (HMI) provides overview similar to a small SCADA system (Supervisory Control And Data Acquisition)
RTU Fundamentals
What is a RTU?

Network Control System

Monitoring and control

Station Control System

Parallel I/Os

Sub devices
RTU Fundamentals
Challenges in the market

- Retrofit of existing switchgear and control panels
- Need for cost-effective and extensible access to devices in the substation
- Need for reliable monitoring and control
- Request for standard-based, open protocol solution such as DNP3.0 and IEC 61850
- Mix of several interfaces and devices, addition of new devices
- Need for centralized system diagnosis and management, logging, trending, alarms, web-based HMI, time stamping
- Challenge to manage the data that comes with increased monitoring and turn it into knowledge
- Ensure Cyber Security implementation across the entire solution supporting our customers to meet NERC-CIP requirements and more
RTU Fundamentals
Requirements for modern RTUs

- Flexible and scalable hardware concepts
- Migration to existing solutions
- Security of investment
- Enhanced communication capabilities
- Flexible communication to IEDs
- Ability to perform complex PLC functions (IEC 61131-3)
- Integrated HMI for station monitoring

- Modern engineering tools with data exchange interface
- Archive functionality
- Diagnosis and maintenance functionalities
- Highest reliability (redundant solutions)
- Robustness against cyber security attacks (NERC-CIP, IEEE 1686)
- Effective and reliable service and support
RTU Fundamentals
Requirements for modern RTUs

Network Control System

Monitoring and control

Station Control System

- Data archives
- Easy engineering
- Diagnosis
- PLC logic (IEC 61131-3)
- Parallel I/Os
- Sub devices
- Relay to protect and control field devices

- Redundancy
- Integrated HMI
- Cyber security
- Set of protocols
RTU Fundamentals

Typical applications – Electrical applications

- **Feeder automation**
  - Gas-insulated compact switchgear units
  - Pole-top RTUs
  - Capacitor banks
  - RTU520

- **Secondary distribution substation**
  - Demand response
  - Fault detection isolation restoration
  - Voltage optimization
  - Decentralized energy resources
  - RTU520
  - RTU540

- **Primary distribution substation**
  - Classic RTU
  - Substation automation
  - Gateway
  - RTU540
  - RTU560

- **Transmission/sub transmission**
  - Classic RTU
  - Substation automation
  - Gateway

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RTU Fundamentals

Typical applications – Process automation

Oil and gas
- Wellhead automation
- Pipeline supervision
- Monitoring and control of pumping stations
- Monitoring and control of lift stations

RTU520 RTU540 RTU560

Water
- Monitoring and control of water reservoirs
- Monitoring and control of pumping stations
- Monitoring and control of lift stations

RTU520 RTU540

Waste water treatment
- Monitoring and control of lift stations

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# RTU Fundamentals

## Differences between RTUs and PLCs

<table>
<thead>
<tr>
<th>RTU</th>
<th>PLC</th>
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<tbody>
<tr>
<td>Operates event-driven</td>
<td>Operates cyclical, cycle is performed non-stop</td>
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<tr>
<td>Transmits changes only</td>
<td>Transmits all information cyclical according to the programming</td>
</tr>
<tr>
<td>Transmission path is rather long → slower communication speed</td>
<td>Pre-programmed cycle with predictable cycle time → faster communication speed</td>
</tr>
<tr>
<td>Only requested data will be communicated, very efficient</td>
<td>All programmed data will be communicated, possibly unnecessary data</td>
</tr>
<tr>
<td>Own time stamping of events, data will be transmitted with time stamp to central control unit</td>
<td>Central control unit does the time stamping of events</td>
</tr>
<tr>
<td>Various process voltages (24…60 VDC, 110…125 VDC)</td>
<td>Mainly 24 VDC process voltage</td>
</tr>
<tr>
<td>Not limited to any kind of application</td>
<td>Mainly for local area control applications (industrial applications, control systems, process controls, etc.)</td>
</tr>
</tbody>
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Protocols and norms are different
RTU Fundamentals
Application examples – Successful migration solutions

- Integrated solution – no separate PC necessary
- Plug-and-play solution for minimal installation- and engineering effort
- Maintenance-free – no rotating parts
- Security approved
RTU Fundamentals

Application examples – Annunciator replacement solutions

- Traditional annunciators indicate alarms locally through an aging array of lights
- Challenge to maintain and impossible to integrate into a communication architecture
- RTUs are capable of collecting all the hard-wired alarm inputs and display as well as communicate those alarms locally and remotely
- Customized alarm lists includes time stamping, grouping and dynamic coloring functionality
- Protocol conversion and communication to upstream devices via DNP3.0, IEC 61850, Modus, and others
Remote data collection from transformer monitoring devices (e.g. temperature, hydrogen-moisture, tap position) via RTU540 (hard-wired / serial / Ethernet)

- Wireless communication back to the control room via Tropos 1410
- Reception of transformer data at control room via Tropos 6310 sitting outside
- Communication from the control room to network control center via RTU540
- Consolidated dashboard turns data into knowledge with MicroSCADA Pro
- Option to add physical security to remote substations
RTU Fundamentals
Questions and answers

- Please feel free to ask any questions you might have
- Also, please feel free to contact me after the webinar
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- **MicroSCADA** - Advanced control and applications
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Thank you for your participation

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http://new.abb.com/substation-automation/products/remote-terminal-units
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