## Agenda

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From AREVA T&D to ALSTOM GRID

AREVA
- Nuclear fuel front end processing
- Nuclear reactors
- Nuclear fuel re-processing
- T&D

ALSTOM
- Marine
- Transport
- Power
- GRID
ALSTOM GRID Business

Transmission projects
Distribution systems
Power conversion

HV switchgear
Power transformers
MV products

Energy Automation & Information (EAI)

Services

EAI: Provide control systems for all stages of power system operation
Hierarchy of monitoring and control functions

Market Mgt

SCADA / EMS / DMS

Telecom systems

Substation Control Systems
Digital Control Systems

Protections
Measurement

HV / MV switchgear
Transformers
Instrument Transformers
Sensors
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Control Systems dedicated to the operation of electric power systems
POWER SYSTEM organization

Transmission network

Sub-transmission network

VHV customer

HV customer

Primary distribution system

MV customer or MV / LV transformer

Generation & transmission applications (EMP)

Distribution applications (DMP)
Power System Operation

Operate a power system = satisfy the demand at any time

- With the required SECURITY
  - No equipment overload (current, voltage, power, ...)
  - Dynamic limitations (thermal stress, water flows, ...)
  - Preventive maintenance requirements

- With the required SERVICE QUALITY
  - Continuity
  - Constant frequency
  - Satisfactory voltage level
  - Good voltage wave shape (low harmonics)

- At the lowest possible OPERATING COST
  - Generation and startup costs
  - Operations and maintenance costs

Taking account of external forces (poorly predictable)

- Outages
- Natural inflow
- Weather
- The DEMAND itself
NMS Products Portfolio

- e-terra market
- e-terra settlements
- e-terra commit
- e-terra platform
- e-terra control
- e-terra com
- e-terra scada
- e-terra generation
- e-terra transmission
- e-terra load forecast
- e-terra simulator
- e-terra vision
- e-ttadirisgen
- e-terra renewable plan
- e-terra source
- e-terra distribution

**e-terra gridcom**
- NMS: 5000
- SDH/ PDH: e-DXC5000
- PDH: DXC5000
- SDH: MSE5000
- LMU: 5000
- PLC: 5000 / T390
- TP: DIP 5000 / TPI

**MiCOM C264**
- e-terra rtu600

Remote control and Acquisition
Alstom Grid Automation NMS Offering

e-terra

e-terra

RTU600

Supervise your Distribution network
Improve Quality of Service

Network coloring, Power Flow, Fault Location & Restoration, Switching management, Volt &VAR control, Trouble call system, Work orders, GIS and AMR interface...

Remote Terminal Unit

Market Management System

Real time Balancing Market
Day ahead Market
Transmission Capacity Management Settlement

Distribution Management System

Energy Management System

Improve the Transmission security of your grid.

State estimator, Contingencies analysis, Load forecast, AGC, Safety Management, Dispatching Simulator,

Improve the Transmission security of your grid.

Telecom System

Dedicated Digital solutions for Power Line Carrier and Teleprotection Telecommunication

Substation SCADA

Telecom products

Telecom System

MiCOM C264

PACiS

MiCOM Relays

(SAS) Protection & S/S Automation

Presentation title - 15/03/2011 - P 12
• Traditional EAi Business: Large Control Centers for electrical Utilities
  – e-terra *platform*
    ( = SCADA + EMP / DMP power applications): typical system is about 100’000 points
    – large catalog of electrical applications (G + T + D)
    – e-terra *control* (SMP) covers
      • decentralized Front Ends for e-terra *platform*
      • the smaller SCADA segment
• Dedicated teams and products for Telecom Engineering
System Architecture
Previous vision - centralized

- Control Center
- Network
  - Generation
  - SCADA
  - Front End

Dedicated telecom

Substations
- RTU
- RTU
- RTU
- RTU
- RTU
- RTU

Presentation title - 15/03/2011 - P 14
System Architecture
EMP / DMP + SMP Front End - Decentralized

Control Center

Internet

e-terraBrowser

Wide Area Network

Network
Generation
SCADA

e-terraplatform

Emergency System

Substation

e-terra Control
Distributed SCADA

RTU

RTU

RTU

Substation

e-terra Control
SCADA / Front End

RTU

RTU

RTU

Substation

e-terra Control
SCADA / Front End

RTU

RTU

RTU
Control architecture with *e-terra*

1. **Plant Interface / Gateway**
   - Ethernet or Serial
   - Equipment
   - DCS
   - Substation

2. **Substation Data Server**
   - IED

3. **Front End**
   - Modem
   - Remote Terminal Unit

4. **Small Operations Center**
   - SCADA
   - DMS

5. **Substation**
   - Remote Terminal Unit
   - Modem

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*Presentation title - 15/03/2011 - P 16*
EMP / DMP
Product Overview

• EMP = Full EMS solution
• DMP = Full DMS solution

Common core and basic functionality

• HABITAT is the core technology layer (UIMS, DBMS, SW utilities)
  common for EMP & DMP

• Large installed base:
  – HABITAT : > 1’300 licences
  – EMP / DMP : > 110 customers in more than 20 countries

• Consistent Product Support
  – Training Centers
  – Customer Services
  – 3 Users Group ( USA, Europe, Australasia )
  – “Tech Times” monthly bulletin
  – ESD ( Electronic Software Distribution)

• Consistent Product Strategy
AREVA T&D EAI technical strategy (1)

• Strong Product approach, with a common line of technology world wide

• Migration and Upgradeability across releases

• Operating System following to the trend of H/W and S/W (Windows)

• Support interoperability:
  – development environment & published APIs
  – standards (protocols, CIM / XML data model, ...)
  – MS-Windows (DDE, ActiveX controls, ...)
  – ORACLE interface for historical data (HIS = e-terra archive)

• Web-enabled solutions and architectures
AREVA T&D EAI technical strategy (2)

- Reduced Cost of Ownership
  - high quality delivery
  - simplified installation and system management
  - productivity in modeling activities
- Industrial delivery model to shorten time schedule
- Integrated solution from Equipment to Central Markets
- Maintain worldwide leadership position and product differentiation
Energy Automation and Information Business
Build your SCADA system with e-terra rtu600 for Substations Transmission and Distribution Networks
e-terra rtu600 : Key Features and Benefits

- Compact standard DIN 3U high racks (30TE to 84TE width), rugged metallic case
- 8 to 128 I/O in mono-rack configuration
- High scalability with Multi-Rack for I/O expansion up to 10 000 I/O
- Multi-processor & distributed architecture
- Intelligent processor built-in DI, DO, AI cards for high performances
- Ladder logic program
- Interlock checking for control security
- 1ms time-stamping resolution for SOE
- Heavy-duty contact relays for CB control
- SBO (Select Before Operate) control
- Plug/Unplug cards & connectors for easy integration and maintenance
- Local/Remote control management

- Multi Host (Control Centers) Communication with Standard IEC and DNP 3 Protocols
- Communications interface with meters and protection IEDs
- Direct CT/VT high accuracy measurements for transducer-less application.
- Fault current detection capability
- Integrated meter
- Integrated GPRS radio modem
4 sizes of Rack (30 T, 42T, 63T, 84T)
Energy Automation and Information Business

Power System Telecom Product

Mission: build private infrastructure

Administrative Offices

Control Centres

Power Stations

Distribution Centres

Transmission Substations

Telecom Management Centre

Video Conference Facilities
Power System Telecom
System Integration

Backbone network
Optical Fibre
(OPGW, ADSS, Wrapped)
Microwave Radio
SDH technology

Access network
Optical Fibre
PDH Microwave
Power Line Carrier (PLC)
UHF/VHF Radio
Trunked/Cellular Radio
AF Cable
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Platform of application software for the management of power transmission & generation systems
SCADA
- Process analogs, status, accumulators
- Value replacement
- Calculations
- Limit checking
- Historical data record
- Intersite data
- Topology processing
- Tagging
- Controls
- Load shedding

NETWORK
- Topology processing
- State estimation
- Monitored element processing
- Bus load model update
- Bus load forecasting
- Loss sensitivities
- Short-circuit analysis
- Contingency analysis
- Security enhancement
- Voltage / VAr dispatch
- Power flow
- Optimal power flow

GENERATION
- AGC
- Economic dispatch
- Reserve monitor
- AGC performance monitor
- Historic loss model update
- Production costing
- Transaction scheduling
- Load forecasting
- Operations planning
- Study generation
- Transaction evaluation

EMP on-line functions:
SCADA / EMS

Acquisition → Control

RT data
SCADA limits

Repl. val.

RENTEQ

Interchange transactions
Load forecast

Gen. sched. / status / part.fact. / costs

Outage scheduler

Loss sensitivities

Generation limits

RT data
Telemetered limits

Gen. set-points
EMP
Functional Scope (1)

SCADA subsystem

- Data acquisition:
  - non proprietary environment (PC + serial boards)
  - multiple RTU protocols: IEC101&104, DNP3, proprietary protocols
  - Core data processing: POINTs, ANALOGs, COUNTs, calculated values, quality flags, limits, AOR, SOE, ..
  - SCADA event logs, exception lists, alarms
- Controls (1,2,3 steps, DO, SBO, group, sequence, interlock, tagging)
- SCADA related functions:
  - Topology, Loadshed, Mapboard
  - Disturbance storage & analysis (HDR)
- Can accommodate large systems (300'000 points)
- Interfaces with external systems: ISD, ICCP, ELCOM ("e-terra Comm" / OAG)
NETWORK subsystem:
- Topology
- State Estimation
- Contingency Analysis
- Short Circuit
- Security Enhancement
- Optimal Power Flow
- Volt VAr Dispatch
- Power flow
- Real Time and Study modes
EMP
Functional Scope (3)

GENERATION subsystem:
- Automatic Generation Control
- Reserve Monitor
- Economic Dispatch
- Transaction scheduling
- Real Time and Study Modes

Operations Planning
- Resource Scheduling & Commitment : RSC
  ("e-terra Commit")
- Load Forecast

DTS subsystem ("e-terra simulator")
- Use the same database & displays as the EMS / DMS

ORACLE based Historical Information System : HIS
( "e-terra Archive" )
Platform of application software for the management of power transmission & generation systems
Training simulator: What is to be simulated?

**Simulation environment**

**Instructor**
- specifies scenario
- substitutes for other operators

**Simulation software**
- Power System Simulator
  - DYNAMICS
  - PWRFLOW
- COM / RTU simulator

**Electric Power System**
- Generation
- Transmission net.
- Distribution feeders
- Protections
- Regulations
- COM / RTU

**Externals**
- loads
- events
- other operators

**EMS or DMS**
- SCADA
- Power apps
- User interface

**Operator**

**Trainee**
- SCADA
- Power apps
- User interface

**EMS or DMS replica**

**Grid**
EMP / DMP  Example of hardware architecture

Data servers
- Historical data server
- Development computer DTS server
- Office LAN
- Inter-center access server

Communication front-ends
- Operator stations
- Router
- Time device
- GPS time

Other CCs
- WEB FG server
- Trouble call & work order server
- Hard copy devices
- Wall board or video projection

OPS server
- WEB FG server
- Development computer
- DTS server
- Other CCs

Presentation title - 15/03/2011 - P 33
EMP / DMP Advantages

- **Flexibility.** The EMS / DMS can be of any size or complexity.

- **Open Design.** Communication with the PC world and with third party applications through published APIs.

- **Web-enabled.**

- **Reliability.** Field proven technology.

- **Broad Functional Scope.** All aspects of Network Operation from LV Customers, Generation Control, to MV and HV network analysis in a fully integrated yet modular package

- **Investment Protection.** EMP / DMP can be incrementally extended and / or enhanced through custom applications, new product releases, and AREVA add-on products.

- **Strong, long-term relationships.** As a consistently maintained product with a well supported migration strategy, EMP / DMP supports strong, and long-lasting customer / supplier relationships.
## Agenda

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2. **2nd topic**  
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4. **4th topic**  
   DMP POWER APPLICATION DISTRIBUTION  
   Page 36

5. **5th topic**  
   SUBSTATIONS RTU/BCU FOR UTILITY  
   Page 50

6. **6th topic**  
   TELECOMMUNICATION FOR UTILITY  
   Page 56

7. **7th topic**  
   REFERENCES  
   Page 62

8. **7th topic**  
   REFERENCES  
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Based on the same technology as EMP

Platform of application software for the management of distribution systems
DMP
Functional Scope overview

• DMP = Same SCADA + DTS as EMP
  + Distribution oriented applications

• SCADA related functions
  • Radial topology
  • Temporary modifications
  • Volt VAr Control
  • Load shedding
  • Sequence switching

• NETWORK analysis and optimization
  • Real-Time & Study Power flow with radial constraints
  • Radial Network Reconfiguration

• Operation Support
  • Trouble Call & Outage Management
  • Work Orders Management

• Automatic generation of schematic one-line displays
DMP
SCADA related functions

• Radial topology
  • Downstream of specified links
  • Feeder identification (recognize upstream / downstream relationships)
  • Feeder coloring
  • Circuit tracing
  • Mesh detection

• Temporary Modification Management
  • Line CUT (special mark on display)
  • Line grounding (special mark on display)
  • Switch bypass (considered closed whatever its actual state)
  • Switch withdrawal (does not affect topology anymore)
DMP
SCADA related functions

• **Volt VAr Control (VVC)**
  - Regulation exercised at the control room
  - Use designated transformers and capacitors in a primary substation
  - First objective is to maintain voltage at a specified node
  - Second objective is to minimize MVAR flow through transformers
  - Target voltage can be made dependent on the load level

• **Load Shedding (Preventive)**
  - Manual tripping of selected feeders
  - Automatic tripping of feeder up to reaching operator specified MW
    - in a user selected group of loads
    - by Priority or Round Robin
  - Multi-Site capability: Overseer or Participant
DMP
SCADA related functions

- Sequence Switching Management
  - TRIP, CLOSE, RAISE, LOWER, and SETPOINT commands
  - Sequence creation by Point & Click
  - Time delay between control issuance
  - Automatic / Step-by-Step Execution
  - Pause on impossibility to implement control
Real-Time & Study Power flow with radial constraints

- State estimator (real-time load flow)
  - Load model provides necessary pseudo-measurements
  - Line flow measurements in a radial subnetwork are used to rescale the loads pseudo-measurements downstream of the measured flow

- Study load flow
  - Full Jacobian Newton-Raphson for robustness even for widely differing $R / X$ ratios
  - In addition to usual load flow data, user can specify line flows for rescaling of downstream loads
Radial network Reconfiguration

- Manually specified normal topology
- Optimal Switching (OSW):
  - Examine switching possibilities in the feeders of designated primary substations so as to improve user specified criteria
  - Criteria: Margin, Voltage, Reliability
- Fault Detection Isolation & Restoration (FDIR):
  - Use information provided by fault detectors or manually entered to locate the fault
  - Identify switches to open to isolate the faulty area
  - Restore the upstream part
  - Identify switching plans to restore load downstream of faulty subtree
DMP
Trouble Call & Outage Management

Customers

Call handling

Problem analysis & dispatch

Phone operators & Analysts

Call

Callback

Billing info
LV connectivity

Task assignment

End of task

Low Voltage Maintenance Crews

T C S

Potential MV Network problems

Investigation results & known outages

C I S

Controls

Data Acquisition

Medium Voltage Network

D M S
DMP Trouble Call & Outage Management

- Electronic Management of Customer Calls & Outages
- Improve Quality of Service and Customer Satisfaction
- Detect and solve network problems as quickly as possible
- Automatically group related calls according to real-time topology
- Consolidate outage information from all sources, including DMS SCADA
- Manage scheduled outages
- Provide general access to current outage situation (Web-enabled)
- Track actual outage duration and repair time
- Statistics and reporting, Indexes on quality of service
DMP
Work Orders Management

- Work Orders
- Operation Manager
- Resource scheduling
- Operations planning department
- Work crews
- Safety personnel
- MV network
- Remote controls
- Tags
- Outages
- Controls
- Status

WORK ORDERS server

Operation Manager

Work crews
Safety personnel

MV network
DMP
Work Orders Management

- Electronic Management of Maintenance, Construction and Emergency Works
- Enforce Safety Rules
- Standardize and accelerate the job life cycle
- Optimize allocation of resources
- Simulate execution of the tasks, analyze network reconfiguration
- Coordinate automatically with the DMS (including FDIR & OSW)
- Allow all people involved to monitor progress of work. Web-enabled
- Track actual work time, duration, assignments
- Statistics and reporting
DMP Advantages (according to a customer)

• Proven combination of DMS and VRS (Voice Response System)

• Automatic generation of operation schematic one-lines

• Good interface with GIS (Geographic Information System)

• Several key applications for operators, such as
  – FDIR (Fault Restoration)
  – TCS (Trouble Call System / Outage Management)
  – WOM (Work Orders management)

• WEB enabled

• Easy to work with

• Proven record of on-time / fast track deliveries
**e-terra rtu600**: > 25 types of cards

<table>
<thead>
<tr>
<th>P/S</th>
<th>DI (1 s)</th>
<th>DO (1 s)</th>
<th>AI (1 s)</th>
<th>AO (1 s)</th>
<th>ACI (1 s)</th>
<th>ACV (1 s)</th>
<th>ACC (1 s)</th>
<th>ACPM (1 s) Power Meter (3 s)</th>
<th>COM (1 s)</th>
<th>Charger (2 s)</th>
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<tr>
<td>19-60 VDC</td>
<td>(8) DI 24-48V</td>
<td>(4) DOH + 1 select</td>
<td>(4) +/- 1 mA</td>
<td>(4) +/- 1 mA</td>
<td>(4) 1A CT + FCD</td>
<td>(4) 7V VT</td>
<td>(8) Pulse Count Accu.</td>
<td>(3) 1A CT + 3 VT</td>
<td>(4) 1A CT + 4 VT</td>
<td>GPRS</td>
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<td>85-265 VAC/DC</td>
<td>(8) DI 125V</td>
<td>(5) DOH</td>
<td>(4) 4-20 mA</td>
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<td>(8) DO</td>
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Cards front panels examples
Pole mounted: cubicle integration example
Installation at TPC. From HV substation to pole mounted

GIS 160KV/60KV

32KV /11KV

One base rack per feeder integrated with protection
Installation at TPC. From HV substation to pole mounted

Aerial 11KV
Pole mounted Switch & RTU
GPRS

Underground 11KV
RMU (4Ways Switch & CB)
Optical fiber (ring)
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</table>
EAI Telecom Product Range

- LINE TRAP
- COUPLING CAPACITOR
- Protection MICOM
- Teleprotection TA 314
- Terminating set Alspa TS 313
- Alspa PLC 1790 Power Line Carrier
- Line Matching unit
- H.V. TRANSPORT NETWORK
- P.C.
- FAX
- SCADA RTU

- EAI Telecom Product Range
- Alspa PLC 1790
- COUPLING CAPACITOR
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- Terminating set Alspa TS 313
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EAI Telecom Product Range

Digital Teleprotection
DIP 5000

H.V. TRANSPORT NETWORK

MUX

Optical link

Management system
SPV 5000

Electrical link

OCM 5000

Services

Control command or SCADA
<table>
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<tr>
<th>Product Name</th>
<th>Availability</th>
<th>Features</th>
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<td>PLC1790, Analogue PLC</td>
<td>Available</td>
<td>• up to 80W</td>
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<td>• up to 4 RS232 Interfaces</td>
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<td>• Data V11 Interface 64Kbps</td>
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<td></td>
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<td>• 1 LAN Port, SNMP management</td>
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<td></td>
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<td>• up to 5 speech channels</td>
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<tr>
<td></td>
<td></td>
<td>• Teleprotection (up to 4 commands)</td>
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<tr>
<td>PLC5000, New digital PLC</td>
<td>March 2004</td>
<td>• up to 40W</td>
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<tr>
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<td></td>
<td>• up to 2 speech channels</td>
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<td></td>
<td>• 4 wire data interface</td>
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<tr>
<td></td>
<td></td>
<td>• Integrated modem</td>
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<td>TA 314, Analogue teleprotection</td>
<td>Available</td>
<td>• Up to 4 commands</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 4 wire analogue interface</td>
</tr>
<tr>
<td>DIP5000, Universal teleprotection</td>
<td>Available</td>
<td>• Up to 8 commands</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Optical (1310,1550) interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• V11, G703 electrical interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Analogue interface (March 2004)</td>
</tr>
<tr>
<td>OCM5000, Optical &lt;-&gt; electrical</td>
<td>Available</td>
<td>• 1 V11 or V24 interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 1 optical interface</td>
</tr>
<tr>
<td>LMU5000, Line Matching Unit</td>
<td>Available</td>
<td>• Universal line matching unit</td>
</tr>
</tbody>
</table>
Energy Automation & Information
We take full responsibility in Turn-Key Projects

Control Center
- SCADA
- EMS
- DMS
- MMS

Information Technology, Communications Tools
- UPS
- Control Rooms
- Civil Works

Telecommunications Network
- Fiber Optic
- Digital Microwaves
- Pilot Cable
- Power Line Carrier
- Teleprotections
- Telephone Network
- Telecoms Management System

Substations, Power Stations
- RTUs DCS
- Process Interface
- 48V DC

Design
- Engineering
- Hardware
- Software
- Installation
- Commissioning
- Training
- Maintenance
- Product update
| Agenda |
|------------------|-----------|
| 1st topic        | ALSTOM - GRID |
| 2nd topic        | AUTOMATION CONTROL SYSTEM PRODUCT |
| 3rd topic        | EMP POWER APPLICATION TRANSMISSION |
| 4th topic        | DMP POWER APPLICATION DISTRIBUTION |
| 5th topic        | SUBSTATIONS RTU/BCU FOR UTILITY |
| 6th topic        | TELECOMMUNICATION FOR UTILITY |
| 7th topic        | REFERENCES |
| 8th topic        | SOLUTION PROPOSED |
25% Market Share

SCADA / EMS Systems
- 48% of the top 40 Investor Owned Utilities
- 20% of the top 176 control areas
- Over 40% of all US generation

RTO / ISO / Transco
- 7 out of 10

Gencos
- 12 systems
A fast growing installed base of e-terra platform customers
## EAI - Other Recent References

### Africa / Middle East
- Sharjah - NCC - EMS
- Kuwait - Jahra DCC - DMS
- Libya - NCC & Tripoli - EMS
- Syria - NCC - EMS
- Bahrain - EMS / DMS / WMS
- Ivory Coast - CIE – EMS / DMS
- Mali Manantali East - EMS
- Mauritius NCC - SCADA
- Algeria – BCC Oran - DMS
- IRAN – Teheran - TREC - EMS

### South America
- Brazil - ONS - 3 EMS
- Peru - ETECEN - EMS
- Brazil - Electrometropolitana - EMS

### Asia
- India North - 33 Centers - EMS
- India North East - 9 Centers - EMS
- India East - 16 Centers - EMS
- Indonesia - U. Pandang – EMS / DMS
- Thailand - MEA - EMS
- Vietnam PC3 - EMS
- Philippines - MMS

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A fast growing installed base of e-terraplatform customers
BEKASI POWER
Advantages New Control Centre Architecture

» NEW SYSTEM OFFERED
CTRL CENTER – e-terracontrol

- Redundant SCADA Server & Networking
- Integrated System / HMI for S/S & Branch
- CIM/XML Standar SCADA Database
- Enhanced Application & HMI *)
- SCADA standard protocol comm. SW **)
- Vector based graphical ***)

⇒ SAIDI / SAIFI could be implemented, because the system is integrated.

Telecommunication

- Telecom. Optic
- Telecom. Radio 400 MHz

⇒ Good and sufficient for next develop’t
⇒ Continues acquisition real time data

Substation (Gardu Induk)

- With RTU Concentrator
- Added Supervisory Interface
- Access Protec’n Digital through RTU
- Added Limit Access (Local/Remote) sw.

⇒ Having more I/O for the extension i.e. Aux
⇒ Safety for check oper. & maint. on interface
⇒ Operation Check & Maintenance on RTU
⇒ Standard Safety for SCADA oper. & maint.

“The system is follow to PLN Pola SCADA to reach the standard operation performance (KPI)”
BEKASI POWER
Other Advantages New Control Centre Architecture

- **Strong Point of e-terracontrol Architecture System**
  - Flexible architecture with human friendly configurator “Process Starter” for docking / undocking the application required
  - Flexible WEB base User Interface Application & Automatic Tabular Data, will rich the displays
  - Have many standard modules for Interfacing to Field Devices & External System
  - Have user friendly CIM standard SCADA DB and Display Builder based on multi layer graphic
  - Providing the interface point entry for the self development program
  - Builder simulator
  - Comprehensive on-line help for the users

- **Default SCADA User Interface Application**
  - Persistent analog, status, and accumulator measurements
  - Scaling and dead banding
  - Limit checking and data quality
  - Multiple step control analogue and digital
  - Alarm and event processing
  - Trending of historical information
  - Monitoring of SCADA internal peripheral status
BEKASI POWER
Other Advantages: Process Starter
BEKASI POWER
Other Advantages: User Interface & Applications
BEKASI POWER
BEKASI POWER
Other Advantages: SCADA DB & GRAPHICAL BUILDER
BEKASI POWER
Other Advantages: Customer’s self application integration

Diagrams

Most of the diagrams presented in this document follow the Unified Modeling Language (UML) notation. The main conventions for static diagrams are:

- A class A.
- An instance of the class A.

Generalization: The class A inherits from class B.

Composition: An instance of A has a collection of references to instances of B.

Aggregation: An instance of A has a reference to an instance of B.

Association: An instance of A has a relationship to an instance of B.

Realization: Class A realizes the two interface classes 11 and 12 (two synonymous interfaces).

The small arrow (>) at the end of a relation means that the targeted object is visible to the other object.

This document also uses other intuitive diagrams defined by UML that are not described in this section.
BEKASI POWER
Other Advantages: Simulator Builder
BEKASI POWER
Other Advantages: On Line - Help
BEKASI POWER
Other Advantages: Measurement History & Event Viewer
BEKASI POWER
Other Advantages: Trending Recorder
**BEKASI POWER**

Other Advantages: Internal SCADA Peripheral Status

|-----------------------|----------------------|

<table>
<thead>
<tr>
<th>Total</th>
<th>1072</th>
<th>1236</th>
<th>59</th>
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<tbody>
<tr>
<td>Changed from ISD</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Changed from a Device</td>
<td>3188</td>
<td>39</td>
<td>0</td>
</tr>
<tr>
<td>Changed from Remote Scada</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Changed by a Calculation</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Changed Total</td>
<td>3188</td>
<td>39</td>
<td>0</td>
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<table>
<thead>
<tr>
<th>Measurements Total</th>
<th>2367</th>
<th>Active Alarms</th>
<th>291</th>
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<tbody>
<tr>
<td>Measurements Max</td>
<td>50000</td>
<td>Active Events</td>
<td>770</td>
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<table>
<thead>
<tr>
<th>Clients</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clients Max</td>
<td>200</td>
</tr>
</tbody>
</table>

**Performance Counters**
- `ScadaSocket\1034\Bytes Sent = 5162`
- `ScadaSocket\1034\Bytes Received = 41618`
- `ScadaSocket\1035\Bytes Sent = 72163`
- `ScadaSocket\1035\Bytes Received = 2362`
BEKASI POWER
Other Advantages: Remote Maintenance Equipment

- **Telecommunication – Radio Data 400 MHz**
  - To have the continues acquisition of real time data

- **Substation (Gardu Induk) – RTU MiCOM C264 & MDF system**
  - To improve the safety for operation and maintenance
  - Following to the standard Pola SCADA PLN, get more detail information from site
  - Remote diagnosis & maintenance to decrease the downtime during maintenance
SCOPE OF WORK

Control Center
- SCADA Master Station with the redundant server and network
- Two console HMI and Master Station environment

Telecommunication System
- Routing Data Path of FO & Radio Communication
- Monitoring of Telecommunication Equipment

Main Substation / Switching Substation and Pole Mounted
- Advanced Remote Equipment with remote maintenance facility
- Interfacing method on Substation using the RTU as pola SCADA PLN and Supervisory Interface as well
BEKASI POWER
Control Centre Architecture

New Architecture Plan

Objectives:
» Safety operation
» Flexible to follow Pola SCADA design
» Open system for common use IED comm.
» Continues real time data

Objectives:
» Extendable to DMS system
» Open system with various choices of protocol comm.
» Complete with historical system
» Continues real time data
» Larger data sizing
» Single system for overall distribution network

RTU MiCOM C264 + Radio Modem
Objectives:
» Safety operation
» Flexible to follow Pola SCADA design
» Open system for common use IED comm.
» Continues real time data

SCADA AREVA
E-terracontrol
Objectives:
» Extendable to DMS system
» Open system with various choices of protocol comm.
» Complete with historical system
» Continues real time data
» Larger data sizing
» Single system for overall distribution network

1. IEC 104
2. WAN
3. Hardwired I/O
4. Modbus RTU / DNP 3.0
5. RTU MiCOM C264 + Radio Modem
BEKASI POWER
Control Centre Architecture

New Architecture Plan

- RTU MiCOM C264 + Radio Modem
  - Objectives:
    » Safety operation
    » Flexible to follow Pola SCADA design
    » open system for common use IED comm.
    » continues real time data

- SCADA AREVA
  - E-terracontrol
  - Objectives:
    » extendable to DMS system
    » open system w/ various choices of protocol comm.
    » complete w/ historical system
    » continues real time data
    » larger data sizing
    » single system for overall distribution network

- Hardwired I/O
- WAN
- Automation Network
- GRID
THANK YOU

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