KES

Kajganic Energy Systems

Monitoring System

Software Development and Engineering the Future

November 2015

KES - Objective, products and services

○ We help companies to improve the network operation and data management by implementing high technological solutions

- ◆ Single-user SCADA

- ◆ Main applications for EMS/DMS
  (state estimation, optimal feeder reconfiguration, loss minimization, OPF, etc.)

- ◆ Expert advice
  (Technical and economical network assessment, network modelling, data cleaning and collecting, operator training)

○ Main features of KES products

- ◆ Applications are independent from operating system (Windows, Linux, Unix, etc.)

- ◆ Supports wide possibilities of databases (Firebird, Oracle, SQL, MySQL, etc.)

- ◆ Applications are modular and scalable according to the economic budget
  (improvements of existing applications and addition to new ones easy to implement)

- ◆ All applications supports open source as well as commercial solvers
  - • Third part software can be license free (no hidden costs)

→ Low implementation cost that are also compatible with existing equipment and data

SCADA System

○ Single-user SCADA for substation use incorporating latest technology

Main features
○ Supports main communication protocols including the latest one (IEC 61850)
○ Independent from operating system
○ Supports wide ranges of database (Firebird, Oracle, SQL, MySQL, Postgres, etc.)
   ◆ Flexible choice depending on specific requirements
○ Interface to real-time database → easy incorporation of external applications

Applications and advantages
○ Primary SCADA: Online-system supervision and control
○ Secondary SCADA: Online-system for supervision working parallel with primary SCADA
○ Tertiary SCADA: System for historical data and report development

→ Automation of information intake, reducing personnel burden
→ Possibility of retrieving much more information enabling historical trends and reports
→ First step to achieve a distributed architecture, which enables to take autonomous and independent decisions without involving the main SCADA (Smart Grid)
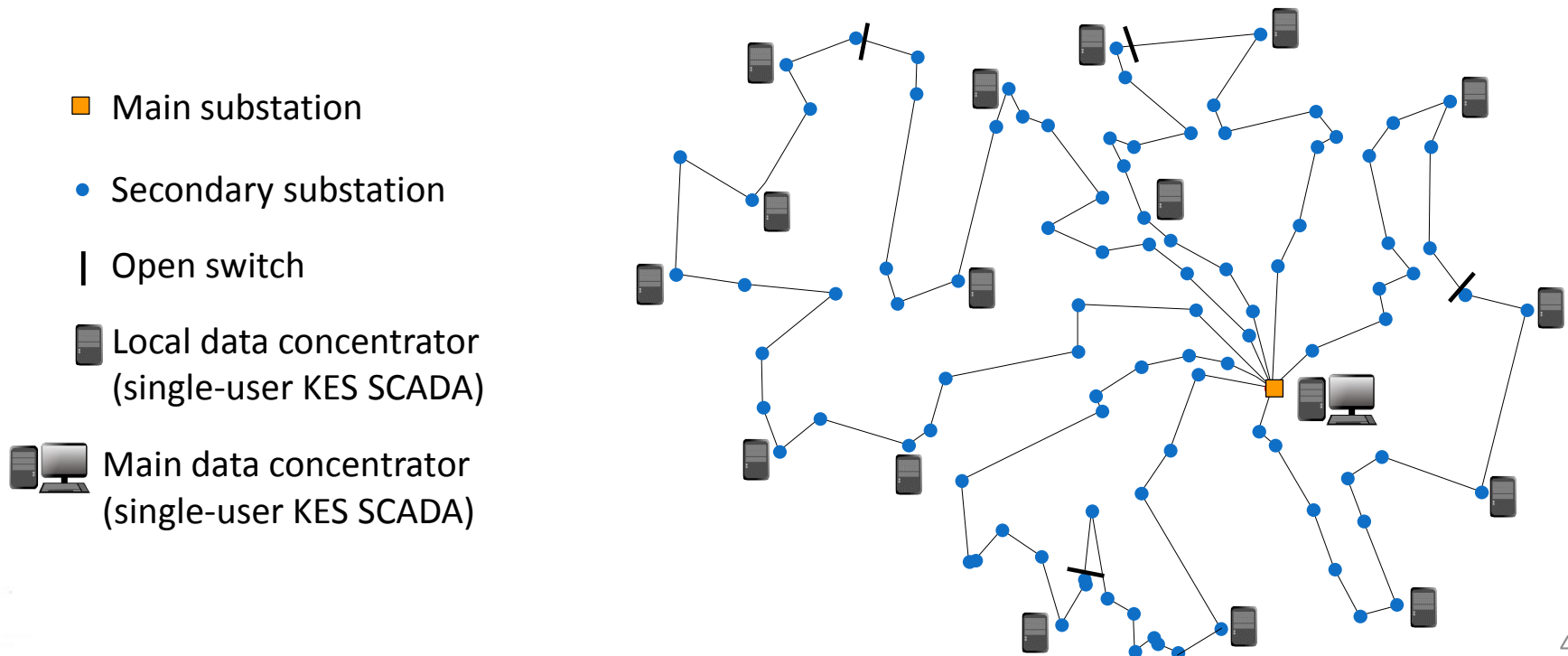
SCADA Application: Monitoring System for Protections (1/2)

- Centralized monitoring of the protections (at the Control Center level) enables to
  - Check the status and relevant signals of the protections without having to go to the substation
  - Change parameters of the protections remotely (if desired)
  - → Better use of personnel resources
  - Get oscillographic data of the protections immediately after a disturbance
  - → Faster reaction in case of a disturbance

- Most distribution companies and large industries face the problem of having different protections from different manufacturers
- → Single system for the protection monitoring requires vendor independent software

- KES-SCADA enables to monitor protections from different manufacturers and models
- → No need to change the protections to achieve a centralized monitoring system, which enables to save costs of infrastructure

- Requirements:
  - Communication protocols must be available and implementation must be done according to the guidelines in order to replicate them
  - Remote access to the protections must be available (free output)

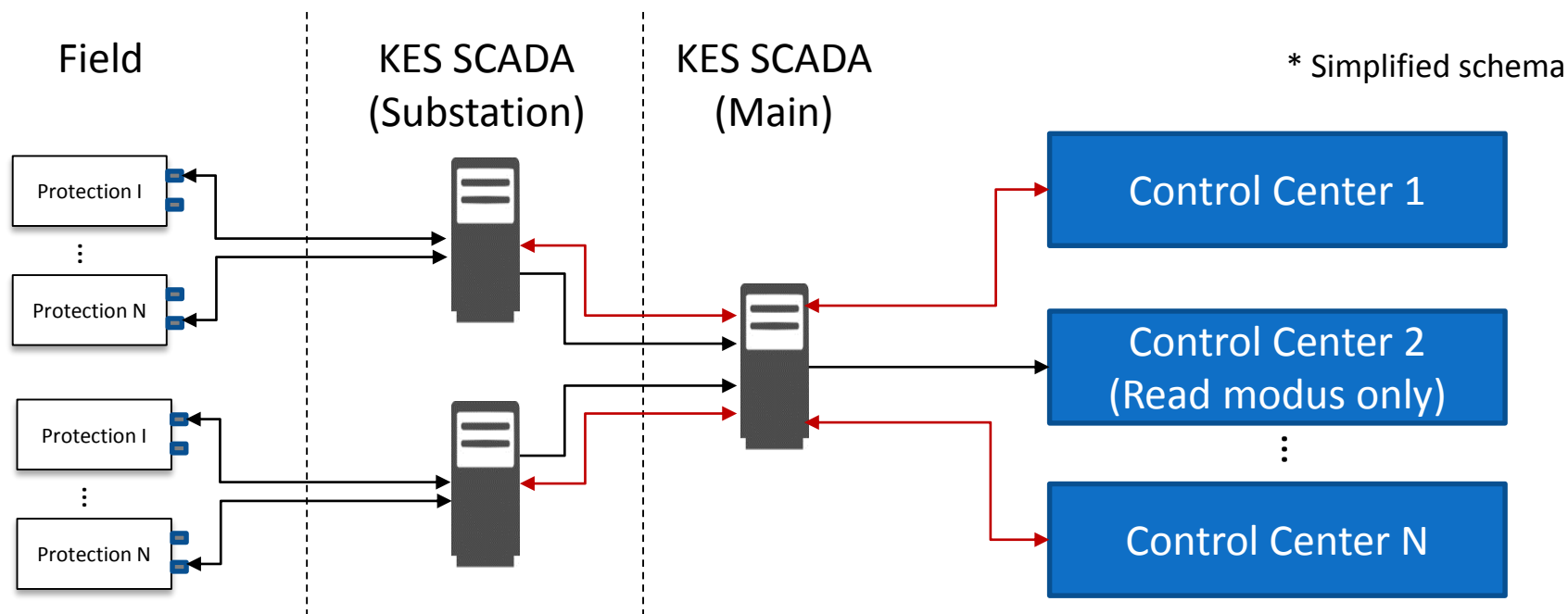# SCADA Application: Monitoring System for protections (2/2)

Proposal

○ KES SCADA at substation level: Protection interrogation, local data storage and data transfer to main Data Concentrator (KES SCADA)

○ Main Data Concentrator: Data reception from local SCADA (via TCP/IP), format conversion according to requirements and data transfer to web portal from CDEC

○ Advantage: Single monitoring system for all protections

■ Main substation

● Secondary substation

| Open switch

▯ Local data concentrator
(single-user KES SCADA)

▯🖥 Main data concentrator
(single-user KES SCADA)

Remote Access to the protections: Implementing options

○ KES SCADA has a "protocol translator", which enables a fast and modular incorporation of new protections, provided availability of communication protocols

Field   KES SCADA (Substation)   KES SCADA (Main)   * Simplified schema

Protection I
⋮
Protection N

Protection I
⋮
Protection N

Control Center 1

Control Center 2 (Read modus only)
⋮
Control Center N

○ Interrogation of protections through KES SCADA
○ Only allowed users may change certain parameters of the protections (otherwise read modus only)
○ Event data are always stored in KES SCADA, in case that protection storage is not sufficient to keep data for 60 days (depending on number of events)

Project development- Remote access to protections

1. Feasibility Study in coordinated company (2 - 4 weeks, 1 week at facilities)

- Objectives
  - Data gathering (infrastructure of electrical network and communication system)
  - Communication test with protections
  - Client requirements and concrete definition for implementation
- Results: Concrete proposal for the implementation
  - Substations to be monitored and implementation (location and placement, hardware, database, protections to be monitored, communication system, etc.)
  - Main data collector (location and placement, hardware, database, communication link with local data collectors)
  - Data management and information transfer to web portal (communication protocol and system, data structure, etc.)

2. Project implementation (2 to 6 months depending on the scope)

- Implementation of main data collector and data collectors at the substations
- Implementation of Data Transfer Format to the Data Collectors
- Implementation of interface for accessing the protections remotely

Phasor Measurement Module

- Major challenge in the incorporation of a Wide Area Monitoring System (WAMS) lies in having applications able to use the data coming from the PMU's

- Benefits
    - Improved real-time awareness, incl. neighboring systems
    - Improved out-of-step tripping and blocking
    - Separate the system on most-balanced way
    - Assist operator during manual reclosing of tie lines

Main characteristics of KES Software (SCADA and EMS/DMS Applications)

- Modern software, written in C++ and platform independent
- Applications are modular and scalable according to the economic budget
- All applications supports open source as well as commercial solvers
    - Third part software can be license free (no hidden costs)
- Interface to Real Time Database available, which allows the incorporation of external applications

Phasor Measurement Module

Main characteristics of KES Software (SCADA and EMS/DMS Applications)

- High performance State Estimator based on latest research on the field
  - Use of different probabilities, based on the modelled variable
  - Correlation between renewable energy resources included
  - Use of phasor measurements coming from the PMU's
  - Much better accuracy in input data and better observability
  - Tolerance for input data as well as for network parameters
  - Better convergence and module for bad data detection included
  - Each measurement (also the current) is part of the solution vector
  - Single model of each injection possible (not aggregated model)

Thank you for your attention

Contact us

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