

MTAT.03.229 – Enterprise System Integration

Architecture and Proof-of-Concept Implementation of Ruritania's Electricity Market Data Exchange Platform

Teams: 3 or 4 members

Worth: 40 points

Deadline: 19 December 2011 (see other deadlines below)

Background: Ruritania's Electricity Market

Ruritania is a constitutional monarchy located in Europe, with a population of 4 million inhabitants and an area of 112088 sq. km. Ruritania is an associated state of the European Union, but not a member state.

Until now, Ruritania's electricity has been provided by a state-owned monopoly, namely Ruritania Energia. Electricity is produced mainly by two coal-fired power stations. Five small wind parks have been constructed in recent years and ten more are planned for the next 5 years. Ruritania also imports about 20% of its electricity from neighbouring countries.

Ruritania's government has a plan to liberalize its electricity market by 2015. To this end, Ruritania Energia will be split into two separate companies: Ruritania Energia, which will become a pure electricity supplier and Ruritania Reto, which will be an electricity transmission network owner. Initially, these two companies will be the only players in the market, but other electricity suppliers and electricity network owners should emerge once the market is liberalized. Additionally, a newly created government agency, namely Ruritania Krado, will be responsible for managing the entire electricity grid of Ruritania (e.g. to ensure a balance between electricity production and consumption) and to manage Ruritania's electricity market. Multiple electricity suppliers and network owners will provide their services to electricity customers in this market.

Ruritania's government intends to use the Swedish Electricity Market as a model for their new liberalized electricity market. In this context, Ruritania Krado will be the entity equivalent to Svenska Kraftnät. One key difference with respect to Svenska Kraftnät is that Ruritania Krado will also play the role that "balance providers" play in the Swedish Electricity Market. This arrangement will be temporary and it is planned that by 2020, balance providers will be separate private entities.

Trial Project for Ruritania's Electricity Market Data Exchange Platform

As part of an ongoing feasibility study, Ruritania Krado has launched two trial projects in which several IT service provisioning companies have been invited to set up a "mockup" version of a data exchange platform for operating the electricity market. There are two separate trial projects will run in parallel and are expected to produce independent solutions. Each trial project involves 6 companies: two companies playing the role of electricity suppliers, two companies playing the role of network owners, and two companies playing the role of Ruritania Krado. Thus, 12 companies are involved in total across both trial projects. Each company is represented by a team of 3-4 analysts and developers who will design and provide a proof-of-concept implementation of a data exchange platform to support the main business processes of the envisaged electricity market. The trial

projects will focus on the process “Acceptance of electricity supply (change of electricity supplier)” described in Section 3.1 of the [Swedish Electricity Handbook](#).

Ruritania Krado has set the following high-level non-functional requirements for the envisaged Electricity Market Data Exchange Platform (EMDEP)

NFR1. EMDEP should support the objective of lowering the entry barriers for competitors.

Therefore, it should be as easy as possible for new actors (electricity suppliers, network owners and balance providers) to connect their internal systems into EMDEP. In particular, the platform should be based on standards supported by both commercial and open-source products, so as to provide ample choice of technologies to new entrants. All interfaces should be appropriately documented.

NFR2. EMDEP should be scalable, to the extent that it can support an electricity market with 4 million users, and dozens of electricity suppliers, network owners and balance providers.

NFR3. EMDEP should protect the integrity and confidentiality of the data exchanged by the market participants and the privacy of electricity users.

NFR4. EMDEP should allow partners to exchange messages quickly and reliably.

NFR5. EMDEP should be decentralized (no central message broker).

The functional requirements shall be extracted from the Swedish Electricity Market Handbook (see link above).

It should be kept in mind that the aim of the trial projects is to provide an initial architectural blueprint for EMDEP, and not to provide a mature implementation. It is expected that a second project will be started in 2012 with the aim of realizing a first full-scale implementation in multiple iterations. In particular, the contents of messages exchanged in this proof-of-concept implementation are not considered to be important. Also, in the case of front-end applications, teams may adopt a very minimalistic UI design, since the UIs are not part of EMDEP. The technology used to implement UIs is irrelevant in these trial projects.

Krado has assigned 160 man-hours to each team in the trial projects.

Teams

For practical purposes, teams will be named as follows:

- T1ES1, T1ES2 are the teams playing the role of electricity suppliers in trial project 1.
- T1NO1, T1NO2 are the teams playing the role of network owners in trial project 1.
- T1RK1, T1RK2 are the teams playing the role of Ruritania Krado in trial project 1.
- T2ES1, T1ES2 are the teams playing the role of electricity suppliers in trial project 2.
- T2NO1, T1NO2 are the teams playing the role of network owners in trial project 2.
- T2RK1, T1RK2 are the teams playing the role of Ruritania Krado in trial project 2.

The prototypes produced in Trial Project 1 only need to interact with other prototypes produced in Trial Project 1. For example, T1ES1 must interact with T1RK1 and with T1RK2, but T1ES1 it need not interact with T2RK1 nor T2RK2.

What to Submit

Each team is expected to produce a prototype system capable of receiving and sending messages from the perspective of the role taken by the team (electricity provider, network owner or Ruritania Krado). The system documentation should include:

- Description of the interfaces provided by the system, including description of provided operations, order in which these operations should/can be invoked, inputs/outputs of these operations and data-types necessary to describe these input/outputs. Interfaces should be described both in a human-readable manner and in a machine-readable manner when necessary (e.g. descriptions of datatypes should be given in XML Schema). Descriptions of interfaces should also provide links to the endpoints where the system is available. Ruritania Krado requires that the teams expose their interface descriptions in the form of a browsable document (e.g. HTML pages), containing links to the XML schemas or other machine-readable interface descriptions (e.g. WSDL).
- A report providing an overview of the structure of the system, including for example logical layered architecture diagrams, choreography diagrams, collaboration diagrams and/or deployment diagrams. The report can be presented in the form of a browsable document or a “traditional” electronic document (e.g. PDF).

All documentation should be in English

Deadlines

Unless otherwise indicated, all deadlines are at 17:00 Ruritania time (EET).

- 21 November: Teams must be publicly registered using the following [message board](#). Teams should indicate the role their wish to play (T1ES1, T1ES2, etc.) and the composition of the team.
- 28 November: Deadline for submitting the first version of the interface descriptions (covering all operations to be provided). The URL to the interface descriptions should be posted in the message board.
- 12 December at 10:15am: Oral presentation of the system (10 minutes per team).
- 19 December: Deadline for submitting report using the following [site](#). The final system and final version of interface descriptions should also be available by this deadline (at the same URL posted on 28 November).

Terms of Payment

Ruritania Krado will pay each team member in Ruritania points, which is Ruritania’s official currency. A maximum of 30 points will be paid. Normally, all members of a team will get the same payment. However, Ruritania Krado reserves the right to withhold part of the payment to a given team member if, according to the other team members, his/her contribution to the project was marginal.

Collaboration Infrastructure

Each team must keep the code in a version control system (e.g. SVN). Ruritania Krado’s IT team may check your SVN repository when marking the assignment. The SVN repository may be used to verify which teams members contributed to the project, should there be disputes between team members regarding the payment. Teams are also encouraged to use a task tracking system. Teams may use an external repository (e.g. GitHub) or they may request an SVN repository for them. In any case, the source code should be publicly available.