Workplan for Master's Dissertation

Master's Degree in Informatics Engineering

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Abstract

The modern and globalized world became more and more dependent on energies such as electricity, oil or nuclear. The power grids all over the planet became increasingly bigger leading to problems of energy waste and sustentability. The smart grids appeared to address this issues as they introduce ICT and computation to the grid. One of the biggest advantages of smart grids is the ability to remotely read fine-granular measurments from each smart meters, wich enables the grid operators to balance load efficiently and offer adapted time dependent tariffs. With data aggregation from the smart meters it's possible to reduce the energy consuption and change it to be more efficient .
In this work we address the problem of smart metering data aggregation. We propose a distributed data aggregation approach, where all the smart meter sense the comsuption data and some work as aggregators as well. We also focus in observe how the agreggation algortihms work in the smart grid, collecting the results and evaluate wich algorithm suites the best.

1 Introduction

The power electrical grid is a very important infrastructure in the modern world. The energy it provides is consider of main importance and a main condition to guarantee minimum life quality. As important it is and thanks to its large size, the power grid consumes a enourmus ammount of natural resources, make it insustanble in long term. The recent introduction of ICT and computation in the grid is trying to change it to became more sophisticated and eco sustanble. This new concept of grid is called Smart Grid.

Smart Grid is a modern power grid that uses computation, information and communication to, in an automatic way, improve its energy efficiency, sustentability in power distribution and in electrecity production. It enables the grid to become more eco-sustanble as it makes a more efficient management of natural resources. The Smart Grid work as 'Islands of Automation' interconnected with a communication infrastructe[2].

One of the Smart Grid main components are the smart meters. The Smart meters are devices located in the consumers/costumers houses or in industrial

facilities that sense the energy consumption. They read periodically in shorter intervals that range from minutes to millisencond. This ammount of data can be used for performing statistical analyses that lead to effective consumption forecasting and profiling. This fine grained readings will assist users in achieving a more efficient energy use and adapting to the network status and supply by choosing an appropriate and advantgeous tariff [3].

In the next years, the amout of user data collected by the Smart grid is expected to dramatically increase with respect to the current electrical power grid[1].The amount of *Big Data* collected is important because it leads to a great number of comercial advantages an better energy consuption preddictions[5].

2 Objectives

There are two types of Smart Meters network architectures[introduzir citação] namely *distributed* and *centralized*. In a *centralized* architecture, the meters only sense the energy consuption every specific time and send it to a central data aggregator center. In a *distributed* architectute the meters also sense the consumers consuption and they also perform a partial data aggregation themselves, It's called in-network aggregation.

In this work, we will focus on the second type of architecture wich provides more interesting challenges.The propurse of this work is, considering a distributed architecture, evaluate an efficient data aggregation algorithm that provides relevant information to the consumer and the electricity producer. In order to achieve the main goal, it's important to first understand the various possible distributed architectures and the the role of all components. As we saw in [4] there are several sensors that work as aggregation nodes an others that work as simple node. After the awarness of the model that will be study, it is time to study the data aggregation algorithms that we saw in [6] and select the ones that suites the model that will be choosen. When we have both the model and also the algorithms, the next step will be implement them. We are interested in knowing which algorithm provides the best results in time and which one provides the most relevant information. We also choose the one wich provides better scalibility, resilliance and fault tolerance to the network.

In the end, an overall comparison between the algorithms will be presented in order to determine the best one. An also the possibilities that information obtained may provide.

3 Time Scheduling

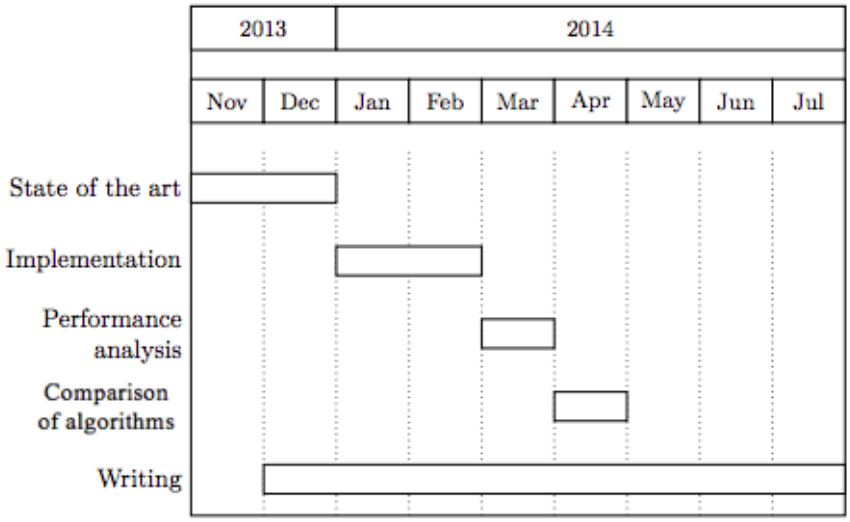

Figure 1: Gantt diagram

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