UTILIZING A SINGLE TRANSITIONAL PLATFORM FOR TRADITIONAL & SMART METERS. OPPORTUNITIES AND CHALLENGES

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ABSTRACT

As early as the year 2006 the European Union defined in a European directive the basic principles to reduce CO_2 emissions. Based on these principles, the German Government laid down the rules for market liberalisation around meter operations and meter measurements, the rollout of intelligent Meters (Smart meters) as well as the transparency of the energy accounts of power and gas [1]. A new role of an "independent Meter Operator" was also defined concomitant with this market liberalisation. This role defined capabilities of service for new market players. The goal of this paper is to describe the requirements to serve the market as a service provider from the viewpoint of umetriq[1], a company which was founded at the end of the year 2008 as meter service provider. Within this paper, potential clients of these services are defined as well as the requirements on the complex IT-Infrastructure and its market interfaces.

INTRODUCTION

The goal of the energy efficiency rule [1] which was decided on 6th of June in 2008 in the Deutsche Bundestag, is to increase transparency to the account holder / bill payer of the energy consumer. The rule applies to both power and gas. In particular, the customer should have near-time access to, and early transparency of, his energy costs during any payment period. As a basic consequence, this means that consumers will have access and the right to billing information produced more frequently than just once per year. (This could be a monthly bill or any bill period shorter than one year.) Further decisions were also made under the legislation for retailers to provide tariffs which are based both time of use and consumed energy. These tariffs have to be available to consumers beginning of 2011. Such rules obviously force the implementation of intelligent meters (smart meters) for private households as well as business customers. Additionally, in new buildings and within large redevelopments it was also legislated that smart meters must be implemented since January 2010. To open the market to full competition, an additional law was put in place which opened the liberalization of meter operations and meter measurement. This means that customers can choose the provider for their installation(s), services and billing – these services are no longer automatically provided by the traditional grid company. Due to this legislation customer choice was enabled, i.e., the customer can make his own decision for a meter service provider who meets his individual needs, and these needs are normally dependent on the level of transparency of consumption required in combination with the cost of energy offered by the provider. For a meter service provider to make such offers and services available to the market a new and complex IT-infrastructure is necessary. This IT-infrastructure has to be implemented to ensure efficient operation and guarantee fulfilment of the data and process requirements of the various market participants - the consumer, the meter operator, the grid company and the supplier. To add one more layer of complexity, liberalization was not only put in place for smart meters. The operation and measurement of legacy analogue meters, which are still predominantly used by the majority of German households, was also included.

1 umetriq Metering Services GmbH www.umetriq.com

SCENARIO & STAKEHOLDER ANALYSIS

With the implementation of an independent meter service provider the key question which must be addressed is: Who are the actual market participants to be served?

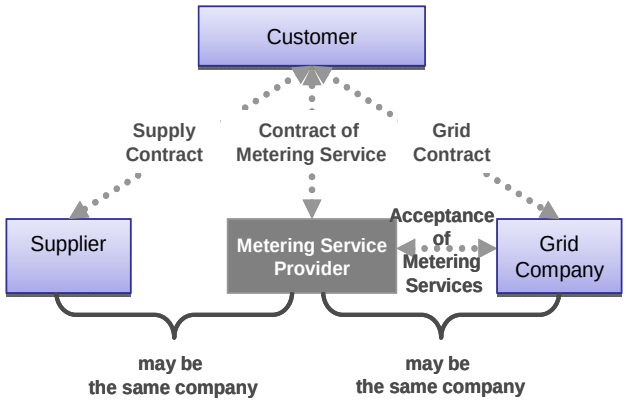

Figure 1. Market rules and contract relations

Looking at figure 1 we see the defined market roles and the contract relations. In principle the customer (access user) has the choice to contract with a meter service provider as well as with a supplier and grid company. In this case the meter service provider has to make direct contracts with every access user, has to provide individual bills and must implement a claim management for every customer. This could lead to extremely high costs to service these requirements. Another key question will be, if individual

householders are actually interested in getting independent services and independent bills from an independent meter service provider? Households will have additional administration to perform if they get another bill besides the well known energy bill. Market roles can also be combined. So any market player (except the customer) can be a meter service provider in addition to its role as supplier or grid company.

However, it is unlikely that in practice individual householders will make contracts directly with an independent meter service provider. Only large business customers, e.g. facilities management companies, actually do this. In addition to these large business consumers, a prime target group of the meter service provider will be the suppliers. The suppliers will offer an integrated contract or contracts, but only one itemised bill to customers will be provided. In cases such as these, umetriq provides the role of meter service provider, and offers these services to the suppliers, with the market role as meter operator and meter Measurement Company fulfilled by the supplier. We find this business model frequently where the supplier is interested in contracts with customers which are based on time of use and capacity. Also, if the supplier wants to provide value-added services to the customer such as more detailed information on energy use, then the supplier will undertake the market role of the meter service provider. In reality, the biggest and most relevant target group for umetriq is the grid company. The grid company get more flexibility if they choose a partner for metering services than if they implement their own service. Due to the complexities in the new market rules and processes, the interfaces between players and the integration costs and IT-skills required, it is more effective to for grid companies to buy these services from an independent services provider.

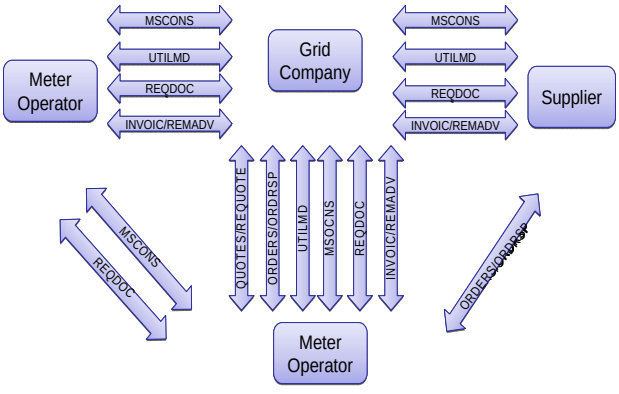

Figure 2. Messages to be processed by market rules

Figure 2 shows the new requirements in the German market which have to be processed by the meter service provider. Meter operators have to generate standard messages for a meter operator change, if they acquire or lose an access point. The grid company has to be part of this communication process and the energy regulator is still carrying out the consulting process [2] to finalize these communication rules. The grid company has the biggest opportunity to be the central point of communication, or data hub, and manage the transmission of every meter measurement to be sent to the different market partners. In addition, if an independent meter service provider goes out of business then the grid company will be the fall back position for meter services provision.

In case of cooperation between a grid company and a meter service provider the service costs can be substantially reduced. In this case the meter service provider, like umetriq will only act as a service provider for the grid company. The grid company will be the contract partner of the end customer. The financial streams between meter service provider and the grid company will be reduced to a collective invoice of all services connected to the served meter points.

SYSTEM DESIGN

First it must be clearly defined which market roles will be supported when looking at the IT-solution of a meter service provider. If you are looking for a model combining an independent meter service provider and a service partner for grid companies, any solution must be able to support the role of "central point of communication" that the grid company is responsible for. The IT-solution must be able to separate the data of different partners (multi-client capability). In this case umetriq will be able to act as independent meter service provider as well as the service partner of a supplier or grid company.
In the following sections, we describe in more detail the component parts of the IT-solution umetriq has put in place to meet these challenges. A modular design which has functionalities implemented across decentral systems, central systems and interfaces.

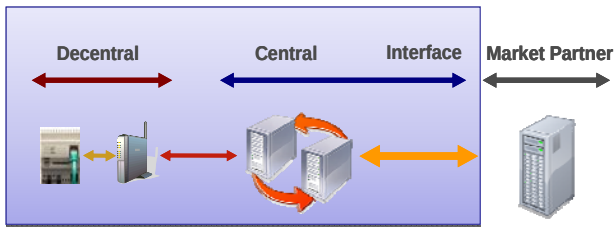

Figure 3. System Design

Decentral Systems

A universal system landscape will be implemented if the components can be standardized. Analogue Ferraris-meter solutions are currently used as the "household standard", but a mandated standard for smart meters would also be helpful because the requirements and functions of these meters are much more complex. Whatever reason for a meter exchange exists, be that re-calibration or for fault swap-out Meter, access to a supply chain of standardised

meter products over a long period of time is required. This standardisation will also allow for meters to be procured from a number of different manufacturers. Only in the case of these standards being in place can it truly be guaranteed that the IT-system will function to purpose after a meter exchange.

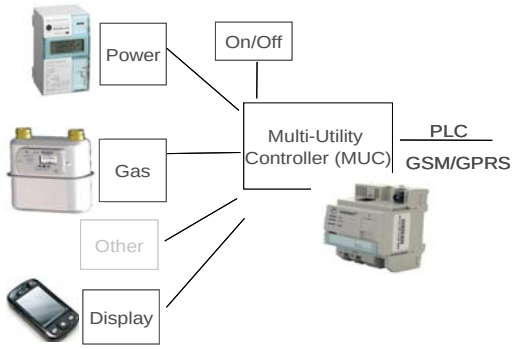

Figure 4. MUC - Multi Utility Communication Concept

To meet this challenge large energy companies, meter service providers and meter manufactures in Germany have therefore defined, (within a workgroup of de VDE (Verbands der Elektrotechnik Elektronik Informationstechnik e.V.)), a specification that standardizes meters and the communication layer. The concept combines every energy sector as a multi-utility solution. The concept was described with the name „MUC Multi-Utility Controller“[2]. Meters of different energy sectors communicate central through the MUC with the central system. The communication is described with a standardized communication language the „Smart Meter Language (SML) “. Today the MUC concept is just known in Germany and this is a restriction for meter manufactures, but as long as the big energy companies of Germany have committed to this concept, then there is a good chance that it will become an established standard.

Central Systems

The central IT-systems are the heart of the IT-solution within the metering service. The main parts will be described in this part of the paper.

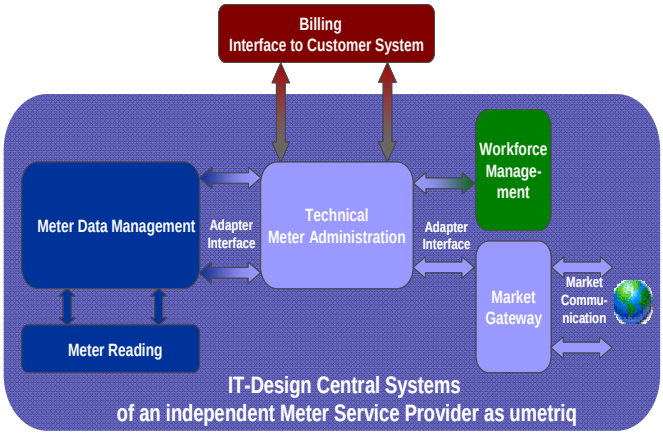

Figure 5. Central Systems

Technical Meter Administration

One of the main components of the IT solution is the so called technical meter administration, which supports analogue components and smart meters. This component administrates all types of meters. As well as all of the central asset data being held within the system, other standard functions such as meter calibration exchange time, or orders will be generated and stored.
Through an interface all necessary data will be delivered to the client of the meter service provider. For meters which are served from the meter service provider it will be just a small amount of data used for “informational purposes” and known as Info Data. Generally suppliers and grid companies use this meter data to bill (supplier and use of grid bill). The most important interface to the client system will be used to deliver the aggregated measured data from the meters. The data aggregation will be defined in the individual contract between the supplier or grid contract and the customer. Because only the aggregate data will be delivered to the billing system the billing system will be released from the mass of raw data. For example after an installation of a smart meter and a contract with a time of use tariff between supplier and customer the tariff information of the meter data reading periods will be sent from the billing system of the supplier to the technical meter administration system of the meter service provider. This information will be sent to the meter data management system which will generate meter readings in the defined time period. Only if the supplier actually produces a bill the aggregated meter data will be sent to the supplier system.

Meter reading

The raw data of smart meters is collected by the meter data reading system (data concentrator and head end system) and sent to the meter data management system for storage. Analogue meters will be read manually and the data uploaded into the meter data management system. Again for the meter data reading system a standardization of meters is highly recommended because for every type of meter a special meter driver software must be implemented. This standardisation will increase costs for this infrastructure.

Meter Data Management

The meter data management system stores all raw meter data. Normally up to 15 minute data intervals will be stored in this system. The granularity of the data is depenendent – as described in the section on technical meter administration - on the contract of the customer. Data will only be held and stored as described in these contractual parameters. This is absolutely necessary to guarantee household information privacy and equates to the principle of data minimization [4]. The meter data systems administrate this contract information and give an order to the meter data reading system depending on this information. All read meter data will be validated by the meter data management system against these defined parameters. If a meter can't be read for a pre-defined time period the meter data management system will generate substitute values. The system then generates a message flag with this fault, which if necessary produces a work order for the technical meter administration team to act upon.

Workforce Management System

To ensure most process efficiencies within installation, troubleshooting and maintenance services, the use of a workforce management system is essential. This is even more crucial when a mass service implementation or mass meter rollout is planned. After the generation of an order with the technical meter administration system the work order will be communicated through the interface to the workforce management system. The system schedules this order with all other orders. Normally the work scheduling to the field service team will be optimised against regional and route parameters. The installation process for smart meters must also include an automated registration of the meter in the communication infrastructure. After the meter is installed in the communication network by the field service team the system must get an "ok message", or handshake as part of the installation process. If this all works fine, then no additional second expensive field service visit is necessary. If the communication can't be confirmed then the workforce management system will get a fault and generate a call to the field service agent at the installation point. The field service engineer can then correct the fault directly. The data of the meter installed is then sent automatically to the technical meter data administration and manual data administration for the field service team is marginal, significantly improving efficiency and saving costs.

Market Gateway

The market communication interface for the rules of the exchange of the meter operator, the communication of the meter readings and basic data changes is implemented in the market gateway. It is recommended to use a separate system for the market gateway which is specifically adapted to the technical meter administration requirements. At the moment, the consultation process for the German market communication rules isn't completed. In addition, we have two exchange times per year for adjustments to the data formats and rules within the exchange processes of the supplier and we expect similar updates for the communication data formats and rules for the meter services. Therefore, if a separate system for the market gateway is implemented these entire exchange requirements can be implemented and tested autonomously without significant impact to the running systems. The market gateway should have a monitoring cockpit for the clerk. With this cockpit the messages will be automatically controlled. Faults will be shown as traffic lights. For example if a change of a meter service provider isn't confirmed by the old meter operator, or rejected, the cockpit will show a fault. Only with all such functionality in place can the expected volume of messages be controlled efficiently. Umetriq has checked within the selection process the individual implementation of the market gateway and a standard solution. The decision made was to choose a standard system because of the anticipated frequency of changes to the market rules and the complexity of the communication environment.

CONCLUSION

With this paper we have tried to show that all of the market players within the energy market must implement major parts of the outlined system solution. Also if the supplier won't serve the role as meter service provider he must implement a system to store the raw data and aggregated meter data to bill time of user tariffs. In particular, grid companies may well incur high costs because of their central role within the communication process if care is not taken. The installation of an efficient IT-solution and attendant processes and services will be critical. The vital components of this IT-solution upstream to the billing system are the meter data management, the technical meter administration system and the market gateway.

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