Grinpal Success Story in Alexandra

Background

Alexandra Township is situated in the North-Eastern outskirts of Johannesburg. Established in 1905 after being acquired from a farmer, it is one of Gauteng's most densely populated townships, with about 3 000 000 residents. Just like many other Black townships during apartheid years, the residents were deprived basic services like housing, electricity, water etc, which were provided to only a few privileged ones and government institutions like the Municipality, schools and clinics etc.

Electrification Project

In 1990 Eskom and the government embarked on the electrification programme in rural areas and Black townships that did not have electricity, and prepaid meters were installed in such areas. Advantages of pre-paid electricity then were (and still are now):

- Consumers can buy electricity before consuming it. This alleviates unpleasant surprises that come with electricity bills after a certain consumption period, and helps consumers to manage their electricity usage.
- The token that is loaded with electricity or number printed on the slip can be used by the specific consumer only, so no one can steal your electricity.
- The problem of meter reading, which has always been debatable, is automatically solved.
- The utility does not have to send out bills every month, and this is a saving on their side.

- The utility does not have to spend so much time as they used to in the past to cut off customers who did not pay their electricity bills.

Non-payment

Due to the culture of non-payment and other problems like crime etc, some residents learnt how to by-pass the prepaid meters and consumed electricity without paying for it. The problem became very big when most of the residents began paying these criminals a fee to have their meter also by-passed, and Municipalities began to suffer financially. What worsened the situation was that the utility did not have a way of establishing immediately when a consumer has by-passed or tamper with the meter in any way. They depended entirely on tip-offs from honest consumers, members of the Community Policing Forum and / or random audits. Unfortunately, not many community members would come out, obviously for fear of their own safety. At the same time, the municipality got under a lot of pressure from the government to collect revenue for basic services, and electricity especially (because electricity is the municipality's cash-cow). The municipality therefore had to look for a more effective way to collect revenue, identify those who stole electricity and punish them and their "clients". Unfortunately, though, as soon as these thieves learnt that the municipality was busy with the audits, they would quickly reverse the by-pass and when the municipality arrived at their places, they would find no by-pass. That is when the Johannesburg Metropolitan Council approached Grinpal, a division of Grintek, to supply them with meters that are more difficult (almost impossible) to tamper with, and which could prove a tamper / bypass even after it was reversed, so that they could bring the transgressors to book.

Pilot Project

This pilot project was launched in 2002, with only a few sections of Alexandra Township installed with these prepaid meters. At the beginning of the project, out of 60 000 households on prepaid, Johannesburg City Power, the Municipality's supplier of electrical services, was collecting only R250 000-00 per month for electricity consumption. Grinpal installed smart meters into clients' households where tampering / bypassing had been established, and in houses that did not have electricity before, 20 000 households in total. The aim of this pilot project was to improve revenue collection, detect tampering and improve customer services. After installation of the meters by Grinpal, payment levels increased gradually. Presently the utility receives R 1.6 million monthly, from those 20 000 households. 48 000 households still need to be electrified, and one can imagine how greatly revenue will improve in Alexandra.

Grinpal's IM001 Split-meters

The IM001, as the Grinpal smart meters are called, are different in that the meter is separated from the ready-board, hence the term "split meter". The installation of the meter is by mounting it onto the street pole outside the house, where only Grinpal employees are permitted to work on the meters. This has deprived would-be criminals the opportunity to learn the system, and the positioning of the meter is so far and high above that one would need a ladder to climb onto the pole and touch / tamper with the meter. However, even if a transgressor were to climb onto the pole and try to tamper, as soon as one opens the kiosk / meter box, a tamper alarm installed in the kiosk sends a signal to the central server at Grinpal's Customer Support Centre (to find out if Grinpal knows about the opening of the kiosk). The operator then can establish from the relevant technician whether they are working on the

meter. If not, then it established that it is a tamper, and proper action is taken against such persons. The technology is such that if a tamper is established, the meter can be switched off remotely, without the need to expose staff to the dangers of being attacked by unruly people who don't want to pay for electricity.

Other features, advantages and benefits of Grinpal's smart metering system are:

- Direct, two-way communication based on Power line communication (PLC),
- Possibility to choose between most all existing communication media (PLC, RF, GSM, GPRS etc),
- The ability to function both as prepaid and conventional meter (AMR), without having to use additional means like cards, tokens, numbers etc,
- Reduced administrative costs,
- The ability to automatically load free electricity units to indigent customers,
- Electricity is loaded onto the customer's meter within seconds of having purchased electricity,
- Multi-tariff operation means energy management initiatives like load shedding / load shifting, time-of-use etc can be exploited to the benefit of both the utility and consumers,
- Low installation, operation and maintenance cost,
- Remote anti-tampering facility enhances the client's revenue collection,
- Bad debt recovery can be speeded up, and
- Retentions of data e.g. previous balance after power outage.

System Application Domains

- Electrical Energy Metering
- Demand Management
- Loss Control
  - Anti-tampering
  - Remote Switching
- Multi-tariff Usage

System Potential Users

- Utilities
- Municipal Services
- Power Services of Enterprises
- Co-operative consumers

Scalability, Flexibility and Openness

The system can be scaled according to the amount of customers/connections, starting from a single server infrastructure handling up to a 1000 connections, growing to an interconnected system with potentially millions of customers, across different areas. The flexibility of the system is such that it can be owned and managed by the client, or managed and maintained for the client by Grinpal, with the client only having to read and act upon reports and information sent to him on a regular, scheduled basis. Multiple communication methods and vending interfaces are available (although GPRS is the preferred method), and the system already accommodates multiple third party vendors, cell phone based vendings, as well as Automated Vending Machines, with future expansion directly to ATM's.

The systems architecture and design allows for fast development to accommodate client's specific needs. The design was done specifically so that new products and technologies can be integrated with ease and without having to remodel the entire system, thereby keeping the system up to date and up to speed with al the latest communication and hardware technologies

Basic Technology

Technology implemented and used in the system are the following:

- o PLCc – Power Line Carrier communication. The "last-mile" communication medium to the customer's premises. Allowing bi-directional communication and active monitoring of all events and data flow.
- o GPRS APN – GPRS is the basic data communication method provided by cell phone service providers, but using a private access point network (APN) to ensure security and stability of the communication network.
- o Microsoft based servers with SQL databases, structured in size, layout and quantity based on the amount of customers and the client's needs.

System Manufacturers

The system and all its components is designed, manufactured and assembled by Grinpal in conjunction with multiple South African based manufacturers. It is a proudly South African product, with all the intellectual property developed in-house by a leading team of hardware, firmware and software developers.

Understanding the unique challenges faced by local electricity service providers and distributors are key to the development of the product; ensuring robustness, reliability, flexibility and scalability. This makes Grinpal's in-house

developed solution far more suitable for South African climate, conditions and infrastructure.

System Evolution

The system has evolved from a complex, technically orientated system to an easy to use, easy to implement and easy to maintain solution. With initial systems based on trunk radio communications, the hunger for more bandwidth to relay information faster and with greater ease pushed the development towards a GPRS based infrastructure.

Along with this migration came the need to process more data, make information more easily and quickly available, and being able to display and interact from a common platform. These factors necessitated the move to web-based client interaction, easy to use and maintain client privileges and a lot more factors that were built into the latest top-end software platform. This top end, currently in its final testing stages, allows users access to online, task specific help in a language platform of their choice. Any new language can be added and can be incorporated seamlessly into the system once the necessary translation has been done, allowing scalability and flexibility for any customer. The basic language used in the system is English.

The system is continuously being evolved with future development aimed to provide graphic overviews and one-click interaction with the system in a large Network Operations Centre (NOC) environment, providing a live, real-time overview of the status of the system, from the "big picture" overview right down to what is happening at the customer's premises where the meter is installed!