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1 Introduction

This paper will discuss some issues encountered with time of use metering and more notably the world wide phenomenon of the convergence of Information Technology (IT) and metering equipment.
We will conclude that higher data speeds are possible than what is currently used in Time of Use (TOU) meters and by implementing this, one can get maximum use of the meter and new possibilities are opened.
I will first of all discuss some of the current and potential uses of TOU meters. The current data speeds will then be discussed and then we will look at the potential benefits of using a very high data transfer rate.

2 Time of Use Meters Current and Some Future Possibilities

2.1 Current Applications

TOU meters are mostly used to perform more or less complex Billing and Load Profile functions. The company which I represent also has a Quality of Supply feature built in to the NRS 048(A) specifications.
It is still quite normal to send a meter reader to these meters armed with a paper note book. Reading Billing information is kind of feasible provided the number of registers is not too big. Reading Load Profile information implies the use of a Hand Held Unit or a laptop computer. The risks and complexities of using these can be considerable.
More and more companies and utilities resort to Automatic Meter Reading (AMR). In this respect, I note Drakenstein Municipality who is busy upgrading their meters to Cellular enabled meters and Vaal Reefs Goldmine who has taken this step already successfully.
Slow data speed however implies a relatively higher cost in reading these meters as well as the potential risk of data corruption over the transmission medium due to the long transmission times required.

2.2 Some Future Possibilities of TOU meter functions

Given the state-of-the-art of the current micro-processors, Digital Signal Processor chips and the emergence of low cost bulk memory, we can anticipate more uses for the TOU meter.
As the meter is connected to the relevant Voltage and Current Transformers any way, we can contemplate the following uses of the meter:

- Remote monitoring of instantaneous voltages, currents, frequency, apparent power, real power, reactive power, power factor
- The full spectrum of Quality of Supply information, inclusive of harmonics and flicker statistics
- Energy Management features
- Network analysis
- Statistical metering
- Measurement of power outages and reconnection times
- The meter as a transducer using pulse outputs, mA loops and RS 232 and RS 485 serial links
- Control via the meter of over or under voltage, over or under current etc for reporting purposes or to be fed into a PLC via an Ethernet link

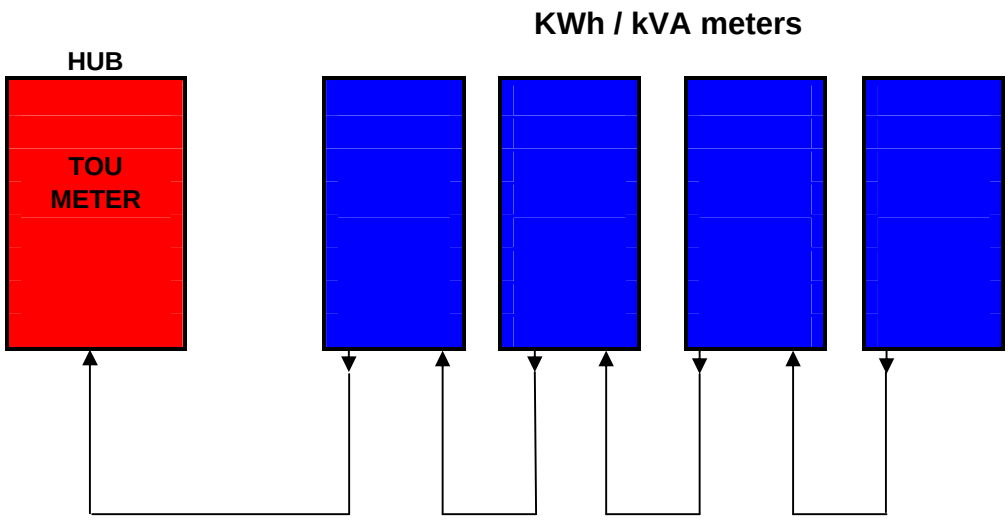
The above propositions each operate in a different time domain. For example, Energy Management typically requires a 1-3 minute response whereas the instantaneous voltages etc are required on a second or sub-second refresh time. Profile data may be required on a shift or daily time span. Billing is only needed on a monthly basis!

These various uses are entirely feasible in a meter PROVIDED one can access, deploy and utilize this information in a timeous manner

2.3 The meter as a "Hub" concept

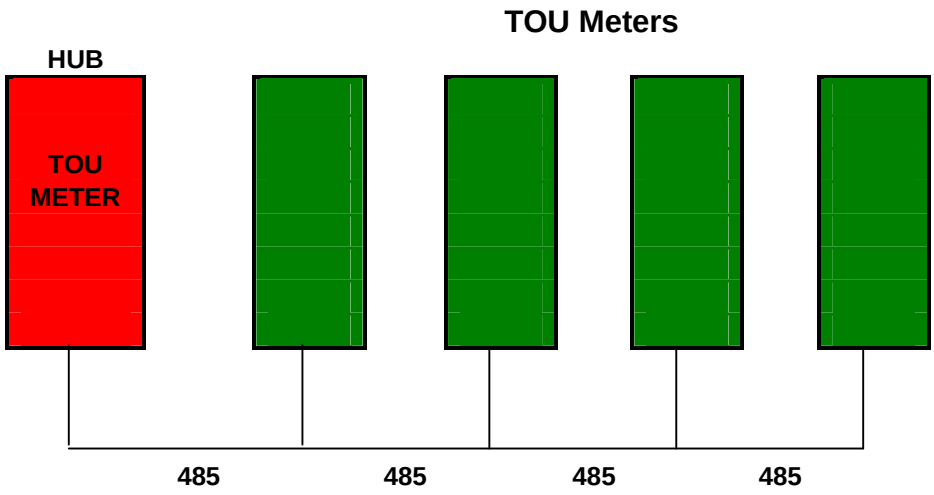
So far, we have been looking at the TOU meter as a stand alone unit. In many cases, notably in industrial settings, we can see many meters in close proximity. This opens up the concept of a metering "hub"
Some examples will clarify this:

SLIDE 1



Simple meters pulsing to "HUB"

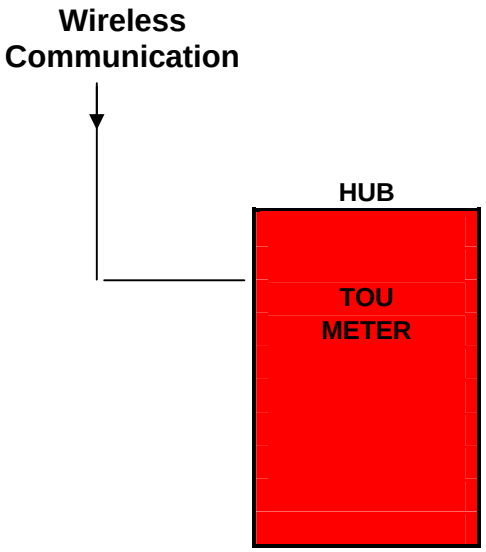
SLIDE 2



RS485 Meters connected to "HUB"

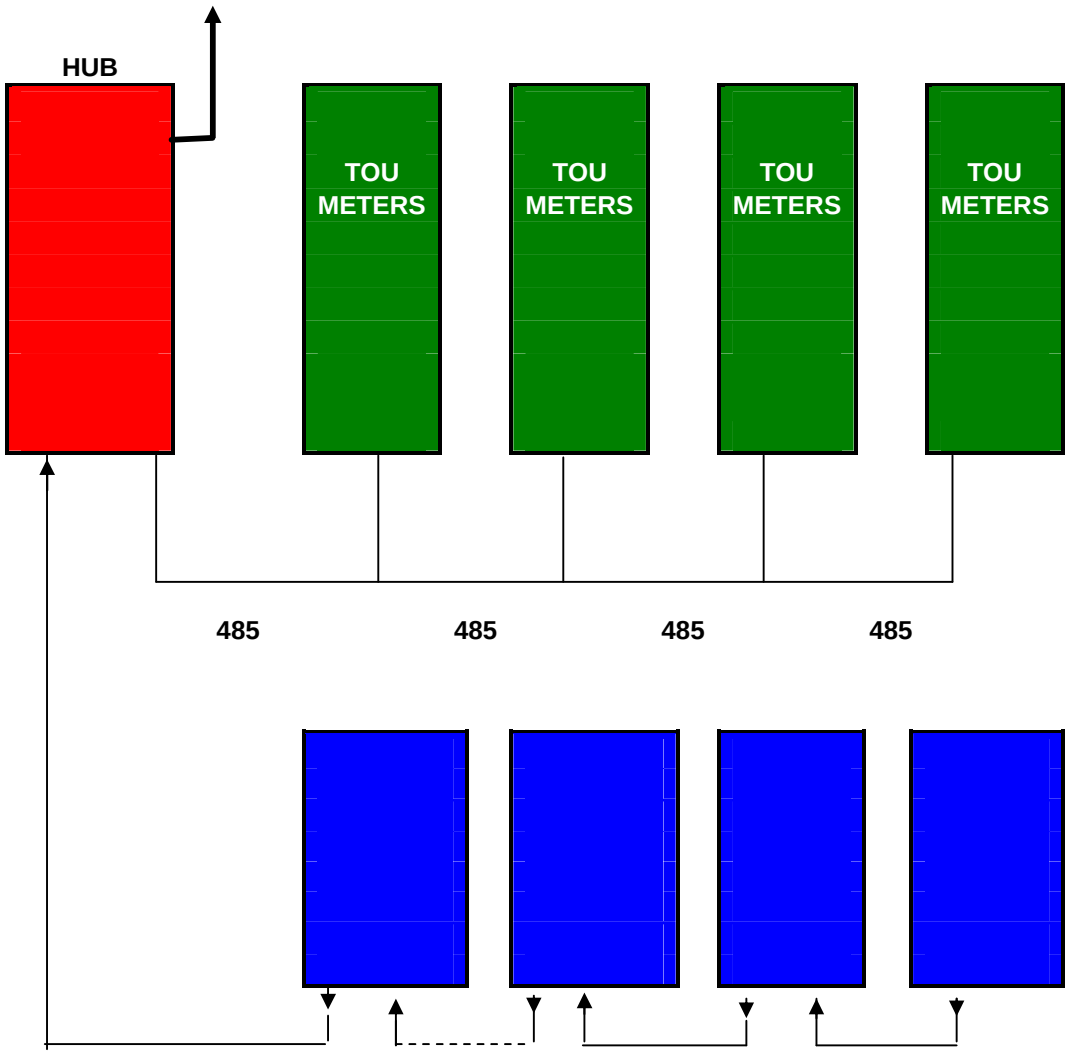
RS 485 meters connected to the “hub”

SLIDE 3



"HUB with wireless communication

SLIDE 4



Super "HUB"

Simple and low cost meters pulsing to the “hub”

2.4 Implications

All these various meter combinations and permutations, combined with all the data as discussed above and noting that data may need to be combined from the various meters such as the synchronous peaks and synchronous profiles including combined currents and Energy Management parameters, poses a huge data transfer requirement.

The current specification for the IEC 62056-21 draft states under 5.2 (p. 33) states:
“Initial baud rate -300 (only required for the optical head communications. Fixed port communications can initiate at the operating baud rate)
Standard baud rates -300, 600, 1 200, 2 400, 4 800, 9 600, 19 200
Special baud rate –as desired”

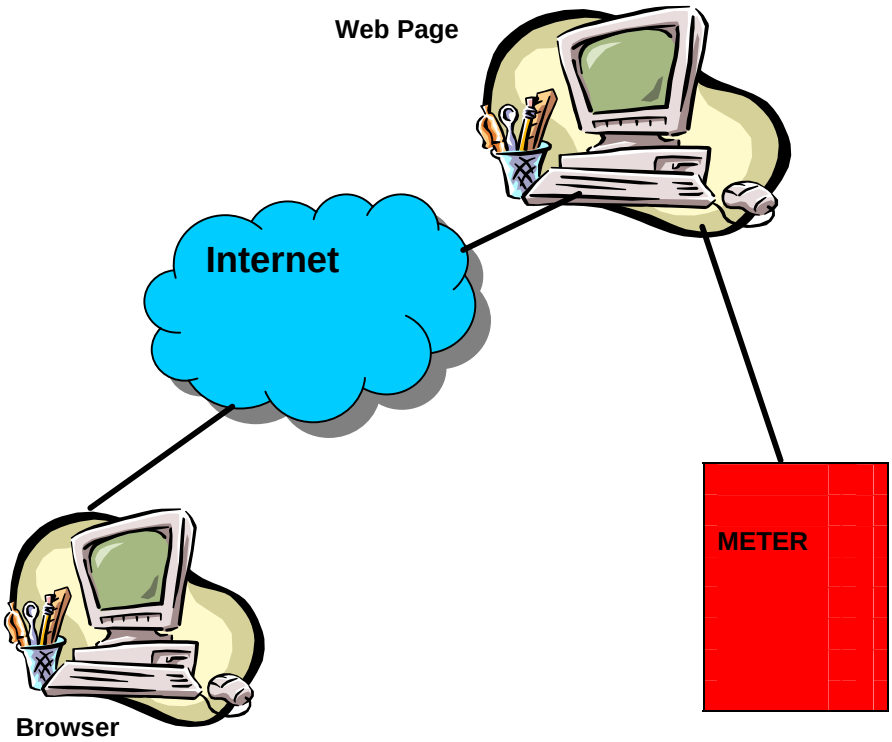
In view of the above discussion, we will have to operate in the “special baud rate” range in order to transmit this potentially huge amount of data and processed data.
How is the meter coping with such a high data transfer rate and is it feasible?

3 Solutions

3.1 The meter infrastructure solution

The meters can be equipped with dedicated expansion modules to provide for inter alia:

- RS 232 serial links point-to-point communication and these days short end multi-drop as well
- RS 485 serial links daisy-chained communications
- GSM communications
- GPRS communications
- Via an Ethernet connection onto a LAN or WAN
- Radio links
- Internet enablement of the meter (See slide 5)



- “Blue tooth” environment
- Satellite links (future)

All these methods are well understood and can be implemented forthwith.

3.2 The World infrastructure solution

GSM, GPRS, Ethernet and satellites (although the latter is expensive) are available in more and more places and the benefit of their increased availability is a massive cost reduction. Indeed, the increased level of these services makes now possible the new applications as we have contemplated above. There is an emerging synergistic relationship in that the decreasing costs open new possibilities which in turn generate adequate profits for the operators of these services. The prerequisites are that guaranteed connect-ability and very high baud rates are available at affordable cost AND that the traffic thus generated is returning an adequate profit for the service providers

3.3 Some benefits

Various benefits emerge from this scenario:

- The meter hub cluster can perform all the various meter functions in a location
- Lower cost of data acquisition as no “traditional” meter readers are required
- Metering bureaus can read and bill plants
- Specialists can monitor plants remotely
- The various parameters thus generated can be read, interpreted and used by the relevant user i.e. the billing can be sent directly to the billing computer, the profile data can be read by the Energy Engineer, the instantaneous data can be fed into a PLC
- The users can be geographically separated, i.e. the Mine Manager can look at one set of data while the Consulting Engineer in London is interested in a different bundle of information
- Low cost data acquisition and access to data that is normally not easily available to a particular user
- World wide billing becomes possible across borders
- Web enablement does away with all sorts of special software in cases such as viewing billing data, as the standard web browser could be sufficient to access the data Specialist requirements would still necessitate proprietary software
- Data of various regional or global plants can be combined in a seamless way
- Energy Management can be undertaken on a regional, national or even global scale with this infrastructure

4 Conclusions

The emergence of economical high speed links provided by the World infrastructure opens up totally new opportunities in TOU metering. The possibilities and advantages will increase with the data speed. Metering of this kind can now combine all types of metering functions that were not easily possible before
The “hub” concept can further increase the viability of this paradigm
The condition is that these meters are equipped with high speed data links in order to make the huge amounts of data available to the relevant end-users in a timeous manner. The current IEC proposal on data speed will have to be seen in this light. Our company has taken cognizance of world trends in technological development and is working towards offering cost effective solutions that will make many of these possibilities a reality in the foreseeable future, to the ultimate benefit for the end user.