



Sink or Swim with Smart Meter Data Management

Benchmarking to Business Value

21st September 2011

SINK OR SWIM?

BACKGROUND TO THE BENCHMARK

With rapidly increasing numbers of Smart Meters rolling out across the globe, utilities are beginning to realise the significant challenge associated with processing and leveraging these huge volumes of metering data.

These new automated meters provide a variety of different data streams at regular intervals (e.g. active and reactive power, import and export consumption, voltage and other diagnostic information) which offer the potential for significant business value, but also place significant strains on the operation of the business processes that must leverage this huge increase in data volume.

For example, consumption data can now be recorded at a frequency of half hourly, fifteen minute and even lower levels of granularity throughout the day. This is very different to the traditional quarterly or even annual meter reads that are used for billing and settlements. There are many statistics around for smart metering data but around a 4000 per cent increase in data volumes could be expected and many more streams of data from the meter may be added over time as the technology matures and the back office systems and processes develop.

In order to process this data and turn it into information that can be used further upstream, high performing meter data management solutions are required to process, analyse and enrich this data in line with local practices and utility specific requirements. The information that is then created can be used for key processes such as billing, demand forecasting and management, network management, product propositions and many other key activities including enabling smart grid initiatives. Depending on the local implementation of smart metering and the channels through which the data is made available it can also be used by consumers to help reduce their energy consumption and allow consumers to react to peaks and troughs in energy demand.

AMT-SYBEX's Affinity Meterflow™ application, which has been developed with the support of IBM and their Informix TimeSeries technology, has demonstrated the ability to meet this huge data challenge in a ground-breaking Benchmark exercise performed in 2011.

At AMT-SYBEX we have built our Meter Data Management product as an extension to our market leading energy industry data flow management product (Affinity Marketflow™ - formerly DTS). Affinity Meterflow manages the complexities of the new smart metering network by processing and managing the smart metering data and associated functions on behalf of the utility whilst retaining the link to the traditional metering world. Affinity Meterflow also provides an open set of services to other applications for end to end processing along with specific support for SAP via the SAP AMI Interfaces and our unique SAP integration adapters

THE BENCHMARK

The following section provides both business context and the results of the benchmarking activity that was carried out by IBM and AMT-SYBEX. A key aspect of the Benchmark is that all of these performance tests were carried out using a single server (IBM Power® P750 16 core (3.5GHz) running AIX® 7.1).

We believe that this represents a ten-fold increase in system performance when compared with other published benchmarks in this area.

DATA PROFILE

The following data characteristics were used in the benchmarking activity across two different data volumes of 10 Million Meters and 100 Million Meters.

- ☞ Import Consumption Data
- ☞ Combination of single and multi-register meters
- ☞ Register Read for each register, for each day
- ☞ 48 half hourly intervals for each day
- ☞ Data quality indicator was present for each of the 48 intervals each day

At 30 minute interval reads (48 readings a day), 10M meters generate about 500 million meter readings every day and 100M meters generate about 5 billion meter readings every day.

An error of 5.94% was applied to the data which was spread across all of the different failures that were possible to ensure all possible validation failures would be included.

The daily data for these meters was then loaded for one month (31 days) and average load and Validation, Estimation and Editing (VEE) times were calculated.

TECHNICAL VALIDATION

Whilst utility providers and the energy industry as a whole influence meter manufacturers to work toward local and global standards for data and services on their meters, in the current market place there are still many proprietary formats that need translating on the way in and out of the AMI Network.

The Technical Validation process within Affinity Meterflow handles variable formats and data structures sent from the AMI network. This technology is built on the tried and tested Affinity Marketflow platform which currently manages over a thousand energy dataflow formats across the UK and Irish market place for traditional metering and industry processes.

This process not only translates the data into an optimised format but also carries out key technical validation before loading.

Number of Meters	Average Time (Across the 31 days load)
10 Million Meters	10 Minutes and 2 seconds
100 Million Meters	2 Hours and 10 Minutes

DATA LOAD

Once the data has been technically validated and transformed into the native load format, the data is then inserted into the database tables from where in can have business and usage validations applied.

Number of Meters	Average Time (Across the 31 days load)
10 Million Meters	13 Minutes 56 seconds
100 Million Meters	3 Hours 14 Minutes

VALIDATION AND ESTIMATION

Validation and Estimation is one of the most resource intensive parts of a meter data management system as it carries out numerous checks that ensures that the data coming from the AMI network is fit for purpose and can be used for key activities such as billing and settlements. It does this by checking incoming data using various algorithms including globally recognised validations and also local validation requirements. Affinity Meterflow contains a comprehensive set of validation and estimations including:

- ☞ Interval Validations (Data Quality Flags, Spike Check, Max Demand, Consecutive Zeros)
- ☞ Check Sum between Register and Interval Data
- ☞ Register Advance
- ☞ Consumption Gaps
- ☞ Profile Comparisons
- ☞ Asset Matching
- ☞ Date and Time Check
- ☞ High Priority Event Check (Such as Tamper)
- ☞ De – Energisation Check

Once Validation has been completed any register or interval data that has been identified as invalid is passed to the estimation routine. A configurable hierarchy of estimation is then attempted by Affinity Meterflow in order to fix the invalid data. The Estimations include:

- ☞ Estimating Interval Data using register data
- ☞ Historic Data Estimation
- ☞ Meter Profile Estimation

- Linear Interpolation
- Linear Extrapolation

The validations and estimations used in the current version of Affinity Meterflow are compliant with detailed local codes of practice (e.g. the UK Electricity Codes of Practice and Uniform Network Code) and this ability to provide localised product support applied to the geographies where Affinity Meterflow is implemented.

All of these checks were carried out on the data loaded in the benchmark and the following results were achieved where the previously stated 5.94% error rate was used:

Number of Meters	Average Time (Across the 31 days load)
10 Million Meters	11 Minutes 18 Seconds
100 Million Meters	2 Hours 11 Minutes

BILLING

The final part of the journey for consumption data requires it to be presented for billing in line with the utility provider’s product and tariff structure. Whilst there are differences in the handling of billing across the globe (e.g. register vs. Interval, Back office vs. Meter) for this benchmark, back office time of use billing using interval data has been simulated as this is deemed to be the most resource intensive method.

Number of Meters	Average Time (Across the 31 days load)
6 Million Meters	5 Hours

Billing calculation was run each day on 6 million meters (6% of the 100 million meters). This calculation was performed in parallel to the data load.

SUMMARY AND CONCLUSIONS

Data challenges on this scale need an application that can combine the best technology with a flexible dataflow and meter data management platform that can keep pace and enable the utility to maximise the value from the data. Affinity Meterflow can provide absolute confidence in a technology platform with local support for complex markets from AMT-SYBEX, a proven supplier of high performance energy data flow management solutions in the most complex energy markets in the world.

REFERENCE INFORMATION

About AMT-SYBEX

<http://www.amt-sybex.com/about-us/>

About IBM Informix

<http://ibm.com/informix/>

About Affinity Meterflow

<http://www.amt-sybex.com/meterflow/>

AMT-SYBEX and IBM joint Executive Summary of Benchmark

<http://www.amt-sybex.com/case-studies/affinity-meterflow-benchmark/>

IBM Full Benchmark Whitepaper

<https://www.ibm.comdeveloperworks/forums/thread.jspa?threadID=391263>