What brings smartness- smart meter/ smart analytics

CBIP Workshop on Technical and Testing Challenges for Smart Meters

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What brings smartness- smart meter/ smart analytics

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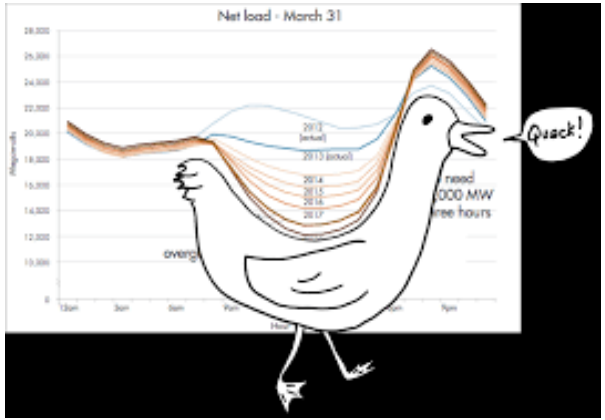
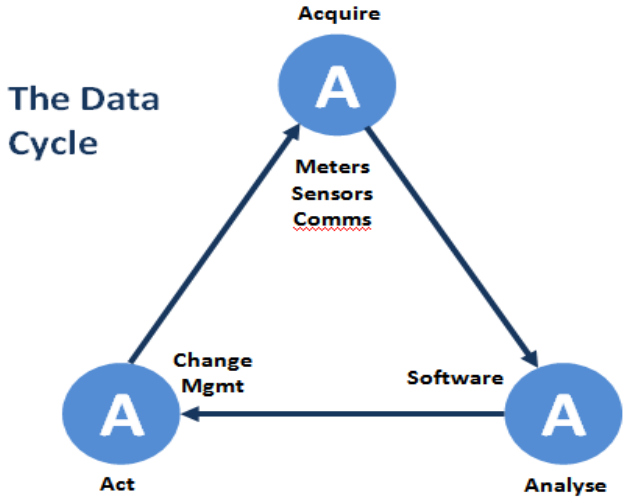


Let’s understand

Additional functionalities in smart meter

- Two way communication
- Connect/ disconnect



Smart Utility Landscape

Genus

Smart Meter GSM

Smart Meter RF

Smart Meter PLC

IOT

IOT

IOT

RF/PLC – Collector

Customer Interface

HES

Mobility Solutions

ESB-Enterprise Service Bus(Multi-Speak & CIM)

MDM / managed services solution

Utility-MIS

CIS & Billing

Utility: Loss/Utility operational efficiency improvement

Benefits of smart metering

- Active tracking of suspicious/ inactive meters and theft in real time, use of analytics
- Control of renewable integration, export only when utility needs it
- Enforcement of sanctioned load limit, IS 16444, Cl. 11.1, 11.2
- Improved and mistake-proof billing processes and efficiency, post and prepaid options
- Faster consumer complaint response time due to outage detection
- Customer service connection/disconnection convenience, saves efforts and time

Consumer and Societal Benefits

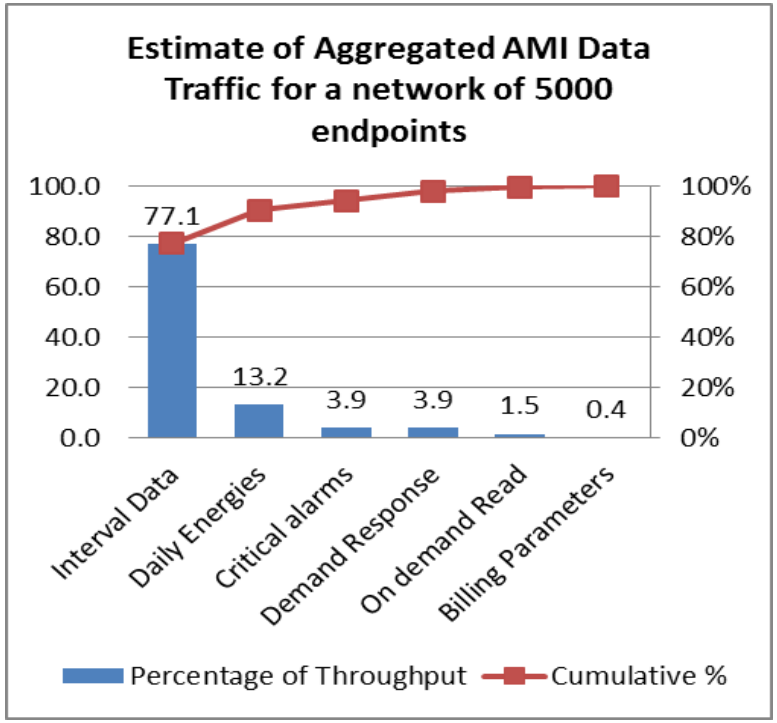
- Safety features against shock hazard, fire hazard
- DSM, flattening of peak demands, reduction in outages, personal energy management
- Smart In-home Systems – to provide energy information and consumption feedback
- Lower Energy Bills – by shifting consumption to off-peak periods and by conservation

Smart meter data and smart data analytics can be very useful for consumers

Linking smart meter data with end use

Problem in Power Distribution	Resolution by AMI	AMI Data for Analytics
AT &C Losses	Timely energy accounting, Theft alarms, Billing efficiency	Critical Alarms, Interval Data, Daily Profile, Billing Profile
Un-availability of Power	Better Forecast based on interval data, Loss control	Interval Data
Growing Peak Demands	Time of use (TOU) tariff, demand response	TOU tables, Demand Response
Energy Inefficiency	'var' and voltage control	On demand read of tail end and DT meters
Quality of Power	Outage management, asset management	Interval Data and alarms from DT meters
Integration of Green Energy	Availability based micro generation-storage, net metering	Interval Data, Daily data and Billing data from net meter and solar generation meter

Interval data constitutes 77% of total throughput



Interval data is like omni bus

Estimated smart meter data throughput for India

	Message transaction rate /s	APDU size (Bytes)	77% Throughput per meter Bytes /day	100% Throughput per meter Bytes/ day
Europe, P2P case study	0.463 exp (-04)	725	2900	3766
USA, W16 case study	1.1exp(-04)	2017	19169	24894
Proposed for India	0.694 exp(-04)	402	2410	3130

Problem of abundance

*Provided data is designed SMART

SMART Data, Block load profile IS 15959 (Part 2)

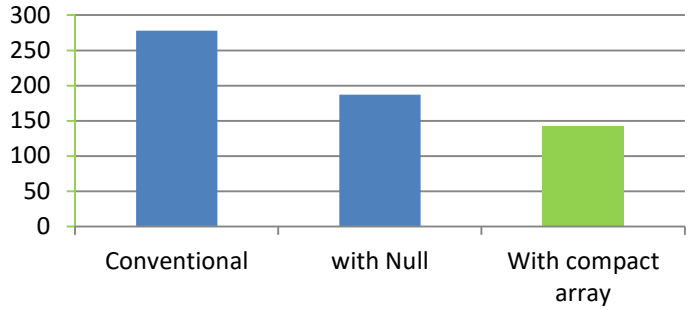
- **S**pecific
- **M**easurable
- **A**ccurate
- **R**esult oriented
- **T**imely

Interval data 1.0.99.1.0.255	Use, different capture parameters for different meters
kWh import	Real time energy accounting, modelling, forecasting
kWh export	Real time energy accounting, modelling, forecasting
*Abnormality flags	Need to incorporate for safety features (overload, temperature, leakage, outages, low signal strength, internet not connected etc.) for conservation of AMI traffic

***There is a strong justification for a debate to re-design the interval data profile**
Proposal to add abnormality flags

Smart use of DLMS: APDU Data Compression

Example Load Profile reading from 1P Meter for 8 IP with 6 channels including RTC as per IS 15959 part 2, 1.0.99.1.0.255



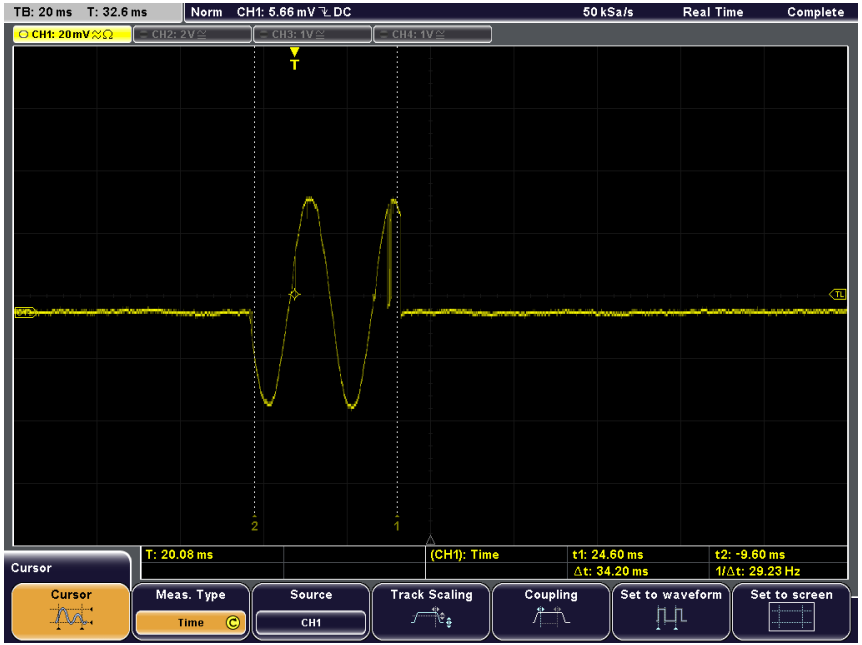
Bytes in APDU	Conventional Method	With Null Vector for next RTC	With Compact Array* and null vector for next RTC
Bytes to be sent by Meter	278 (100%)	187 (67%)	142 (51%)

*After taking up with DLMS UA, support of compact array is now included in CTT

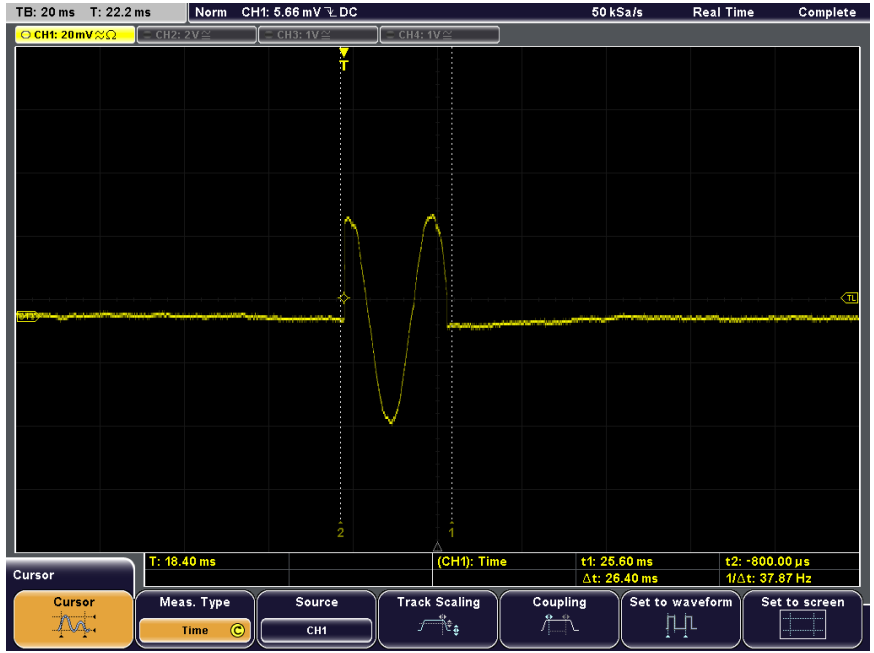
Proposal to add more '**Push**' profiles in IS to reduce unnecessary data traffic, conserve resources and improve reliability

Profile	Push frequency	Time division
Interval data compact array	5 minutes to 4 hours (array of last 4 hour intervals) depending on type of meter	5 min slots for TDM
Daily energy registers	At midnight	5 min slots for TDM
Billing data	On billing date at midnight	5 min slots for TDM

Safety feature, PoC to demonstrate smart meter as RCCB



RCCB, trip time 34.2ms



Smart Meter, trip time 26.4ms

Smart meter as MCB (short circuit protection)

Smart meter can prevent short circuit fires

*With use of PGA's management it is possible to detect short circuit from overload in mere 60ms

Conclusion

- Smartness lies in the information sent in AMI data for each end -use
  - **S**pecific
  - **M**easured
  - **A**ccurate
  - **R**esult oriented—mapped to the end use
  - **T**imely
- AMI data and push profiles need to be designed intelligently to meet SLA's. Alarm flag addition in interval data, smart data compression within DLMS framework
- Smart features can be added in smart meters to provide safety and transparency to consumers through mobile Apps
- Smart analytics is the name of the game today

Thanks for your attention

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-SENECA