SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

19EET304/ IOT FOR ELECTRICAL SCIENCES

III YEAR VI SEM

UNIT 4 – ACTIVATION DEVICES

TOPIC 2 – Smart Meter

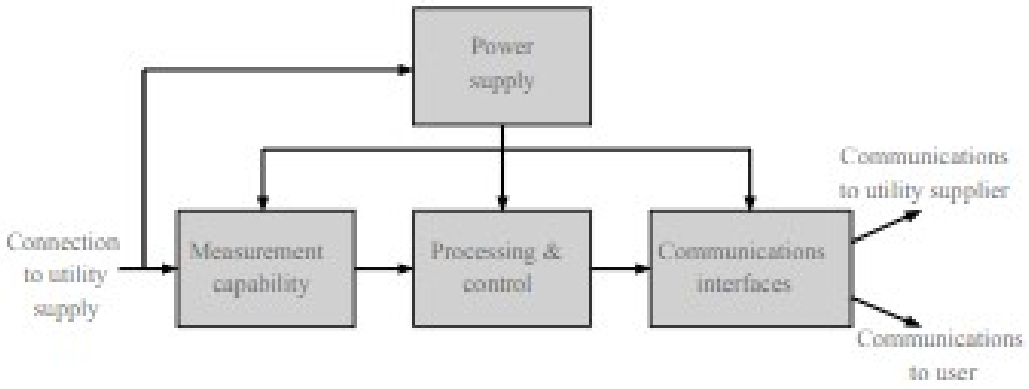
Consider an example,

Differentiate the products

SMART METER

Smart Meter works by measuring the electrical current flow and voltage at regular intervals and then using this up to calculate the power used in a half-hour period. Similarly, for gas the flow is measured at regular intervals. This information can be sent to your In Home Display and to your supplier

SMART METER



Basic block diagram of a smart energy meter for electricity consumption

SMART METER

wer supply: This section of the smart meter powers the circuitry for the meter and also provides battery back-up as well as protection against transients etc.

Measurement capability: This section of the smart energy meter block diagram addresses the basic measurement of the utility that is used. It requires to be reliable and accurate. It will typically output the data in a digital format and will therefore include a analogue to digital converter.

SMART METER

Processing: Any meter like this will require manipulation of the data. It needs to be formatted to send via the communications links as well as displaying on the smart meter itself.

Communications: The smart meter needs to communicate the information back to the utility supplier for billing and management of their smart grid. It also needs to provide information tot he user on a smart energy monitor or In-Home Display, IHD. A variety of different communications methods can be used for this including cellular communications, power-line communications, Zigbee, etc.

Sensing & measurement

- The sensing and measurement circuitry needs to be particularly accurate for a smart meter. They need to be able to provide the same levels of accuracy as the previous generation manual meters . . if not better.
- The accuracy relies on revenue grade measurement components.
- The resistors used for current sampling and the scaling resistors for voltage measurements must have a very tight tolerance with a low temperature coefficient so that the measurements remain accurate over a wide temperature range.
- Any analogue data must be converted into a digital format, and of course an analogue to digital converter is required for this.

Processing and control

- Typically the system will use a microcontroller to provide the processing for formatting the data, processing it, and converting it into the required formats needed for the interfaces.
- Even though the data is primarily required to be transmitted, smart meters also have their own display for local readings in case this is required. The display is normally a low current LCD, even though these displays do not work well below 0°C and ultimately stop working if it becomes too cold.
- The processor also needs to manage the sending and receiving of data and commands over the various wireless communications interfaces.

Processing and control

- Typically these interfaces will include the long distance wireless communications tot he utility provider, and a must shorter distance wireless communications link to the smart energy monitor or In-House Display provided to the consumer.
- Typically a microcontroller is used in this application as the processing needs for the smart meter can normally be accommodated by a controller rather than a microprocessor, and the current consumption is typically less, as well as it allowing for a smaller footprint..

Wireless communications interfaces

- There are many different wireless communications interfaces that are used for the links to the utility provider and the smart energy monitor in the users premises.
- There are many different wireless communications interfaces that are used. These include:
- Broadband over Power Line (BPL)

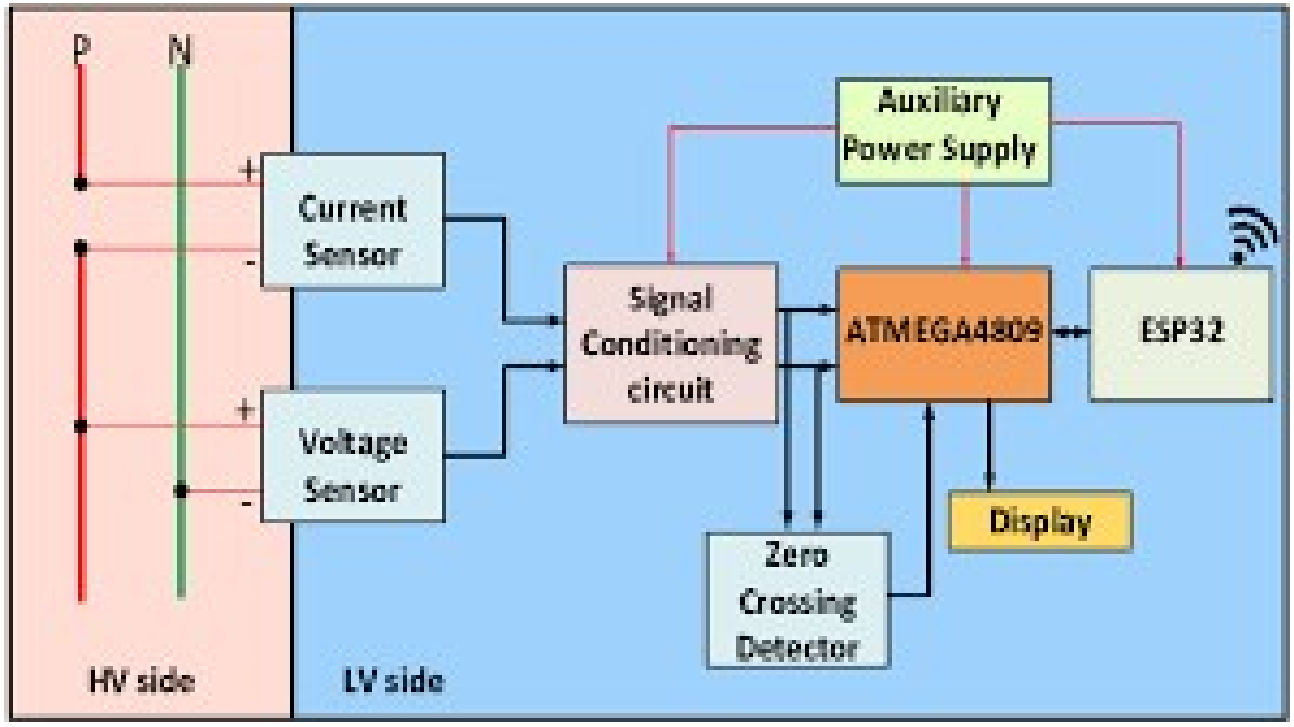
Wireless communications interfaces

- Mobile communications or cellular communications. 2G GSM is still widely sued and with GPRS it provides a low cost and reliable access method. 3G is less well used and in fact 3G is being withdrawn earlier than even 2G in many countries so there is even less incentive to use it. Of course 4G and now 5G are also options.
- RF mesh networks including systems such as Zigbee provide a good option for local communications whereas systems like LoRa or SigFox are options for longer range wireless communications.
- Whatever the wireless communications system that is chosen, consideration must be given to the overall system communications requirements.

Wireless communications interfaces

- Smart meters are now widely used and have been in use for many years. Their design is always evolving as requirements change, new wireless communications options and other new technologies are deployed.
- It is absolutely essential to ensure that whatever is designed into the smart meters and then deployed will be able to operate for many years to come. Some of the old meters have been in service for ten, fifteen, twenty or more years and operate well. As costs for renewal can be high, it is essential to ensure that any smart meter is reliable, accurate and the technologies used are supported for many years to come.

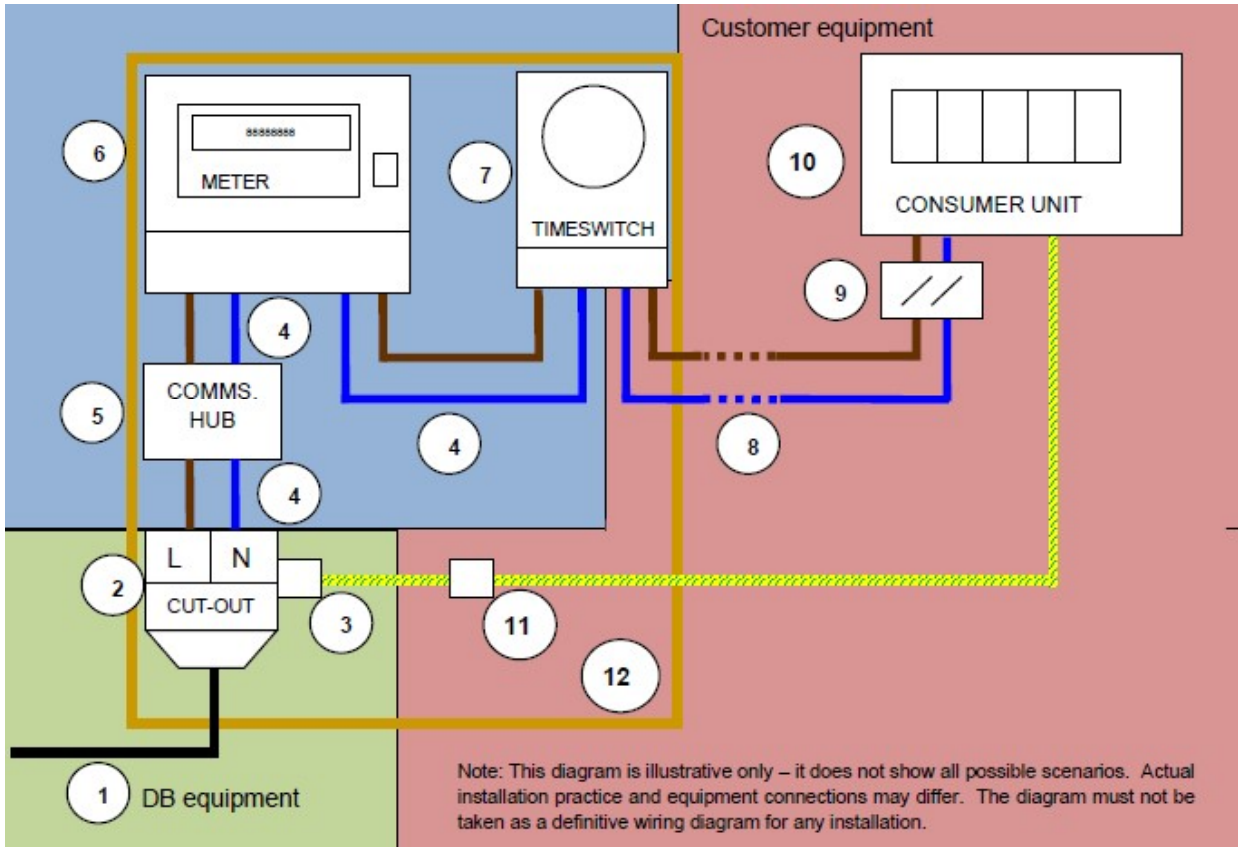
Construction



ASSESSMENT - 1

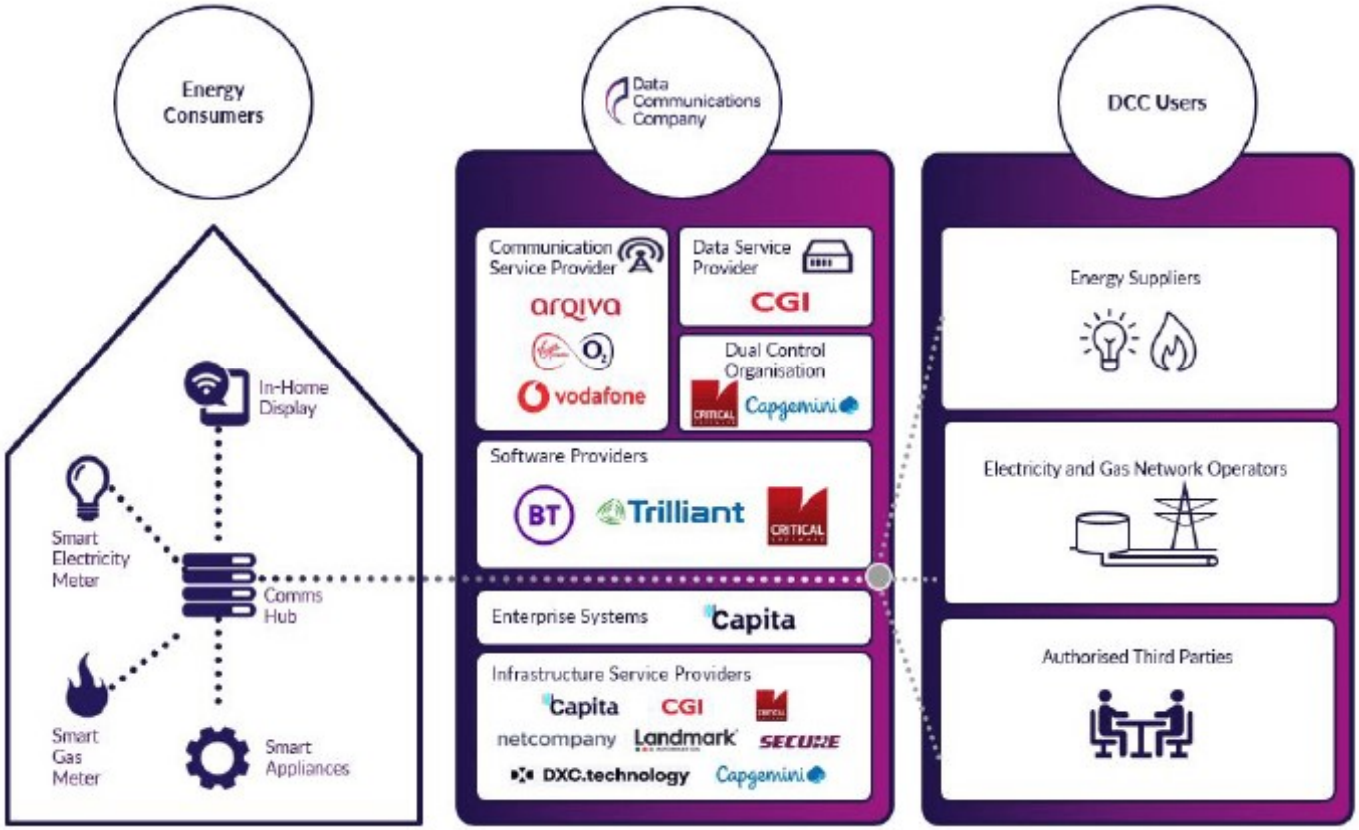
Imagine the Process

Areas of Responsibility at Electrical



meter and Teleswitch Unit

The Smart Meter end to end journey



ASSESSMENT – 2

Find the Process

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Thank You