IoT Protocols

Protocol Standardization for IoT

IoT-Architecture is one of the few efforts targeting a holistic architecture for all IoT sectors. This consortium consists of 17 European organizations from nine countries Summarized current status of IoT standardization as

• Fragmented architectures

• No holistic approach to implement IoT has yet been proposed

• Many island solutions do exist (RFID, sensor nets, etc.)

• Little cross-sector reuse of technology and exchange of knowledge

M2M and WSN Protocols

Most M2M applications are developed today in a highly customized fashion. High-level M2M architecture from M2M Standardization Task Force (MSTF) does include fixed & other non-cellular wireless networks. M2M and IoT sometimes are used interchangeably in the United States.

Other M2M standards activities include:

• Data transport protocol standards - M2MXML, JavaScript Object Notation (JSON), BiTXML, WMMP, MDMP

• Extend OMA DM to support M2M devices protocol management objects

• M2M device management, standardize M2M gateway

• M2M security and fraud detection

• Network API's M2M service capabilities

• Remote management of device behind gateway/firewall

• Open REST-based API for M2M applications

SCADA and RFID Protocols

One of the IoT pillars to represent the whole industrial automation arena. IEEE created standard specification called Std C37.1™, for SCADA & automation systems in 2007. In recent years, network-based industrial automation has greatly evolved. With the use of intelligent electronic devices (IEDs), or IoT devices in our terms, used in substations and power stations.The processing is now distributed and the functions that used to be done at control center can now be done by IED i.e. M2M between devices.

Due to restructuring of electric industry, traditional vertically integrated electric utilities are replaced by many entities such as

- GENCO (Generation Company),
- TRANSCO (Transmission Company),
- DISCO (Distribution Company),
- ISO (Independent System Operator), etc.

BACNet Protocol

Communications protocol for Building Automation and Control (BAC) networks. It Provides mechanisms for computerized building automation devices to exchange information. It is Designed to allow communication of building automation & control system for application like , Heating, Ventilating and Air-conditioning Control (HVAC) , Lighting Control, Access Control, Fire Detection Systems and their Associated Equipment.

It defines a number of services that are used to communicate between building devices. Protocol services include Who-Is, I-Am, Who-Has, I Have which are used for Device & Object discovery. Services such as Read-Property and Write-Property are used for data sharing. It defines 60 object types that are acted upon by services. It also defines no. of data link/physical layers including

ARCNET, Ethernet, BACnet/IP, BACnet/IPv6, Point-To-Point over RS-232, Master-Slave/Token-Passing over RS-485, ZigBee , LonTalk.

Modbus

- Serial communications protocol originally published by Modicon (now Schneider Electric) in 1979
- Commonly available for connecting industrial electronic devices
- Developed with industrial applications in mind
- Openly published and royalty-free
- Easy to deploy and maintain
- Enables communication among many devices connected to the same network

Protocol Versions

- Modbus ASCII
- Modbus TCP/IP or Modbus TCP
- Modbus over TCP/IP or Modbus over TCP or Modbus RTU/IP
- Modbus over UDP
- Modbus Plus (Modbus+, MB+ or MBP)
- Pemex Modbus
- Enron Modbus

KNX Protocol

Standardized (EN 50090, ISO/IEC 14543), OSI-based network communications protocol for automation

Defines several physical communication media:

• Twisted pair wiring (inherited from the BatiBUS and EIB Instabus standards)

• Power line networking (inherited from EIB and EHS - similar to that used by X10)

• Radio (KNX-RF)

• Infrared

• Ethernet (also known as EIBnet/IP or KNXnet/IP)

KNX System Components

All the devices for a KNX installation are connected together by a two wire bus to exchange data

• Sensors

• Actuators

• System devices and components

ZigBee

IEEE 802.15.4-based specification for a suite of high-level communication protocols. It is used to create personal area networks with small, low-power digital radios.

ZigBee based applications

• Home Automation

• Medical Device Data Collection

• other low-power low-bandwidth

ZigBee Architecture

Zigbee Architecture is divided into three sections.

• IEEE 802.15.4 which consists of MAC and physical layers

• ZigBee layers, which consist of the network layer, the ZigBee device object (ZDO), the application sublayer, and security management

• Manufacturer application: Manufacturers of ZigBee devices can use the ZigBee application profile or develop their own application profile

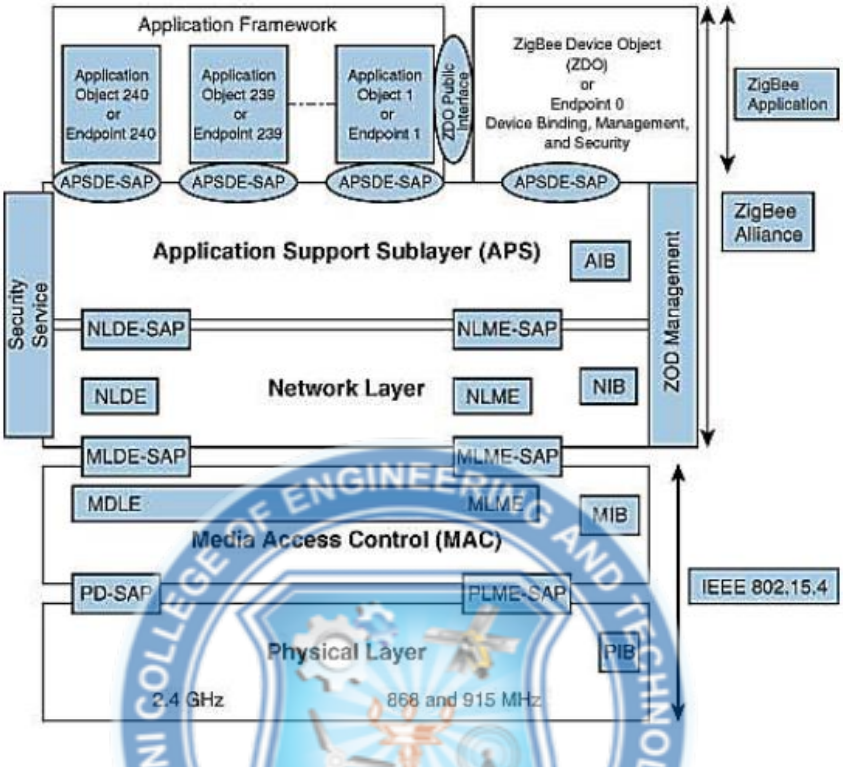

Fig.2.11 Zigbee architecture

[Ref: Honbo Zhou, "Internet of Things in the cloud: A middleware perspective", CRC press, 2012]