

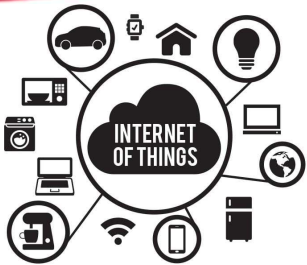


SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution



Department of Information Technology



19ITT30 - INTERNET OF THINGS

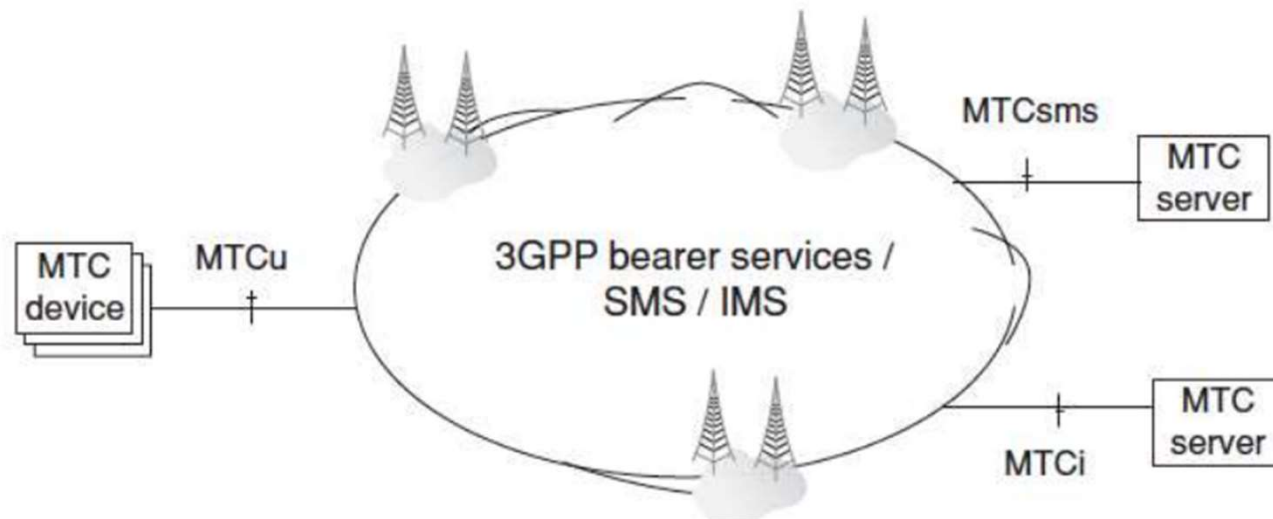
III B.Tech. IT/ V SEMESTER

UNIT III : EVOLVING IoT STANDARDS & PROTOCOLS

Topic 5 : Over Low Power WPAN (6LoWPAN)- IP in Small Objects (IPSO)

IETF IPv6 Routing Protocol for RPL Roll – Constrained Application Protocol (CoAP) – Representational State Transfer (REST) – Third Generation Partnership Project Service Requirements for Machine Type Communications- Over Low Power WPAN (6LoWPAN)- IP in Small Objects (IPSO) - WPAN Technologies for IoT/M2M – Zigbee/IEEE 802.15.4, RF4CE, Bluetooth and its Low-Energy Profile.

Recap

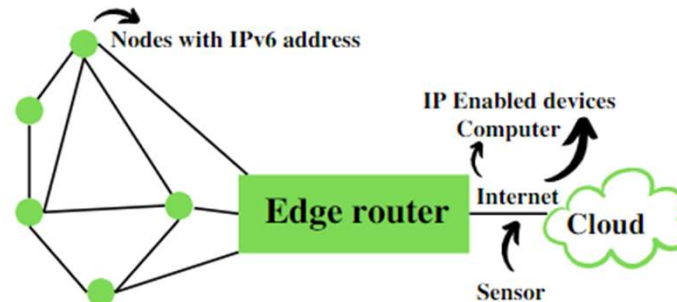


Over Low Power WPAN (6LoWPAN)

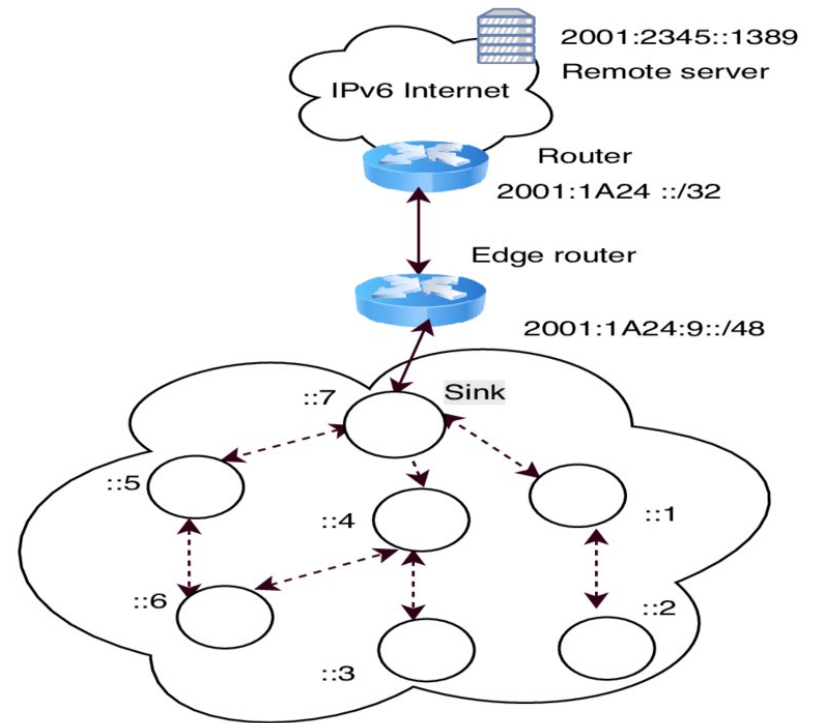
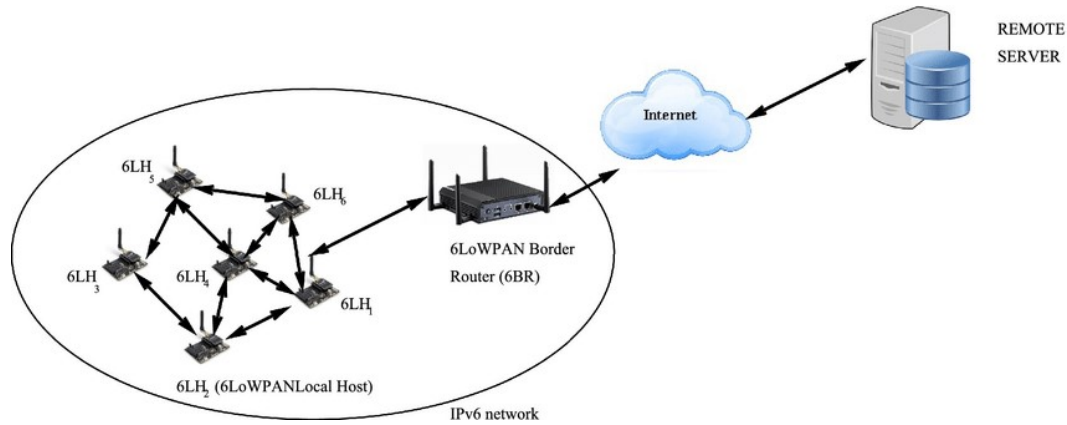
- 6LoWPAN is an IPv6 protocol, and It's extended from is IPv6 **over Low Power Personal Area Network**
- 6LoWPAN allows communication using the IPv6 protocol.
- IPv6 is Internet Protocol Version 6 is a network layer protocol that allows communication to take place over the network.
- It is faster and more reliable and provides a large number of addresses.

Over Low Power WPAN (6LoWPAN)

- It has very low cost, short-range, low memory usage, and low bit rate.
- It comprises an Edge Router and Sensor Nodes.
- Even the smallest of the IoT devices can now be part of the network, and the information can be transmitted to the outside world as well.
- For example, LED Streetlights.



Over Low Power WPAN (6LoWPAN)



802.1	LAN/MAN bridging, remote MAC bridging
802.2	Logical Link control standards for connectivity
802.3	Ethernet standards for CSMA/CD
802.4	Standards for token passing bus access
802.5	Standards for token rings & LAN/MAN comm.
802.6	Standards for information exchange
802.7	Broadband LAN cabling
802.8	Fiber Optic connection
802.9	For services like voice and data

802.10	For LAN/MAN security implementations
802.11	WiFi-Wireless Networking
802.12	Standards for demand priority access methods
802.14	For cable television broadband communications
802.15.1	Bluetooth
802.15.4	Wireless Sensor/Control Networks: Zigbee
802.16	Wireless Networking: WiMAX

Standard	Purpose
802.1	Internetworking
802.2	Logical Link Control
802.3	Ethernet LAN (CSMA/CD)
802.4	Token-Bus LAN
802.5	Token-Ring LAN
802.6	Metropolitan Area Network
802.7	Broadband Technical Advisory Group
802.8	Fiber-Optic Technical Advisory
802.9	Integrated Voice OR Data Network
802.10	Network Security
802.11	Wireless Networks
802.12	Demand Priority Access LAN
802.15	Wireless Personal Area Network
802.16	Broadband Wireless Metropolitan Area Networks
802.17	Resilient Packet Rings
802.20	Mobile Broadband Wireless Access

Over Low Power WPAN (6LoWPAN)

- It is a technology that makes the individual nodes IP enabled.
- 6LoWPAN can interact with 802.15.4 devices and also other types of devices on an IP Network. For example, Wi-Fi.
- It uses AES 128 link layer security, which AES is a block cipher having key size of 128/192/256 bits and encrypts data in blocks of 128 bits each. This is defined in IEEE 802.15.4 and provides link authentication and encryption.

Over Low Power WPAN (6LoWPAN)

Basic Requirements of 6LoWPAN

- 1.The device should be having **sleep mode in order to support the battery saving.**
- 2.**Minimal memory** requirement.
- 3.Routing **overhead should be lowered.**

Features of 6LoWPAN

- 1.It is used with **IEEE 802.15.4 in the 2.4 GHz band.**
- 2.Outdoor range: **~200 m** (maximum)
- 3.Data rate: **200kbps** (maximum)
- 4.Maximum number of nodes: **~100**



Advantages of 6LoWPAN:

- 1.6LoWPAN is a mesh network that is **robust, scalable, and can heal on its own**.
- 2.It delivers **low-cost and secure communication** in IoT devices.
- 3.It uses IPv6 protocol and so it can be **directly routed to cloud platforms**.
- 4.It offers **one-to-many and many-to-one routing**.
- 5.In the network, **leaf nodes can be in sleep mode for a longer duration** of time.

Disadvantages of 6LoWPAN:

- 1.It is comparatively less secure than Zigbee.
- 2.It has lesser immunity to interference than that Wi-Fi and Bluetooth.
- 3.Without the mesh topology, it supports a **short range**.

Over Low Power WPAN (6LoWPAN)

Applications of 6LoWPAN

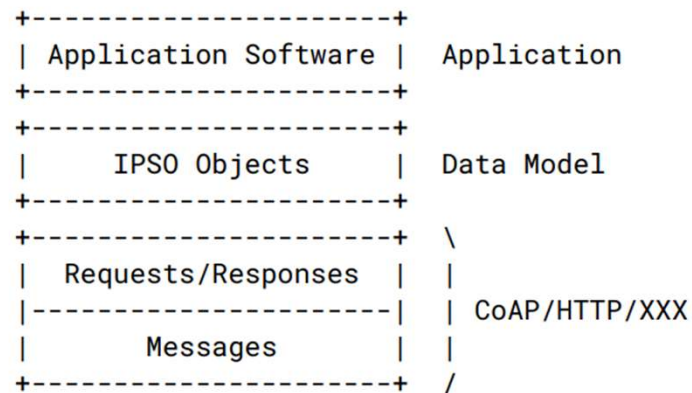
- 1.It is a **wireless sensor network**.
- 2.It is used in **home-automation**,
- 3.It is used in **smart agricultural techniques**, and **industrial monitoring**.
- 4.It is utilized to make IPv6 packet transmission on networks with constrained power and reliability resources possible.

Security and Interoperability with 6LoWPAN

- **Security:** 6LoWPAN security is ensured by the **AES algorithm**, which is a link layer security, and the transport layer security mechanisms are included as well.
- **Interoperability:** 6LoWPAN is able to **operate with other wireless devices as** well which makes it interoperable in a network.

IP in Small Objects (IPSO)

- The Internet Protocol for Smart Objects (IPSO) defines an object model, based on the **Open Mobile Alliance (OMA) standard** for the Internet of Things (IoT), to achieve **interoperability for data transmitted between devices and application software.**
- set of object definitions enables **software to interact with any device.**





IP in Small Objects (IPSO)

Data Model

Object Representation

Object ID/ Object Instance ID/ Resource ID.

3300 -> Temperature Sensor

0 -> instance 0 of a Temperature Sensor

5700 -> resource having the current value or a most recent reading`

Data Types

String, Integer, Float, Boolean, Object Link, Time, Opaque.



IP in Small Objects (IPSO)

Data Model

Operations

R/W/X over resources, C/D over Instances, ...

Content Format

Resources: text/plain, tlv. Objects: text/senml+json, application/cbor...

Object Name	ID	Instances	Object URN
Temperature Sensor	3303	Multiple	urn:oma:lwm2m:ext:3303

Resource	ID	Oper.	Mandatory	Type	Units	Description
Sensor Value	5700	R	Mandatory	Float	Defined by "Units" resource	Current measured sensor value
Min Measured Value	5601	R	Optional	Float	Defined by "Units" resource	The minimum value measured by the sensor since power ON
Max Measured Value	5602	R	Optional	Float	Defined by "Units" resource	The maximum value measured by the sensor since power ON
Min Range Value	5603	R	Optional	Float	Defined by "Units" resource	The minimum value that can be measured
Max Range Value	5604	R	Optional	Float	Defined by "Units" resource	The maximum value that can be measured
Sensor Units	5701	R	Optional	String		Measurement units definition e.g. "Cel" for celsius
Reset Min and Max Measured Values	5605	E	Optional	String		Reset the min and max measured values to current value

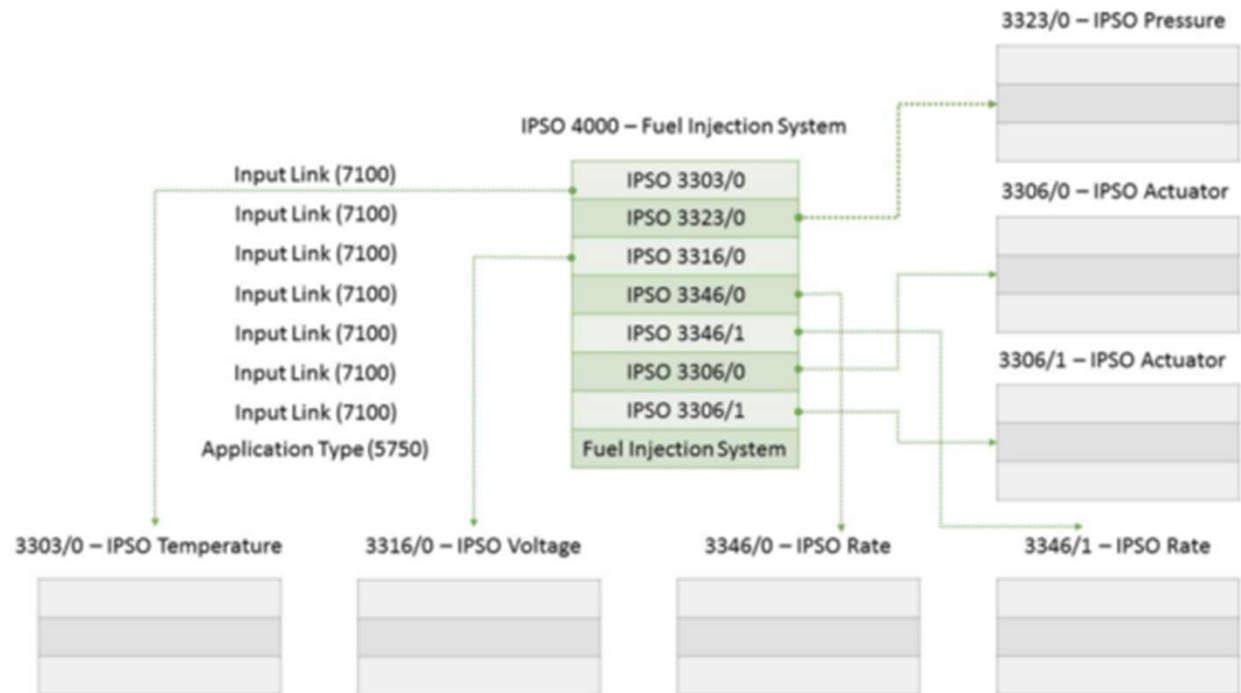
Data Model

Temperature Object

Data Model

Composite Object

IPSO Object	Real Sensor/Actuator
IPSO 3303 Temperature	ECT Sensor
IPSO 3316 Voltage	Throttle Position Sensor
IPSO 3316 Rate	Mass Airflow Sensor
IPSO 3346 Rate	Crankshaft Speed Sensor
IPSO 3323 Pressure	Fuel Pressure Sensor
IPSO 3306 Actuator	Fuel Injector
IPSO 3306 Actuator	Pump Valve





Thank You!