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Redesigning Common Mind & Business Towards Excellence



Build an Entrepreneurial Mindset Through Our Design Thinking FrameWork

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Architecture and Design Principles for IoT – 6LoWPAN



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What is 6LoWPAN?



- **6LoWPAN** stands for **IPv6 over Low-Power Wireless Personal Area Networks**. It's a communication protocol designed to enable small, low-power devices to connect over wireless networks.
- 6LoWPAN is an IPv6 protocol, and It's extended from IPv6 over Low Power Personal Area Network.
- As the name itself explains the meaning of this protocol is that this protocol works on Wireless Personal Area Network.
- WPAN is a Personal Area Network (PAN) where the interconnected devices are centered around a person's workspace and connected through a wireless medium.
- You can read more about WPAN at WPAN. 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.



What is 6LoWPAN?

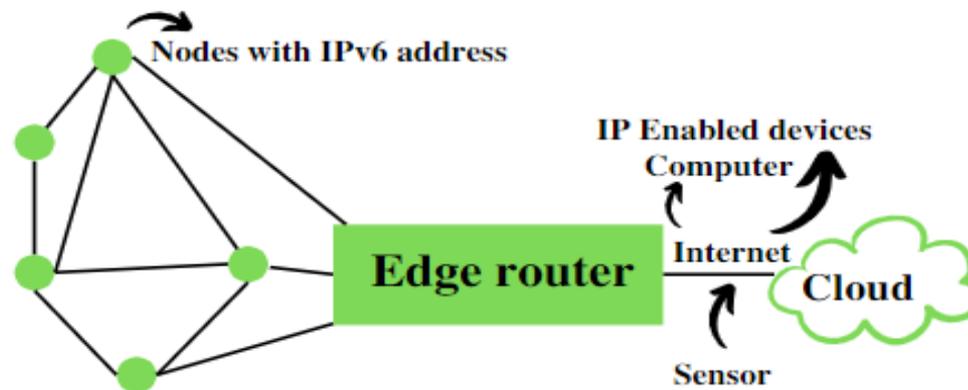


- 6LoWPAN initially came into existence to overcome the conventional methodologies that were adapted to transmit information.
- But still, it is not so efficient as it only allows for the smaller devices with minimal processing ability to establish communication using one of the Internet Protocols, i.e., IPv6. 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.



What is 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





Basic Requirements of 6LoWPAN

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



Features of 6LoWPAN



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



Advantages of 6LoWPAN

- 6LoWPAN is a mesh network that is robust, scalable, and can heal on its own.
- It delivers low-cost and secure communication in IoT devices.
- It uses IPv6 protocol and so it can be directly routed to cloud platforms.
- It offers one-to-many and many-to-one routing.
- In the network, leaf nodes can be in sleep mode for a longer duration of time.



Disadvantages



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



Applications of 6LoWPAN



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



Security and Interoperability with 6LoWPAN

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- **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.



Conclusion

- 6LoWPAN allows small, low-power devices to communicate with wireless networks via the IPv6 protocol.
- It provides a low-cost, scalable, and secure solution for IoT applications by enabling mesh networking and interoperability with multiple devices.
- Despite its benefits, such as reliable communication and cloud connectivity, 6LoWPAN has restrictions in terms of security and range when compared to other protocols such as Zigbee, Wi-Fi, and Bluetooth.
- It is commonly used in applications such as home automation, smart agriculture, and industrial monitoring to ensure the efficient delivery of IPv6 packets in limited contexts.



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