

# IoT Gateway Design and Characteristics

# What is an IoT gateway?

- An IoT gateway is a platform i.e. a combination of specialized hardware and software called as an IoT gateway device.
- An IoT gateway device acts as a bridge interfacing IoT sensor network with backend traditional internet.
- An IoT gateway device is the one that ensures compatibility between different IoT networks that may be based on different communication protocols such as IEEE 802.15.4, Bluetooth, BLE, Wi-Fi, LoRA, Zwave etc.

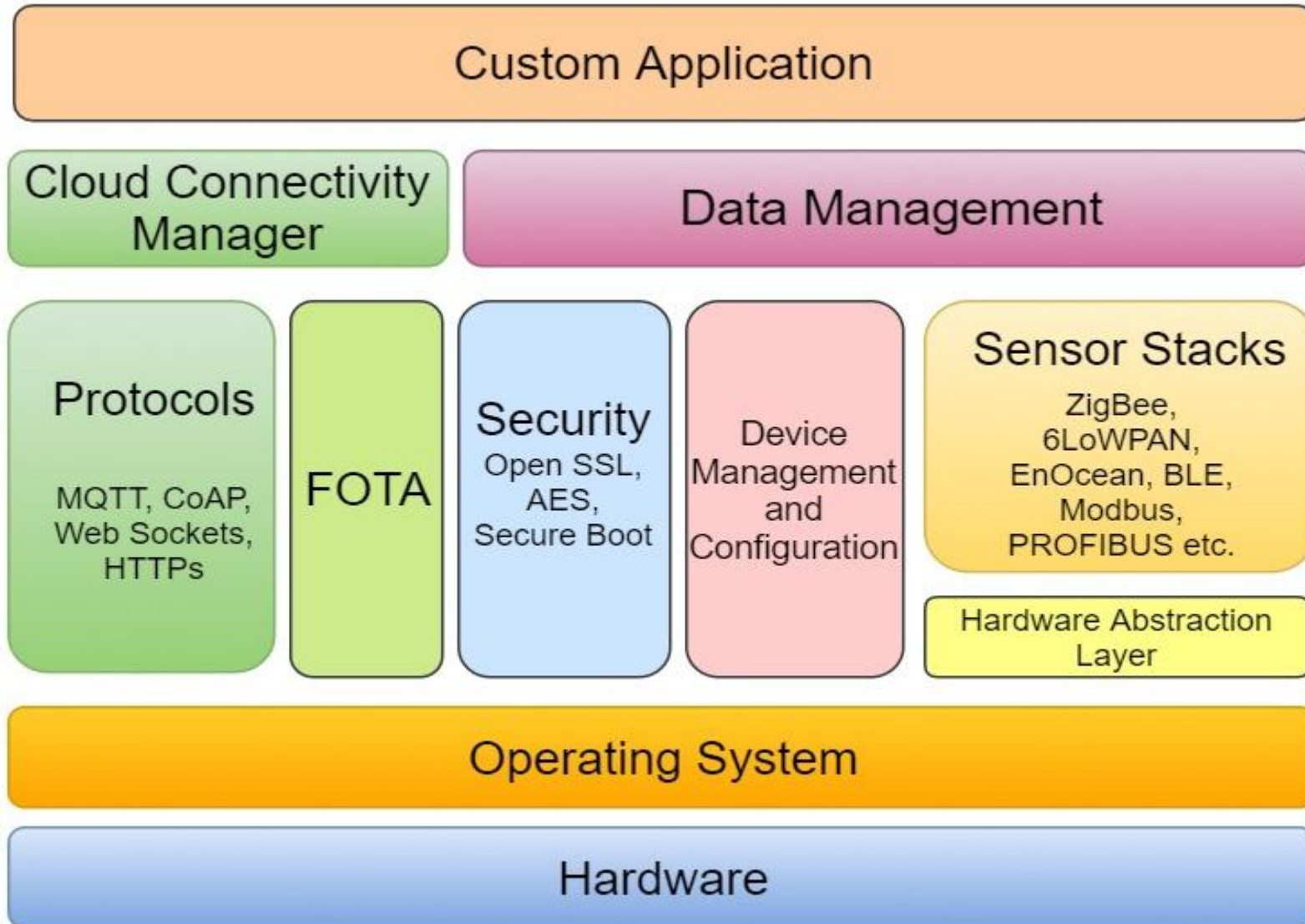
# Structure of an IoT gateway

- Hardware Platform consisting of an high-end application processor with sufficient on board memories and support for IoT sensor communication networks and connectivity with traditional IP network.
- Software Platforms are usually based on operating systems such as embedded Linux or Android.
- May also have analytics engine

# IoT gateway as Edge device

- IoT device may function as an edge computing device acting as interface between IoT sensor network and IoT cloud platforms.
- Edge device may perform critical data analytics, Data filtering, data aggregation, sending alerts etc.

# IoT gateway device architecture



# IoT gateway Security

- Key considerations for data security, device security and network security
- Device security through hardware based crypto authentication chips
- Secure booting
- Data encryption between sensor network and gateway
- Data encryption between gateway and cloud

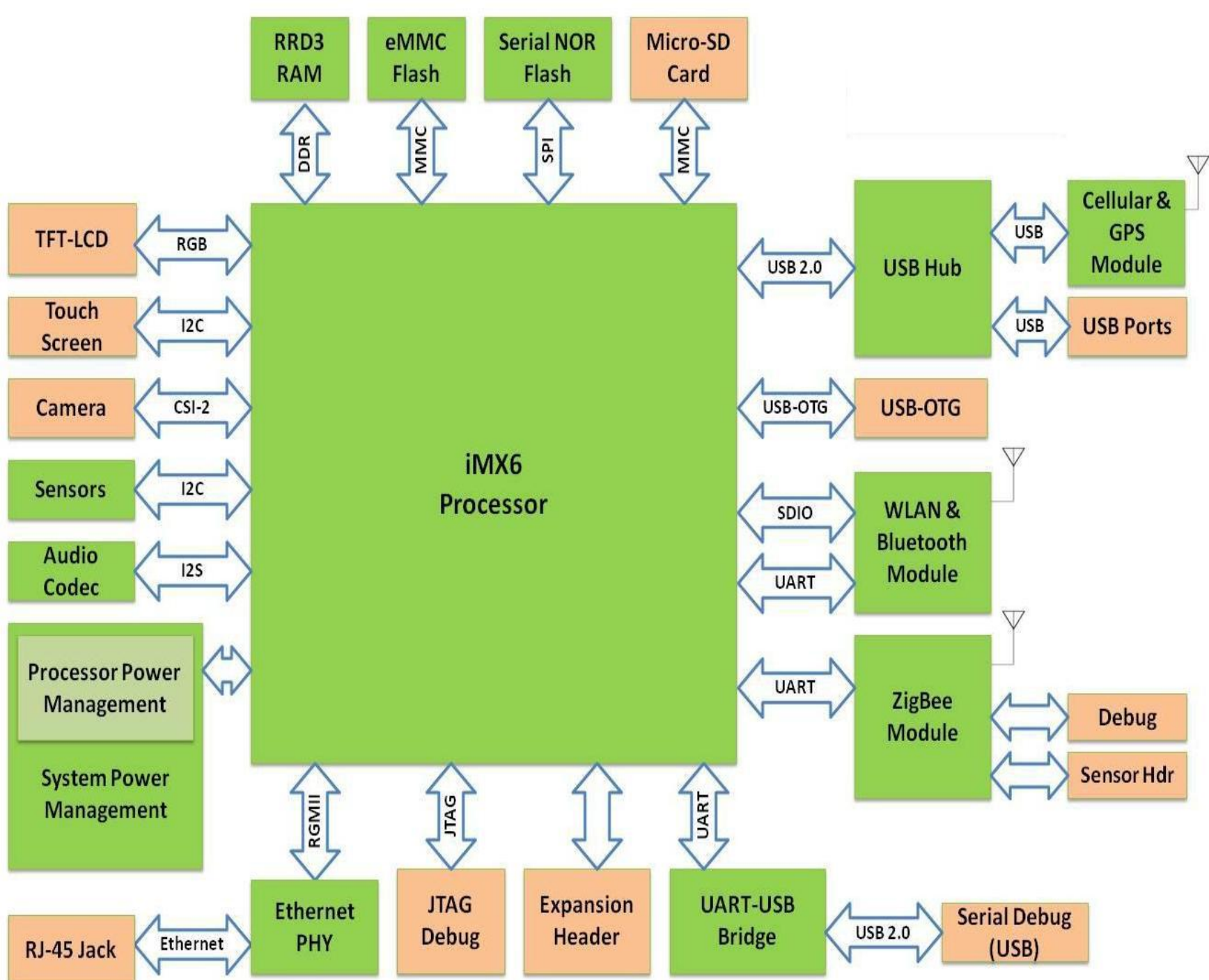
# FOTA

- Firmware over the air updates (FOTA)
- IoT gateway software updation through FOTA for security patches, new versions etc.

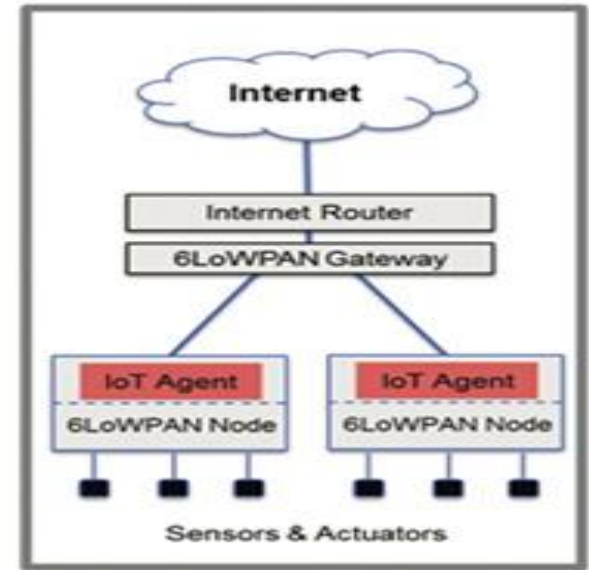
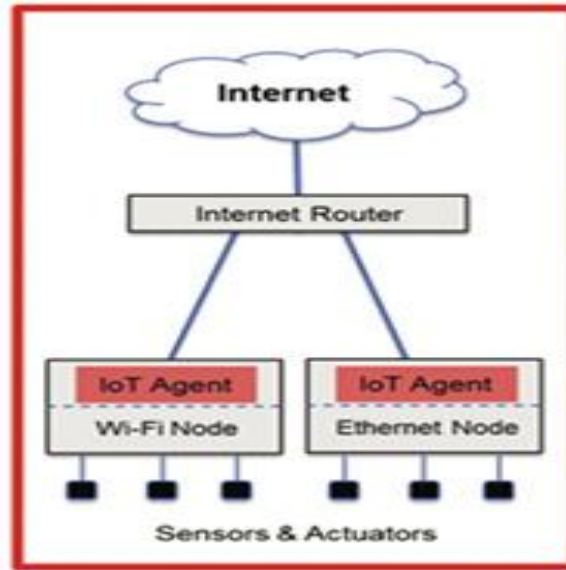
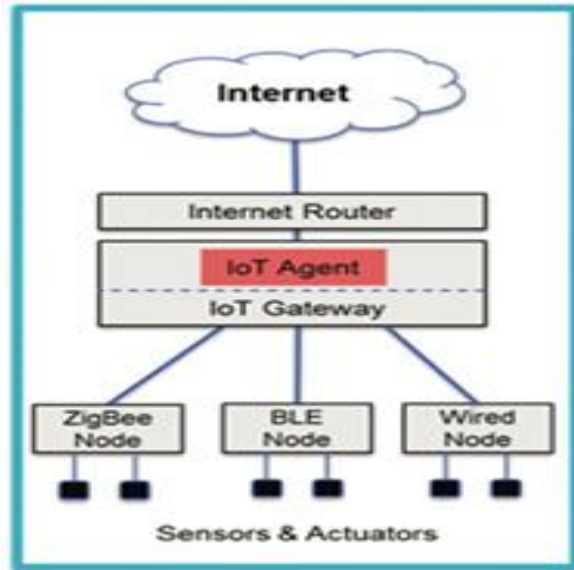
# WINGZ as gateway device

- Wireless IP network gateway for Zigbee (WINGZ) is C-DAC's multiprotocol gateway
- Has multiple wireless PAN (personal area network)
- Support for IEEE 802.15.4, Bluetooth/BLE, and Wi-Fi interfaces.
- 1 GHz dual core Cortex A8 processor
- On board TFT-LCD touch screen and HDMI interface
- OS Support :- Linux and Android





# Gateway as bridge between low power sensor network and Internet



1. Fig-1 for non IP based sensor devices
2. Fig-2 for IP based Wi-Fi sensor devices
3. Fig-3 for 6LowPAN stack based devices

# Usage of Ubuntu Snappy Support

- Since the most preferred software platforms for gateway devices are based on Linux, snappy helps in developing and maintaining software across Linux distribution.
- Snappy is software deployment and package management system allowing distro-agnostic upstream software packaging and can be used in IoT gateways.

# What is Edge Computing

- Critical data processing happens at the data source rather than in a centralized cloud based location.
- **Edge computing** is a method of optimizing cloud computing systems by performing data processing at the edge of the network, near the source of the data.
- Advantages of edge computing are:
  - Reduces transmission costs, Latency and improves QoS
  - Suitable for real time IIoT data
  - Improves network availability & reliability
  - Reduces bandwidth cost & computing resources

# Edge Computing



Cloud and Edge Computing - Complementary Technologies powering IIoT

## CLOUD

Big Data processing  
Business Logic  
Data Warehousing

INTERNET

## EDGE

Realtime data processing  
At source/on premises  
data visualization  
Basic analytics  
Data caching, buffering  
Data filtering, optimization  
M2M comms

LAN/WAN

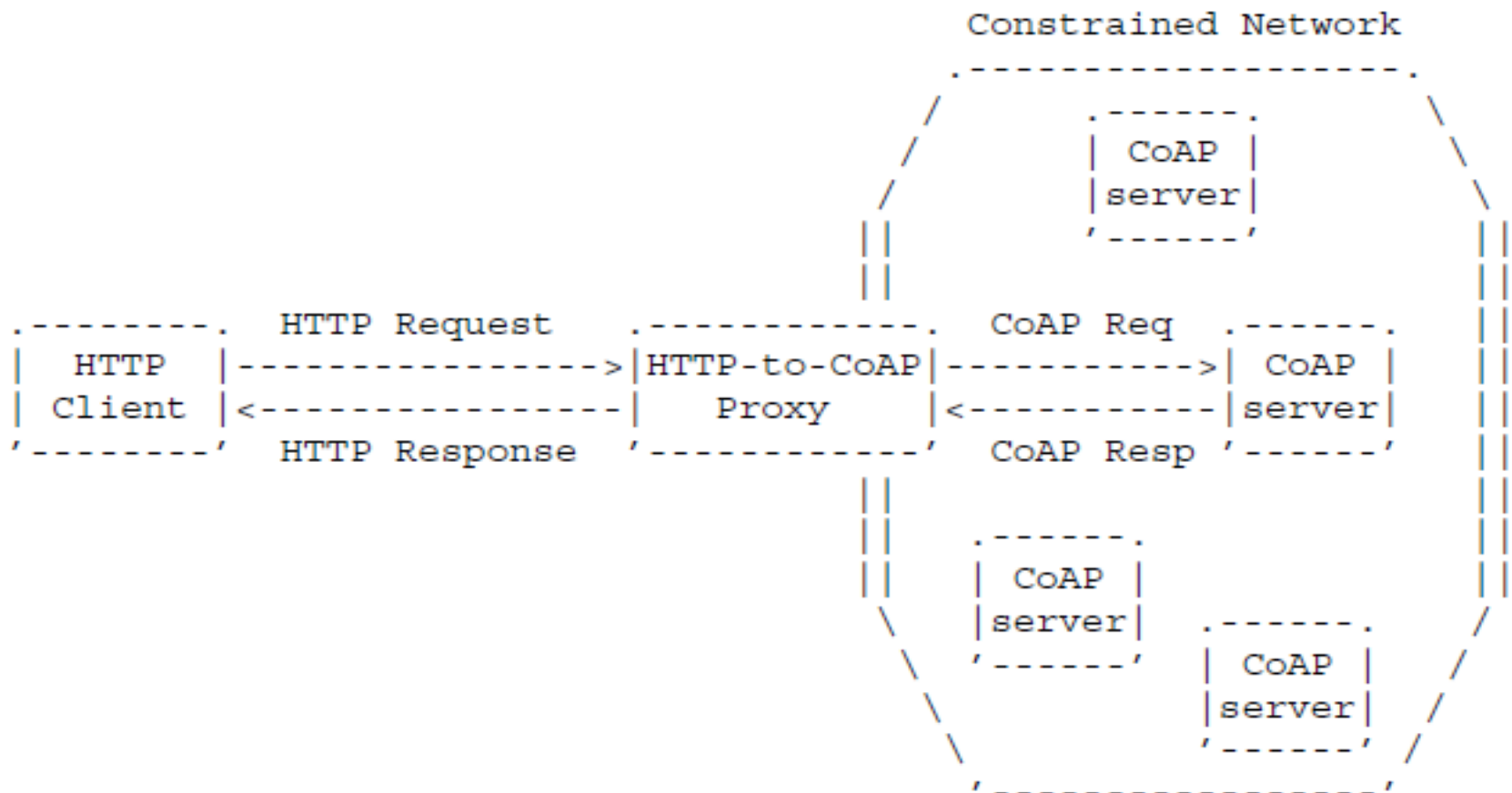


# Protocol Bridging HTTP - CoAP

# HTTP – CoAP Proxy

- IETF RFC 8075 defines a set of guidelines for implementing a cross protocol network proxy that performs translation from HTTP to CoAP.
- The proxy shall enable a HTTP client to access resources on a CoAP server by mapping an HTTP request into an CoAP request and a CoAP response into an HTTP response.
- HTTP to CoAP proxy does URI mapping and media type mapping.

# HTTP – CoAP Proxy Deployment





# Proxy Implementations

- Squid 3.1.9 with transparent HTTP-CoAP mapping module
- jcoap Proxy
- Californium cf-proxy
- CoAPthon
- FreeCoAP

# M2M integration with IoT

- M2M systems are relatively simple as they communicate with a single communication network, with a single type of device and hosting a single application
- With the emergence of IoT systems, applications have become more complex as we have diverse devices proliferated throughout the world.
- In order to connect legacy M2M systems with IoT based applications we may require an intermediary system called M2M integration platform.

# M2M integration with IoT

For advanced M2M systems, multiple services are required to run on edge devices supporting various communication interfaces and implementing business logics that are customer centric on edge devices.