UNIT-3: M2M & SDN

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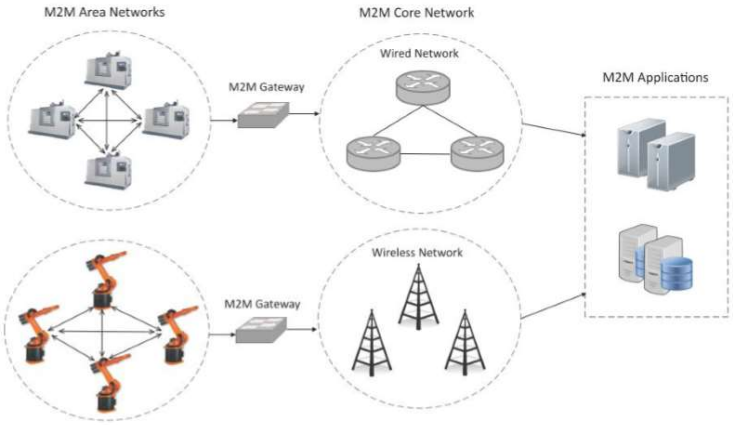
MACHINE-TO-MACHINE (M2M)

- Machine-to-Machine (M2M) refers to networking of machines (or devices) for the purpose of remote monitoring and control and data exchange.

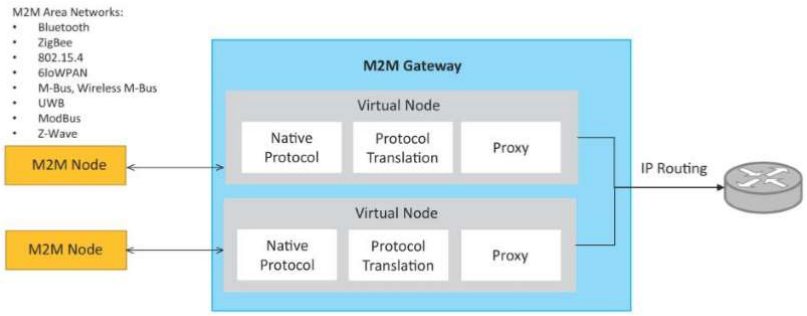


MACHINE-TO-MACHINE (M2M)

- An M2M area network comprises of machines (or M2M nodes) which have embedded hardware modules for sensing, actuation and communication.
- Various communication protocols can be used for M2M local area networks such as ZigBee, Bluetooh, ModBus, M-Bus, Wirless M-Bus, etc.
- The communication network provides connectivity to remote M2M area networks.
- The communication network can use either wired or wireless networks (IPbased).
- While the M2M area networks use either proprietary or non-IP based communication protocols, the communication network uses IP-based networks.

M2M GATEWAY

- Since non-IP based protocols are used within M2M area networks, the M2M nodes within one network cannot communicate with nodes in an external network.
- To enable the communication between remote M2M area networks, M2M gateways are used.



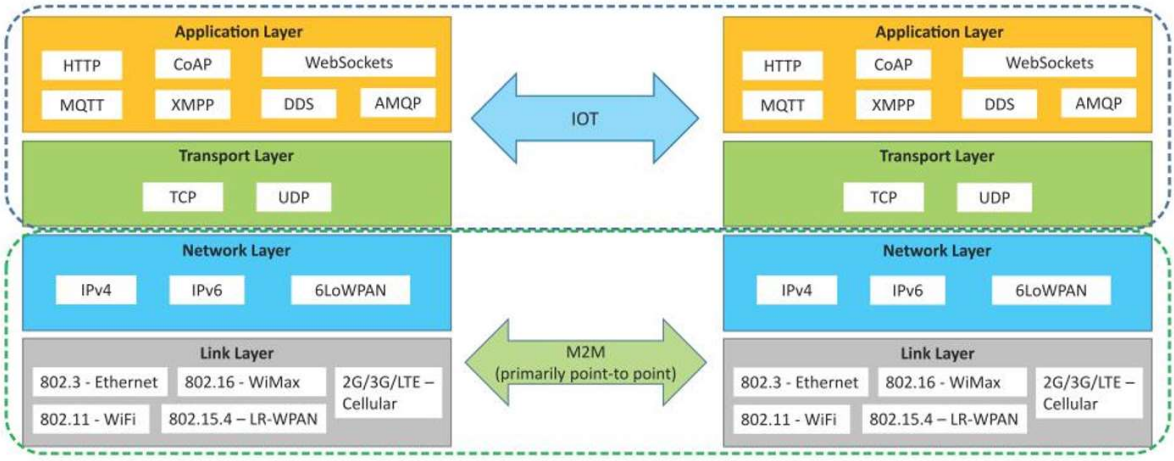
DIFFERENCE BETWEEN IOT & M2M

- Communication Protocols
  - M2M and IoT can differ in how the communication between the machines or devices happens.
  - M2M uses either proprietary or non-IP based communication protocols for communication within the M2M area networks.
- Machines in M2M vs Things in IoT
  - The "Things" in IoT refers to physical objects that have unique identifiers and can sense and communicate with their external environment (and user applications) or their internal physical states.
  - M2M systems, in contrast to IoT, typically have homogeneous machine types within an M2M area network.

DIFFERENCE BETWEEN IOT & M2M

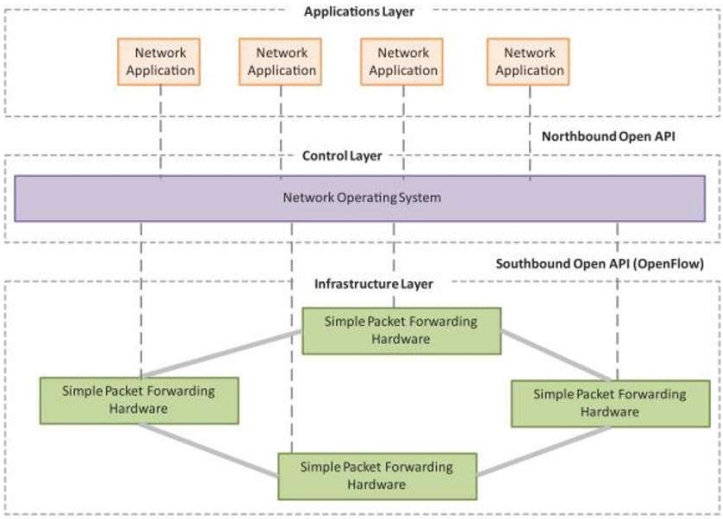
- Hardware vs Software Emphasis
  - While the emphasis of M2M is more on hardware with embedded modules, the emphasis of IoT is more on software.
- Data Collection & Analysis
  - M2M data is collected in point solutions and often in on-premises storage infrastructure.
  - In contrast to M2M, the data in IoT is collected in the cloud (can be public, private or hybrid cloud).
- Applications
  - M2M data is collected in point solutions and can be accessed by on-premises applications such as diagnosis applications, service management applications, and on-premisis enterprise applications.
  - IoT data is collected in the cloud and can be accessed by cloud applications such as analytics applications, enterprise applications, remote diagnosis and management applications, etc.

COMMUNICATION – IOT VS M2M



SDN

- Software-Defined Networking (SDN) is a networking architecture that separates the control plane from the data plane and centralizes the network controller.
- Software-based SDN controllers maintain a unified view of the network and make configuration, management and provisioning simpler.
- The underlying infrastructure in SDN uses simple packet forwarding hardware as opposed to specialized hardware in conventional networks.



BEFORE SDN – PROBLEMS IN TRADITIONAL MOBILE N/W

- Difficult to scale – static, over-provisioned network are inflexible to manage the mobile traffic with high demand.
- Difficult to manage – many times lead to mis-configurations
- Inflexible – requires too much time to introduce a new service as the h/w architecture is inflexible
- Cost – Both capital expenditure and operational expenditure are high (expensive)

SDN – FOR MOBILE NETWORKING

- Flow Table paradigm for SDN :
  - Well suited for end-to-end communication over multiple technologies such as WiFi, 3G, 4G etc.
- Logically centralized control :
  - Particularly useful for efficient base-station coordination for addressing inter-cell interference
- Path Management :
  - Data can be routed based on service requirements without depending on core-routing policies
- Network Virtualization:
  - Abstracts the physical resources from the network services
  - Helps in providing seamless connectivity and service differentiation among users

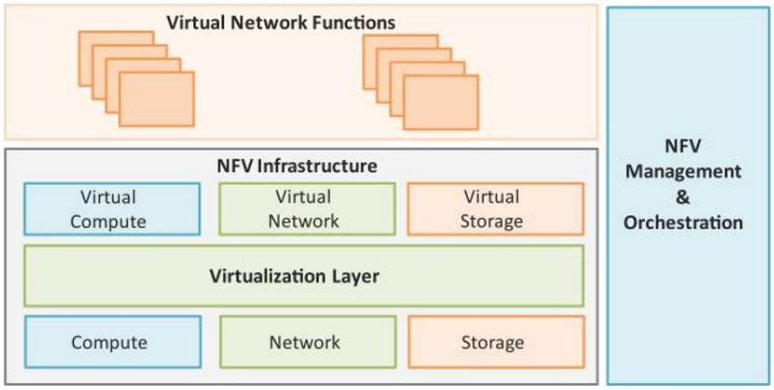
KEY ELEMENTS OF SDN

- Centralized Network Controller
  - With decoupled control and data planes and centralized network controller, the network administrators can rapidly configure the network.
- Programmable Open APIs
  - SDN architecture supports programmable open APIs for interface between the SDN application and control layers (Northbound interface).
- Standard Communication Interface (OpenFlow)
  - SDN architecture uses a standard communication interface between the control and infrastructure layers (Southbound interface).
  - OpenFlow, which is defined by the Open Networking Foundation (ONF) is the broadly accepted SDN protocol for the Southbound interface.

NFV

• Network Function Virtualization (NFV) is a technology that leverages virtualization to consolidate the heterogeneous network devices onto industry standard high volume servers, switches and storage.

• NFV is complementary to SDN as NFV can provide the infrastructure on which SDN can run.



Features and Capabilities

- Clustering: High availability and scale
- Serviceability: Monitoring, metrics collection, and log management
- Open Virtual Appliance (OVA) packaging: Simplified installation and deployment flexibility
- Programmatic interfaces include:
  - Northbound Representational State Transfer (REST) APIs that support application integration to the network
  - Network services Java APIs that enable the creation of embedded functions to deliver "custom" controller capabilities
  - Southbound device plug-ins that connect virtual and physical network elements, supporting heterogeneous network environments

SDN FLOWS DEMONSTRATIONS