SDN in IoT

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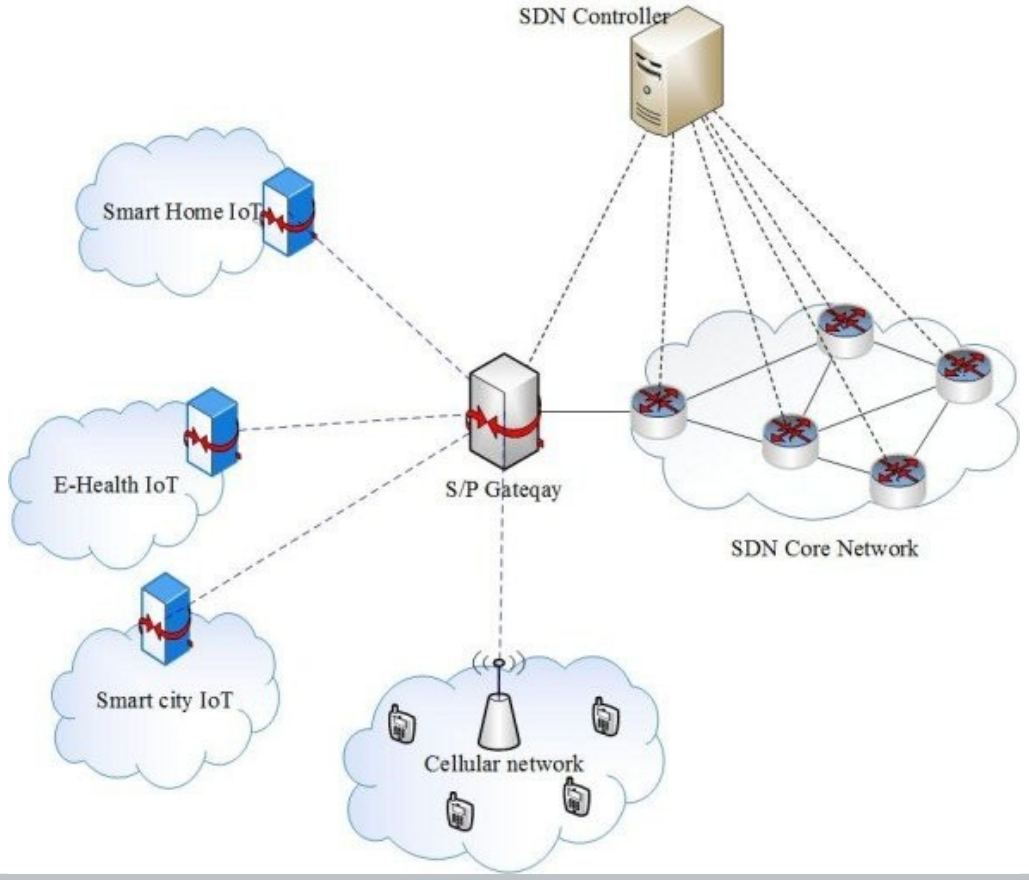
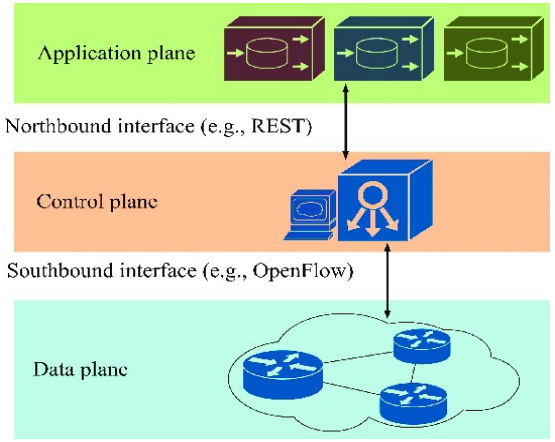
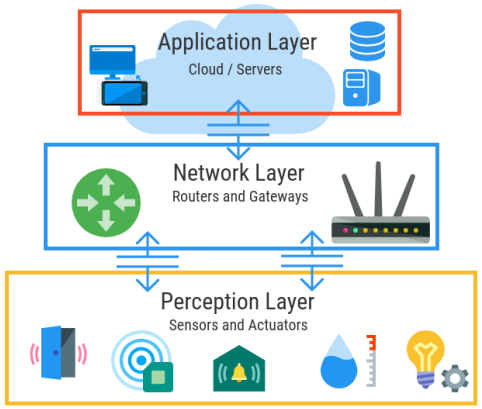
Why SDN in IoT ?

- **Intelligent routing decisions**
- **Decision making after analysing traffic pattern**
- **Visibility of network resources facilitating easy network management**

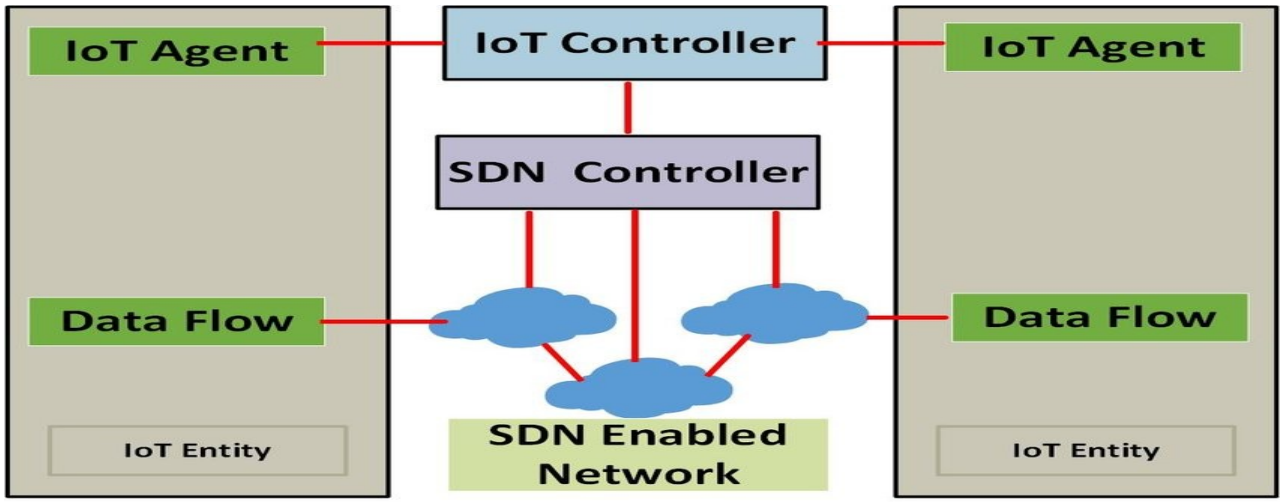


SDN for IoT



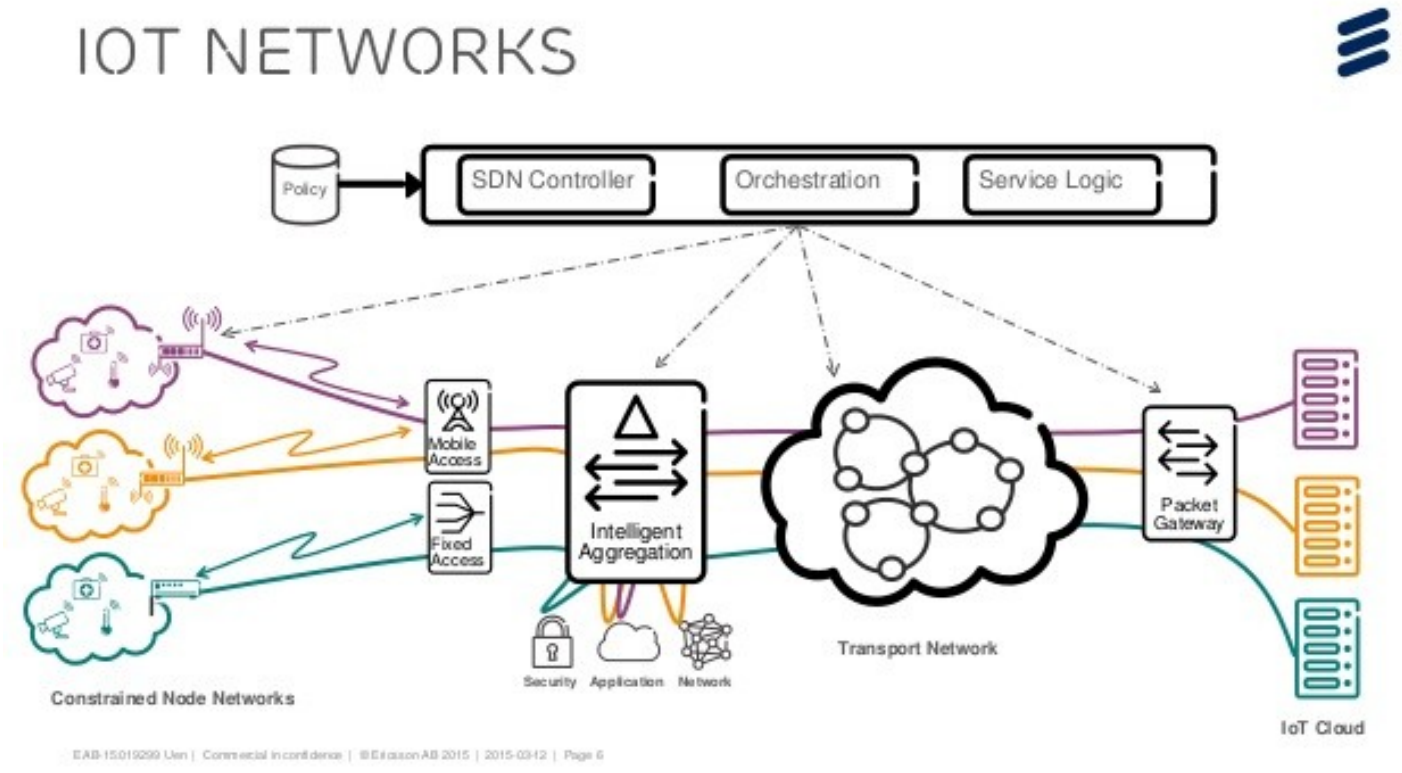


SDN + **IoT**



SDN in IoT

SDN for IoT


IOT NETWORKS
Policy
SDN Controller
Orchestration
Service Logic
Mobile Access
Fixed Access
Intelligent Aggregation
Packet Gateway
Transport Network
Security
Application
Network
Constrained Node Networks
IoT Cloud
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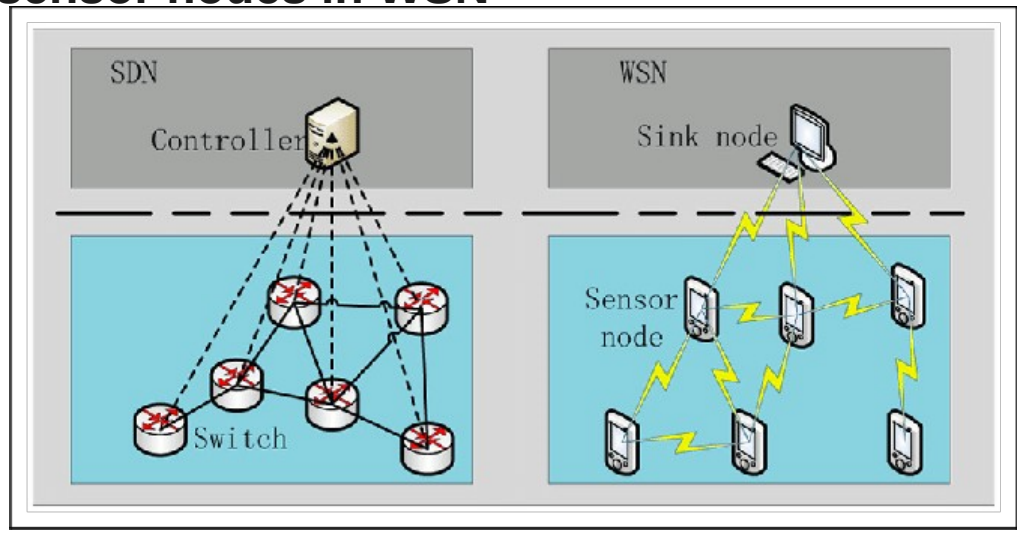
SDN for Wireless Sensor Networks

Challenges in Wireless Sensor Network

- Constrained environment – limited memory and computing power
- Architecture is Vendor Specific
- Real time programming of sensor nodes

How to ensure?

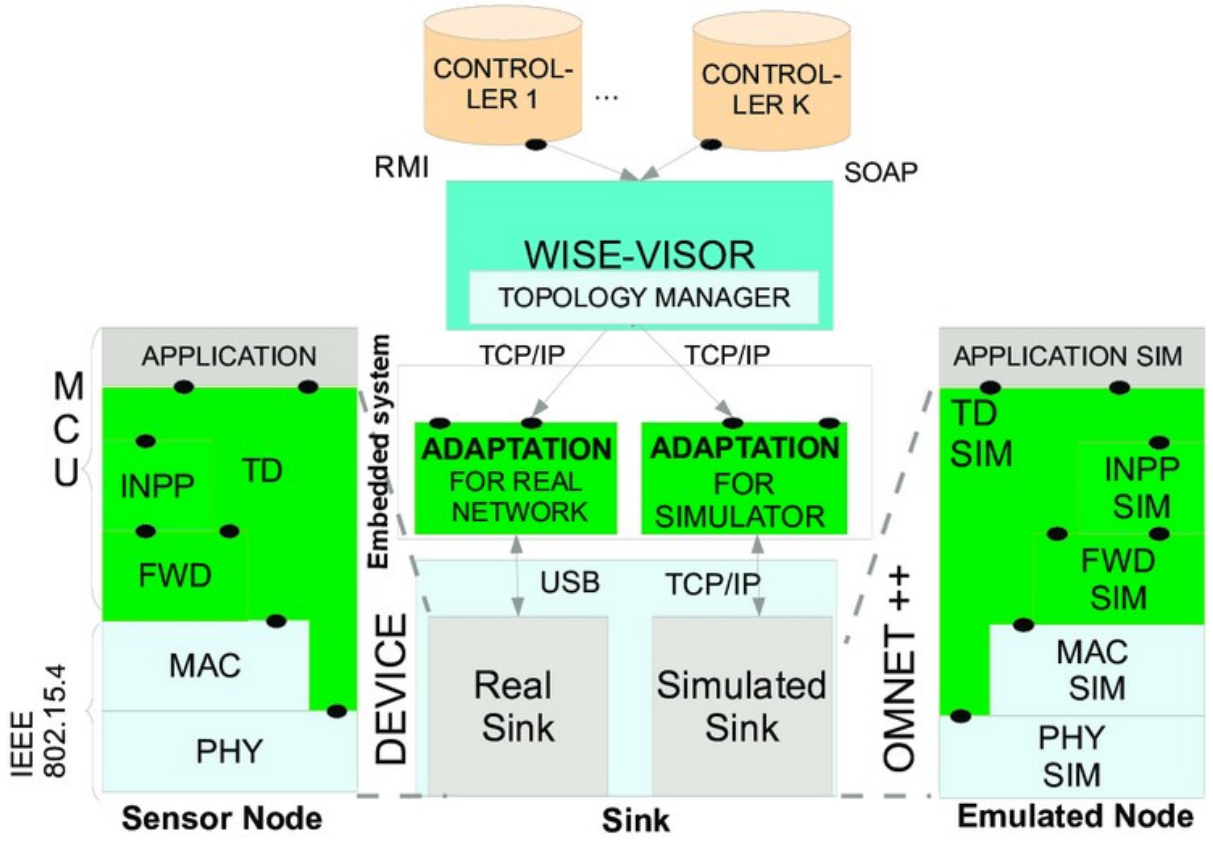
- Real time programming of sensor nodes and forwarding path
- Integrate different sensor nodes in WSN



Software Defined SDN

- **Sensor Open Flow (Luo et al., IEEE Comm. Letters ‘12)**
  - Data forwarding based either source node id or if it exceeds some threshold
- **Soft WSN (Bera et al., IEEE SJ’16)**
  - Implementing multiple sensors on a single board, change sensing delay dynamically, change active and sleep mode dynamically
- **SDN WISE (Galluccio et al., IEEE INFOCOM’15)**
  - Software defined WSN platform
  - Design of Flow table for rule placement at sensor nodes
  - Any programming language can be used

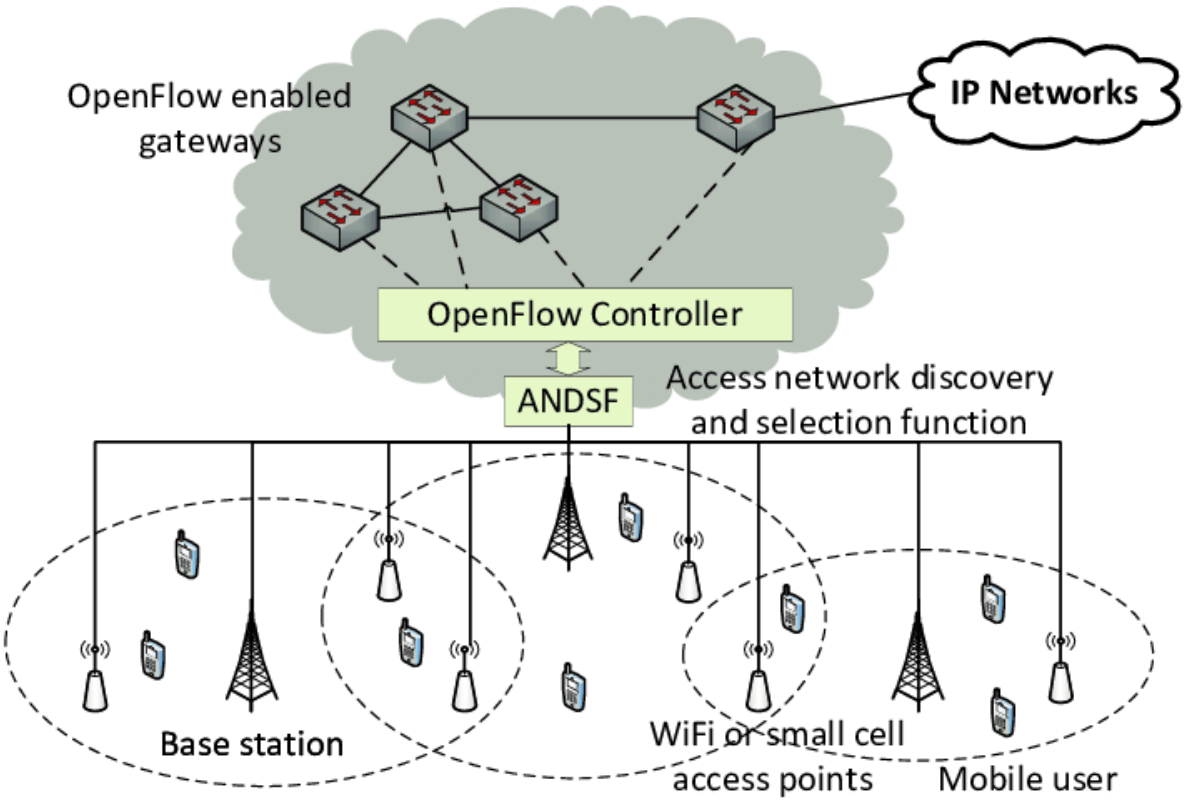
SDN WISE Protocole Stack [Galluccio etal. IEEE INFOCOM'15]



SDN for Mobile Networking

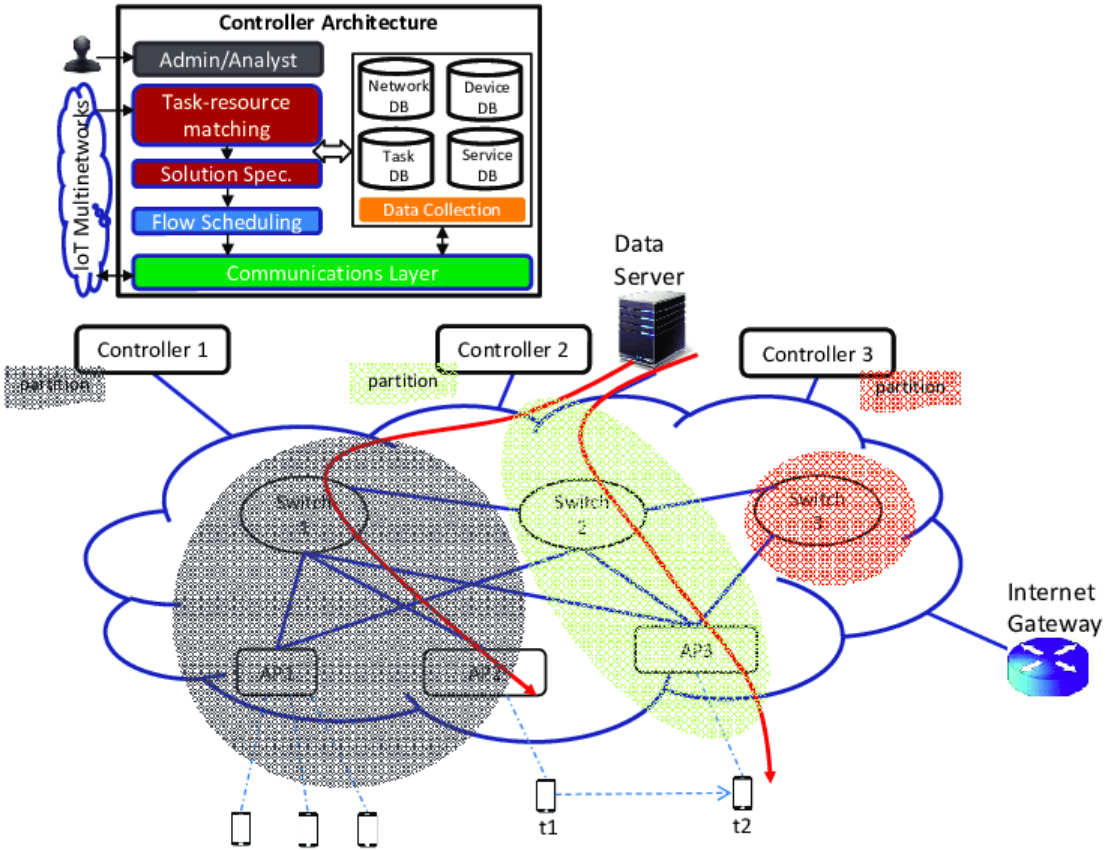
- **Flow Table Paradigm of SDN**
  - Well suited for end-end communication over multiple technologies such as 3G, 4G and WiFi
- **Logically Centralized Control**
- **Path Management**
  - Data routed on the basis of service requirement
- **Network Virtualization**
  - Abstracts physical resources from network services

SDN For Mobile Networking : Mobile Data Offloading



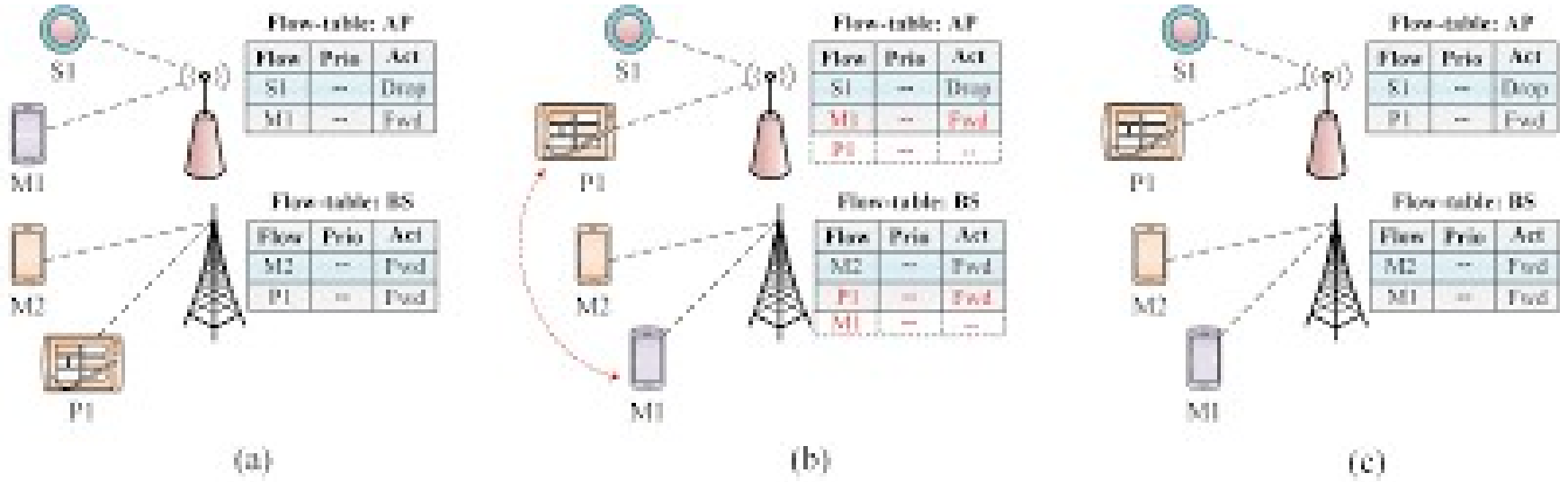
Ubi - Flow : Software Defined IoT

- **Mobility Management in SDIoT**
  - Scalable control
  - Fault Tolerance
- **Flow Scheduling**
  - Network Partition
  - Network Matching
  - Load Balancing



Ubi-Flow : Mobility Management in Urban-Scale Software Defined IoT, IEEE Infocom, 2015

Mobility Aware Flow Rule Placement



Mobility Aware Flow Table Implementation in Software Defined IoT, IEEE Globecom, 2016

Rule Placement for Software Defined IoT

- **Existing rule placement schemes for wired network can be used**
- **Load Balancing to be considered due to the dynamic nature of IoT network**
- **Dynamic resource allocation can be integrated**

Anomaly Detection in IoT Network

- **Monitor the network through Open Flow to detect any anomaly in the network**
  - Done by monitoring each flow in the network
  - Collect port statistics of the network
  - Generation of large number of packets in the network indicates anomaly