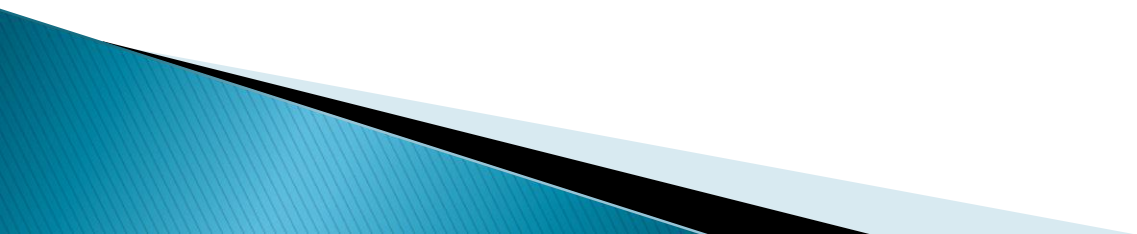
مهندس گلزار

Challenge in IT World

Solving Complex and Timeconsuming Problems



Solutions:

1. Super Computer/Main frame
2. Cloud Computing
3. Cluster Computing
4. Grid Computing

Super Computer/Main frame

Issues:

1. Computational Power Limitation
2. Cost Limitation
3. Resource Wasting

Cloud Computing

Solving before issues
Remaining one of them:

Computational Power Limitation
=
UnScalability

Cluster Computing

- Solving unscalability
- High cost for setup

Difference between Cloud and Grid

- Resource Distribution
  - cloud:centralized
  - grid: decentralized
- Ownership
  - cloud is owned by single party
  - cloud is owned by multiple party

Difference between Cluster and Grid

Grid Computing	Cluster Computing
Loosely coupled	Tightly coupled
Dynamics and divorsity	Static
Heterogenous	Homogenous
Dynamic job management and scheduling	Static job management and scheduling

Cloud definition(NIST):

1. Cloude is a model for enabling ubiquitous and on demand network access
2. Shared pool of configurable resources of
3. That can be provisioned and released with minimum interaction with service provider

Cloud Protocol

- SOAP
- RSS REST,AJAX,…

Cloud services:

- IaaS(Infrastructure as a Service)
- PaaS(Platform as a Service)
- SaaS(Software as a Service)

IaaS Providers:

- Amazon
- Go Grid

Paas Providers:

- Google
- Microsoft
- Amazon

SaaS Providers:

- Google
- Facebook

Category of Cloud based on deployment

- Private cloud
- Community cloud
- Public cloud
- Hybrid cloud

Amzon Services

- S3(Simple Storage System)
- EC2(Elastic Cloud Computing)
- Amazon Simple DB
- Amazon Cloud Front
- Amazon Simple Queue

Challenges in Cloud

- Internet Interface Requirement
- Delay

Fog Computing/Edge Computing

IEEE 802.11

Components:
Station
Wireless Medium
Access Point/Base Station
DS

BSS

- Search/Scan
  - Active-Scanning
  - Passive-Scanning
- Authentication
- Association

Mobility in IEEE802.11 Protocol

- No Transaction
- BSS Transaction
- ESS Transaction

IEEE 802.11 Services

- Distribution System
  - Distribution
  - Integration
  - Association
  - Reassociation
  - Disassociation
- Station
  - Authentication
  - Deauthentication
  - privacy

Elements of IOT(Communication)

- IEEE 802.15.4
- Bluetooth
- WiFi
- LTE
- Communication tech:
    - NFC
    - RFIS
    - UWB

Elements of IOT(Processing)

- Microcontroller
- SOC

Operating System	Language Support	Minimum Memory (KB)	Event-based Programming	Multi-threading	Dynamic Memory
TinyOS	nesC	1	Yes	Partial	Yes
Contiki	C	2	Yes	Yes	Yes
LiteOS	C	4	Yes	Yes	Yes
Riot OS	C/C++	1.5	No	Yes	Yes
Android	Java	-	Yes	Yes	Yes

Elements of IOT(Services)

- Identity-Related Services
- Information Aggregation Services
- Collaborative-Aware Services
- Ubiquitous Services

Elements of IOT(Semantics)

- RDF:Resource Description Framework
- WOL:Web Ontology Language

Elements of IOT

IoT Elements		Samples
Identification	Naming	EPC, uCode
	Addressing	IPv4, IPv6
Sensing		Smart Sensors, Wearable sensing devices, Embedded sensors, Actuators, RFID tag
Communication		RFID, NFC, UWB, Bluetooth, BLE, IEEE 802.15.4, Z-Wave, WiFi, WiFiDirect, , LTE-A
Computation	Hardware	SmartThings, Arduino, Phidgets, Intel Galileo, Raspberry Pi, Gadgeteer, BeagleBone, Cubieboard, Smart Phones
	Software	OS (Contiki, TinyOS, LiteOS, Riot OS, Android); Cloud (Nimbits, Hadoop, etc.)
Service		Identity-related (shipping), Information Aggregation (smart grid), Collaborative-Aware (smart home), Ubiquitous (smart city)
Semantic		RDF, OWL, EXI

IOT Technology

- Networks:
  - WSN
  - Cloud Computing

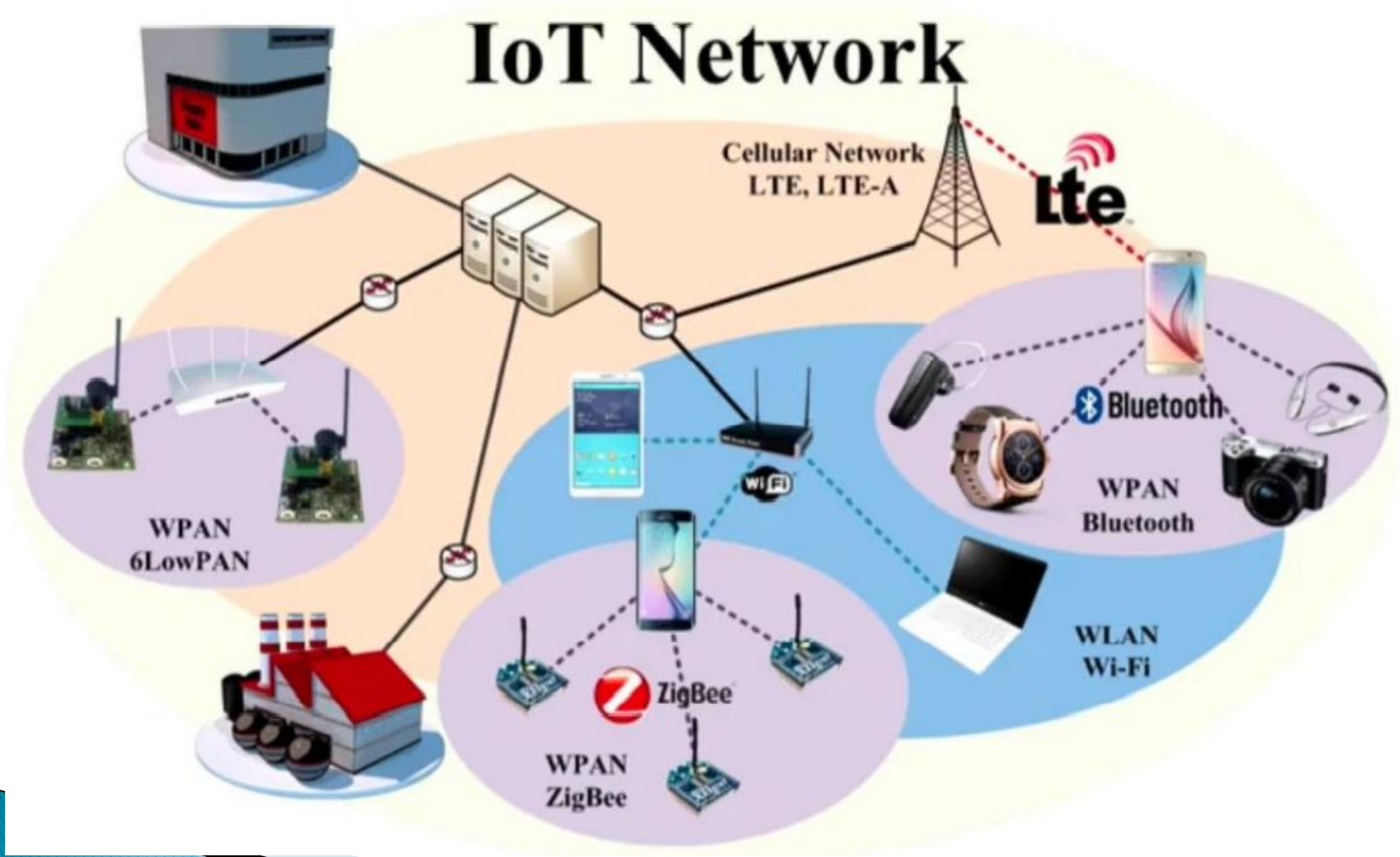
IOT Technology(WSN)

- Tele application
- Need to device with low energy,low cost,high efficency

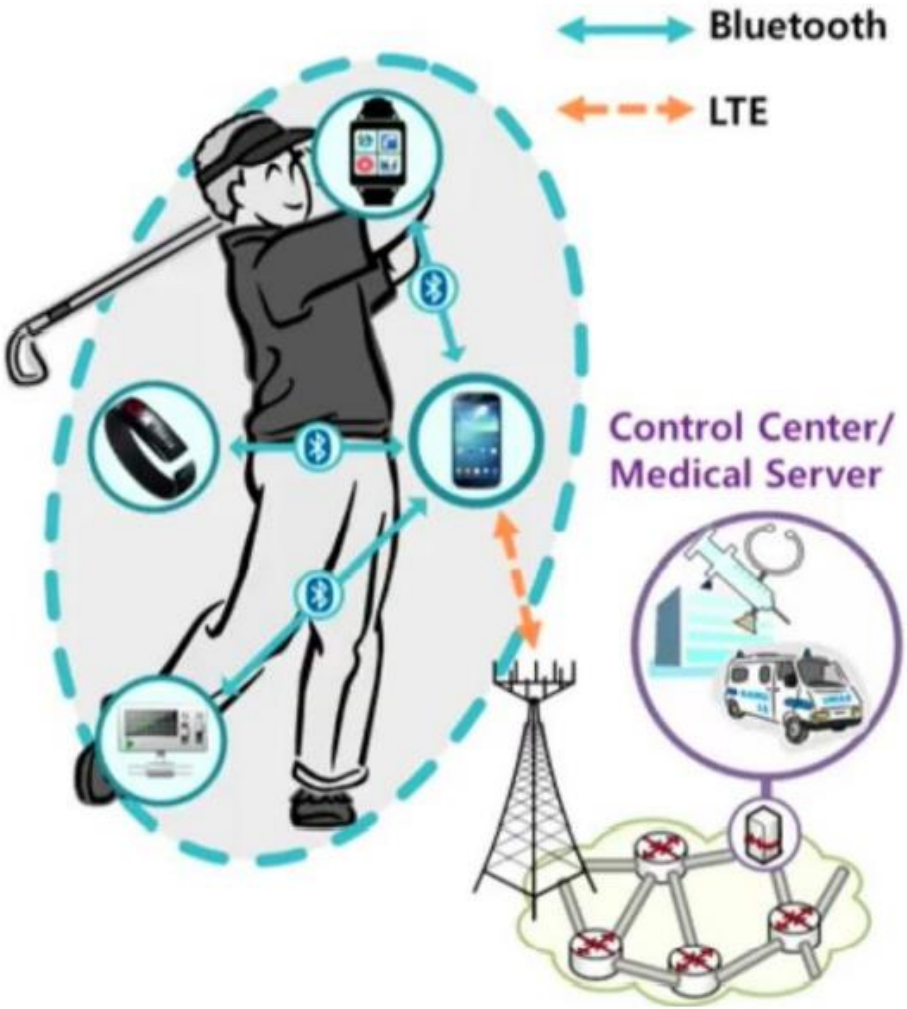
IOT Technology(Cloud Computing)

- Need to IOT infrastructure that collect,process and analyze big data

IOT Network


IoT Network
Cellular Network
LTE, LTE-A
lte
Bluetooth
WPAN
Bluetooth
WPAN
6LowPAN
Wi Fi
WLAN
Wi-Fi
ZigBee
WPAN
ZigBee

IOT Network(wearable network)



IOT Network

- Wi-Fi
- Bluetooth
- ZigBee
  - FFD(Full Function Devices)
  - RFD(Reduced Function Devices)

IOT Protocols:

Application Protocol		DDS	CoAP	AMQP	MQTT	MQTT-NS	XMPP	HTTP REST
Service Discovery		mDNS				DNS-SD		
Infrastructure Protocols	Routing Protocol	RPL						
	Network Layer	6LoWPAN				IPv4/IPv6		
	Link Layer	IEEE 802.15.4						
	Physical/ Device Layer	LTE-A	EPCglobal	IEEE 802.15.4		Z-Wave		
Influential Protocols		IEEE 1888.3, IPSec					IEEE 1905.1	

IOT Protocols:

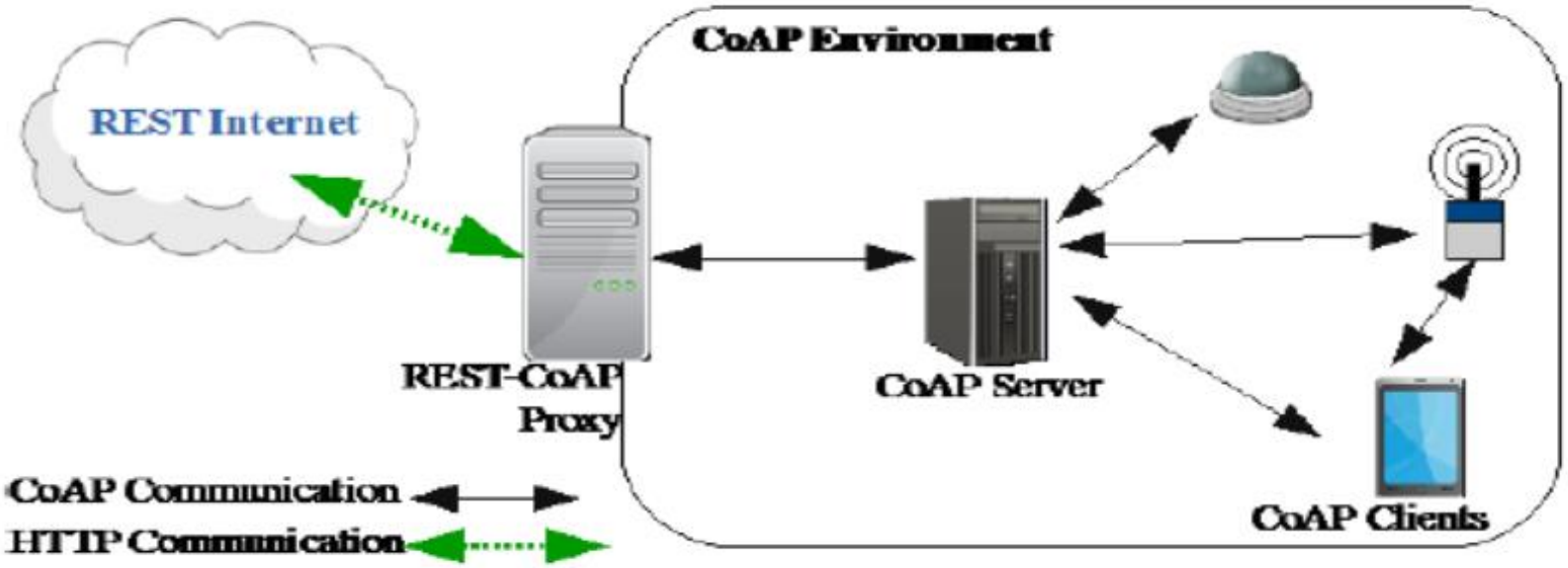
- Application Protocols
- Service Discovery Protocols
- Infrastructure Protocols
- Other Influential Protocols

Application Protocols

- COAP
- Message Queue Telemetry Transport
- Extensible Messaging and Presence Protocol
- Advanced Messaging Queuing Protocol
- Data Distribution Service

Application Protocols

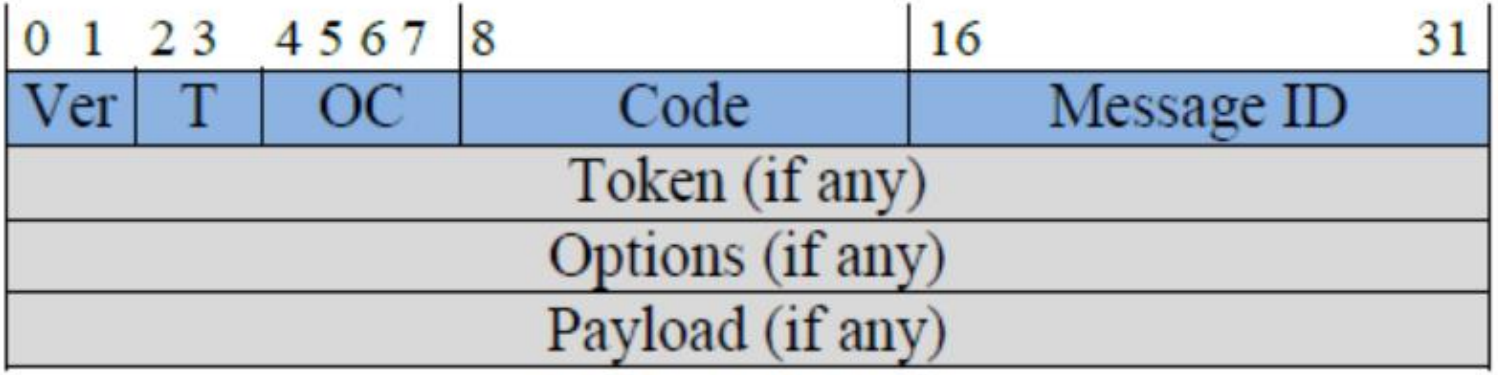
- COAP



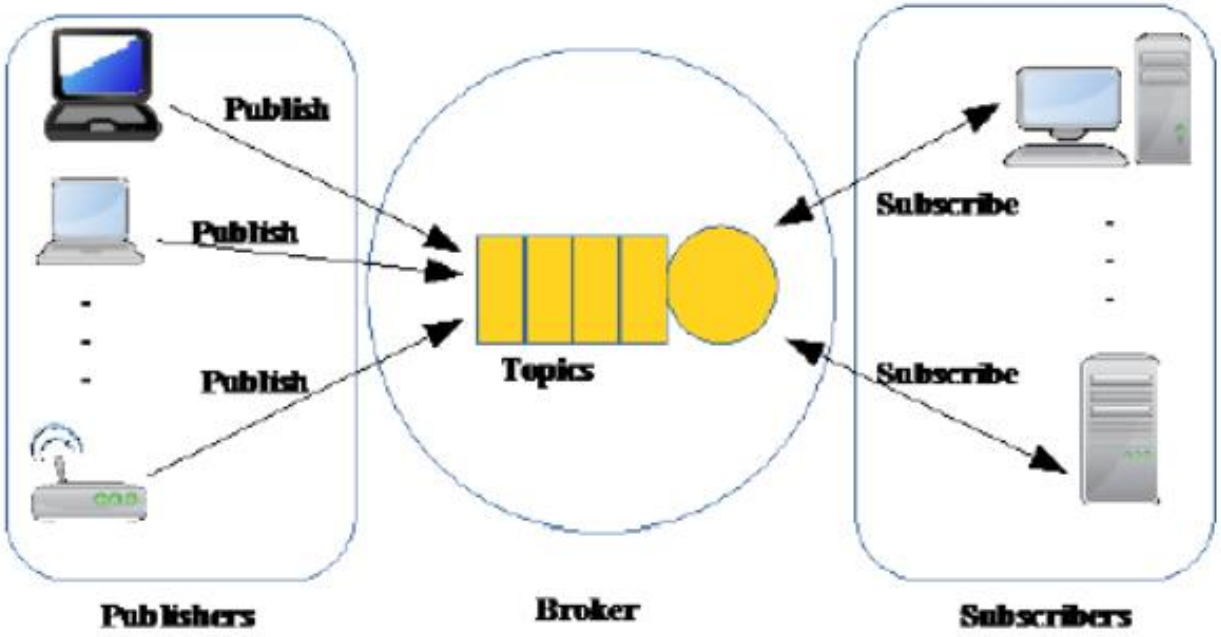
Constrained Application Protocol(COAP)

- CON : Confirmable
- NON : Non – Confirmable
- ACK : Acknowledge
- Reset

COAP message format

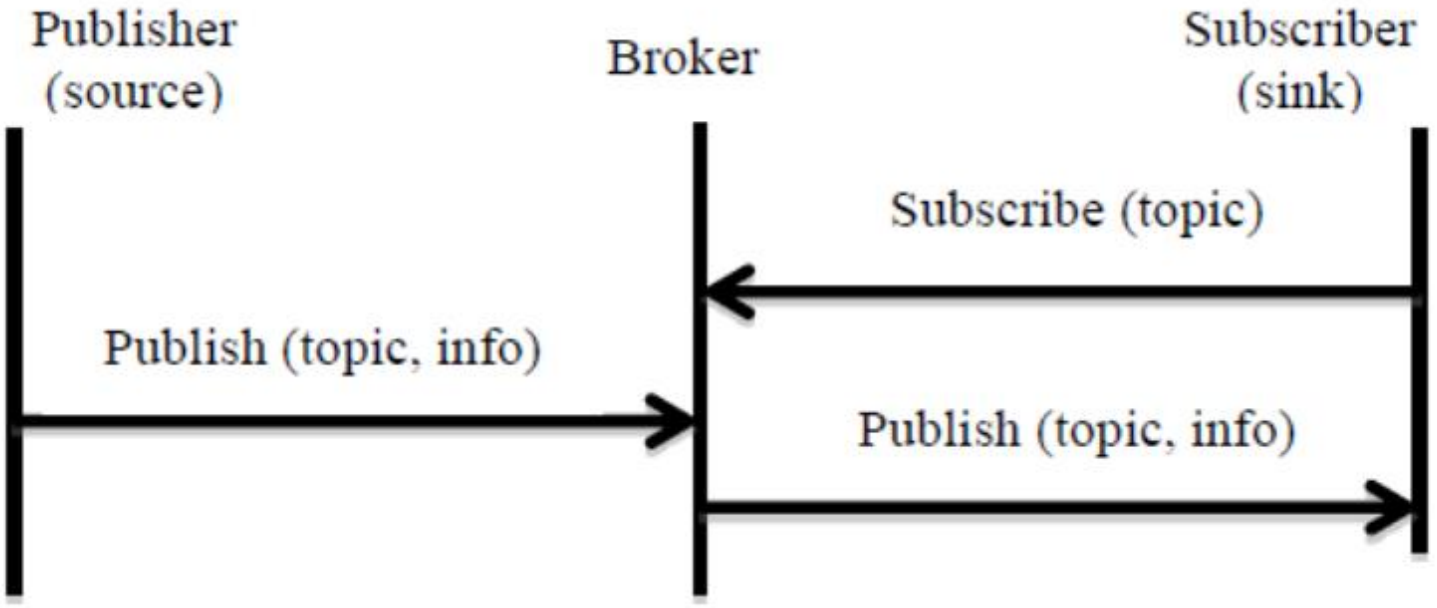


Message Queue Telemetry Transport(MQTT)

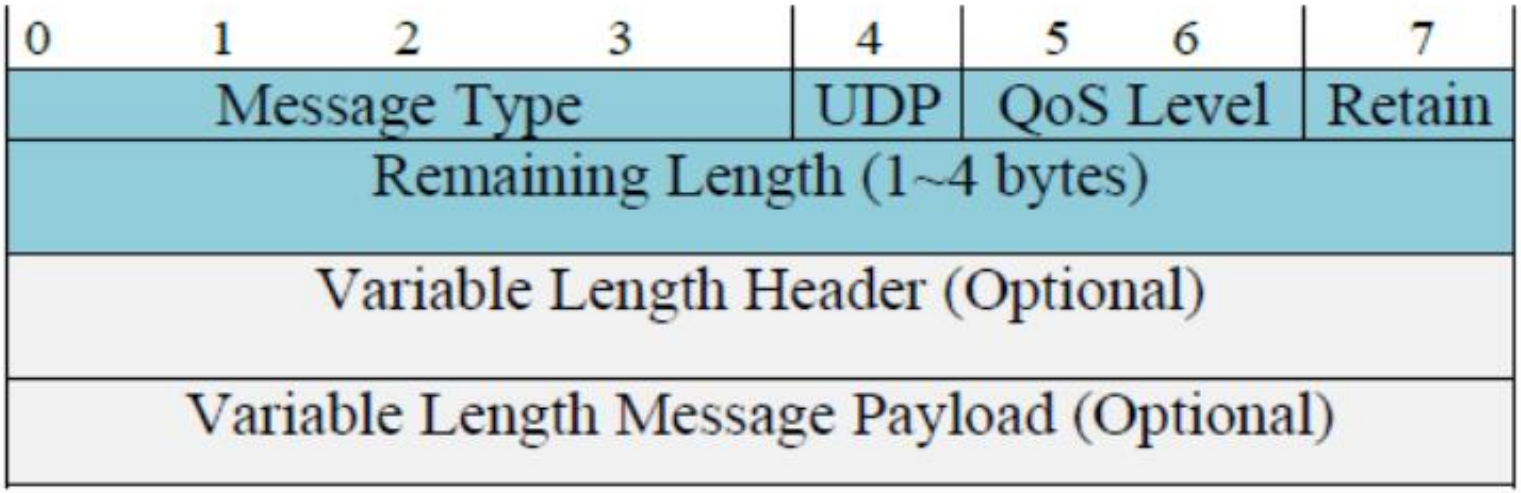


MQTT

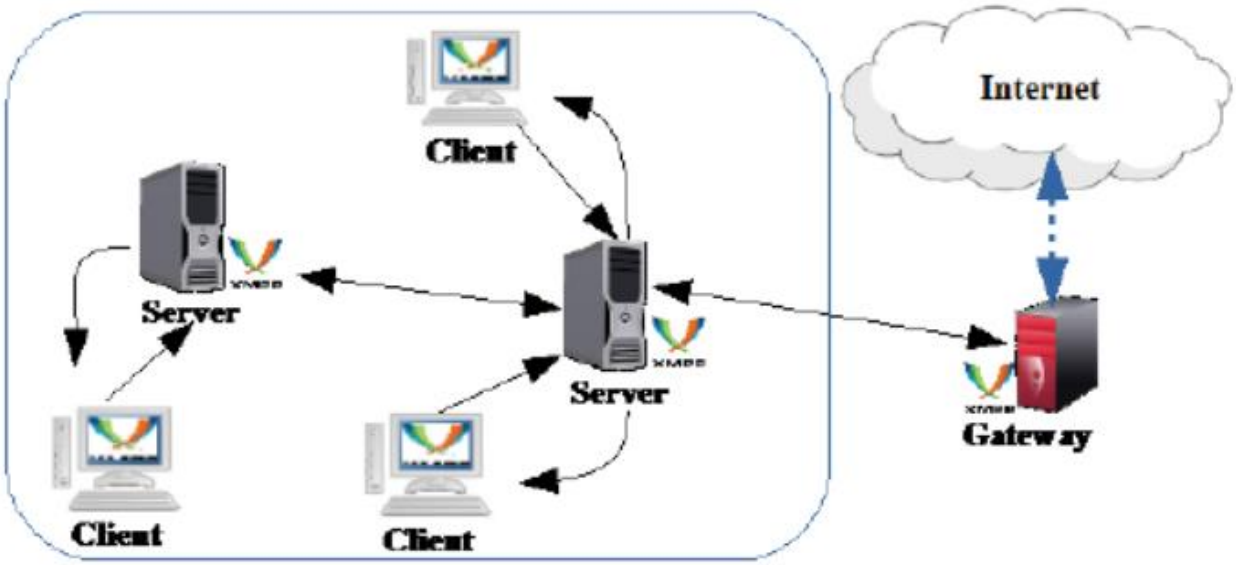
- Publisher
- Subscriber
- Broker



MQTT message format

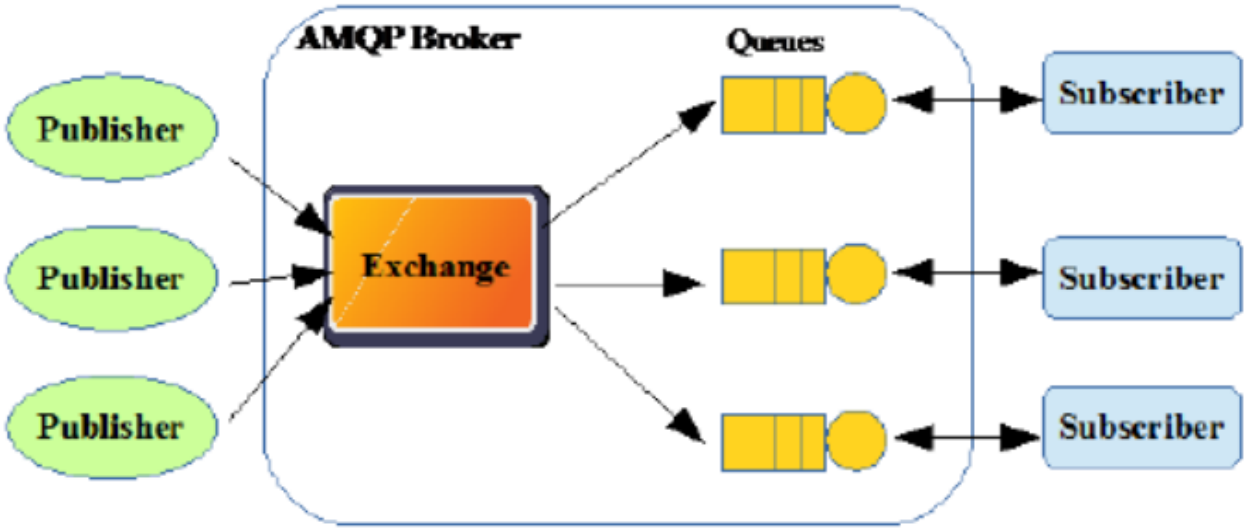


XMPP protocol

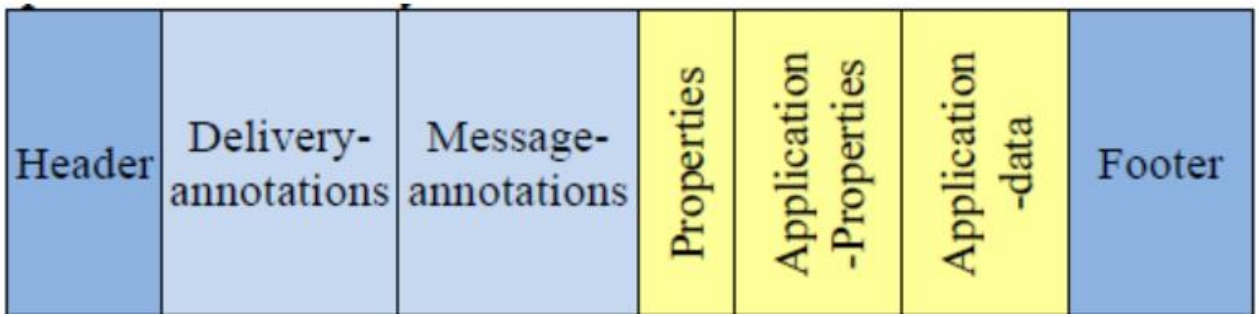


AMQP(Advanced Messaging Queuing Protocol)

- Exchange
- Message Queues



AMQP message format

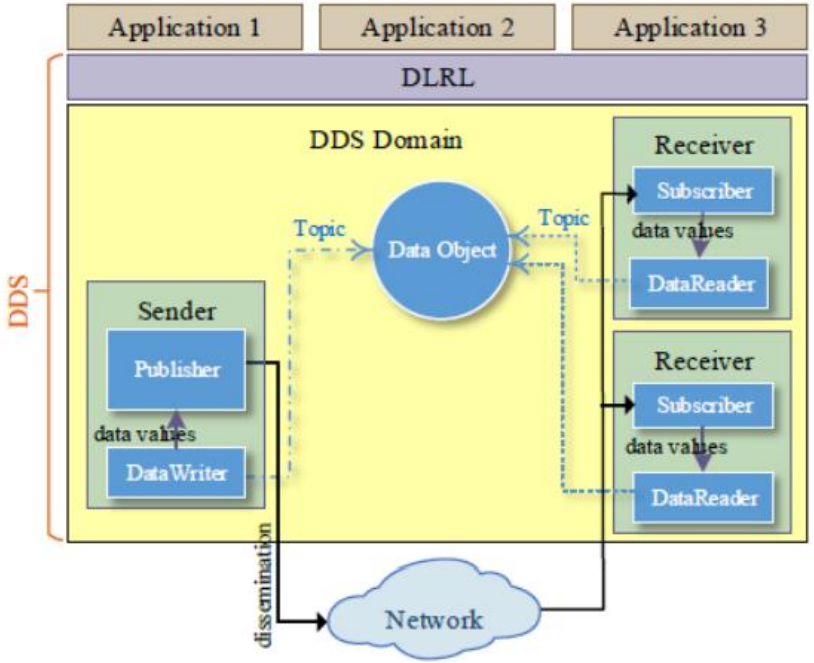


AMQP message format

- Header
- Delivery-annotation
- Properties
  - Message_id
  - User_id
  - Subject
  - Replay-to
- Application-data
- Footer

Data Distribution Service(DDS Protocol)

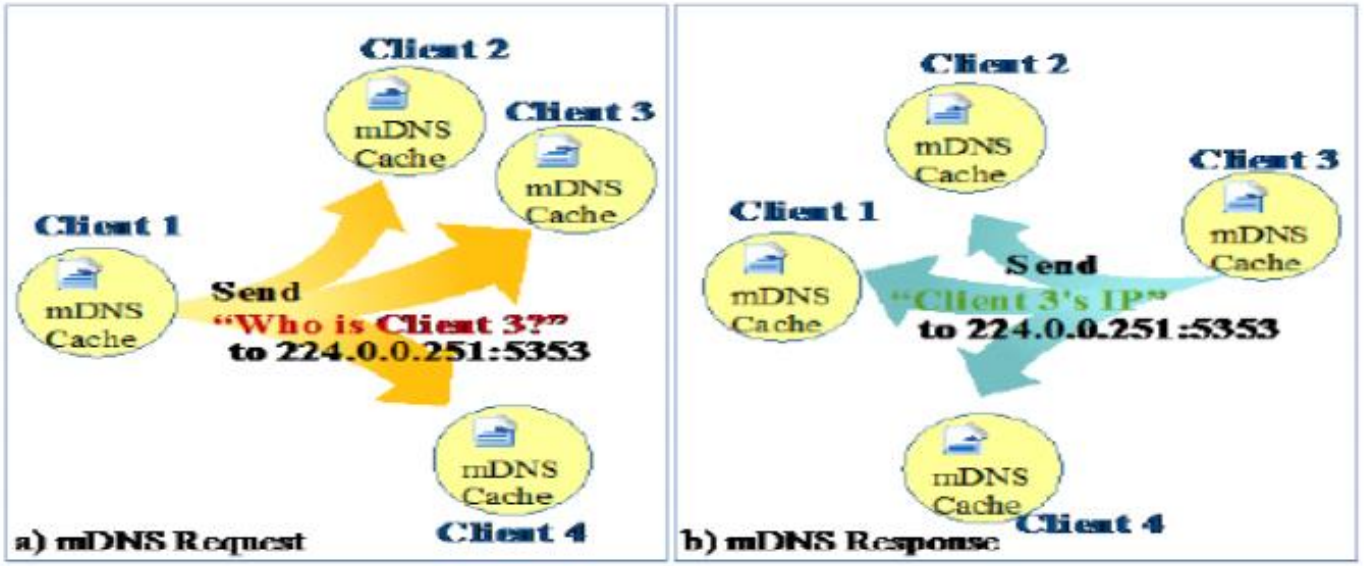
- DCPS(Data Centric Publish/subscribe)
- DLRL(Data Local Reconstruction Layer)



Service Discovery protocol

- Multicast Domain Name Service (MDNS)
- DNS-SD

Multicast Domain Name Service (MDNS)



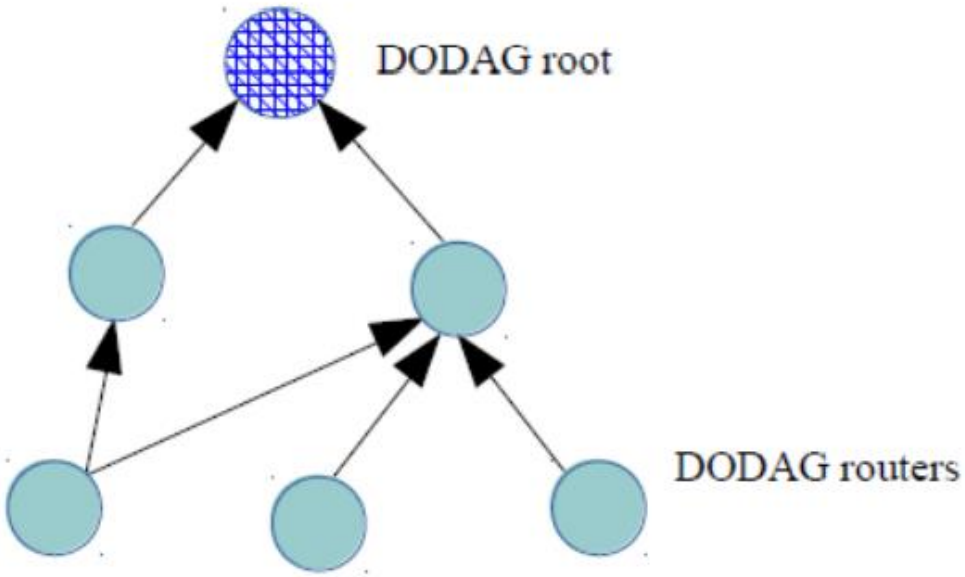
DNS-SD

Homework????

Infrastructure Protocols

- Routing Protocol for low power and lossy network
- IPV6 over low power wireless personal Area Network(6lowPAN)
- IEEE 802.15.4
- Bluetooth Low Energy
- LTE A
- ZigBee
- Z-Wave

Routing Protocol for low power and lossy network



Routing Protocol for low power and lossy network

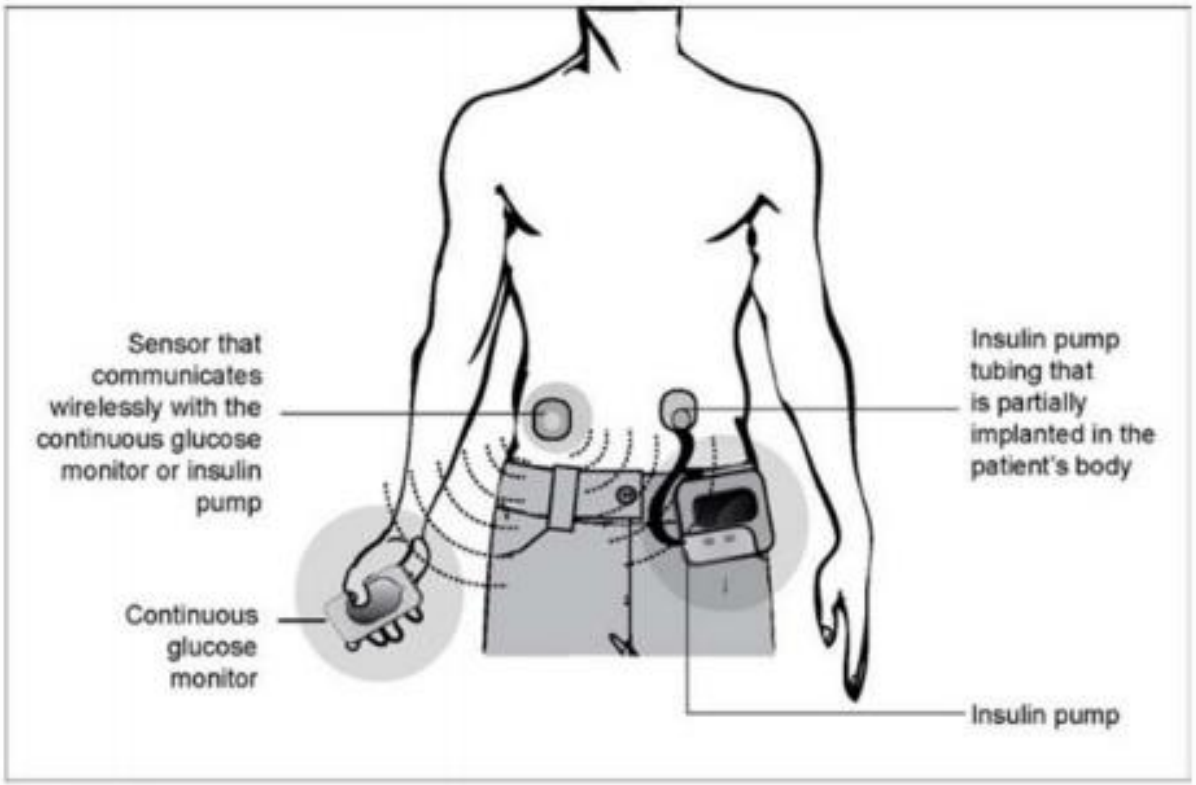
- Messages:
  - Destination Advertisement Object(DAO)
  - DODAG Information Solicitation
  - DIO
  - DAO-Ack

IOT challenges

- Availability
- Reliability
- Mobility
- Performance
- Management
- Scalability
- Interoperability
- Security and privacy

IOT security

- BashBug/Shellshock



IOT security(example)

Number	Attack
1	Autonomus Cars hack
2	LIFX
3	Spam
4	Heartrate device
5	Google glasses

IoT security requirements

- security requirements
- Privacy requirements
- Trus requirements

security requirements

- Safety of human lives
- System avilability
- Confidentiality & integrity
- Log & Report
- Protection from Dos,Ddos,…

Challenges and Open Problem in IOT

- Reason:
  - Big data for each thing
  - Communication between hardwares

Data collection

- Collected big data
- Security and privacy

Communication subjects

- Many Things in IOT
- IOT and TCP challeng
- Data realtime detection

- Security for IOT
- Privacy for IOT

Architecture

- ARM
- MGC
- SOA and Compose
- WOA