Lesson 2
CoAP Web-Connectivity Protocol

Constrained Environment for Connected Devices

- Data is limited in size
- 10s of Bytes from a device
- Limited compared to data interchange of 1000s of bytes between web clients and web servers when using HTTP, TCP and IP

Constrained Environment for Connected Devices

- Data routes over the low power and lossy (ROLL) network
- Devices may sleep most of the time in low power environment
- Awakes when required (when a client initiates)

Constrained Environment for Connected Devices

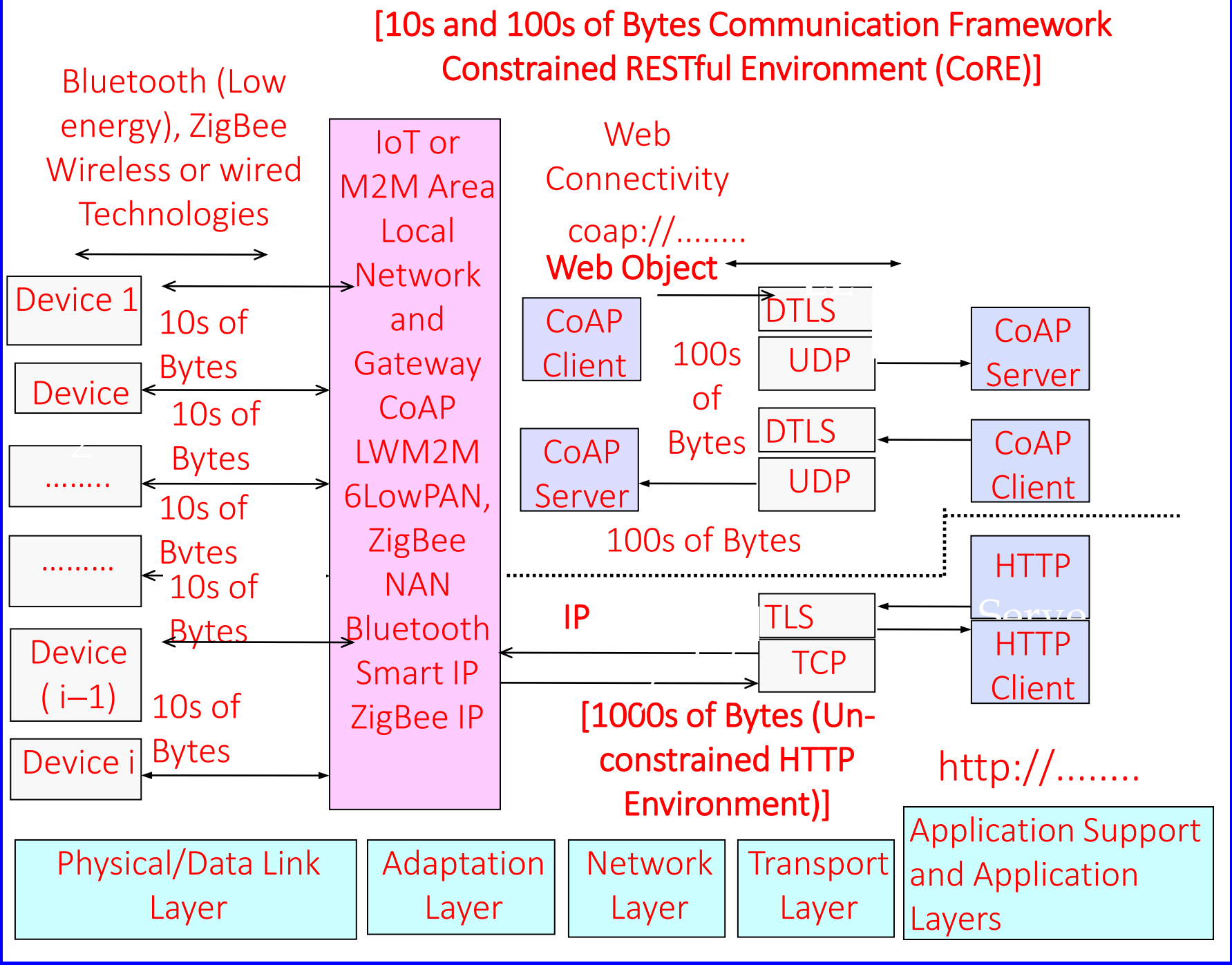
- The connectivity breaks for long periods
- Have limited up intervals in lossy environment

Constrained RESTful Environment (CoRE)

- The gathered data from number of devices consists of 100s of Bytes after enriching and consolidating at Gateway

Constrained RESTful Environment (CoRE)

- Communication framework enables that data of networked devices communicate over the Internet using the REST software architecture

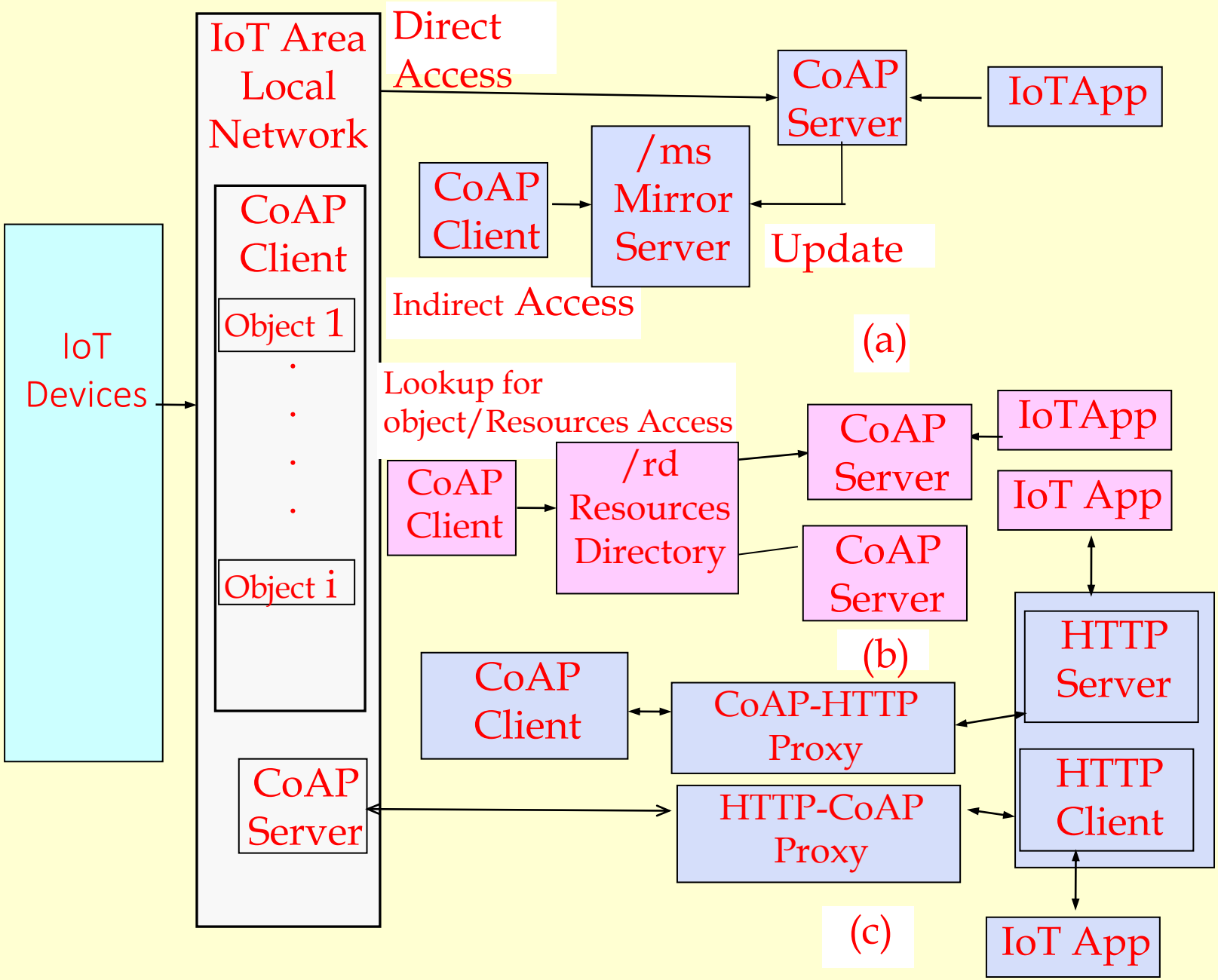

[10s and 100s of Bytes Communication Framework Constrained RESTful Environment (CoRE)]
Bluetooth (Low energy), ZigBee Wireless or wired Technologies
IoT or M2M Area Local Network and Gateway CoAP LWM2M 6LowPAN, ZigBee NAN Bluetooth Smart IP ZigBee IP
Web Connectivity
coap://.....
Web Object
Device 1
Device
.....
.....
Device (i–1)
Device i
10s of Bytes
10s of Bytes
10s of Bytes
10s of Bytes
10s of Bytes
CoAP Client
CoAP Server
100s of Bytes
DTLS
UDP
DTLS
UDP
CoAP Server
CoAP Client
100s of Bytes
IP
TLS
TCP
HTTP Server
HTTP Client
[1000s of Bytes (Un-constrained HTTP Environment)]
http://.....
Physical/Data Link Layer
Adaptation Layer
Network Layer
Transport Layer
Application Support and Application Layers

CoAP (Constrained Application Protocol)

- An IETF recommended protocol for constrained environment devices
- A web-object's data transfer standard protocol for sending a request or response
- For example, RESTful CoAP

CoAP Client and Server

- Object or resource uses CoAP
- CoAP client at a device, IoT/M2M Area Local Network or Gateway sends requests to a server
- CoAP server sends the responses, messages, resources and notifications


IoT Area Local Network
Direct Access
CoAP Server
IoTApp
CoAP Client
/ms Mirror Server
Update
Indirect Access
IoT Devices
CoAP Client
Object 1
Object i
(a)
Lookup for object/Resources Access
CoAP Client
/rd Resources Directory
CoAP Server
IoTApp
IoT App
CoAP Server
(b)
CoAP Client
CoAP-HTTP Proxy
HTTP Server
HTTP Client
CoAP Server
HTTP-CoAP Proxy
(c)
IoT App

CoAP Features

- Standard organisation IETF defined Application support layer protocol
- CoAP web-objects communication using request/response interactions model

CoAP Features

- A specialized web transfer protocol used for CoRE using ROLL network.
- Use of object model for resources, and each object can have single or multiple instances.
- Each resource can have single or multiple instances

CoAP Features

- Supports resource directory and resource discovery functions.
- The resource identifiers use the URIs coap://…
- Small message-header of 4 bytes.

CoAP Features

- CoRE communication is asynchronous communication over the ROLL
- Integrates easily with the web using the CoAP application cross-protocol proxies.
- Because HTTP and CoAP both share the REST model

UDP (Universal Datagram Protocol)

- A transport layer standard protocol sending a request or response datagrams

DTLS (Datagram Transport Layer Security protocol)

- Provisions for three types of security services (integrity, authentication and confidentiality
- Security binding with PSK or RPK or Certificate

Summary

We learnt

- CoAP a constrained environment Application protocol
- IETF standard
- Uses UDP at transport layer and
- DTLS at data datagram transport security

Summary

We learnt

- Four byte header
- CoAP client at local area network/ Gateway sends request
- CoAP server responds to the requests or sends notifications/messages

End of Lesson 2 on CoAP Web Connectivity Protocol