Mobile Client Devices and Pervasive Computing

Lesson 04
RFID

Radio Frequency identification (RFID) method

- An identification system using the tagging and labelling of objects
- RFID technology enables tagging with a product, parcel, postal article, person, bird, animal, vehicle or object
- RFID tags or labels contain integrated circuit chips and antennas

RFID

- Makes the identification feasible using RF
- An ID can use UART or NFC protocol, and identify the tag, when RFID

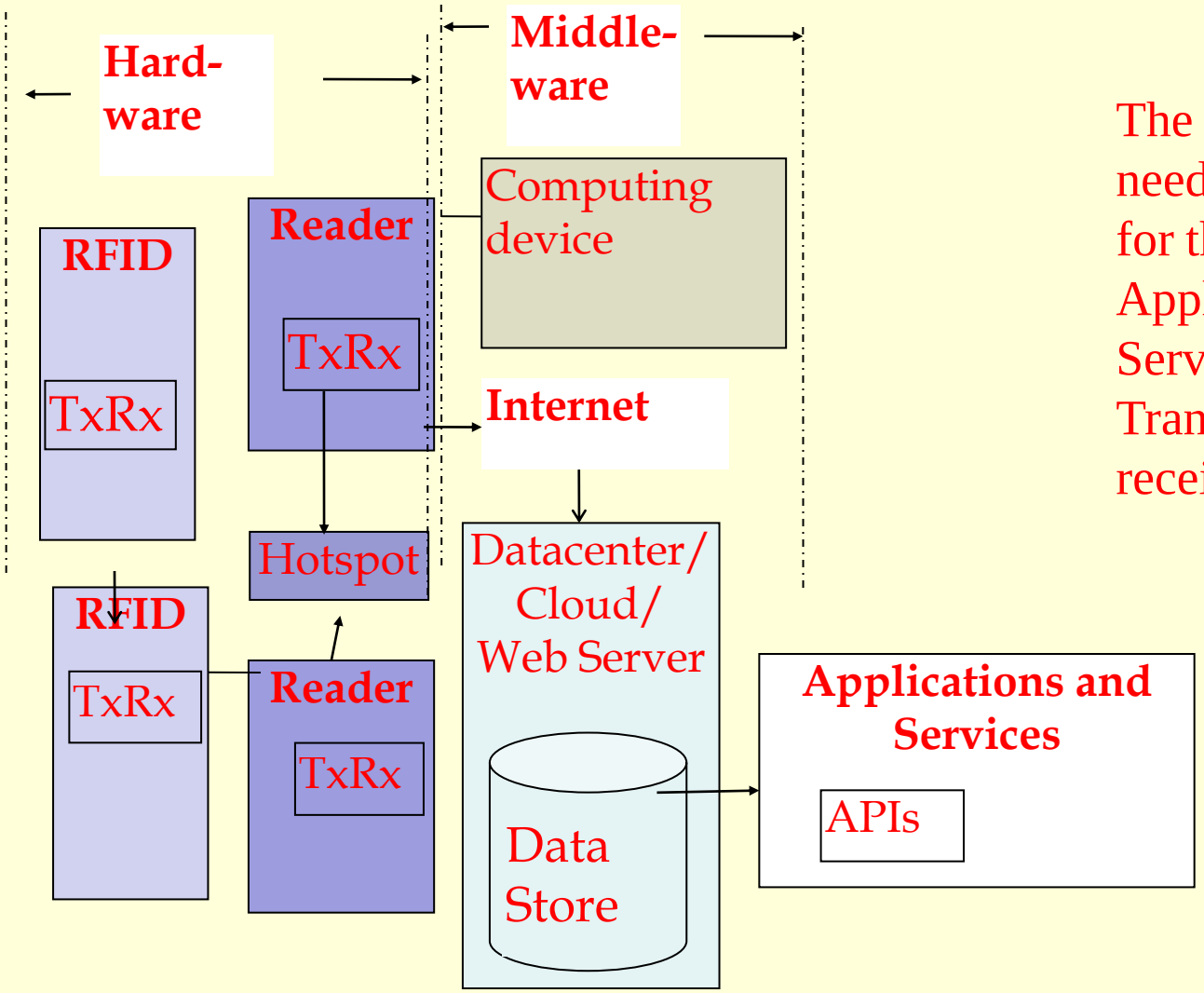
RFID tag communication of ID

- ID communicate using UART or NFC protocol
- Identifies a tag, when at a distance less than 20 cm
- An active NFC device/mobile generates RF field and generates enough power for device RFID transmitter
- Using that power, the RFID transmits the identification tag contents.
- Active device has a built-in power source (battery) and transmits the informationon its own.

Passive device

- Drives power from electrical current induced in its antenna by the incoming RF signals from a reader or hotspot
- Then the tag transmits information back

TxRx- Transmitter-cum-receiver, Applications and Services



The Components needed in a system for the Applications and Services; TxRx- Transmitter-cum-receiver

Middleware

- Software components used at the reader, read manager, data store for the transaction data store and APIs of the applications

Applications and services

- Other associated applications software use the Data Store at the cloud/web server

Design and Security Issues

- Design issue: Designing a unique ID system needs a standard global framework.
- Security issues: A tag is read only— Can thus interact with any reader and thus allows automated external monitoring

Privacy Issue

- A privacy issue arises when tag and reader need not to be authenticated before their use
- Full implementation of privacy and security needs data processing at the tag and reader with access encryption and authentication algorithms
- RFID system vulnerability to external virus attacks.

Cost and Protection

- RFID tag and reader become costly with data processing and security
- enhancing technology.
- Tag needs protection from the adverse weather condition, damage to the tag.

Recycling and Active life Issues

- Recycling of the tags, environment concern.
- Active RFID, which consists of battery, has limited life or 2 to 4 years

EPCglobal Architecture Framework

- The group suggested Electronic Product Code (EPC)
- standards, roles and architecture
- Assignment of a unique identity
- The framework to facilitate business processes, applications and services uniquely identifying the physical objects
- loads, locations, assets, and other entities.

EPC Information Services (EPCIS) Design Of An EPC Global Standard

- EPC related data sharing within and across enterprises
- EPCIS Capturing Application (ECA), for capturing the EPC-related data required for the business processes

EPCIS Accessing Application (EAA) and Repository

- EAA for the enterprise business processes supported by data captured using ECA
- Partner Applications such as postal tracking system connected with payment systems.
- Repository for storing the records of events and for retrieving using queries from EAA

Object Name Service version 2.0.1 (2013)

- Performs the lookup functions which are based upon the DNS (domain name system) which governed by IETF
- DNS name enables connectivity to web-server using Internet
- ONS implements that function using a distributed set of servers.
- Lookup function refers to looking at the DNS name for enabling the web server connectivity.

RFID Technical Challenges

- Interference: When an organisation uses number of wireless systems, since RFID hotspot also wireless installation, the frequencies may interfere among the systems
- The systems require effective mitigation from interference

RFID Technical Challenges

- Effective implementation at data processing subsystem consisting of reader and tag protocols, middleware architecture and EPC standards
- Needs of low cost of the tags and RFID technology
- Design robustness
- Data security

Security Challenges

- Discovery of foreign attacks (intrusions)
- Maintain overall data integrity
- Unauthorised disabling of a tag by a reader which is external, thus making tag useless
- Unauthorised tag manipulation by a reader which is external, thus making tag useless

Security Challenges

- Cloning of the tag by unauthorised entity
- Eavesdropping which means setting up additional reader pretending to reader belonging to the system
- Man-in-the-Middle attack: When an external object pretends to be either a tag or reader between system tags and readers

Solutions

- Encryption
- Tag deactivation on detection of intrusion
- Mutual authentication between tag and reader,
- Detection of tag owner
- Use of read data analyser
- Data cleaning

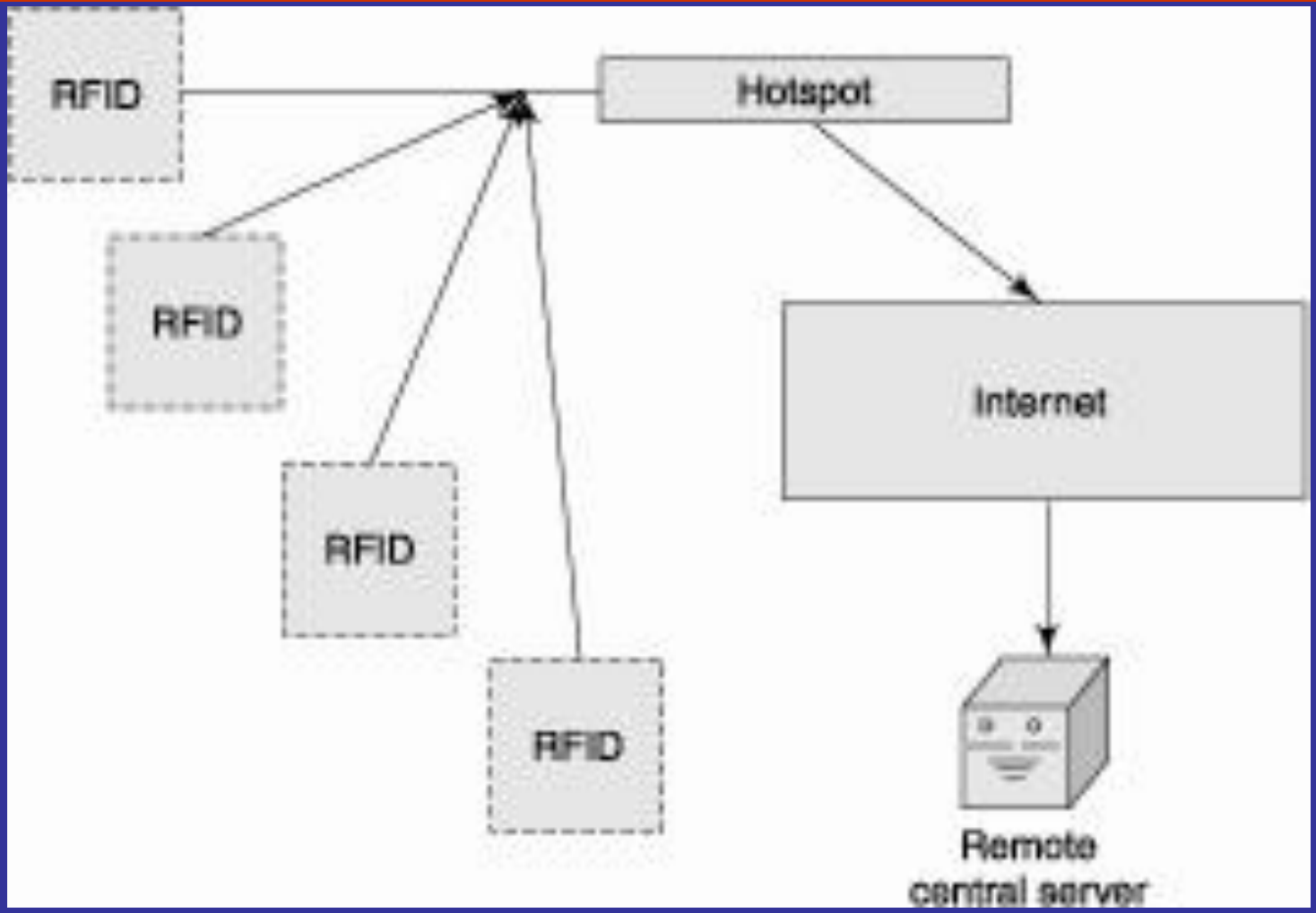
NEAR FIELD COMMUNICATION (NFC) PROTOCOL

- When RFID tag is at a distance less than 20 cm, then a device using can identify the tag
- Active NFC device generates RF field that induces the currents in RFID and generates power
- Using generated power, RFID transmits the identification tag contents

RFID tag hotspots

- The hotspots connect to the Internet through a leased line, wireless, or mobile services.
- A mobile device or PC with a wireless interface is programmed to function as the hotspot.

RFID and Hot spot



Summary

- RFID
- NFC Protocol
- Enable identification using radio waves received and transmitted from and to a nearby source

End of Lesson 04
RFID