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Developing Internet of Things Retail Inventory Control/Sales Monitoring

CREATE THE FUTURE

CON6249

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Consulting Member of Technical Staff
IoT Group

September 30, 2014

JavaOne ORACLE

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Safe Harbor Statement

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Program Agenda

1. Introduction to Internet of Things (IoT)
2. IoT in Retail Inventory
3. Sample Using RFID tags
4. Device to Cloud
5. Code Samples

Developing Internet of Things Retail Inventory Control/ Sales Monitoring

Presentation Update

- All code samples and updated slides at:
  - https://java.net/projects/orbit/pages/Home

Program Agenda with Highlight

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Introduction to Internet of Things (IoT)

Next Step in Network Connectivity

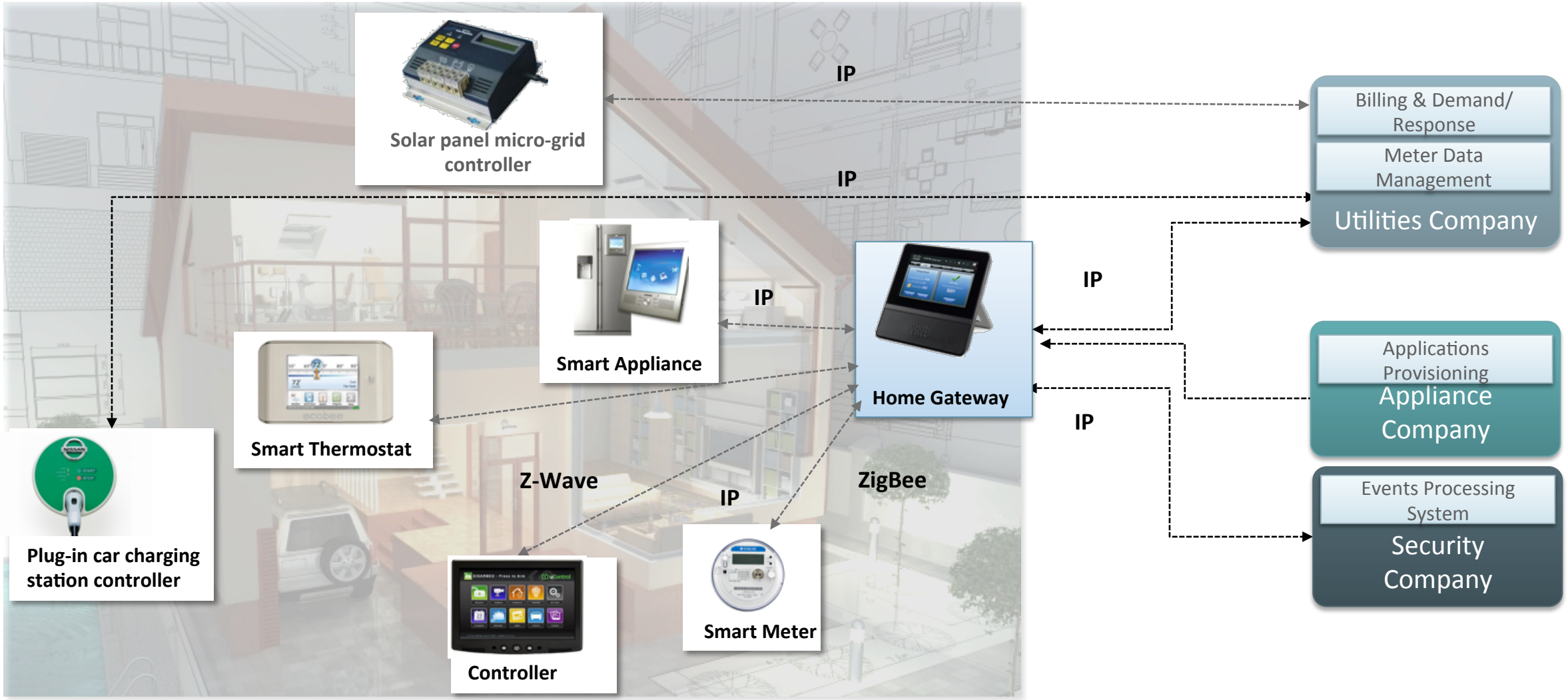
- The Next Horizon
  - Network Connectivity of Devices, Sensors, Appliances, etc.

Internet of Things: The Next Horizon

Use Case: Home Automation

- Real-time pricing with adaptive intelligence for carbon footprint reduction
- Automatic water usage metering enables conservation
- Intrusion detection

Complex network of smart devices communicating with business applications



IoT Development IS Different

Variety of devices	Volume of devices	No human control
Critical nature	Information privacy	Limited functionality
Low powered	Hard to reach	Long device lifecycle

Software Development must adapt

Complexity of development, integration, and maintainance

CPU

Programming Language

Lua

c/C++

python

Proprietary API

RTOS

THREADX

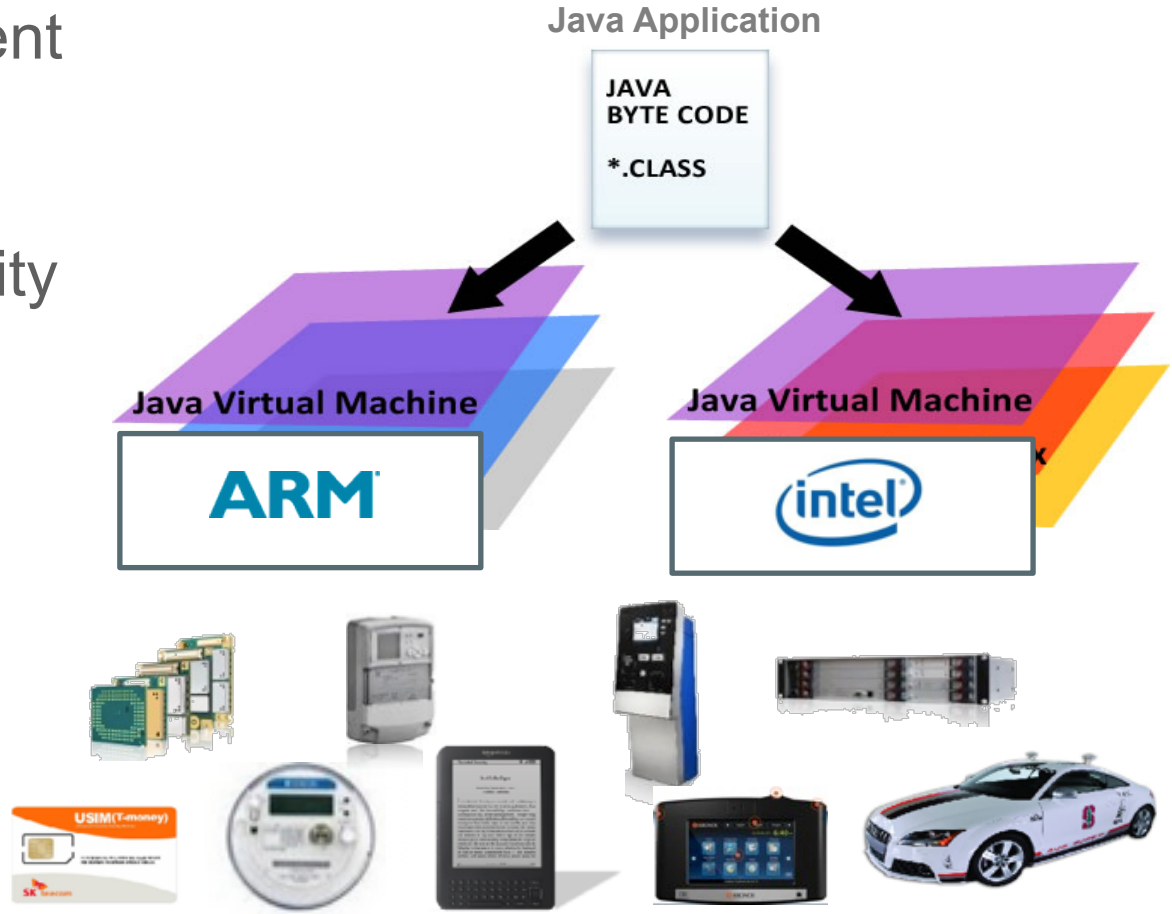
Mentor Graphics

WIND RIVER

Java in Embedded: Things You need to know

Solves some of the Tough Problems in the Embedded Space

- Java is a highly productive development and deployment platform
- Virtualization environment: Platform-independent binary format & functionality
- Any market, any device, any size (Write Once Run Anywhere)
- Ecosystem of 9 million+ developers: The largest community in the industry
- Open standards-based platform
  - No vendor lock-in
  - You can influence Java's future



Java lets You focus on the Solution

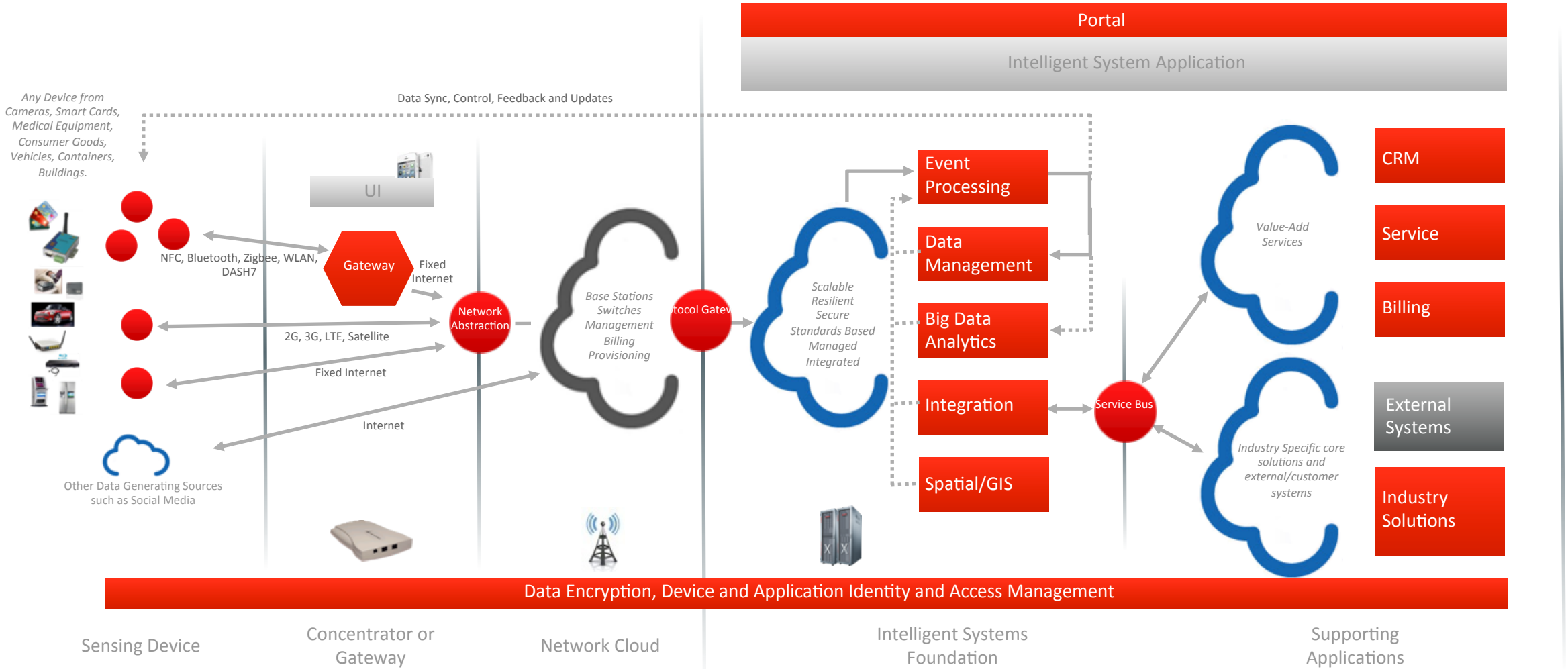
Stop reimplementing. Start scaling your code

Java

Java provides a common platform

The Full Picture: Oracle IoT Platform

End-to-End Data Flow, Security, Management, Integration



Example Use Cases

Enabling products and services across different market segments

Wireless Modules, Gateways

Industrial Control, Telemetry

Smart Meters & Smart Sensors

Medical: eHealth & TeleHealth

General IoT and Machine-to-Machine (M2M) solutions

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IoT in Retail Inventory

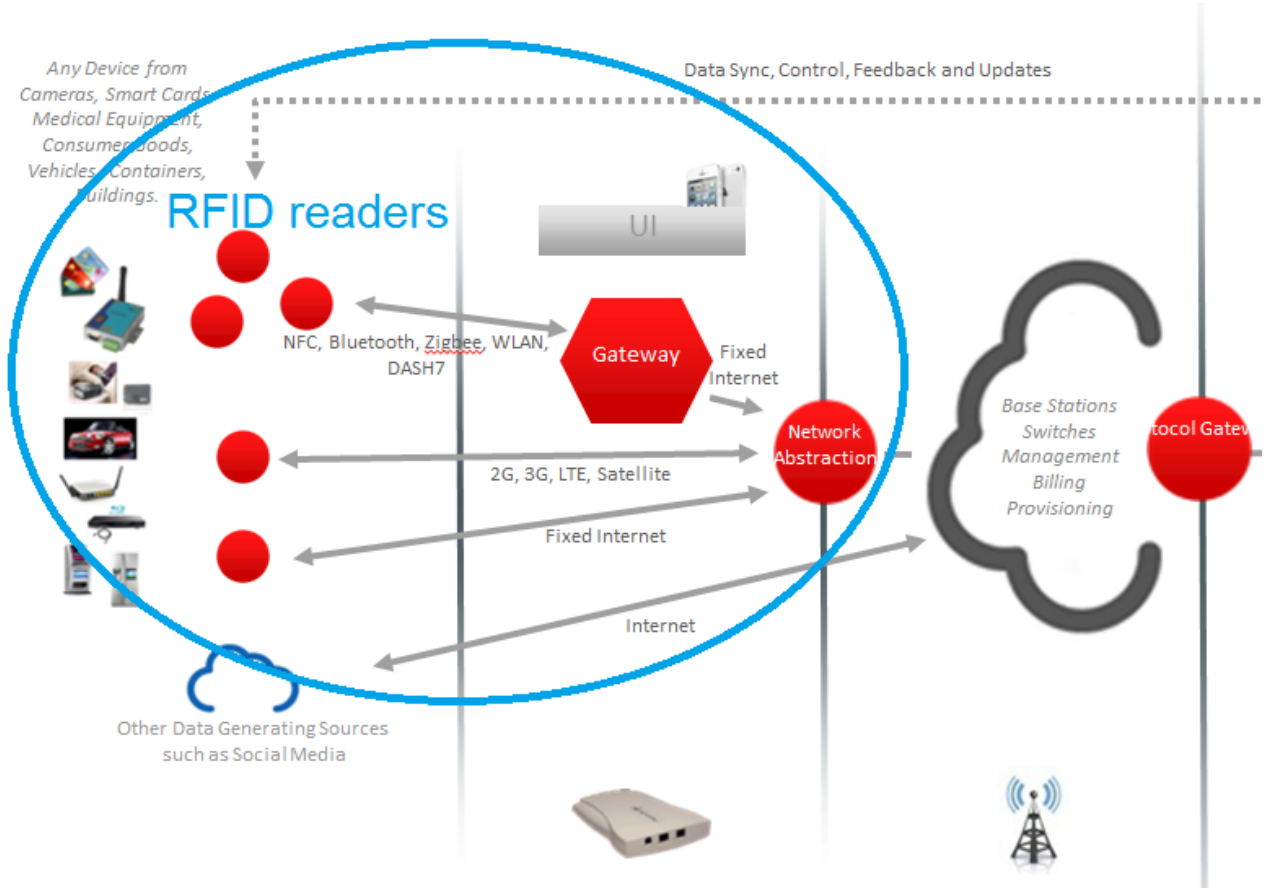
Use Case: RFID

- RFID reader on shelves: Use Cases
  - Retail Stores
  - Stockroom
  - Pharmacies
  - Warehouses

IoT in Retail Inventory

Use Case: RFID

- RFID: How it works
  - RFID readers and antennas on shelves
  - Assets with RFID tags read all at once
  - IoT Gateway transfers data to the Cloud



IoT in Retail Inventory

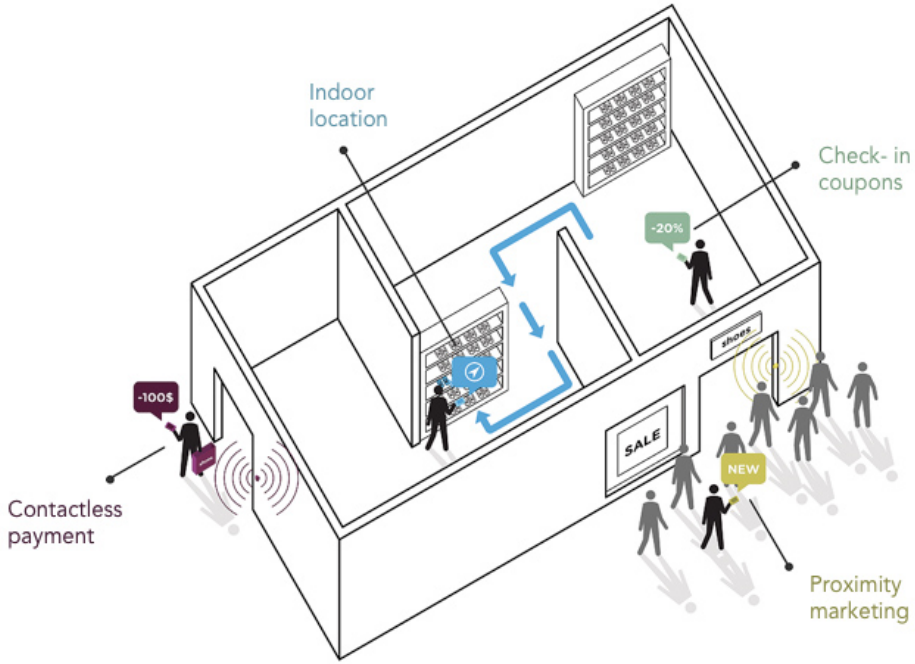
Use Case: Bluetooth iBeacons – Estimote Beacons

- Bluetooth iBeacon standard
- Estimote Beacons
  - ARM M0 Cortex, BLE, motion & temperature sensors
  - Battery life 3 years
- Estimote Stickers
  - ARM M0 Cortex, BLE, motion & temperature sensors
  - Battery life 1 year

IoT in Retail Inventory

Use Case: Bluetooth iBeacons – Estimote Beacons

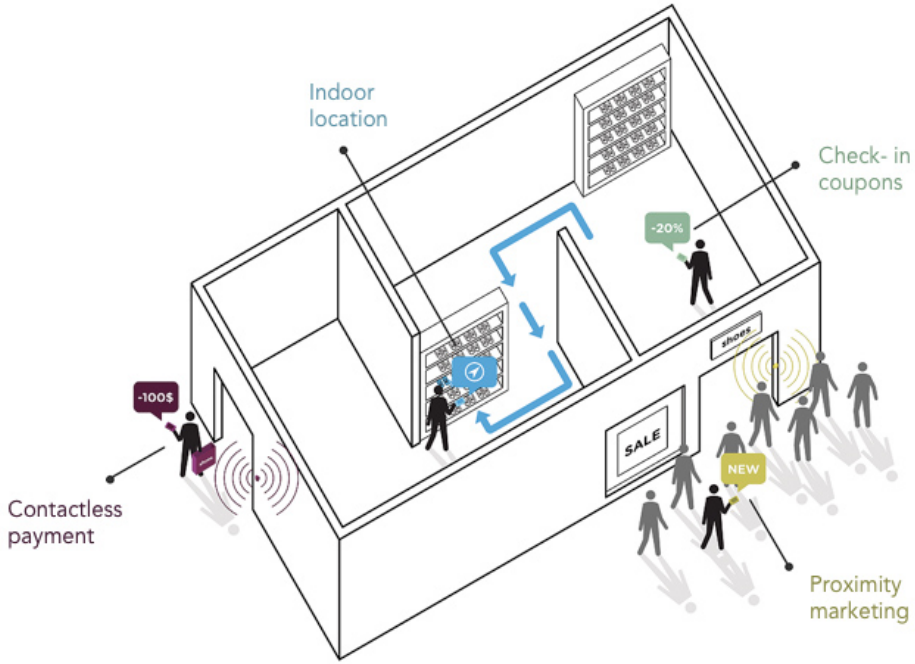
- Estimote Beacons & Stickers: How it works
  - Small wireless sensors
  - Attach to any location or object.
  - Broadcast radio signals which to give micro-location and contextual awareness.



IoT in Retail Inventory

Use Case: Bluetooth iBeacons – Estimote Beacons

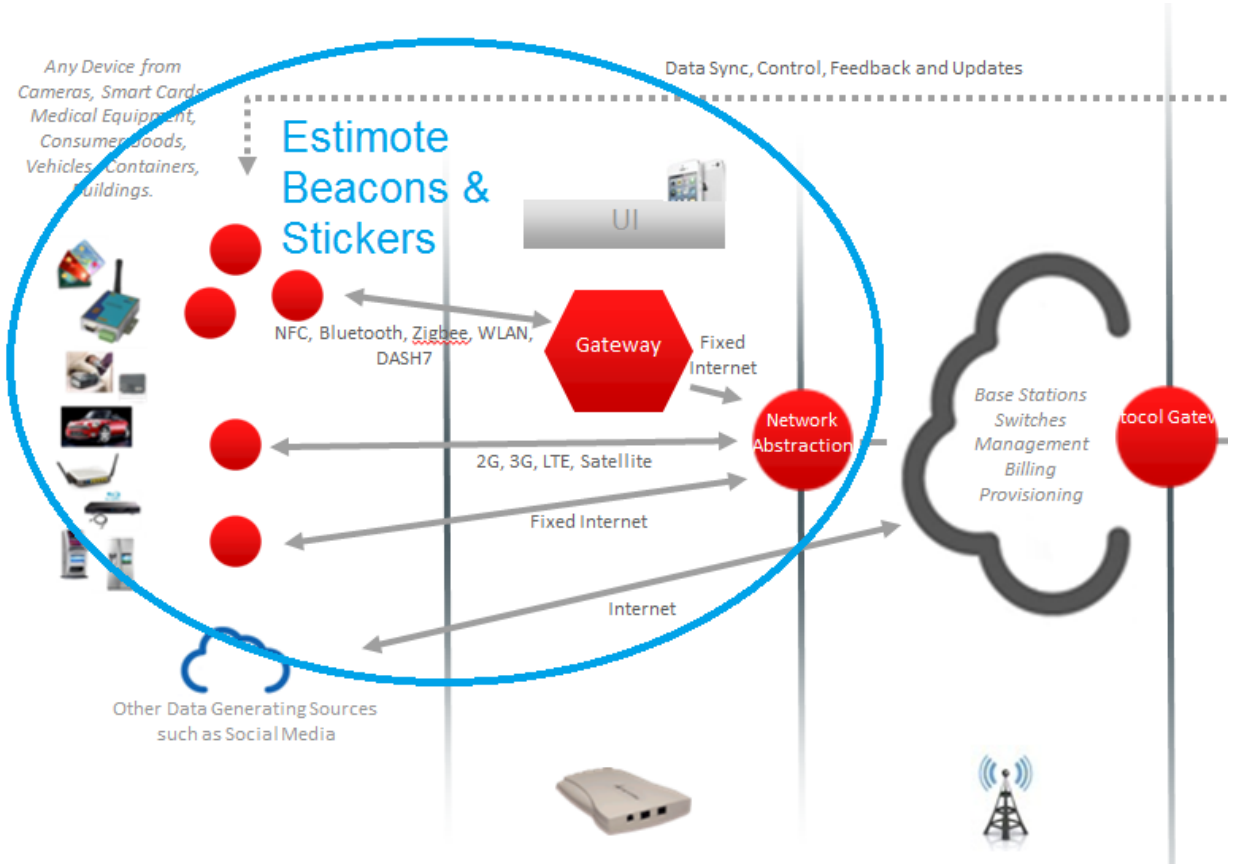
- Estimote Beacons & Stickers: Use Cases
  - Proximity promotions
  - Proximity Coupons
  - Context Recommendations
  - Payment



IoT in Retail Inventory

Use Case: Estimote Beacons & Stickers

- Estimote Beacons & Stickers on assets, shelves, & locations
  - Shopper opts in with smartphone
  - Shopper walks around with smartphone while app reads data and sends to IoT Gateway
  - IoT Gateway processes data locally and sends to IoT Cloud



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Sample Using RFID tags

Raspberry Pi with Java Embedded

- Setting up the Raspberry Pi
  - Burn a Raspbian OS SD card (**NOTE: not part of this tutorial)
  - Download and Install Java SE Embedded (oracle-java8-jdk)
    - sudo apt-get update
    - sudo apt-get install oracle-java8-jdk
- Check your version

```
java -version
java version "1.8.0"
Java(TM) SE Runtime Environment (build 1.8.0-b132)
Java HotSpot(TM) Client VM (build 25.0-b70, mixed mode)
```

Sample Using RFID tags

Raspberry Pi with Java Embedded

- Oracle Java SE 8
  - Java Programming Language
    - Lambda Expressions
    - Method references
    - Default methods
    - Repeating Annotations, Type Annotations
  - Compact Profiles - predefined subsets of the Java SE platform

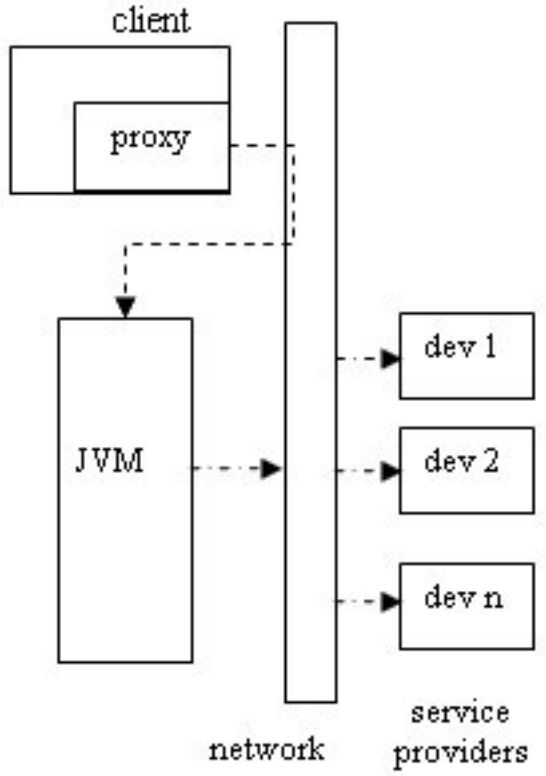
Sample Using RFID tags

IoT Gateway Features

- On-board Devices (sensors, actuators, etc.)
- Manage Devices
- Configure Devices
- Local Storage
- Local Analytics

Sample Using RFID tags

IoT Gateway Lookup Service Manages RFID Readers



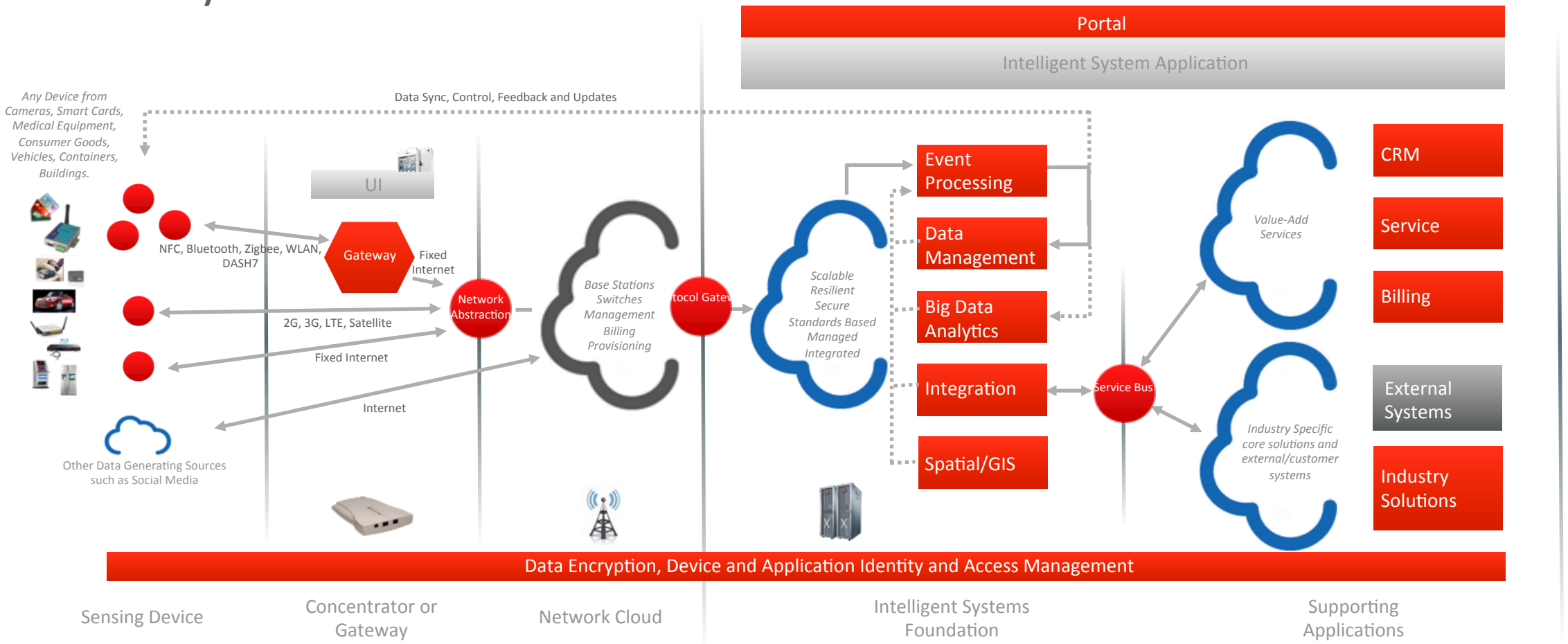
Sample Using RFID tags

IoT Gateway

- IoT Gateway Technology
  - Provides the infrastructure for the Service-object-oriented architecture (SOOA).
  - Locating services is done through a lookup service
  - Services try to contact a lookup service (LUS), either by unicast interaction, when it knows the actual location of the lookup service
  - Clients use the lookup service to retrieve a proxy object to the service

Sample Using RFID tags

IoT Gateway: Device to Cloud



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Sample Using RFID tags

```
static void rfidReaderAdapter() {

        System.out.println("RFID Reader Adapter: storing data locally " +
                "and sending data to IoT Cloud");

        // Store data locally

        // Upload data to the IoT Cloud
        CloudStorageConfig myConfig = new CloudStorageConfig();
        myConfig.setServiceName("myService-myIdentityDomain")
                .setUsername("myUsername")
                .setPassword("myPassword".toCharArray())
                .setServiceUrl("https://storage.us2.oraclecloud.com");
        CloudStorage myConnection = CloudStorageFactory.getStorage(myConfig);
        FileInputStream fis = new
        FileInputStream("iotcloud-rfid-data.txt");
        myConnection.storeObject("MyContainer",
          "iotcloud-rfid-data.txt", "text/plain", fis);

        // Process data

}
```

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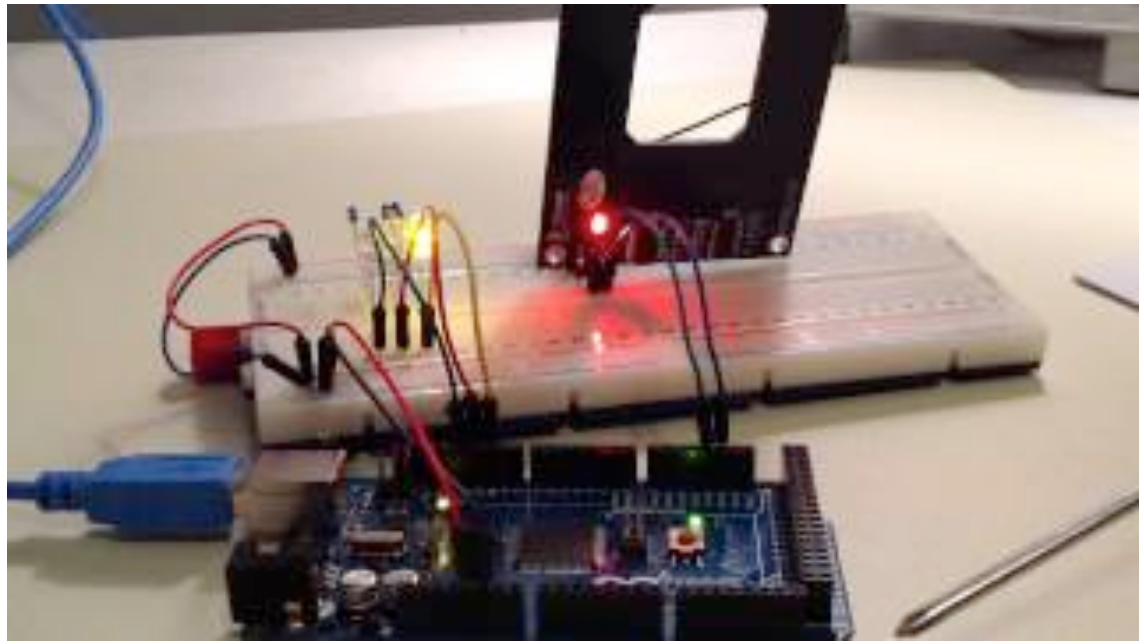
Sample Using RFID tags



Sample Using RFID tags

```
// Endpoint: rfidReader

File rfidReaderCheck = new File("/dev/ttyAMA0");

if (rfidReaderCheck.exists()) {
  commandChannels[0].write(GPIO_ON);
  commandChannels[0].flush();

if (!rfidReaderDiscoveredFlag) {
  System.out.println("RFID Reader discovered");
  joinLookUpService(RFID_READER);

  rfidReaderDiscoveredFlag = true;
}
```

Sample Using RFID tags

```
// RXTX: http://mfizz.com/oss/rxtx-for-java

String SerialPortID = "/dev/ttyAMA0";
System.setProperty("gnu.io.rxtx.SerialPorts", SerialPortID);

String comportidentifier = "/dev/ttyAMA0";

            CommPortIdentifier portIdentifier = null;
            portIdentifier = CommPortIdentifier.getPortIdentifier(comportidentifier);

            if (portIdentifier.isCurrentlyOwned()) {
                JOptionPane.showMessageDialog(null, "port in use");
            } else {

                SerialPort serialPort = (SerialPort)
                  portIdentifier.open("ReadComPort", 500);
                JOptionPane.showMessageDialog(null, serialPort.getBaudRate());
```

Sample Using RFID tags

```
        serialPort.setSerialPortParams(2400,
                SerialPort.DATABITS_8, SerialPort.STOPBITS_1,
                SerialPort.PARITY_NONE);
        serialPort.setDTR(true);
        serialPort.setRTS(true);

        InputStream mInputFromPort = serialPort.getInputStream();

        Thread.sleep(500);

        // Start byte 0x0a, End byte 0x0d
        byte mBytesIn[] = new byte[12];
        mInputFromPort.read(mBytesIn);

        value = new String(mBytesIn);

        mInputFromPort.close();

        serialPort.close();
    }
```

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Q & A

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