

Internet of things (IoT)

Duration – 3 days

Courseware – Reference Material

Learning Internet of Things

Definition for Internet of Things

Competing definitions

Direct consequences

Introduction to IoT Projects

Sensor project

Preparing Raspberry Pi

Clayster libraries

Hardware

Interacting and Interfacing the hardware

Representation of sensor values

Persisting data

Exporting sensor data

Actuator project

Hardware

Interfacing the hardware

Creating a controller

Representing sensor values

Parsing sensor data

Calculating control states

Camera

Hardware

Accessing the serial port on Raspberry Pi

Interfacing the hardware

Creating persistent default settings

Adding configurable properties

Persisting the settings

Working with the current settings

Initializing the camera

Summary

A Case Study on Baby Monitor Exposures and Vulnerabilities

Diving into some required protocols

The HTTP Protocol

HTTP basics

Adding HTTP support to the sensor

Setting up an HTTP server on the sensor

Setting up an HTTPS server on the sensor

Displaying measured information in an HTML page

Creating sensor data resources

Interpreting the readout request

Testing our data export

User authentication

Accessing the alarm output

Using the test form

Accessing WSDL

Using the REST web service interface

Adding HTTP support to the controller

Subscribing to events

Creating the control thread

Controlling the actuator

The UPnP Protocol

UPnP basics

Providing a service architecture

Creating a device description document

Choosing a device type

Providing the device with an identity

Adding icons and references to services

Topping off with a URL to a web presentation page

Adding actions, state variables and unique device name

Providing a web interface

Creating a UPnP interface

Registering UPnP resources

Adding support for SSDP

Implementing the Still Image service

Initializing evented state variables

Providing web service properties

- Using our camera
- Setting up UPnP
- Discovering devices and services
- Receiving events
- Executing actions

The CoAP Protocol

- Making HTTP binary
- Finding development tools
- Adding CoAP to our sensor
- Triggering an event notification
- Discovering CoAP resources
- Testing our CoAP resources
- Adding CoAP to our actuator
- Using CoAP in our controller

The MQTT Protocol

- Publishing and subscribing
- Adding MQTT support to the sensor
- Adding MQTT support to the actuator
- Decoding and parsing content
- Controlling the actuator
- Controlling the LED output
- Controlling the alarm output
- Summary

The XMPP Protocol

- XMPP basics
- Providing a global identity
- Sensing online presence
- Extending XMPP
- Provisioning for added security
- Monitoring connection state events
- Notifying your friends
- Handling HTTP requests over XMPP
- Providing an additional layer of security
- The basics of provisioning
- Initializing the Thing Registry interface
- Registering a thing

- Updating a public thing
- Claiming a thing
- Removing a thing from the registry
- Disowning a thing
- Maintaining a connection
- Negotiating friendships
- Adding XMPP support to the sensor
- Adding a sensor server interface
- Adding XMPP support to the actuator
- Adding XMPP support to the camera
- Adding XMPP support to the controller
- Fetching the camera image over XMPP
- Detecting rule changes
- Connecting it all together

IoT Service Platform

- Select your IoT platform
- The Clayster platform
- Creating a service project
- Executing the service
- Using a package manifest
- Executing from Visual Studio
- Configuring the Clayster system
- Browsing data sources
- Interfacing our devices using XMPP
- Subscribing to sensor data
- Interpreting incoming sensor data
- Creating a class for our actuator
- Customizing control operations
- Creating a class for our camera
- Creating our control application
- Understanding rendering
- Initializing the controller
- Adding control rules
- Defining brieflets
- Displaying a gauge and a binary signal
- Pushing updates to the client
- Completing the application
- Configuring the application

Creating Protocol Gateways

Understanding protocol bridging
Using an abstraction model
The basics of the Clayster abstraction model
Handling communication with devices
Reading devices
Configuring devices
Understanding the CoAP gateway architecture
Security and Interoperability

Understanding the risks

Reinventing the wheel, but an inverted one
Knowing your neighbor
Modes of attack
Denial of Service
Guessing the credentials
Getting access to stored credentials
Man in the middle
Sniffing network communication
Port scanning and web crawling
Search features and wildcards
Breaking ciphers
Tools for achieving security
Virtual Private Networks
X.509 certificates and encryption
Authentication of identities
Usernames and passwords
Using message brokers and provisioning servers
Centralization versus decentralization
The need for interoperability
Allows new kinds of services and reuse of devices
Combining security and interoperability

[Your Fridge is Full of SPAM: Proof of An IoT-driven Attack](#)

[Refrigerator Vulnerabilities - Samsung Security Hack](#)