Course Content

IOT

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

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