

IoT Cloud Developer 2019

(Classroom)

Career path description

The IoT Cloud Developer career path prepares students to apply IoT and cloud computing concepts to build solutions based on devices connected to a cloud-based IoT platform. It explains the basic concepts of IoT, device connectivity protocols, data generated by sensors and other devices, cloud computing, device simulators, flow-based programming tools, REST APIs, and analytics. The concepts are then applied to practical use cases by using IBM Watson IoT Platform, Watson AI services, and tools on IBM Cloud.

ibm.com/training

General information

Delivery method

25% self-placed training

75% Instructor led training

Version

2019

Product

IBM Watson Internet of Thing Platform, IBM Cloud



Audience

Undergraduate senior students from IT related academic programs, for example, computer science, software engineering, information systems etc.

Learning objectives

After completing this course, you should be able to:

- Explain what IoT is.
- Describe the IoT reference architecture.
- Explain how to connect devices to the Watson IoT Platform solution.
- List the communication protocols that are used in IoT solutions.
- Describe the key capabilities of IBM Cloud.
- List services that are available in the IBM Cloud Catalog.
- Explain how to get started with IBM Watson IoT Platform by using IBM Watson IoT Platform Starter.
- List the features of Watson IoT Platform.
- Use the Watson IoT Platform dashboard.
- Manage devices and set up security policies on Watson IoT Platform.
- Manage user access and application on Watson IoT Platform.
- Describe the advanced features of Watson IoT Platform.
- Explain the concept of flow-based programming and Node-RED.
- Describe and compare the OSI and the TCP/IP reference models.
- Describe and compare the MQTT and HTTP protocols.
- Explain the difference between an API, library, and software development kit (SDK).
- Explain the characteristics of REST APIs and JSON data format.
- List the Watson artificial intelligence (AI) services.
- Describe the Cloudant database service on IBM Cloud.
- Describe IBM Geospatial Analytics as a use case of IBM Streaming Analytics.
- Describe IBM Cloud Object Storage.

Prerequisites Skills

- Computer science fundamentals
- Access to IBM Cloud
- Exposure to the IBM Skills Academy Portal learning environment

Duration

35 hours

Skill level

Basic – Intermediate

Hardware requirements

Classroom (ILT) setup requirements

Processor	2 GHz or higher
GB RAM	4 GB
GB free disk space	80 GB
Network requirements	Yes
Other requirements	IBM ID

Notes

The following unit and exercise durations are estimates, and might not reflect every class experience. If the course is customized or abbreviated, the duration of unchanged units will probably increase.

Course Agenda

MODULE I

Duration: 30 minutes

Course I – Introduction to IoT

Unit 1. Introduction to IoT

Duration: 15 minutes

Overview	In this unit you will be introduced to IoT.
Learning objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Understand what is IoT• Understand why IoT is important

Unit 2. IoT Case Studies

Duration: 15 minutes

Overview	In this unit you will learn how IoT is being applied across various industries.
Learning objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Understand how IoT is being applied across various industries.

MODULE II – Prerequisites

Duration: 6 hours

Course I – Build your first IoT application: Node-RED: Basics to Bots

Unit 1. Getting started with Internet of Things and Node-RED

Duration: 1 hour

Overview	In this unit you will understand IoT, Node-RED and its applications.
Learning objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Understand the purpose of Node-RED.• Define the basics needed for creating a Node-RED application.• Explain the basics of Internet of Things (IoT).• Understand how Node-RED can be used to create IoT applications.

Exercise 1. Create your first Node-RED flow

Duration: 1 hour

Overview	In this exercise you will learn how to launch your own instance of Node-RED by using the IBM Cloud boilerplate.
Learning objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Create a Node-RED instance• Connect Watson Services• Create your First Flow

Exercise 2. Build a web page and create a REST API in Node-RED

Duration: 1 hour

Overview	In this exercise you will learn how to build on your first Node-RED flow.
Learning objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Create a Simple Web Page• Add JavaScript to Your Web Application• Create a REST API• Consume the Watson Translator Service

Exercise 3. Translate text, analyze tone, add audio, and send tweets from your Node-RED application.

Duration: 1 hour

Overview	In this exercise you will learn how to add Watson services and community nodes to your Node-RED applications.
Learning objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Add the Community Nodes to the Node-RED Palette• Add the Speech to Text, Tone Analyzer, and Text to Speech Services• Re-create the Interpreter Application• Prepare for the OK Watson Application• Add Link Nodes to More Easily View the Logic of the Application Flow• Import the OK Watson Flow• Connect to Your Twitter Account• Add the Community Nodes to the package.json File

Exercise 4. Create cognitive web pages and a messenger bot

Duration: 1 hour

Overview	In this exercise you will learn how to create advanced Node-RED flows.
Learning objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none">• Obtain Facebook Messenger Credentials• Create Node-RED Webhooks• Create the Node-RED Messenger Listener• Create a Node-RED Messenger Writer• Build a Video Captioning Application

Exercise 5. Create cognitive web pages and a messenger bot

Duration: 1 hour

Overview	In this exercise you will learn how to write HTML web pages that use Git repositories that allow you to reuse HTML, CSS, and browser-side JavaScript across Node-RED applications.
Learning objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none">• Connect the Watson Assistant Service to the Messenger Bot• Build a Node-RED Application That Can Reuse CSS and Browser-side JavaScript

MODULE III – IoT Cloud Developer

Duration: 20.25 hours

Course introduction
Duration: 5 minutes

Unit 1. Introduction to IoT and the IBM Watson IoT platform
Duration: 1 hour and 30 min

Overview	This unit introduces the IBM perspective for a complete IoT solution and provides an overview of Watson IoT Platform and explains how this platform facilitates IoT solution development.
Learning objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Explain the IBM perspective for IoT solution development.• Describe the IoT reference architecture.• Describe the characteristics of Watson IoT Platform that simplify the development of IoT solutions.• Describe the four quadrants of Watson IoT Platform.• Explain how to connect devices to the Watson IoT Platform solution.• List the communication protocols that are used in IoT solutions.

Exercise 1. Designing an IoT solution
Duration: 1 hour

Overview	In this exercise you will design a complete Internet of Things (IoT) solution by using IBM Watson IoT Platform.
Learning objectives	After completing this exercise, you should be able to: <ul style="list-style-type: none">• Choose IoT sensors that best match the IoT overall solution.• Identify the best possible ways to connect an IoT device to Watson IoT Platform.• Explain how data that is sent from an IoT device can be managed and used by Watson IoT Platform.

Unit 2. Introduction to IBM Cloud

Duration: 1 hour and 30 minutes

Overview	This unit provides a high-level overview of IBM Cloud and introduces basic concepts such as the service catalog, cloud applications, cloud services, and starter kits. It also describes Watson IoT Platform Starter and its components.
Learning objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none">• Describe the key capabilities of IBM Cloud.• List services available in the IBM Cloud Catalog.• List databases available on IBM Cloud.• Manage IBM Cloud users and resources.• Manage applications and services on IBM Cloud.• Explain how to get started with IBM Watson IoT Platform by using Watson IoT Platform Starter.

Exercise 2. Creating your first IoT application

Duration: 1 hour

Overview	This exercise shows how you can set up an environment on IBM Cloud to deploy your first IoT application by using some of the services that are provided by IBM Cloud.
Learning objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none">• Set up an IBM Cloud Lite account.• Log in to IBM Cloud from a browser.• Describe the IoT related services in the IBM Cloud catalog.• Deploy the IoT application by using one of the available starter kits.• Set up Node-RED configurations to start developing on Node-RED Editor.

Unit 3. Introduction to IBM Watson IoT Platform

Duration: 2 hours

Overview	This unit takes a closer look at the building blocks of an IoT architecture and at the capabilities that are provided by Watson IoT Platform.
Learning objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none">• List the features of Watson IoT Platform.• Use the Watson IoT Platform dashboard.• Manage devices and set up security policies on Watson IoT Platform.• Manage applications on Watson IoT Platform.• Manage user access on Watson IoT Platform.• Describe the advanced features of Watson IoT Platform.• Use recipes to help jump-start application development.

Exercise 3. Creating an application to monitor room temperature and humidity

Duration: 45 minutes

Overview	In this exercise, you create an IoT system by using IBM Watson IoT Platform. The purpose of the system is to monitor the temperature and humidity of a facility and optimize the use of air conditioning. You use the Watson IoT Platform device simulator to simulate the devices that send temperature and humidity values through the internet to Watson IoT Platform. Finally, you visualize the data that is sent by the devices in real time by using the dashboard.
Learning objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none">• Create a Watson IoT Platform service on IBM Cloud.• Define a device on Watson IoT Platform and retrieve the credentials.• Use the Watson IoT Platform simulator to monitor temperature and humidity.• Chart the data on Watson IoT Platform.

Unit 4. Introduction to Node-RED

Duration: 1 hour

Overview	This unit introduces Node-RED, a flow-based programming tool for wiring together hardware devices, APIs, and online services. It also describes the Node-RED flow editor and its components.
Learning objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none">• Explain the concept of flow-based programming.• Explain what Node-RED is.• Describe the Node-RED workspace and its components.• Describe the Node-RED palette and the palette manager and explain how to use them to build flows.

Exercise 4. Extending IoT application functions by using Node-RED

Duration: 1 hour

Overview	In this exercise, you set up a process to use Node-RED and twilio to receive alerts on your mobile phone. The alerts notify you about changes in device temperature that are reported by a simulated IoT sensor. twilio is a cloud communications platform for building SMS, voice, and messaging applications on an API.
Learning objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none">• Connect your IoT device to Watson IoT Platform.• Configure both IoT app and twilio nodes in a Node-RED flow.• Deploy the Node-RED flow and receive alerts on your mobile phone through SMS.

Unit 5. IBM Watson IoT Platform Network Protocols

Duration: 1 hour

Overview	This unit describes the common protocols that can be used to connect devices to Watson IoT Platform: MQTT and HTTP. This unit explains the difference between the MQTT publish and subscribe model and the Request/Response model in HTTP.
Learning objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Describe the layers in the OSI reference model.• Describe the protocols that are used in the OSI application layer.• Compare the OSI and the TCP/IP reference models• Describe the HTTP protocol.• Explain the concept of publish/subscribe model.• Describe the MQTT protocol.• Compare the MQTT and HTTP protocols.

Exercise 5. Monitoring server CPU usage and reporting statistics

Duration: 1 hour and 30 minutes

Overview	In this exercise, you implement an IoT use case about monitoring server CPU usage in a server room. You use your local workstation as a server by installing Node-RED on your PC or notebook. Your system reports CPU usage to a cloud application through the Watson IoT Platform.
Learning objectives	After completing this exercise, you should be able to: <ul style="list-style-type: none">• Set up Node-RED on a local workstation.• Configure new devices on Watson IoT Platform.• Connect a Node-RED application that is running locally to a cloud application (in this exercise, you use Node-RED on IBM Cloud to represent the cloud application).

Unit 6. Enhancing IoT solutions with REST APIs

Duration: 2 hours and 30 minutes

Overview	This unit provides an overview of application programming interfaces (APIs), their value, and usage. This unit explains the representational state transfer (REST) API, and the JavaScript Object Notation (JSON) format. It describes how to access Watson and Cloudant services on IBM Cloud by using REST APIs.
Learning objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Explain the concept of API and describe type of APIs.• Explain the difference between API, library, and SDK.• Explain the characteristics of REST APIs.• Explain the characteristics of JSON data format.• List the Watson AI services.• Describe the Cloudant database service on IBM Cloud.• Describe how to access Watson and Cloudant services on IBM Cloud with REST APIs.

Exercise 6. Integrating IoT applications with IBM Watson Visual Recognition

Duration: 1 hour

Overview	In this exercise, you learn about the Watson Visual Recognition service, and how to integrate it with IoT applications by using Watson IoT Platform Starter kit and Node-RED.
Learning objectives	After completing this exercise, you should be able to: <ul style="list-style-type: none">• Create a Watson service instance and integrate it with Node-RED.• Create a Watson Visual Recognition service instance and classify images.• Store to and extract images from an IBM Cloudant DB by using Node-RED.• Create a Watson Studio project and add a Visual Recognition built-in model to classify images.

Unit 7. Introduction to analytics services on IBM Cloud

Duration: 2 hours and 30 minutes

Overview	This unit provides an overview of the analytics services available on IBM Cloud. The topics in this unit belong to the data science domain, but IoT systems usually require to combine data science and big data capabilities.
Learning objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Describe the features of IBM Analytics Engine and IBM Streaming Analytics.• Describe Geospatial Analytics as a use case of Streaming Analytics.• Describe IBM Cloud Object Storage.• Explain the capabilities of IBM Cloud SQL Query.• Explain the geospatial capabilities in Cloudant DB.

Exercise 7. Monitoring parking utilization with IBM Cloudant Geospatial

Duration: 2 hours

Overview	In this exercise, you learn about geofencing, which is one of the common use cases of IoT. You will also learn how to configure geofencing in IBM Cloudant, and how to build a Node-RED flow that detects when a car reaches certain points.
Learning objectives	After completing this exercise, you should be able to: <ul style="list-style-type: none">• Demonstrate how you can use Node-RED to build a car simulator.• Demonstrate how to use raw data and analyze it in real time to fulfill a business case.• Understand how to configure Cloudant to do geospatial analytics.
