

Study guide for Exam AZ-220: Microsoft Azure IoT Developer

Purpose of this document

This study guide should help you understand what to expect on the exam and includes a summary of the topics the exam might cover and links to additional resources. The information and materials in this document should help you focus your studies as you prepare for the exam.

Useful links	Description
Review the skills measured as of January 30, 2023	This list represents the skills measured AFTER the date provided. Study this list if you plan to take the exam AFTER that date.
Review the skills measured prior to January 30, 2023	Study this list of skills if you take your exam PRIOR to the date provided.
Change log	You can go directly to the change log if you want to see the changes that will be made on the date provided.
How to earn the certification	Some certifications only require passing one exam, while others require passing multiple exams.
Certification renewal	Microsoft associate, expert, and specialty certifications expire annually. You can renew by passing a free online assessment on Microsoft Learn.
Your Microsoft Learn profile	Connecting your certification profile to Learn allows you to schedule and renew exams and share and print certificates.
Passing score	A score of 700 or greater is required to pass.
Exam sandbox	You can explore the exam environment by visiting our exam sandbox.
Request accommodations	If you use assistive devices, require extra time, or need modification to any part of the exam experience, you can request an accommodation.

Useful links	Description
Take a practice test	Are you ready to take the exam or do you need to study a bit more?

Updates to the exam

Our exams are updated periodically to reflect skills that are required to perform a role. We have included two versions of the Skills Measured objectives depending on when you are taking the exam.

We always update the English language version of the exam first. Some exams are localized into other languages, and those are updated approximately eight weeks after the English version is updated. Other available languages are listed in the **Schedule Exam** section of the **Exam Details** webpage. If the exam isn't available in your preferred language, you can request an additional 30 minutes to complete the exam.

Note

The bullets that follow each of the skills measured are intended to illustrate how we are assessing that skill. Related topics may be covered in the exam.

Note

Most questions cover features that are general availability (GA). The exam may contain questions on Preview features if those features are commonly used.

Skills measured as of January 30, 2023

Audience profile

Candidates for this exam are Azure IoT developers with subject matter expertise in creating and maintaining the cloud and device portions of an IoT solution. In addition to configuring and maintaining the devices by using cloud services, they also set up the physical devices. They are responsible for maintaining and troubleshooting the configuration of the devices throughout the lifecycle.

Azure IoT developers implement design specifications for IoT solutions, including device topology, connectivity, diagnostics and monitoring, and security. They develop the code that enables two-way communication between the device and the cloud. They also develop and deploy modules and configure device networking for the Azure IoT Edge portion of the solution. Professionals in this role implement designs for solutions to manage data streams, including monitoring and data transformation as they relate to IoT. The Azure IoT developer works with architects, device developers, data engineers, and other stakeholders to help ensure successful business integration.

Candidates for this exam should have a general understanding of device types and Azure services, including data storage options, data analysis, data processing, AI, and other platform as a service (PaaS) options. They must be able to program in at least one Azure IoT software development kit–supported (SDK-supported) language.

- Set up the Azure IoT Hub solution infrastructure (15–20%)
- Provision and manage devices (15–20%)
- Implement IoT Edge (20–25%)
- Implement business integration (5–10%)
- Process and manage data (10–15%)
- Monitor, troubleshoot, and optimize IoT solutions (10–15%)
- Implement security (10–15%)

Set up the Azure IoT Hub solution infrastructure (15–20%)

Create and configure an IoT hub

- Create an IoT hub
- Register a device
- Configure a device twin
- Configure IoT Hub tier and scaling

Build device messaging and communication

- Build messaging solutions by using SDKs (device and service)
- Implement device-to-cloud communication
- Implement cloud-to-device communication
- Configure file upload for devices
- Optimize message size and scaling for IoT Hub
- Connect to IoT Hub by using Transport Layer Security (TLS) server certificates

Configure physical IoT devices

- Recommend an appropriate protocol or gateway based on device specifications
- Configure device networking, topology, and connectivity
- Add IoT Plug and Play capabilities to a device in a model-driven solution

Provision and manage devices (15–20%)

Set up the device provisioning service

- Create a device provisioning service
- Create a new enrollment in the device provisioning service
- Link an IoT hub to the device provisioning service

Manage the device lifecycle

- Provision a device by using the device provisioning service
- Deprovision an auto-enrollment
- Decommission (disenroll) a device

Manage IoT devices by using IoT Hub

- Manage devices list in the IoT Hub device registry
- Modify device twin tags and properties
- Specify a set of devices to manage by using IoT Hub Automatic Device Management
- Implement and manage configuration on a set of devices by using IoT Hub Automatic Device Management
- Control access to device functionality by using module identities and module twins

Manage IoT devices by using Azure IoT Central

- Create and manage device templates by using Azure IoT Central and Digital Twins Definition Language (DTDL)
- Configure rules, actions, and commands in Azure IoT Central
- Add, enroll, and manage devices by using Azure IoT Central
- Manage Azure IoT Central applications, including security, tenants, customization, and visualizations
- Manage data integration, including data ingress, data export, and data transformation
- Configure and manage Azure IoT Central jobs
- Manage Azure IoT Central by using APIs

Implement IoT Edge (20–25%)

Set up an IoT Edge device

- Create a device identity in IoT Hub
- Set up an IoT device for IoT Edge
- Install container runtime on IoT devices
- Configure container startup options to interact with the host system
- Update IoT Edge runtime
- Provision IoT Edge devices by using the device provisioning service

Deploy an IoT Edge device

- Create and implement a deployment manifest
- Create a deployment for a single IoT Edge device
- Create a deployment to target multiple devices
- Create a continuous deployment by using Azure DevOps

Develop IoT Edge modules

- Create and customize an IoT Edge module
- Deploy a custom IoT Edge module to an IoT Edge device
- Publish an IoT Edge module to Azure Container Registry
- Define module configuration
- Configure IoT Edge module routing

- Configure environment for IoT Edge development

Configure an IoT Edge device

- Select an appropriate gateway pattern
- Deploy an IoT gateway by using IoT Hub and IoT Edge
- Configure IoT Edge certificates
- Implement and configure offline support (including local storage)
- Create a layered hierarchy of IoT Edge devices
- Interact with the IoT Edge security manager

Implement business integration (5–10%)

Integrate with upstream and downstream systems

- Set up input and output connections to support native Azure services and to enable third-party services
- Set up IoT Hub routing to support downstream Azure resources

Develop an IoT solution that uses Azure Digital Twins

- Create models and digital twins
- Map IoT device data to digital twin models and relationships
- Ingest IoT device messages, and translate messages to digital twins
- Configure routes and endpoints to trigger business logic and data processing
- Manage and query the Azure Digital Twins graph
- Update properties on Azure Digital Twins entities in the graph
- Monitor and troubleshoot Azure Digital Twins

Process and manage data (10–15%)

Configure message routing in Azure IoT Hub

- Implement message enrichment in IoT Hub
- Implement routing of IoT device telemetry to endpoints
- Implement routing of IoT Hub non-telemetry events to endpoints
- Define and test routing queries
- Configure IoT Hub as an Azure Event Grid source
- Reconfigure the default Azure Event Hubs endpoint when there are multiple endpoints

Configure stream processing of IoT data

- Create Azure Stream Analytics for data, and stream processing by using the Azure portal
- Process and filter IoT data by using Azure Functions
- Write user-defined functions and aggregations in Stream Analytics
- Consume Azure Machine Learning functions in Stream Analytics
- Configure Stream Analytics outputs

Create Azure Stream Analytics queries

- Write a Stream Analytics query that runs in IoT Edge
- Write a Stream Analytics query that runs in the cloud

Monitor, troubleshoot, and optimize IoT solutions (10–15%)

Configure health monitoring

- Configure rules and alerts based on IoT Hub metrics
- Set up diagnostics logs for IoT Hub
- Apply Azure Policy definitions for IoT Hub
- Gather IoT Edge metrics
- Retrieve diagnostic logs from IoT Edge

Troubleshoot device communication

- Verify that device telemetry is received by IoT Hub
- Validate device twin properties, tags, and direct methods
- Troubleshoot device disconnects and connects
- Troubleshoot IoT Edge modules and devices
- Troubleshoot message loss
- Evaluate and test IoT Hub failover

Implement security (10–15%)

Implement security for IoT devices and services

- Implement device and gateway security, including shared access keys, key rotation, managed identities, Hardware Security Modules (HSMs), and Trusted Platform Modules (TPMs)
- Implement secure connections, including access control, authentication, shared access policies, and TLS
- Implement secure networking, including IP filtering and private endpoints

Implement Microsoft Defender for IoT

- Configure a Defender for IoT agent-based solution
- Install and configure Defender-IoT-micro-agents (security agents)
- Configure built-in and custom alerts for IoT Hub

Study resources

We recommend that you train and get hands-on experience before you take the exam. We offer self-study options and classroom training as well as links to documentation, community sites, and videos.

Study resources	Links to learning and documentation
Get trained	Choose from self-paced learning paths and modules or take an instructor-led course
Find documentation	Azure IoT documentation Device Update for IoT Hub documentation Azure IoT Edge documentation Microsoft Defender for IoT documentation
Ask a question	Microsoft Q&A Microsoft Docs
Get community support	Internet of Things (IoT) - Microsoft Tech Community
Follow Microsoft Learn	Microsoft Learn - Microsoft Tech Community
Find a video	Exam Readiness Zone Azure Fridays Browse other Microsoft Learn shows

Change log

Key to understanding the table: The topic groups (also known as functional groups) are in bold typeface followed by the objectives within each group. The table is a comparison between the two versions of the exam skills measured and the third column describes the extent of the changes.

Skill area prior to January 30, 2023	Skill area as of January 30, 2023	Change
Audience profile		No change
Set up the Azure IoT Hub solution infrastructure	Set up the Azure IoT Hub solution infrastructure	% of exam increased
Create and configure an IoT hub	Create and configure an IoT hub	No change
Build device messaging and communication	Build device messaging and communication	No change

Skill area prior to January 30, 2023	Skill area as of January 30, 2023	Change
Configure physical IoT devices	Configure physical IoT devices	No change
Provision and manage devices	Provision and manage devices	No change
Set up the device provisioning service	Set up the device provisioning service	No change
Manage the device lifecycle	Manage the device lifecycle	No change
Manage IoT devices by using IoT Hub	Manage IoT devices by using IoT Hub	No change
Manage IoT devices by using Azure IoT Central	Manage IoT devices by using Azure IoT Central	No change
Implement IoT Edge	Implement IoT Edge	% of exam increased
Set up an IoT Edge device	Set up an IoT Edge device	No change
Deploy an IoT Edge device	Deploy an IoT Edge device	No change
Develop IoT Edge modules	Develop IoT Edge modules	No change
Configure an IoT Edge device	Configure an IoT Edge device	No change
Implement business integration	Implement business integration	No change
Integrate with upstream and downstream systems	Integrate with upstream and downstream systems	No change
Develop an IoT solution that uses Azure Digital Twins	Develop an IoT solution that uses Azure Digital Twins	No change
Process and manage data	Process and manage data	% of exam decreased
Configure message routing in Azure IoT Hub	Configure message routing in Azure IoT Hub	No change
Configure stream processing of IoT data	Configure stream processing of IoT data	No change
Create Azure Stream Analytics queries	Create Azure Stream Analytics queries	No change
Process real-time data by using Azure Time Series Insights		Removed

Skill area prior to January 30, 2023	Skill area as of January 30, 2023	Change
Monitor, troubleshoot, and optimize IoT solutions	Monitor, troubleshoot, and optimize IoT solutions	% of exam increased
Configure health monitoring	Configure health monitoring	No change
Troubleshoot device communication	Troubleshoot device communication	No change
Implement security	Implement security	% of exam increased
Implement security for IoT devices and services	Implement security for IoT devices and services	No change
Implement Microsoft Defender for IoT	Implement Microsoft Defender for IoT	No change

Skills measured prior to January 30, 2023

- Set up the Azure IoT Hub solution infrastructure (10–15%)
- Provision and manage devices (15–20%)
- Implement IoT Edge (15–20%)
- Implement business integration (5–10%)
- Process and manage data (15–20%)
- Monitor, troubleshoot, and optimize IoT solutions (5-10%)
- Implement security (5-10%)

Set up the Azure IoT Hub solution infrastructure (10–15%)

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- Write a Stream Analytics query that runs in the cloud

Process real-time data by using Azure Time Series Insights

- Create a Time Series Insights environment
- Connect the IoT hub and the Time Series Insights environment
- Create a reference data set for a Time Series Insights environment by using the Azure portal
- Implement Time Series Model hierarchies, types, and instance fields
- Consume data by using Time Series Expression syntax

Monitor, troubleshoot, and optimize IoT solutions (5–10%)

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