

Resource for AZ-220 Exam

Resources for the skills measured:

1. Implement the IoT Solution Infrastructure
 1. Create and Configure an IoT Hub
 1. * Create an IoT Hub
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-create-through-portal#create-an-iot-hub>
 2. * Register a device
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-create-through-portal#register-a-new-device-in-the-iot-hub>
 3. * Configure a device twin
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-device-twins>
 4. * Configure IoT Hub tier and scaling
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-scaling>
 2. Build device Messaging and Communication
 1. * Build messaging solutions by using SDKs (device and service)
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-sdks>
 2. * Implement device-to-cloud communication
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-d2c-guidance>
 3. * Implement cloud-to-device communication
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-csharp-csharp-c2d>
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-c2d-guidance>
 4. * Configure file upload for devices
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-configure-file-upload>
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-configure-file-upload-powershell>
 3. Configure Physical IoT Devices
 1. * Recommend an appropriate protocol based on device specifications
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-protocols>
 2. * Configure device networking, topology, and connectivity
<https://docs.microsoft.com/en-us/azure/iot-hub/virtual-network-support>
2. Provision and Manage Devices
 1. Implement the Device Provisioning Service (DPS)
 1. * Create a Device Provisioning Service <https://docs.microsoft.com/en-us/azure/iot-dps/>
<https://docs.microsoft.com/en-us/azure/iot-dps/quick-setup-auto-provision>
 2. * Create a new enrollment in DPS
<https://docs.microsoft.com/en-us/azure/iot-dps/how-to-manage-enrollments>
 3. * Manage allocation policies by using Azure Functions
<https://docs.microsoft.com/en-us/azure/iot-dps/how-to-use-custom-allocation-policies>

4. * Link an IoT Hub to the DPS
<https://docs.microsoft.com/en-us/azure/iot-dps/quick-setup-auto-provision#link-the-iot-hub-and-your-device-provisioning-service>
 2. Manage the Device Lifecycle
 1. * Provision a device by using DPS
<https://docs.microsoft.com/en-us/azure/iot-edge/how-to-auto-provision-x509-certs>
<https://docs.microsoft.com/en-us/azure/iot-edge/how-to-auto-provision-symmetric-keys>
 2. * Deprovision an autoenrollment
<https://docs.microsoft.com/en-us/azure/iot-dps/how-to-unprovision-devices>
 3. * Decommission (disenroll) a device
<https://docs.microsoft.com/en-us/azure/iot-dps/how-to-revoke-device-access-portal>
 3. Manage IoT Devices by Using IoT Hub
 1. * Manage devices list in the IoT Hub device registry
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-identity-registry>
 2. * Modify device twin tags and properties
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-device-twins>
 3. * Trigger an action on a set of devices by using IoT Hub Jobs and Direct Methods
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-node-node-schedule-jobs>
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-direct-methods>
 4. * Set up Automatic Device Management of IoT devices at scale
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-automatic-device-management>
 4. Build a Solution by Using IoT Central
 1. * Define a device type in Azure IoT Central
<https://docs.microsoft.com/en-us/azure/iot-central/core/howto-set-up-template>
 2. * Configure rules and actions in Azure IoT Central
<https://docs.microsoft.com/en-us/azure/iot-central/core/howto-configure-rules>
<https://docs.microsoft.com/en-us/azure/iot-central/core/quick-configure-rules>
 3. * Define the operator view
<https://docs.microsoft.com/en-us/azure/iot-central/core/howto-set-up-template>
 4. * Add and manage devices from IoT Central
<https://docs.microsoft.com/en-us/azure/iot-central/core/howto-manage-devices>
 5. * Monitor devices
<https://docs.microsoft.com/en-us/azure/iot-central/core/quick-monitor-devices>
 6. * Custom and industry-focused application templates
<https://docs.microsoft.com/en-us/azure/iot-central/core/concepts-app-templates>
 7. * Monitor application health using metrics
<https://docs.microsoft.com/en-us/azure/iot-central/core/howto-monitor-application-health>
3. Implement Edge
 1. Set up and Deploy an IoT Edge Device
 1. * Create a device identity in IoT Hub
<https://docs.microsoft.com/en-us/azure/iot-edge/how-to-register-device>
 2. * Deploy a single IoT device to IoT Edge
<https://docs.microsoft.com/en-us/azure/iot-edge/how-to-deploy-modules-portal>
 3. * Create a deployment for IoT Edge devices "above"

4. * Install container runtime on IoT devices
<https://docs.microsoft.com/en-us/azure/iot-edge/how-to-install-iot-edge-windows>
5. * Define and implement deployment manifest
<https://docs.microsoft.com/en-us/azure/iot-edge/module-composition#create-a-deployment-manifest>
6. * Update security daemon and runtime
<https://docs.microsoft.com/en-us/azure/iot-edge/how-to-update-iot-edge>
7. * provision IoT Edge devices with DPS
<https://docs.microsoft.com/en-us/azure/iot-edge/how-to-auto-provision-simulated-device-windows>
8. * IoT Edge automatic deployments
<https://azure.microsoft.com/fr-ca/blog/new-enhancements-for-azure-iot-edge-automatic-deployments/>
<https://docs.microsoft.com/en-us/azure/iot-edge/module-deployment-monitoring>
9. * Deploy on constrained devices
<https://docs.microsoft.com/en-us/azure/iot-edge/production-checklist>
10. * Secure IoT Edge solutions <https://docs.microsoft.com/en-us/azure/iot-edge/security>
11. * Deploy production certificates
<https://docs.microsoft.com/en-us/azure/iot-edge/production-checklist#install-production-certificates>
2. Develop Modules
 1. * Create and configure an Edge module
<https://docs.microsoft.com/en-us/azure/iot-edge/tutorial-machine-learning-edge-06-custom-modules>
 2. * Deploy a module to an Edge device
<https://docs.microsoft.com/en-us/azure/iot-edge/how-to-deploy-modules-portal>
 3. * Publish an IoT Edge module to an Azure Container Registry
<https://docs.microsoft.com/en-us/azure/iot-edge/tutorial-deploy-function>
3. Configure an IoT Edge Device
 1. * Select and deploy an appropriate gateway pattern
<https://docs.microsoft.com/en-us/azure/iot-edge/how-to-create-transparent-gateway>
 2. * Implement Industrial IoT solutions with modules like Modbus and OPC
<https://docs.microsoft.com/en-us/azure/architecture/guide/iiot-guidance/iiot-architecture>
 3. * Implement module-to-module communication
<https://docs.microsoft.com/en-us/azure/iot-edge/module-composition>
 4. * Implement and configure offline support (including local storage)
<https://docs.microsoft.com/en-us/azure/iot-edge/offline-capabilities>
4. Process and Manage Data
 1. Configure routing in Azure IoT Hub
 1. * Implement message enrichment in IoT Hub
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-message-enrichments-overview>
 2. * Configure routing of IoT Device messages to endpoints
<https://docs.microsoft.com/en-us/azure/iot-hub/tutorial-routing>

3. * Define and test routing queries
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-routing-query-syntax>
 4. * Integrate with Event Grid
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-event-grid>
 2. Configure Stream Processing
 1. * Create ASA for data and stream processing of IoT data
<https://docs.microsoft.com/en-us/azure/stream-analytics/stream-analytics-get-started-with-azure-stream-analytics-to-process-data-from-iot-devices>
 2. * Process and filter IoT data by using Azure Functions
<https://docs.microsoft.com/en-us/samples/azure-samples/functions-js-iot-hub-processing/processing-data-from-iot-hub-with-azure-functions/>
 3. * Configure Stream Analytics outputs
<https://docs.microsoft.com/en-us/azure/stream-analytics/stream-analytics-define-outputs>
 3. Configure an IoT Solution for Time Series Insights (TSI)
 1. * Implement solutions to handle telemetry and time-stamped data
<https://docs.microsoft.com/en-us/azure/time-series-insights/time-series-insights-overview>
 2. * Create an Azure Time Series Insights (TSI) environment
<https://docs.microsoft.com/en-us/azure/time-series-insights/tutorial-create-populate-tsi-environment>
 3. * Connect the IoT Hub and the Time Series Insights (TSI)
<https://docs.microsoft.com/en-us/azure/time-series-insights/how-to-ingest-data-iot-hub>
5. Monitor, Troubleshoot, and Optimize IoT Solutions
 1. Configure Health Monitoring
 1. * Configure metrics in IoT Hub
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-metrics>
 2. * Set up diagnostics logs for Azure IoT Hub
<https://docs.microsoft.com/en-us/azure/iot-hub/tutorial-use-metrics-and-diags>
 3. * Query and visualize tracing by using Azure Monitor
<https://docs.microsoft.com/en-us/azure/azure-monitor/log-query/log-query-overview>
 4. * Use Azure Policy definitions for IoT Hub
<https://docs.microsoft.com/en-us/azure/iot-hub/security-controls-policy>
 2. Troubleshoot Device Communication
 1. * Establish maintenance communication
<https://docs.microsoft.com/en-us/azure/iot-accelerators/iot-accelerators-predictive-walkthrough>
 2. * Verify device telemetry is received by IoT Hub
<https://docs.microsoft.com/en-us/azure/iot-hub/tutorial-connectivity>
 3. * Validate device twin properties, tags and direct methods
 4. * Troubleshoot device disconnects and connects
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-troubleshoot-connectivity>
 3. Perform End-to-end Solution Testing and Diagnostics
 1. * Estimate the capacity required for each service in the solution
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-scaling>
 2. * Conduct performance and stress testing

6. Implement Security

1. Implement Device Authentication in the IoT Hub

1. * Choose an appropriate form of authentication
<https://azure.microsoft.com/en-ca/blog/iot-device-authentication-options/>
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-security>
2. * Manage the X.509 certificates for a device
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-security-x509-get-started>
3. * Manage the symmetric keys for a device
<https://docs.microsoft.com/en-us/azure/iot-dps/concepts-symmetric-key-attestation>

2. Implement Device Security by Using DPS

1. * Configure different attestation mechanisms with DPS
<https://docs.microsoft.com/en-us/azure/iot-dps/use-hsm-with-sdk>
2. * Generate and manage x.509 certificates for IoT Devices
<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-security-x509-get-started>
3. * Configure enrollment with x.509 certificates
<https://docs.microsoft.com/en-us/answers/questions/34883/how-to-implement-iot-dps-x509-on-device.html>
4. * Generate a TPM endorsements key for a device
<https://docs.microsoft.com/en-us/azure/iot-dps/concepts-tpm-attestation>
5. * Configure enrollment with symmetric keys
<https://docs.microsoft.com/en-us/azure/iot-dps/how-to-legacy-device-symm-key>

3. Implement Azure Security Center (ASC) for IoT

1. * Enable ASC for IoT in Azure IoT Hub
<https://docs.microsoft.com/en-us/azure/defender-for-iot/overview>
<https://docs.microsoft.com/en-us/azure/defender-for-iot/>
2. * Create security modules
<https://docs.microsoft.com/en-us/azure/defender-for-iot/quickstart-create-security-twin>
3. * Configure custom alerts
<https://docs.microsoft.com/en-us/azure/defender-for-iot/quickstart-create-custom-alerts>

If a Pluralsight member, check these courses as well:

1. <https://app.pluralsight.com/library/courses/azure-iot-hub-developers-getting-started/table-of-contents>
2. <https://app.pluralsight.com/library/courses/microsoft-azure-iot-solutions-creating/table-of-contents>
3. <https://app.pluralsight.com/library/courses/microsoft-azure-developing-intelligent-edge-solutions/table-of-contents>
4. <https://app.pluralsight.com/library/courses/microsoft-azure-building-streaming-data-pipelines/table-of-contents>
5. <https://app.pluralsight.com/library/courses/microsoft-azure-solutions-architect-implement-cloud-infrastructure-monitoring-strategy/table-of-contents>

Other resources

Connect IoT DevKit AZ3166 to Azure IoT Hub

<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-arduino-iot-devkit-az3166-get-started>

MXChip IoT DevKit

<https://microsoft.github.io/azure-iot-developer-kit/>

Azure CLI IoT Hub commands

<https://docs.microsoft.com/en-us/cli/azure/iot/hub?view=azure-cli-latest>

<https://docs.microsoft.com/en-us/cli/azure/ext/azure-cli-iot-ext/iot/device?view=azure-cli-latest>

https://docs.microsoft.com/en-us/cli/azure/ext/azure-cli-iot-ext/iot/device?view=azure-cli-latest#ext_azure_cli_iot_ext_az_iot_device_simulate

https://docs.microsoft.com/en-us/cli/azure/ext/azure-cli-iot-ext/iot/device?view=azure-cli-latest#ext_azure_cli_iot_ext_az_iot_device_send_d2c_message

Use *az iot hub --help* command for immediate help.

Azure Storage Explorer

<https://azure.microsoft.com/en-us/features/storage-explorer/>

Sample code to create a self-signed x.509 certificate

<https://github.com/MattHoneycutt/ps-create-iot-solutions>

IoT Central portal

<https://apps.azureiotcentral.com>

Upload files from your device to the cloud with IoT Hub (.NET)

<https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-csharp-csharp-file-upload>