Certified for
IBM | Watson Internet of Things

IBM Watson IoT Professional Certification Program

Study Guide Series

Exam C1000-036 IBM Watson IoT Platform V1 Solution Architect

Purpose of Exam Objectives

When an exam is being developed, the Subject Matter Experts work together to define the role the certified individual will fill. They define all of the tasks and knowledge that an individual would need to have in order to successfully implement the product. This creates the foundation for the objectives and measurement criteria, which are the basis for the certification exam.

The Watson IOT Certification item writers used these objectives to develop the questions that they wrote, and which will appear on the exam.

It is recommended that you review these objectives. Do you know how to complete the task in the objective? Do you know why that task needs to be done? Do you know what will happen if you do it incorrectly? If you are not familiar with a task, then go through the objective and perform that task in your own environment. Read more information on the task. If there is an objective on a task there is about a 95% chance that you WILL see a question about it on the actual exam.

After you have reviewed the objectives and completed your own research, then take the assessment exam. While the assessment exam will not tell you which question you answered incorrectly, it will tell you how you did by section. This will give you a good indication as to whether you are ready to take the actual exam or if you need to further review the materials.

Note: This is the high-level list of objectives. As you review these objectives, you will see a more detailed level of how to perform the task.

High-level Exam Objectives

Section 1 Technical architecture and capabilities of the WIoT Platform
1.1 Understand and detail the overall technical capabilities of WIoT Platform
1.2 Understand and detail the capabilities of WIoT Platform Connection Service
1.3 Understand and detail core capabilities of WIoT Platform Analytics Service
1.4 Understand and detail core capabilities of WIoT Platform Blockchain Service
Section 2 Architectural Patterns
2.1 Understand and articulate Industrial IoT
2.2 Understand and describe IBM's IoT Industry Solutions
Section 3 Planning WIoT Platform Architecture
3.1 Recognizes opportunities performing discovery to define business and technical requirements, and key decision makers
3.2 Evaluate the customer's environment and maturity level
3.3 Evaluate provisioning and cloud topology considerations
3.4 Evaluate service level requirements to meet the cost and performance goals for the environment
3.5 Proposing a high level architecture for early client feedback
Section 4 Design a suitable WIoT Platform Architecture
4.1 Identify critical data entities
4.2 Design approach for Device Management
4.3 Apply requirements for Data Management
4.4 Design how analytic services can be exploited to enrich the solution
4.5 Design how applications can be integrated with WIoT Platform Services
4.6 Summarize validate and present to client
Section 5 Implementation Deployment and Scaling
5.1 Describe the principles and phases of solution lifecyde from pilot to production
5.2 Develop an appropriate process to take an IoT solution from inception to production
5.3 Extend solution to identify and handle typical IoT faults
5.4 Develop a strategy to monitor IoT solutions

Detailed Exam Objectives

Section 1 - Technical Architecture and capabilities of the WIoT Platform

1.1 Understand and detail the overall technical capabilities of WIoT Platform

SUBTASKS:
1.1.1   Explain core characteristics of an IoT solution, specifically device connectivity, security, data communication, internet routing and protocols, and device management.
1.1.2   Explain device connectivity and device twins through the Watson IoT Connection Service.
1.1.3   Explain data capture through Cloudant NoSQL DB.
1.1.4   Explain data aggregation and filtration through DB2 Warehouse.
1.1.5   Explain data archive through Cloud Object Storage.
1.1.6   Explain capabilities of the Secure Gateway and IBM Event Streams.
1.1.7   Explain in detail the key differentiators of the Watson IoT Platform
1.1.8   Explain the end to end security of Watson IoT platform
1.1.9   Understand integration capabilities with existing systems, current IoT offerings, as well as WIoT Platform Analytics Service and WIoT Blockchain Service.

Reference: Business Partner Hands-On Lab
https://ibm.box.com/s/m44424fgkyuo8j73ir5wnaolmp0y66pj
IBM Watson IOT Platform Knowledge Center:
https://www.ibm.com/support/knowledgecenter/tr/SSQP8H/iot/kc_welcome.html
 https://internetofthings.ibmcloud.com/

1.2 Understand and detail the capabilities of WIoT Platform Connection Service

SUBTASKS:
1.2.2.1 Register and connect devices with the IoT Platform
1.2.2.2 Manage devices – track their identification and status
1.2.2.3 Secure devices – manage security credentials and white/black-list devices
1.2.2.4 Capture data from devices and map to a logical data format
1.2.2.5 Associate devices with user and organization ownership
1.2.2.6 Process data by storing in data stores and making available for analysis and access by applications
1.2.2.7 Archive data for long-term storage (at low cost)
1.2.2.8 Data lifecycle and retention durations

Reference:
 IBM Watson IOT Platform Knowledge Center:
https://www.ibm.com/support/knowledgecenter/tr/SSQP8H/iot/kc_welcome.html

1.3 Understand and detail core capabilities of WIoT Platform Analytics Service

Understand the capabilities of WIoTP Analytics Service that can be applied to address requirements in an IoT solution to link IoT data with the Analytics Service

SUBTASKS:
1.3.1   Review the customer's requirements & usecase
1.3.2   Explain the overall capability of Analytics Service
1.3.3   Assess data requirements for device and other data sources supporting the usecase
1.3.3   Feed sample data from device and other sources to Analytics Service
1.3.4   Explore and verify quality of input data
1.3.5   Apply basic transformation to data using standard built-in function
1.3.6   Understand how to develop custom function using Analytics Service API
1.3.5   Assess and map customer outcomes to list of custom functions

Reference:
Overview - https://ibm.box.com/v/WatsonIoTAnalytics
Knowledge center:
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/analytics/as_getting_started.html
Technical deep dive:
Deck: https://ibm.box.com/s/unoqqh3ih4qiaubelv2dkb4u9fl38rcj
Recording: https://ibm.box.com/s/ea5hihhjhw065h1it9unpn3fy39u8nqk

1.4: Understand and detail core capabilities of WIoT Platform Blockchain Service

SUBTASKS:
      1.4.4.1 Mapping IoT and Asset Data to business criteria
      1.4.4.2 Enriching IoT data with business data to provide context for IoT data points
      1.4.4.3 Managing Blockchain Credentials and Connection
      1.4.4.4 Associate IoT devices with Blockchain Smart Contracts

References:
https://www.ibm.com/support/knowledgecenter/en/SSCG66/iotblockchain/kc_welcome.html
https://www.ibm.com/internet-of-things/trending/blockchain

Section 2 - Architectural Patterns

2.1 Understand and articulate Industrial IoT

SUBTASKS:
2.1.1 Understand the characteristics and trends around Industry 4.0
2.1.2 Understand integration with enterprise management systems
2.1.3 Understand integration with third party platforms
2.1.4 Understand the characteristics and trends around edge processing
2.1.5 Understand the characteristics around Digital Twin

Reference: Aberdeen Group report: https://www-01.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=WWL12382USEN
Reference: https://www.ibm.com/internet-of-things
Reference: **https://www.ibm.com/internet-of-things/trending/digital-twin**
Reference:
https://www.ibm.com/search?q=industrial+iot&lnk=mhsrch&v=18&en=utf&lang=en&cc=us
Reference: https://www.ibm.com/industries/manufacturing/industry-4-guide

2.2 Understand and describe IBM's IoT Industry Solutions

SUBTASKS:
2.2.1 Understanding IBM IoT Building Insights and TRIRIGA Integration
Reference: https://www.ibm.com/uk-en/marketplace/iot-building-insights
http://spcn.w3cloud.ibm.com/software/spcn/content/K460956R87252Y06.html#indexb
2.2.2 Understanding IBM Asset Performance Management (APM) Solutions
    Reference: https://www.ibm.com/internet-of-things/solutions/enterprise-asset-management/asset-performance-management
    Reference: https://www.ibm.com/uk-en/marketplace/predictive-maintenance-insights
    Reference:
    https://www.ibm.com/support/knowledgecenter/en/SSQR84/com.ibm.apms.doc/welcome.html
    2.2.2.1 Understanding Maximo APM Equipment Maintenance Assistant
    Reference: https://www.ibm.com/us-en/marketplace/equipment-maintenance-assistant
    2.2.2.2 Understanding Maximo APM - Asset Health Insights
    Reference: https://www.ibm.com/products/maximo/add-ons
    2.2.2.3 Understanding Maximo APM for Energy and Utilities
    Reference:
    https://www.ibm.com/support/knowledgecenter/en/SSESLS/com.ibm.ifeoc.doc/welcome_iot4eu.html
    2.2.3.4 Understanding IBM Production Quality Insights & Production Optimization
    Reference: https://www.ibm.com/internet-of-things/solutions/enterprise-asset-management/production-optimization
 2.2.4 Understanding IBM Worker Insights
    Reference: https://www.ibm.com/uk-en/marketplace/iot-safer-workplace

Section 3 - Planning WIoT Platform architecture

3.1: Recognizes opportunities performing discovery to define business and technical requirements, and key decision makers

SUBTASKS:
3.1.1   Understand and deliver core concepts of a discovery workshop from workshop from a design thinking perspective
3.1.2   Identify key use case or business problem
3.1.3   Define functional and technical requirements based off of use case, priorities and current assets
3.1.4   Identify key decision makers
3.1.5   Compare client use cases with reference blueprints to identify re-use opportunities

3.2 Evaluate the customer's environment and maturity level

SUBTASKS:
3.2.1. Identify client's existing business Application environment
3.2.2. Identify client's Infrastructure dependencies
3.2.3. Evaluate maturity level of customer in terms of skill technology and use
3.2.4. Evaluate maturity level of customer in terms of IoT data use
3.2.5. Determine connectivity and messaging capabilities – sensors/devices/gateways
      3.2.5.1 Determine connection protocols
      3.2.5.2 Evaluate connection level security
      3.2.5.3 Determine messaging protocols
      3.2.5.4 Evaluate messaging layer security
3.2.6   Determine data lifecycle capabilities - how do they store IoT data today, what data lakes do they use, can they consolidate
3.2.7. Determine analytics capabilities - can they use analytics to get better understanding of their IoT data
3.2.8. Determine opportunities for Blockchain
3.2.9. Determine opportunities for security

Reference(S):
https://console.bluemix.net/docs/overview/security.html#security
https://console.bluemix.net/docs/services/IoT/reference/security/index.html#sec-index
https://console.bluemix.net/docs/services/IoT/reference/standards_and_requirements.html#standards_and_requirements
https://console.bluemix.net/docs/services/IoT/reference/mqtt/index.html#ref-mqtt
https://console.bluemix.net/docs/services/IoT/reference/quotas.html#quotas

3.3 : Evaluate provisioning and cloud topology considerations

SUBTASKS:
3.3.1   Understand public, and private cloud
3.3.2   Understand IBM Public and Dedicated Cloud offerings [is Dedicated even worth referencing as it is not a supported option for IoTP?]
3.3.3   Understand IBM Cloud Private
3.3.4   Review client's network topology and application dependencies
3.3.5   Evaluate provisioning considerations - IBM Public vs Dedicated vs ICP vs H

3.4: Evaluate service level requirements to meet the cost and performance goals for the environment

Understand the capacity and pricing structure for the WIoTP Connection Service, Analytics Service and Blockchain Service. Map the customer's requirements onto the most appropriate device type option for IoT Platform Connection Service. Calculate the capacity required for the IoT Platform services required for the solution.

SUBTASKS:
3.4.1 Identify the production environment requirements of the solution in terms of
        3.4.4.1   Number of devices to be connected – sensors and gateways
        3.4.4.2   Frequency and size(s) of messages ingested by IoTPCS
        3.4.4.3   Message frequency and message size determine IoTPCS device type
        3.4.4.4   Growth forecast for devices
3.4.2 Identify additional data sources and requirements to ingest data into the IoT Platform
3.4.3 Identify data retention requirements
3.4.4 Identify analytics requirements for production environment:
        3.4.4.1   Frequency of analytical function calculation
        3.4.4.2   Number of analytical functions to be calculated per device
3.4.5 Calculate total data storage
3.4.6 Identify Blockchain requirements for production environment:
        3.4.6.1   Frequency of transactions per device to be shared on a Blockchain
3.4.7 Identify requirements for non-production instances for development and test usage
3.4.8 Evaluate whether requirements meet the environment cost and performance goals
3.4.9 Perform cost and performance trade off analysis
3.4.10 Review trade off analysis with client

Reference:
https://www.ibm.com/support/knowledgecenter/en/SSQP8H/iot/platform/reference/quotas.html
Reference: https://www-03.ibm.com/software/sla/sladb.nsf/8bd55c6b9fa8039c86256c6800578854/c6e4fc3fd851e7d2862581e60049c873/$FILE/i126-7779-02_11-2017_en_US.pdf

3.5 Proposing a high level architecture for early client feedback

SUBTASKS:
3.5.1 Define architecture and related considerations
3.5.2. Identify where functional requirements have been considered/included in the proposed solution design
3.5.4. Summarize and present solutions to customer

Section 4 - Design a suitable WIoT Platform Architecture

4.1 Identify critical data entities

SUBTASKS:
4.1.1 Gather device information and pay load details from IoT devices
4.1.2 Analyze and define data into WIoTP data format
4.1.3 Identify data required for historical view
4.1.4 Identify data for normalization
4.1.5 Identify data for monitoring and management actions

4.2: Design approach for Device Management

SUBTASKS:
4.2.1   Identify requirements for device connectivity and authentication.
   4.2.1.1   Determine which devices will connect directly, which will connect through a gateway, which will connect via 3rd party platforms.
   4.2.1.2   Determine how the gateways or directly-connected devices are going to authenticate (token or PKI) with WIoTP
   4.2.1.3   Determine how the gateways or directly-connected devices are going to be provisioned with the authentication credentials that they will need.
4.2.2   Identify requirements for device monitoring and diagnostics.
   4.2.2.1   Determine the processes for device troubleshooting. What diagnostic information do the devices provide?
4.2.3   Identify requirements for device software maintenance and updates.
   4.2.3.1   Define a mechanism for updating the firmware on the devices/gateways. Will the firmware updates be driven via Watson IoT Platform, or via some other mechanism?
   4.2.3.2   Identify firmware update server
   4.2.3.3   Identify the requirements for scheduling firmware update. Are the specific times when update on a device can be performed? Are there constraints involving updates of multiple devices (e.g. don't update B while A is being updated)
4.2.4   Understand who is going to be responsible for device management. Is it going to be performed in-house or outsourced?
4.2.5   Determine whether the devices are going to need WIoTP management agents installed on them?

Reference:
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/gateways/dashboard.html
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/reference/security/connect_devices_apps_gw.html
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/devices/device_mgmt/index.html

4.3 Apply requirements for Data Management

SUBTASKS:
4.3.1   Create device types and register devices/gateways within the Watson IoT Platform Service.
4.3.2   Ensure devices are connected and data is being sent to the Watson IoT Platform Service.
4.3.3   Create a physical and logical interface within the Watson IoT Platform Service.
4.3.4   Check to see if data was sent to Cloudant NoSQL DB
4.3.5   Find your device type within DB2 Warehouse and create a table of your data.
4.3.6   Understand the capabilities of Cloud Object Storage.
4.3.7   Understand data is available for 30 days within Cloudant, 90 days within DB2, and 1 year within Cloud Object Storage.
4.3.8   Understand that the Secure Gateway service allows for secure connection between your existing on-premise or third-party services to the IBM Cloud.
4.3.9 Understand that Event Streams enables streaming of data to analytics applications.

4.4 Design how analytic services can be exploited to enrich the solution

SUBTASKS:
4.4.1 Assess and map customer outcomes to list of custom functions
4.4.2 Configure local Python or Watson development environment with sample Jupyter notebook
4.4.3 Develop, register and publish the custom analytic function
4.4.4 Apply & score with the new function on the input stream and verify output

4.5 Design how applications can be integrated with WIoT Platform Services

SUBTASKS:
4.5.1 Identify the IBM Cloud Services that are currently integrated with the platform.
4.5.2. Evaluate tradeoffs between different points of application interaction (e.g., live MQTT vs Event Streams/Cloudant, COS, DB2) and decide how any user applications will receive message data from the platform.
4.5.3   Design how the solution will send commands to devices.
4.5.4   Identify the APIs to be used for device management.
4.5.5   Describe how applications will monitor and respond to (monitoring?) events in the platform

4.6: Summarize validate and present to client
SUBTASKS:
 4.6.1   Summarize and document the final solution design
 4.6.2   Identify where functional requirements have been considered/included in the proposed design solution.
4.6. Present to client

Section 5 - Implementation Deployment and Scaling

5.1 Describe the principles and phases of solution lifecycle from pilot to production

 SUBTASKS:
5.1.1 Describe the characteristics of a pilot IoT solution
5.1.2 Describe the characteristics of a development/test environment
5.1.3 Describe the characteristics of a production environment
5.1.4 Address the challenges in maintaining and improving your IoT real-estate: remote device code changes
5.1.5 Address the challenges in maintaining and improving your IoT real-estate: testing and rolling out updates

Reference:
It's important to recognize challenges for updating device code remotely (e.g., using device management capabilities in IoTP). Need to recognize that updates to device code may not occur at the same time, so it's important to have business logic that handles old and new devices.

5.2 Develop an appropriate process to take an IoT solution from inception to production

SUBTASKS:
5.2.1   Explain how an IoT solution can be prototyped cost-effectively and quickly in WIoTP using collateral including recipes and device simulators
5.2.2   Describe how two IoT Platform service instances can be used to construct a develop/test/production pipeline using different IoTP price plans
5.2.3   Define the touchpoints in your device and business application logic that allow switching between the different IoTP environments
5.2.4   Implement a test plan to cover appropriate testing of your IoT solution
5.2.5   Implement a rollout mechanism to push your changes to your IoT real estate (for initial deployment and making future updates)
5.2.6   Explain how the IoT solution will dovetail with your existing processes (e.g., device registration)

Reference:
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/getting_started/quickstart/index.html
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/iotplatform_task.html
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/devices/device_sim.html
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/developer_doc_overview.html
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/reference/back_up.html

5.3 Extend solution to identify and handle typical IoT faults

SUBTASKS:
5.3.1   Identify characteristic fault problems met in IoT solutions <where do we say 'write your code according to best practice, e.g. understand IoTP connection throttling'>
5.3.2   Describe how Watson IoT Platform's APIs can be used to self-diagnose connectivity issues, and best practices on how these can be used at scale
5.3.3   Describe how Watson IoT Platform's monitoring topic can be used to self-diagnose faults, and best practices on how this can be used at scale
5.3.4   Describe how Watson IoT Platform's device management capability provides a mechanism for devices to publish fault information, and best practices on how this can be used at scale
5.3.5   Identify development/test capabilities to maximizing the potential for your solution to tolerate typical faults

Reference:
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/troubleshooting/ts.html
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/ts_index.html
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/reference/security/client_connect.html
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/applications/api.html

5.4 Develop a strategy to monitor IoT solutions

SUBTASKS:
5.4.1   Describe how monitoring can be used to be alerted to problems quickly
5.4.2   Describe how a simple monitoring application can confirm basic device connectivity
5.4.3   Describe how a monitoring application can pick up live problems with your IoT solution by subscribing to the monitor topic
5.4.4   Explain how to make your monitoring solution fit for scale – and the pitfalls of not doing so

Reference:
https://www.ibm.com/support/knowledgecenter/SSQP8H/iot/platform/getting_started/getting-started-iot-monitoring.html

Next Steps

1. Take the IBM Watson IoT Platform V1 Solutions Architect assessment test.

2. If you pass the assessment exam, visit pearsonvue.com/ibm to schedule your testing sessions.

3. If you failed the assessment exam, review how you did by section. Focus attention on the sections where you need improvement. Keep in mind that you can take the assessment exam as many times as you would like ($30 per exam), however, you will still receive the same questions only in a different order.