

# AI-102

## Designing and Implementing an Azure AI Solution – Exam Prep



# Objective

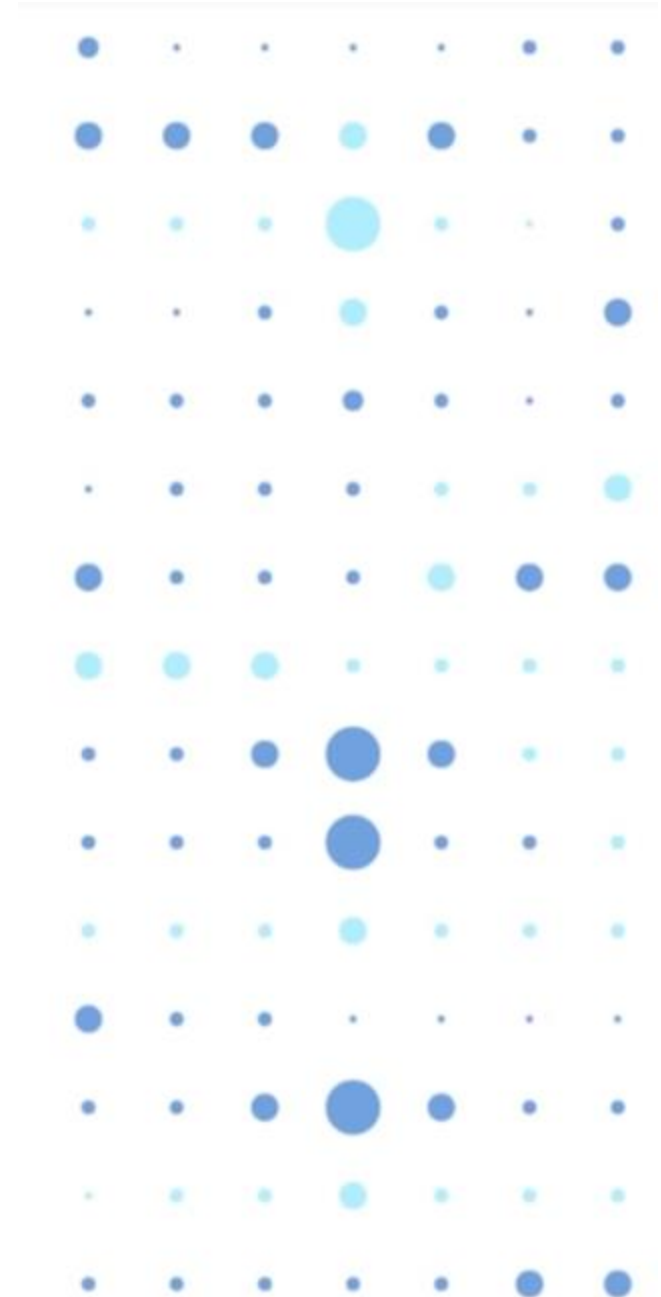
After taking the course you will be able to

- Identify what will be covered on exam
- Determine which concepts to prioritize for further study
- Explain different potential exam question formats
- Locate available learning resource and utilize



# Exam Scoring

- ⌚ **Each Exam has cut score**
  - Score ranges from 0-1000
  - Passing score is 700(scaled score not 70%)
- ⌚ **Tips and Tricks**
  - No points deducted for wrong answers
  - Some questions can not be revisited
  - Answer every question



# Online Role-based training resources:

Microsoft Learn

<https://learn.microsoft.com/en-us/certifications/exams/ai-102>

# How to Register for the exam

## Schedule exam

### Exam AI-900: Microsoft Azure AI Fundamentals

Languages: English, Japanese, Chinese (Simplified), Korean, German, French, Spanish  
Retirement date: none

Prove that you can describe the following: AI workloads and considerations; fundamental principles of machine learning on Azure; features of computer vision workloads on Azure; features of Natural Language Processing (NLP) workloads on Azure; and features of conversational AI workloads on Azure.

For non-students interested in technology

[Schedule with Pearson VUE >](#)

For students or instructors

[Schedule with Certiport >](#)

For job seekers impacted by COVID-19

[Learn about our commitment to support people impacted by COVID-19.](#)

[Schedule for USD15 >](#)

[Official practice test](#) for Microsoft Azure AI Fundamentals

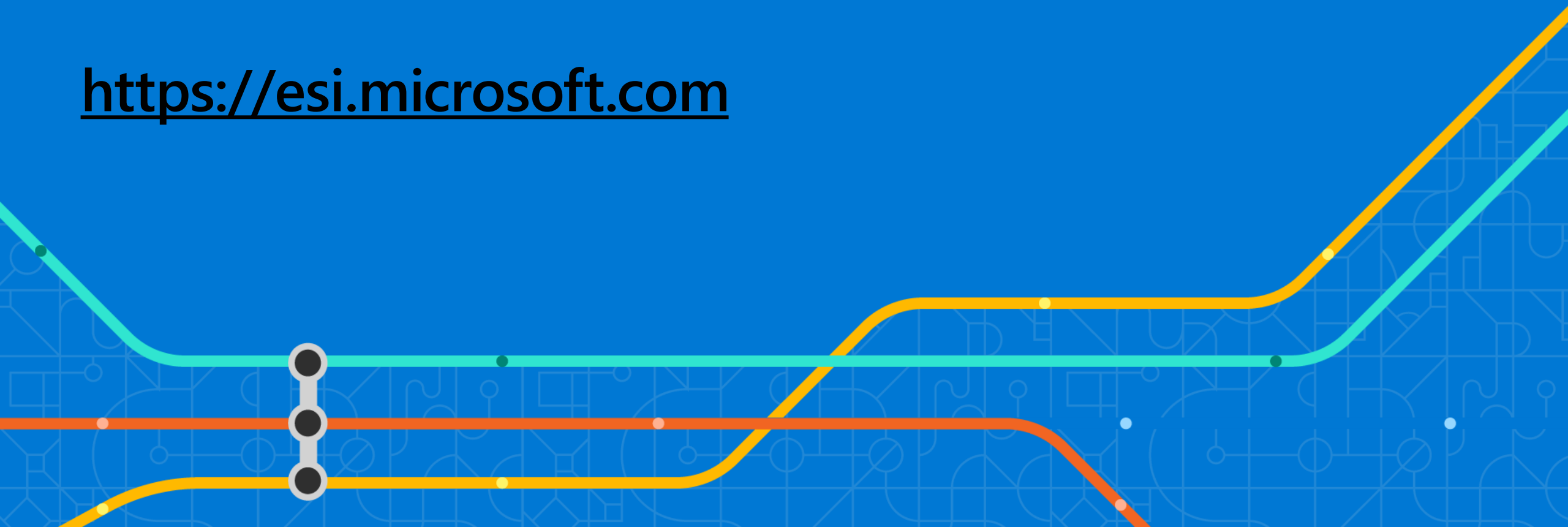
All objectives of the exam are covered in depth so you'll be ready for any question on the exam.



# Enterprise Skills Initiative

## Learner Experience Portal

<https://esi.microsoft.com>



# Learner Experience Portal (LxP) at a glance

The LxP is a one-stop shop for Learners









Enable Learners to view and register for 100% free certifications without the need for a voucher or code via the “Microsoft Certifications” tile



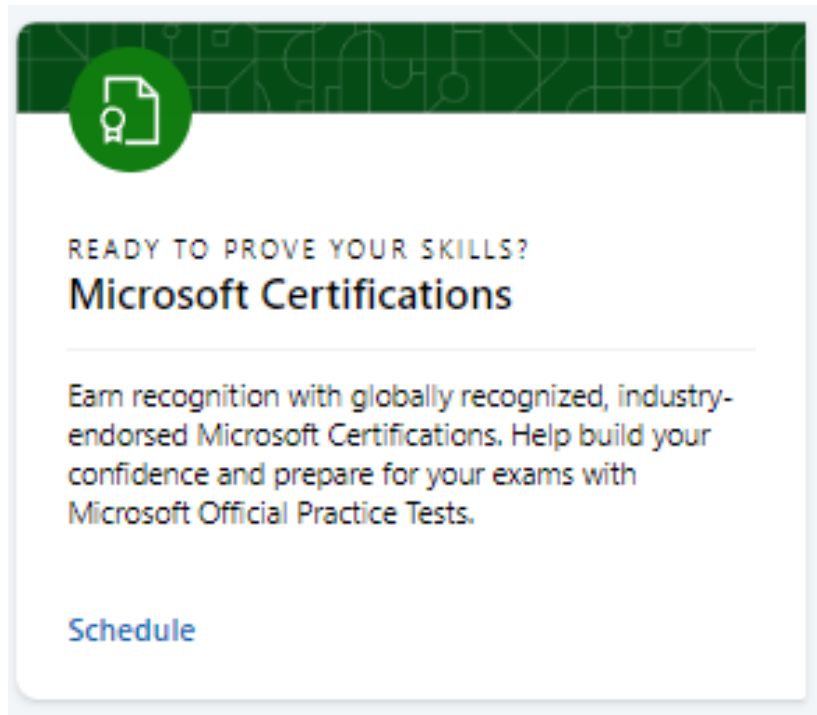
Access registration for deliveries, Learning Partner discounted class seats, and launch self-paced training directly from the portal



Access self-paced learning via Microsoft Learn

 <p>LIKE TO LEARN ON YOUR OWN? <b>Microsoft Learn</b></p> <p>Check out Microsoft Learn. Find online learning paths that combine short, step-by-step tutorials, browser-based, interactive coding and scripting environments, and task-based achievements.</p> <p><a href="#">Explore</a></p>	 <p>NEED ACCELERATED LEARNING? <b>Microsoft Virtual Training Days</b></p> <p>Skill up with Microsoft Virtual Training Days. These one-day digital events with live chat moderators cover fundamentals and advanced topics for Azure, Dynamics 365, security, and more.</p> <p><a href="#">Explore</a></p>	 <p>READY FOR IN-DEPTH LEARNING? <b>Microsoft-Delivered Courses</b></p> <p><b>Join Microsoft experts for in-depth learning.</b> Choose live, hands-on, instructor-led training on consecutive days or in a blended experience across multiple weeks that includes chalk talks, self-study, and community engagement.</p> <p><a href="#">Explore</a></p>
 <p>NEED CUSTOMIZED COURSES? <b>Learning Partner Training</b></p> <p>Get instructor-led training delivered by Microsoft Learning Partners that offer Microsoft Official Courses in times, locations, and languages that suit your needs.</p> <p><a href="#">Register</a></p>	 <p>READY TO PROVE YOUR SKILLS? <b>Microsoft Certifications</b></p> <p>Earn recognition with globally recognized, industry-endorsed Microsoft Certifications. Help build your confidence and prepare for your exams with Microsoft Official Practice Tests.</p> <p><a href="#">Schedule</a></p>	 <p>NEED TO BOOST YOUR BUSINESS SKILLS? <b>Productivity Workshops</b></p> <p>Join Microsoft experts to skill up on Office, Power BI, and more! These live interactive trainings will set you up to work smarter and faster.</p> <p><a href="#">Explore</a></p>

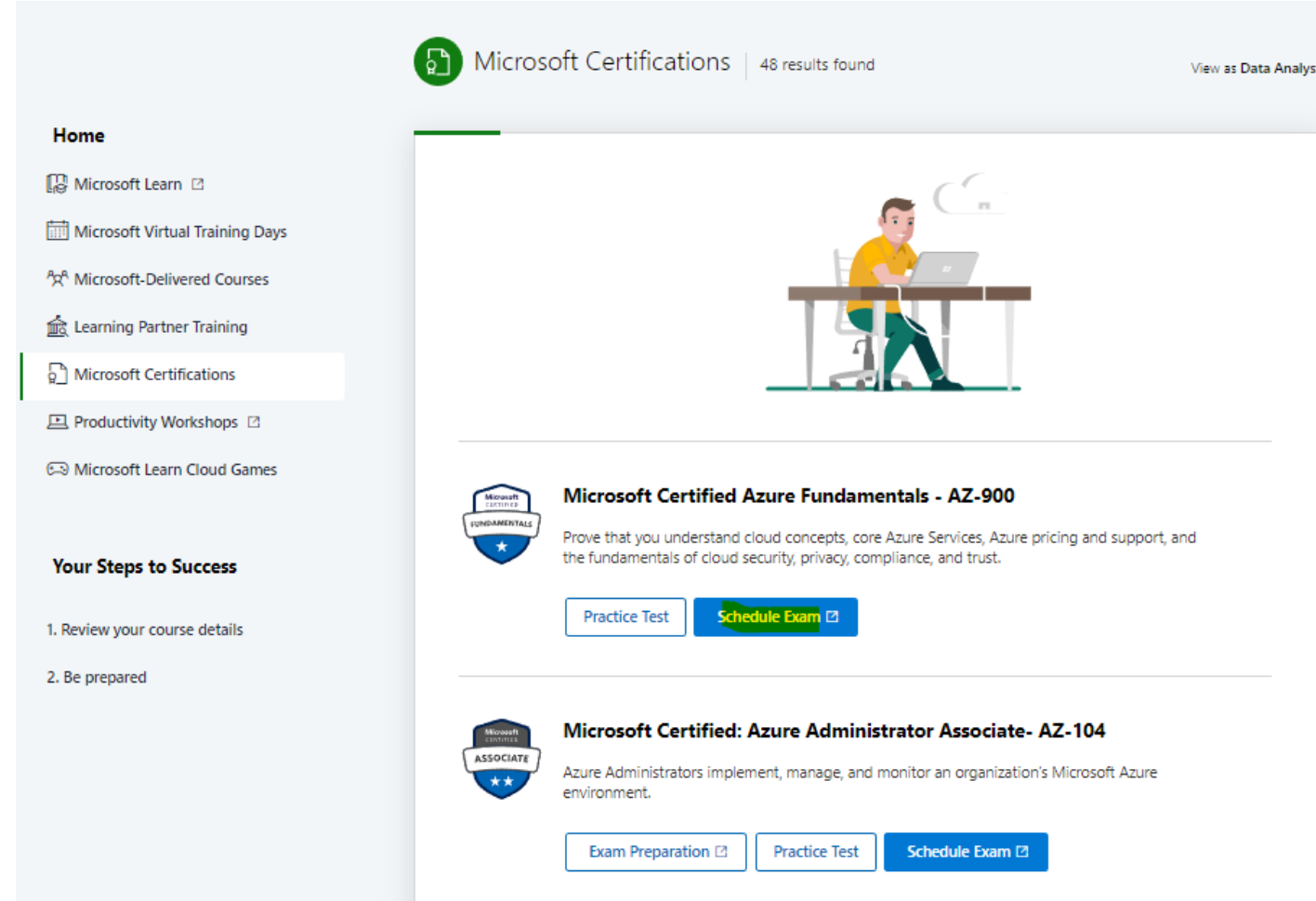
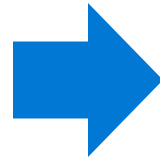
# LxP – Microsoft Certifications Tile



READY TO PROVE YOUR SKILLS?  
**Microsoft Certifications**

Earn recognition with globally recognized, industry-endorsed Microsoft Certifications. Help build your confidence and prepare for your exams with Microsoft Official Practice Tests.

[Schedule](#)



Microsoft Certifications | 48 results found [View as Data Analyst](#)

**Home**

- Microsoft Learn
- Microsoft Virtual Training Days
- Microsoft-Delivered Courses
- Learning Partner Training
- Microsoft Certifications**
- Productivity Workshops
- Microsoft Learn Cloud Games

**Your Steps to Success**

- Review your course details
- Be prepared

**Microsoft Certified Azure Fundamentals - AZ-900**

Prove that you understand cloud concepts, core Azure Services, Azure pricing and support, and the fundamentals of cloud security, privacy, compliance, and trust.

[Practice Test](#) [Schedule Exam](#)

**Microsoft Certified: Azure Administrator Associate- AZ-104**

Azure Administrators implement, manage, and monitor an organization's Microsoft Azure environment.

[Exam Preparation](#) [Practice Test](#) [Schedule Exam](#)



- Enable Learners to view and register for 100% free exam certifications with no need for vouchers or codes
- Provides Learners the ability to take a practice exam at no charge.



# Exam Related Information

- a. LxP (Learning Experience Portal) Introduction:  
<https://aka.ms/LxPWalkthroughVideo>
- b. Schedule your Azure Exam for FREE:  
<https://aka.ms/LxPEXamDiscountVideo>
- c. Azure Learning Journey Documentation:  
<https://aka.ms/ESIAzureTrainingJourney>

# Skills Measured

- Plan and manage an Azure AI solution (15–20%)
- Implement decision support solutions (10–15%)
- Implement computer vision solutions (15–20%)
- Implement natural language processing solutions (30–35%)
- Implement knowledge mining and document intelligence solutions (10–15%)
- Implement generative AI solutions (10–15%)



# Introduction to AI and AI on Azure

# What is Artificial Intelligence?

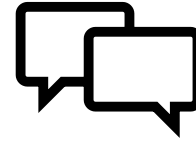
Software that exhibits human-like capabilities, such as:



Visual Perception



Text Analysis



Conversation



Decision Making

# Data Science, Machine Learning, and AI

**Artificial Intelligence**  
Intelligent software apps and agents

**Machine Learning**  
Use of data and algorithms to train predictive models

**Data Science**  
Application of mathematical and statistical techniques to analyze data

# Considerations for Responsible AI

Fairness



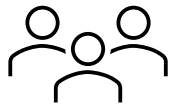
Reliability & Safety



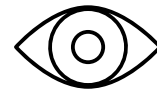
Privacy & Security



Inclusiveness



Transparency



Accountability



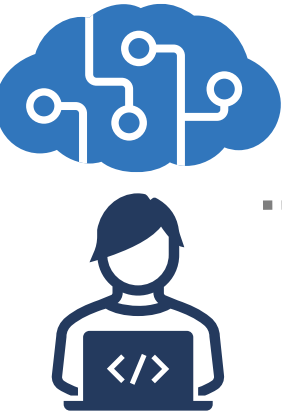
<https://www.microsoft.com/ai/responsible-ai>

# Azure AI Services

## Prepackaged AI services you can integrate into solutions

Capabilities include:

Language	Speech	Vision	Generative
<ul style="list-style-type: none"><li>• Text analysis</li><li>• Question answering</li><li>• Language understanding</li><li>• Translation</li></ul>	<ul style="list-style-type: none"><li>• Speech recognition</li><li>• Speech synthesis</li><li>• Speech Translation</li><li>• Speaker Recognition</li></ul>	<ul style="list-style-type: none"><li>• Image and video analysis</li><li>• Image classification</li><li>• Object detection</li><li>• Optical character recognition</li></ul>	<ul style="list-style-type: none"><li>• Generate text completions</li><li>• Image generation</li></ul>



### Azure AI Services

- Azure AI Document Intelligence
- Azure AI Language
- Azure AI Vision
- Azure OpenAI
- Azure AI Search

# Provisioning Azure AI Services resources

## Create a resource in your Azure subscription

- You will create either a *single-service* resource or a *multi-service* resource:
- Multi-service resource (Azure AI Services):
  - Access multiple Azure AI Services with a single key and endpoint.
  - Consolidates billing from the services you use.
- Single-service resource (for example, Language):
  - Access a single Azure AI service with a unique key and endpoint for each service created.
  - Use the free tier to try out the service.

The screenshot shows the 'Create Azure AI services' portal in the Azure portal. The 'Basics' tab is selected, showing the following fields and options:

- Project Details:**
  - Subscription \***: A dropdown menu showing 'AI Subscription'.
  - Resource group \***: A dropdown menu with a 'Create new' link below it.
- Instance Details:**
  - Region**: A dropdown menu showing 'East US'.
  - Name \***: A text input field.
- Informational message:** A blue box stating: 'Location specifies the region only for included regional services. This does not specify a region for included non-regional services. Click here for more details.'
- Pricing tier \***: A dropdown menu showing 'Standard S0'.
- Terms and Conditions:** A checkbox labeled 'By checking this box I acknowledge that I have read and understood all the terms below \*'.
- Responsible AI Notice:** A text block stating: 'Microsoft provides technical documentation regarding the appropriate operation applicable to this Azure AI service that is made available by Microsoft. Customer acknowledges and agrees that they have reviewed this documentation and will use this service in accordance with it. This Azure AI services is intended to process Customer Data that includes Biometric Data (as may be further described in product documentation) that Customer may incorporate into its own systems used for personal identification or other purposes. Customer acknowledges and agrees that it is responsible for complying'.

At the bottom, there are three buttons: 'Previous', 'Next', and 'Review + create'.



# Endpoints, Keys, and Locations

## Information required to connect Endpoint:

- URL at which service can be consumed
- Required by *most* SDK clients

## Keys:

- Use *either* key to authenticate

## Location:

- Azure data center in which resource is provisioned
- Required by *some* SDK clients

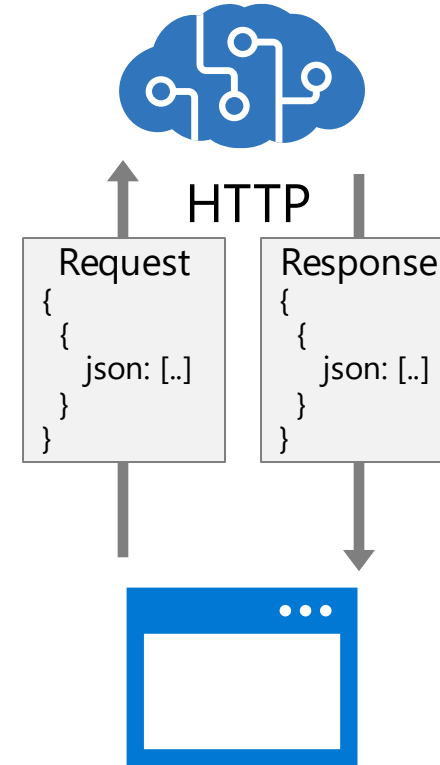
The screenshot displays the configuration page for an Azure Cognitive Services resource. At the top, there is a blue button labeled "Show Keys". Below this, two keys are listed: "KEY 1" and "KEY 2". Each key is represented by a grey bar with a series of dots, indicating a masked value, and a blue copy icon to its right. Below the keys, the "Endpoint" is shown in a grey text box with the value "https://ai102-cog.cognitiveservices.azure.com/" and a copy icon. Finally, the "Location" is shown in a grey text box with the value "eastus" and a copy icon. A small information icon (i) is visible next to the "Location" label.

# Azure AI Services REST APIs

Clients submit HTTP requests to the resource endpoint

- Key specified in request header
- Input data in JSON format
- Specific schema varies by service and method

Service returns JSON response

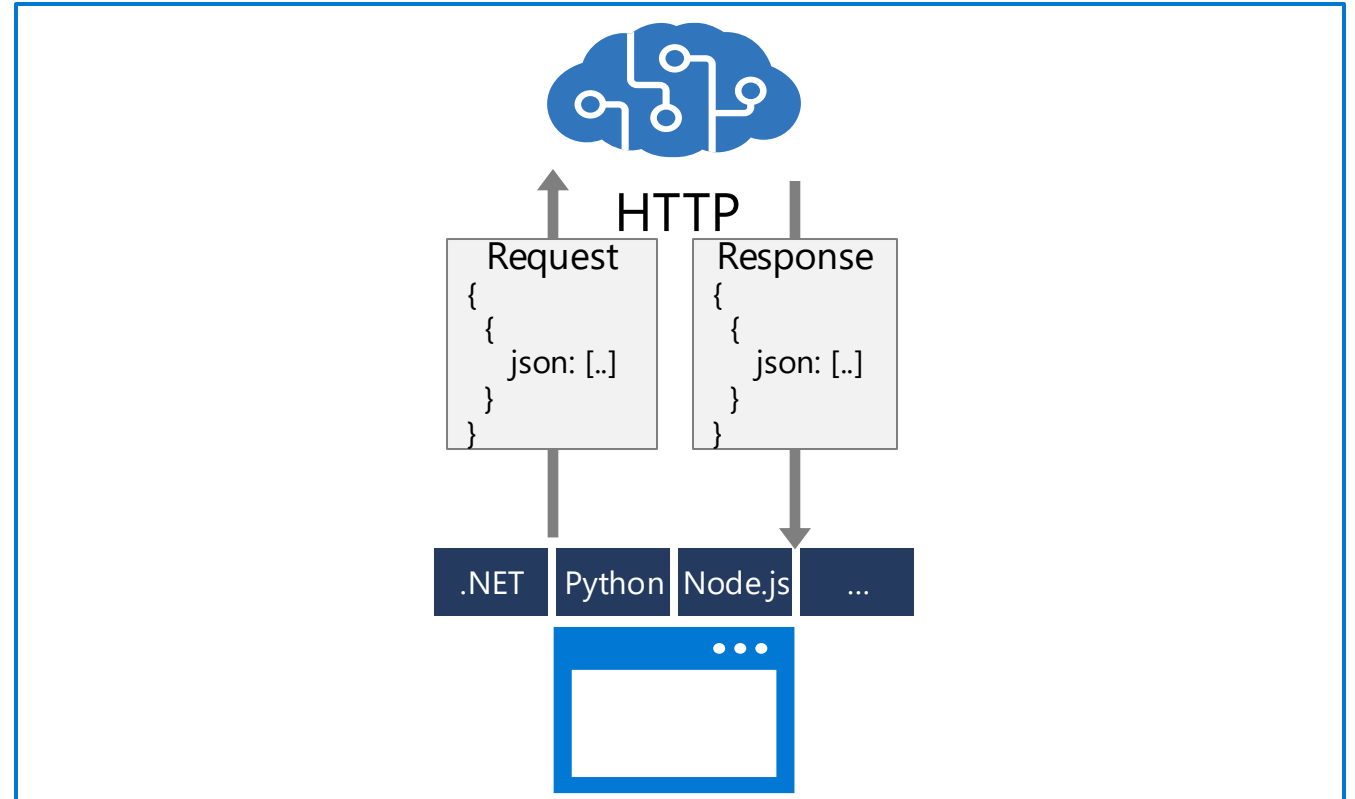


# Azure AI Services SDKs

Runtime library abstracts REST interface

Multiple SDKs for each service:

- .NET
- Python
- Node.js
- Java
- Others...



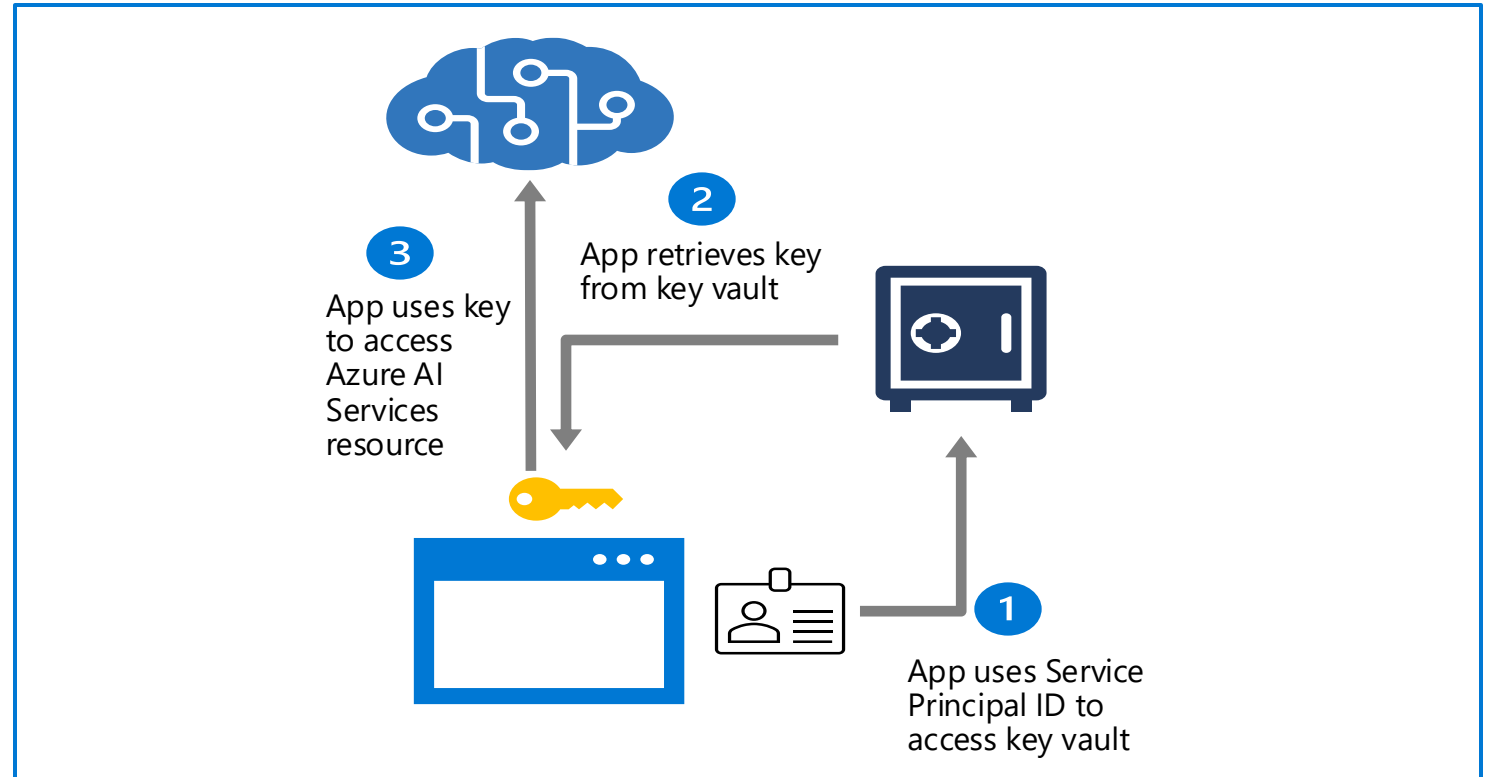
# Considerations for Azure AI Services security

## Regenerate keys regularly to protect access

- To avoid service interruption, switch apps to use key 2 before regenerating key 1; and vice-versa

## Consider protecting keys by storing them in Azure Key Vault

- Apps can use a Service Principal as a managed identity to retrieve keys from Key Vault



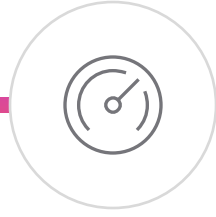
# Monitoring Azure AI Services Activity



## Alerts

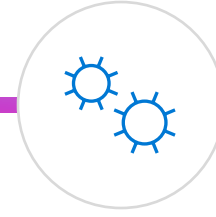
- Alerts will ensure that the correct team knows when a problem arises.
- Every alert or notification available in

**Azure Monitor is the product of a**



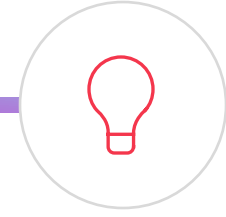
## Metrics

- Metrics are numerical values
- The metrics are collected at regular intervals and are useful for alerting.
- Metrics are stored in a time-series database.



## Diagnostic settings

- Configure diagnostic settings is to provide detailed information for diagnostics and auditing.
- Diagnostic Destinations:
  - Log Analytics Workspace



## Logs

- Logs contain time-stamped information about changes made to resources.
- The log data is organized into record
- The logs can include numeric

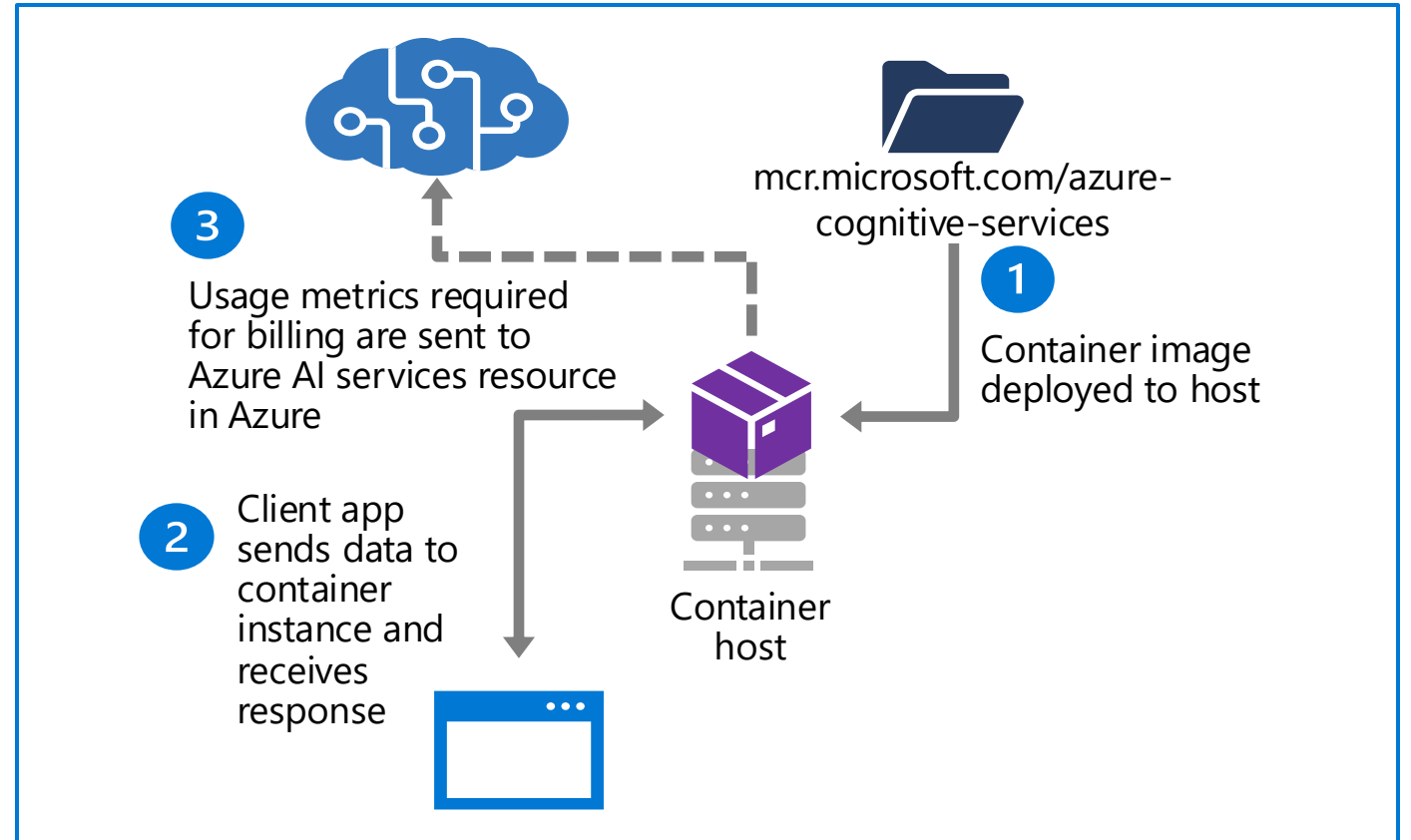
# Azure AI Services and Containers

Container images are available for commonly used Azure AI services APIs

- Deploy containers to:
- Local Docker hosts
- Azure Container Instances
- Azure Kubernetes Services clusters
- others...

Enables more control over data sent to public Azure AI service endpoint

- An Azure AI services resource is still required, and the container must communicate with it to send billing data



# Knowledge check



- 1** How are client applications typically granted access to an Azure AI services endpoint?
  - ☒ The application must specify a valid subscription key for the Azure resource.
  - ☐ The user of the application must enter a user name and password associated with the Azure subscription.
  - ☐ Access to Azure AI services is granted to anonymous users by default.
  
- 2** You want to keep track of how often the subscription keys for your Azure AI services resource are retrieved. What should you do?
  - ☐ Regenerate the keys for your Azure AI services resource.
  - ☒ Create an alert for your Azure AI services resource.
  - ☐ Store the keys in Azure Key Vault.
  
- 3** You plan to use an Azure AI services container in a local Docker host. Which of the following is true?
  - ☐ Client applications must pass a subscription key to the Azure resource endpoint before using the container.
  - ☐ All data passed from the client application to the container is forwarded to the Azure resource endpoint.
  - ☒ The container must be able to connect to the Azure resource endpoint to send usage data for billing.

# Develop computer vision solutions with Azure AI Vision





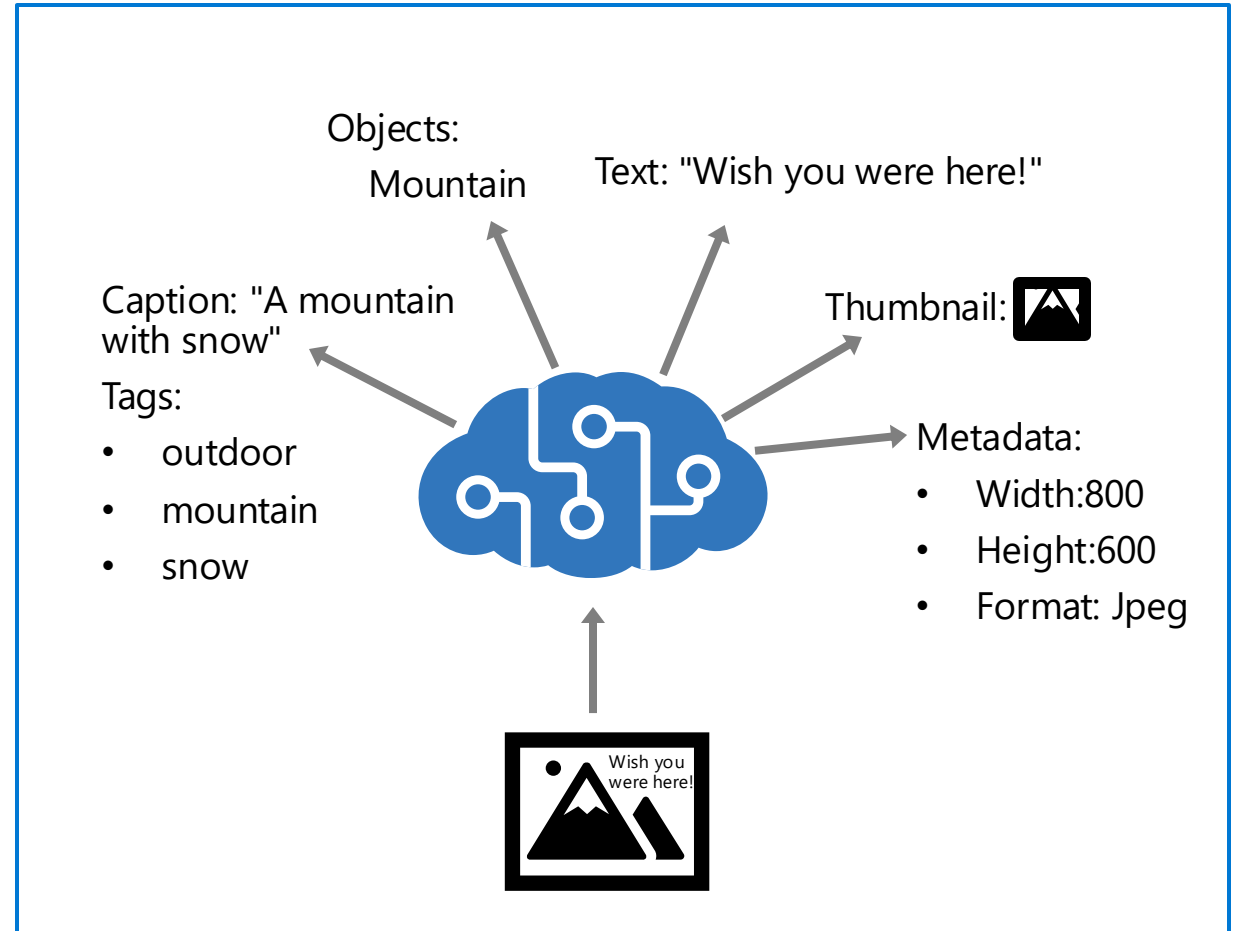
# Azure AI Vision – Image Analysis

## Image analysis:

- Caption and tag generation
- Object detection
- People detection
- Optical character recognition
- Smart crop thumbnails
- Background removal
- Multi-modal embeddings
- Product recognition

## Can be used as:

- Standalone **Azure AI Vision** resource
  - Multi-service **Azure AI Services** resource
- \* Some new features are limited to specific regions



# Azure AI Vision - OCR

Use **Image analysis** with READ feature

Vision OCR vs Document Intelligence:

- OCR: General, non-document images with smaller amounts of text. Synchronous API.
- Document Intelligence: Ideal for larger text heavy documents. Asynchronous API.

Results in JSON (REST) or object (SDK) of similar structure

```
[{
  "lines": [{
    "text": "You must be the change you",
    "boundingPolygon": [
      {
        "x": 251,
        "y": 265
      },
      {
        "x": 673,
        "y": 260
      },
      {
        "x": 674,
        "y": 308
      },
      {
        "x": 252,
        "y": 318
      }
    ]
  },
  "words": [
    {
      "text": "You",
      "boundingPolygon": ...
      "confidence": 0.996
    },
    {
      "text": "must",
      "boundingPolygon": ...
      ...
    }
  ]
}]
```

# Options for Face Detection, Analysis, and Recognition

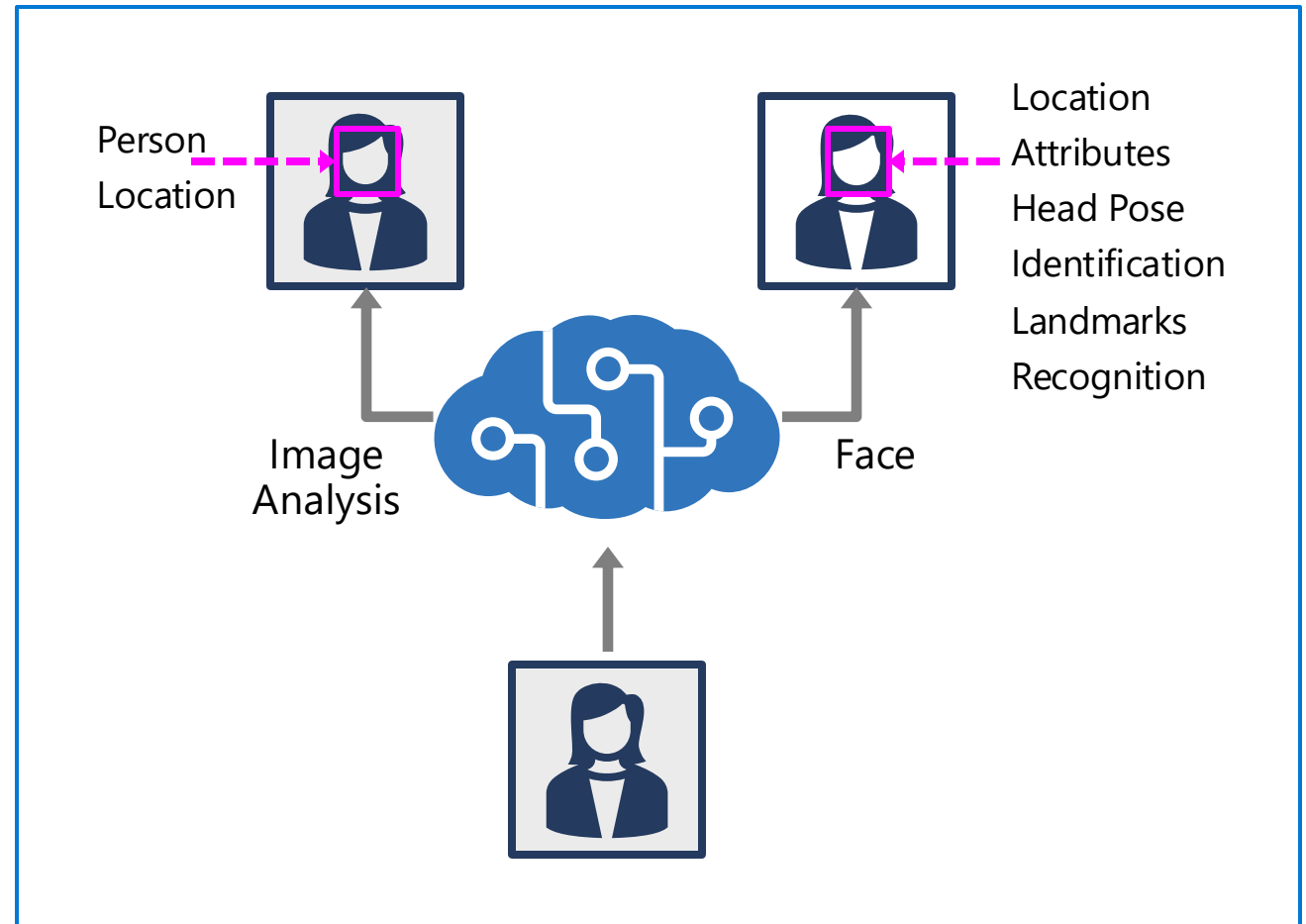
## Image Analysis

- People detection
- Only location provided

## Face Service

- Face detection
- Comprehensive facial feature analysis
- Face comparison and identification\*
- Facial recognition\*

\* *Require Limited Access approval*



# Two types of custom vision models

## Azure AI Custom Vision (previous service)

- **Portal:** customvision.ai
- **Base model:**
  - Convolutional neural network (CNN)
- **Tasks:**
  - Image classification
  - Object detection
- **Labeling:**
  - Customvision.ai
- **Minimum training data needed:**
  - 15 images per category
- **Training data storage**
  - Uploaded to Custom Vision service

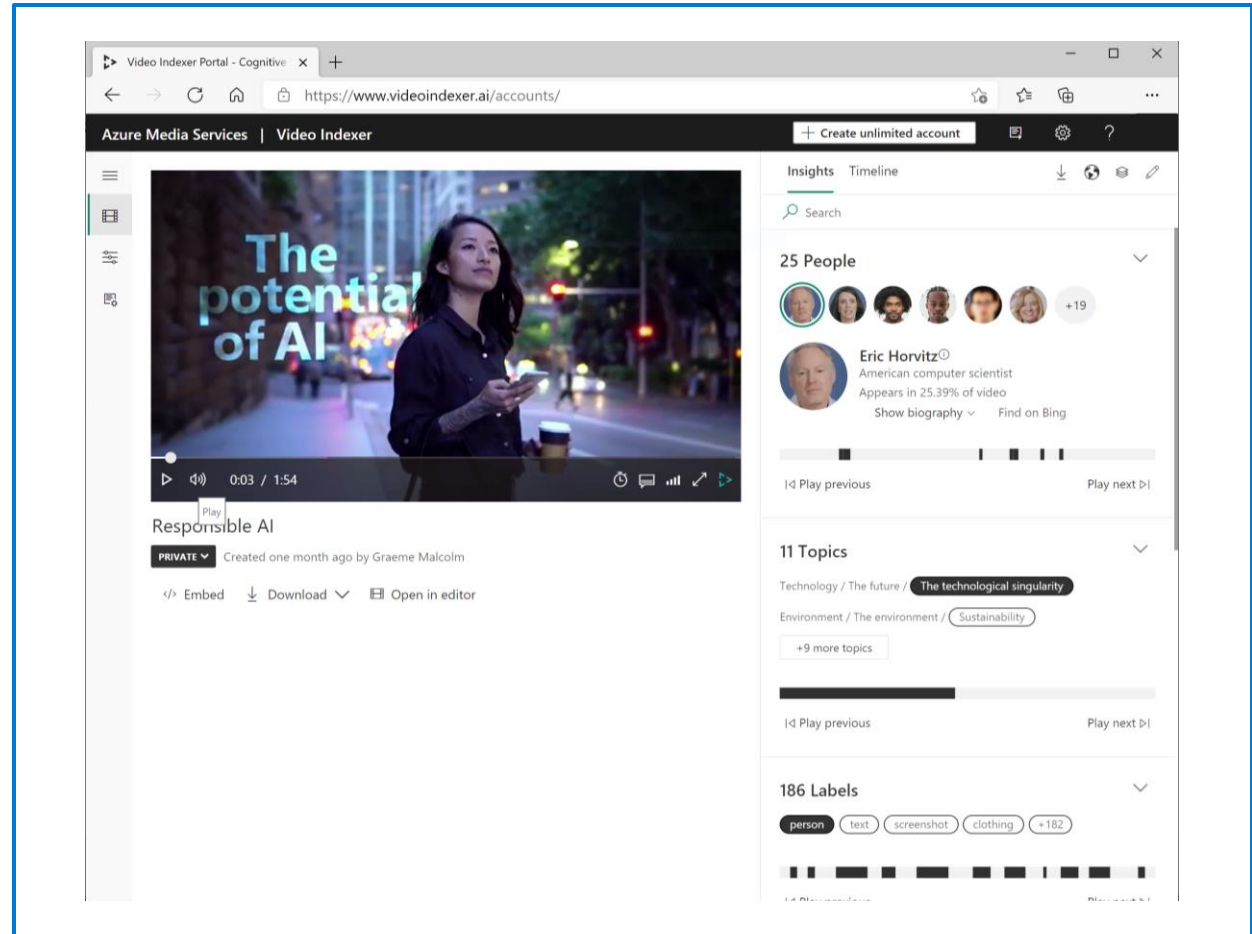
## Custom AI Vision models (new Florence model)

- **Portal:** Vision Studio
- **Base model:**
  - Transformer (multi modal)
- **Tasks:**
  - Image classification
  - Object detection
  - Product recognition
- **Labeling:**
  - AML Studio or COCO file
- **Minimum training data needed:**
  - 2-5 images per category
- **Training data storage**

# Video Indexer

## Video analysis:

- Facial recognition (limited access)
- Optical character recognition
- Speech transcription
- Topics
- Sentiment
- Labels
- Content moderation
- Scene segmentation



# Knowledge check



- 1** You want to use the Azure AI Vision Analyze Image function to generate an appropriate caption for an image. Which visual feature should you specify?

  - ☐ Tags
  - ☒ Caption
  - ☐ Text
- 2** What is the effect of the *Smart Cropping* option when using Azure AI Vision to generate a thumbnail?

  - ☐ The aspect ratio of the original image is maintained.
  - ☐ The thumbnail is skewed to fit the specified proportions.
  - ☒ The region of interest is centered in the thumbnail.
- 3** You want Video Analyzer to recognize colleagues in videos recorded from conference calls. What should you do?

  - ☒ Create a custom model containing a *Person* for each colleague, with example images of their faces.
  - ☐ Edit the conference call videos to include a caption of each person's name on their first appearance.
  - ☐ Embed the Video Analyzer widgets in a custom web site that employees access using their own user credentials.

# Knowledge check



- 4 Which of the following facial attributes can the Azure AI Vision service predict?
- ☒ Location
  - ☐ Type of eye-classes
  - ☐ Occlusion
- 5 You need to create a facial recognition solution that can identify named employees. Which service should you use?
- ☐ Vision
  - ☐ Personalizer
  - ☒ Face
- 6 You need to detect if a specific dangerous item is in your company's inspection photos. What should you do?
- ☐ Create an image classification custom model.
  - ☐ Use the Object feature in Image Analysis.
  - ☒ Train a custom model to detect that item.

# Develop natural language processing solutions





# The Azure AI Language Service

Preconfigured features:

Language detection

Key phrase extraction

Sentiment analysis

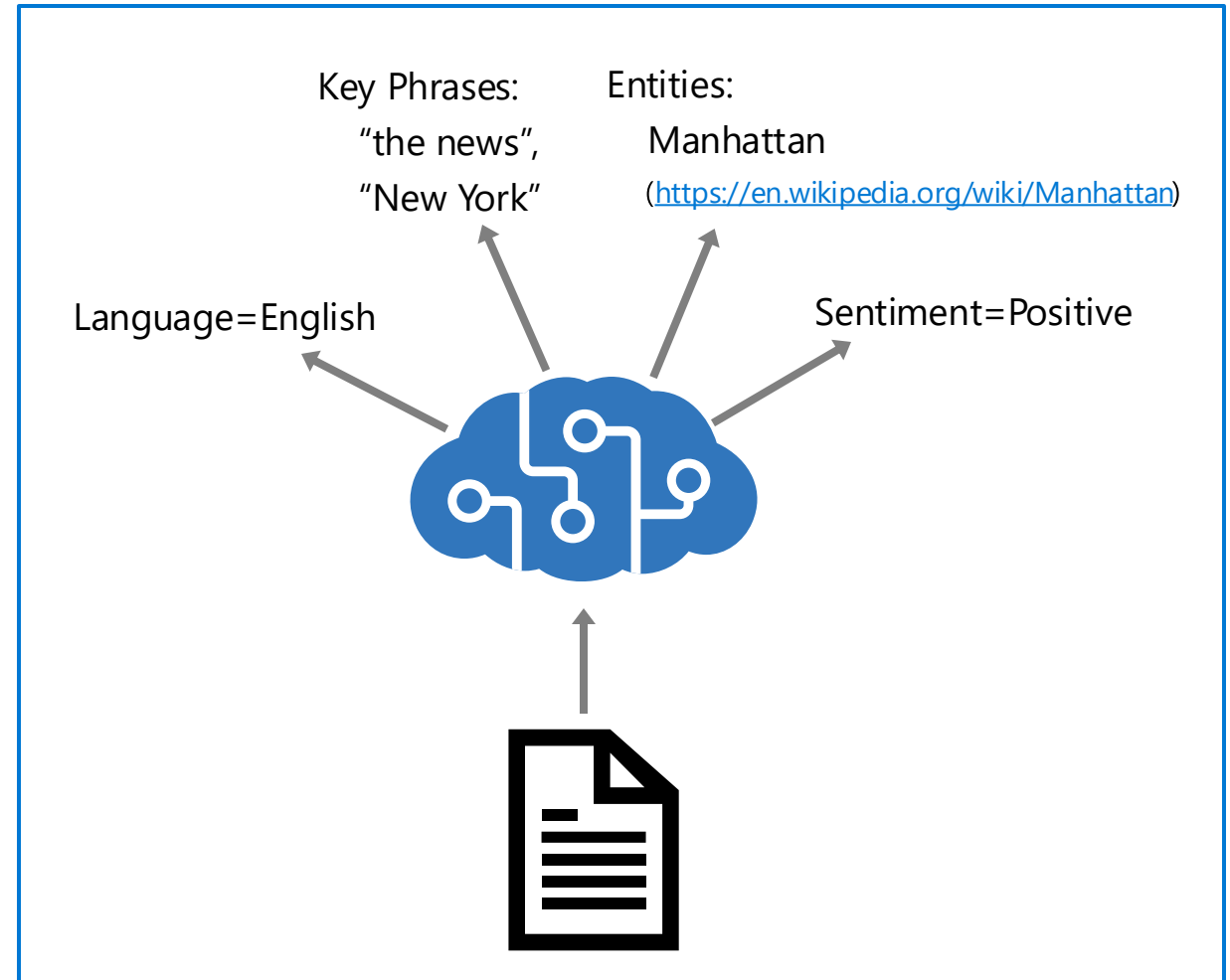
Named entity recognition

Entity linking

Summarization

PII detection

Customizable features are covered in another section



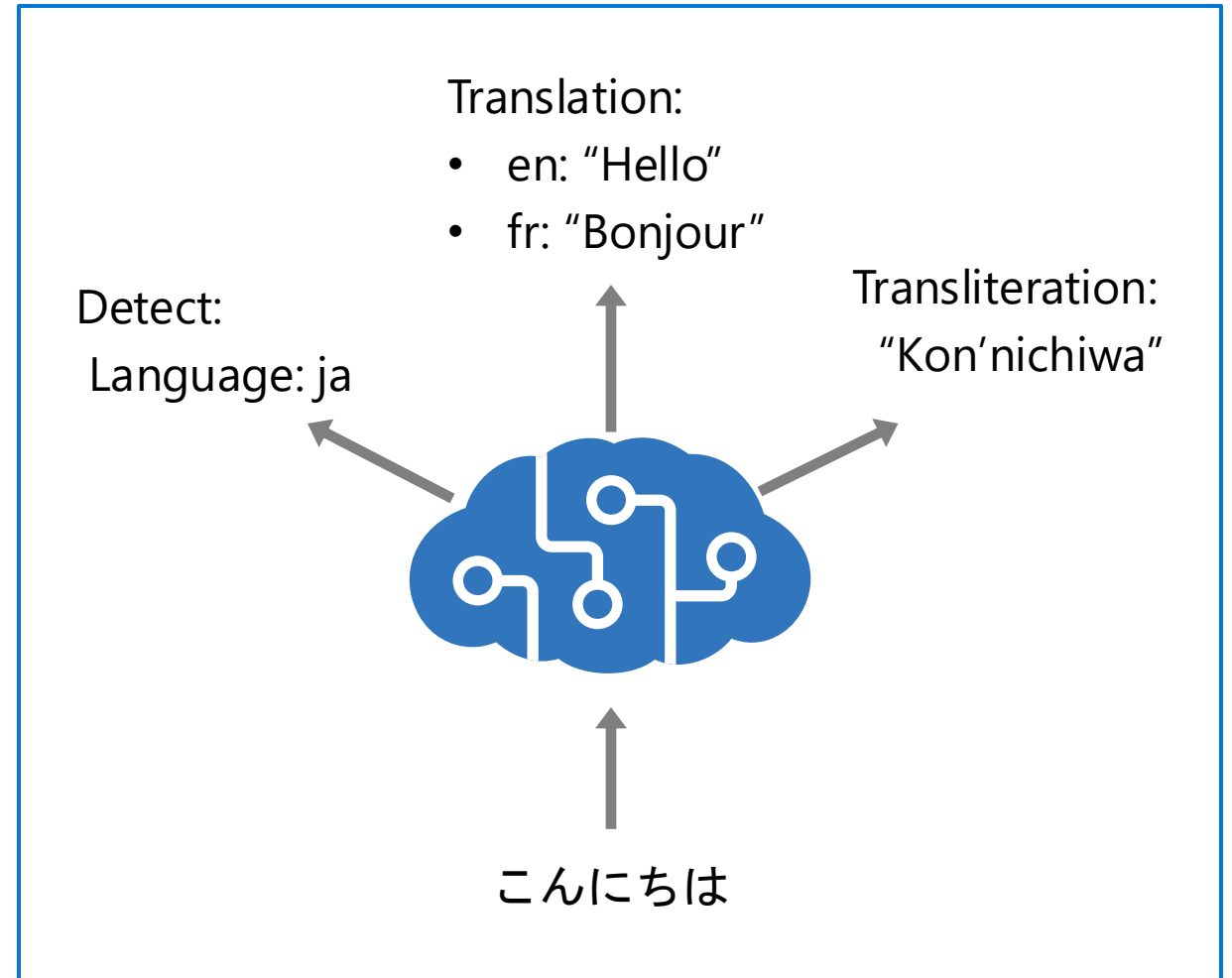
# The Translator Service

Multilingual text translation REST API

Language *detection*

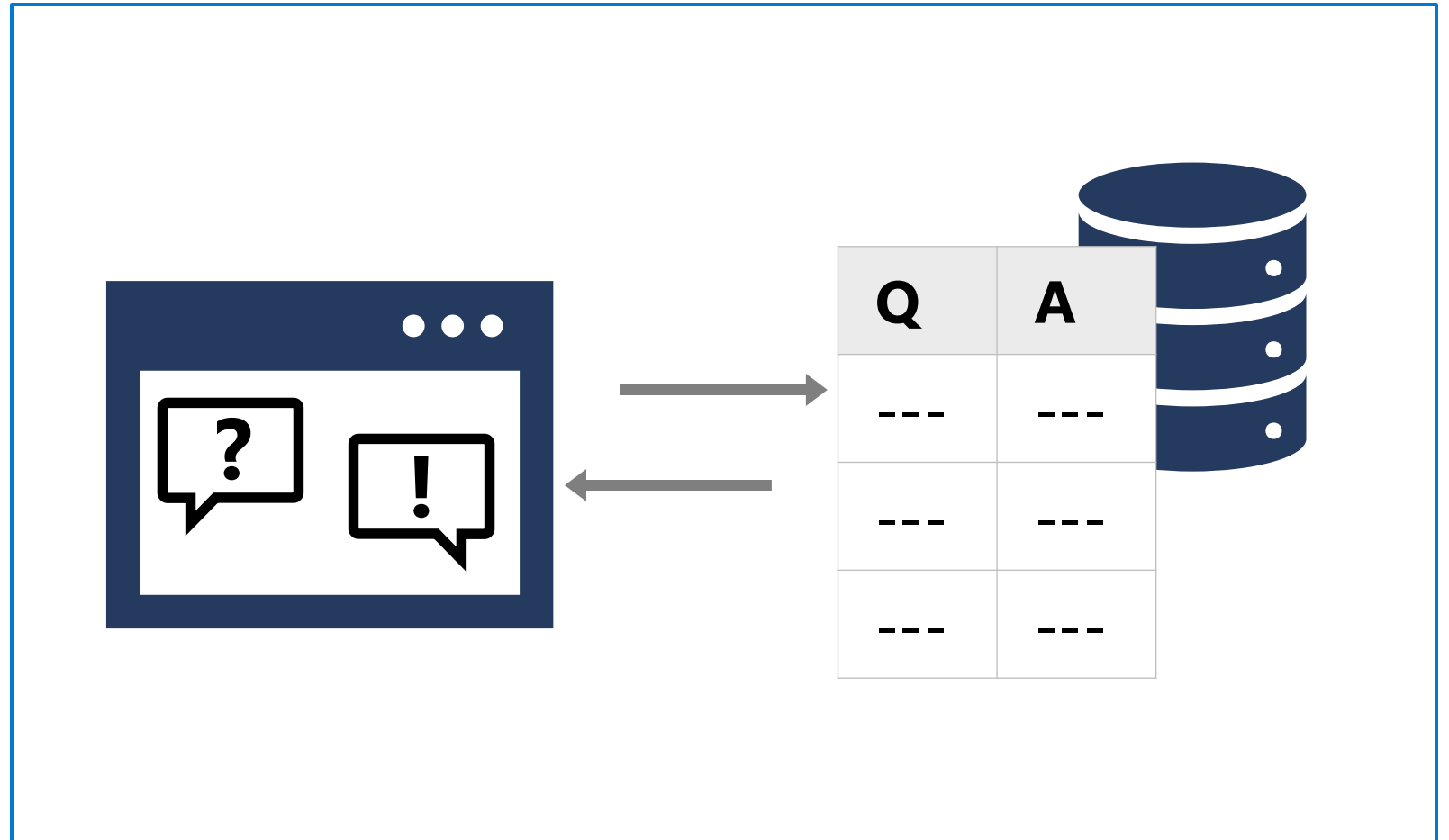
One-to-many *translation*

Script *transliteration*



# Introduction to Question Answering

- Knowledge base of question and answer pairs with natural language understanding
- Published as a REST endpoint for applications to consume
- Available through language specific SDKs



# Intents and utterances

To train a language understanding model:

- Specify *utterances* that represent expected natural language input
- Map utterances to *intents* that assign semantic meaning

Utterance	Intent
What time is it?	GetTime
Tell me the time.	
What is the weather forecast?	GetWeather
Do I need an umbrella?	
Turn the light on.	TurnOnDevice
Switch on the fan.	
Hello	None

# Entities

Define *entities* to add specific context to intents

Utterance	Intent	Entities
What is the time?	GetTime	
What time is it in <u>London</u> ?	GetTime	Location (London)
What's the weather forecast for <u>Paris</u> ?	GetWeather	Location (Paris)
Will I need an umbrella <u>tonight</u> ?	GetWeather	Time (tonight)
What's the forecast for <u>Seattle tomorrow</u> ?	GetWeather	Location (Seattle), Time (tomorrow)
Turn the <u>light</u> on.	TurnOnDevice	Device (light)
Switch on the <u>fan</u> .	TurnOnDevice	Device (fan)

Entity types:

Learned	List	Prebuilt
Machine learned through training	Term in a defined list	Common types like numbers and date/times

# Custom Text Classification

Assign custom labels to documents

1. Connect to documents in Azure
2. Define class labels to assign to your documents
3. Label documents
4. Train your model

Call your model through the Language API

Specify project and deployment name

Can be single label or multi label projects

Language Studio > Custom Text Classification > ClassifyLab - Data labeling

**Data labeling** ✓ Saved

Select a document to categorize it into a class or [use Azure Machine Learning to label](#). After labeling the documents and adding them to training or testing sets, you'll be ready to create a model with this data in [Training jobs](#).

All documents view ▾ Search Filter

<input type="radio"/> Document name ↑ ▾	Labeled as ▾	Dataset ▾
<input checked="" type="radio"/> Article 1.txt	Sports	Training
<input type="radio"/> Article 10.txt	News	Training
<input type="radio"/> Article 11.txt	Entertainment	Testing
<input type="radio"/> Article 12.txt	News	Testing
<input type="radio"/> Article 13.txt	Sports	Testing

**Activity pane**

Labels Distribution Recommendations ...

✓ Ready for training ▾

+ Add class Auto-label 🔍

☐ None

☐ Classifieds

☒ Sports

☐ News

☐ Entertainment

Add additional classes

# Custom Named Entity Recognition

Assign custom labels to entities in your documents

1. Connect to documents in Azure
2. Define entity labels to assign to your documents
3. Label documents completely and consistently
4. Train your model

Call your model through the Language API

Specify project and deployment name

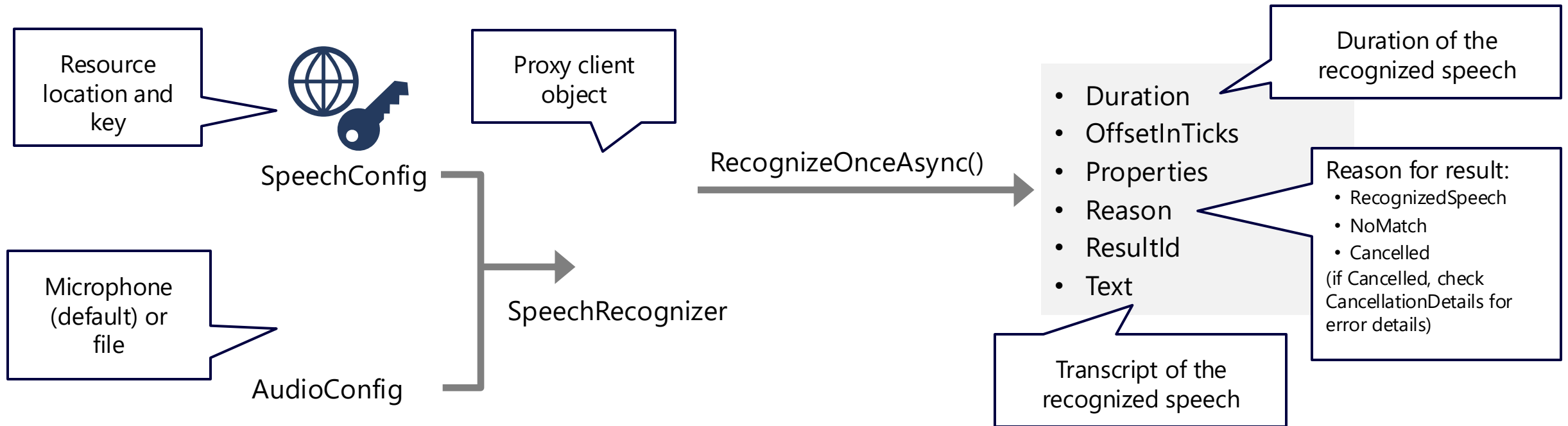
The screenshot shows the 'Data labeling' interface in Azure Language Studio. The breadcrumb path is 'Language Studio > Custom Named Entity Recognition > Demo - Data labeling'. The main heading is 'Data labeling' with a green checkmark and 'Saved' status. Below this, there is a description: 'Select a document to annotate its text with entity labels or [use Azure Machine Learning to label](#). After labeling the documents and adding them to training or testing sets, you'll be ready to create a model with this data in [Training jobs](#).' The document name is 'Article 1.txt'. The text content is: 'How The Footballers Completed One Of The Worst Collapses In Just 4 Minutes' followed by 'With four minutes left in the Championship Game, the [San Francisco] Footballers had the 19-7 lead on Seattle.' The word 'Seattle' is highlighted with a purple line and labeled 'City'. A search box for 'San Francisco' is open, showing 'City' as a suggestion. On the right, the 'Activity pane' shows 'Labels' tab, 'Not ready for training' status, and a list with 'City (1)'. A callout box points to the 'Add entity' button with the text 'Add additional entities'.

# Speech recognition, translation and synthesis





# Speech-to-Text

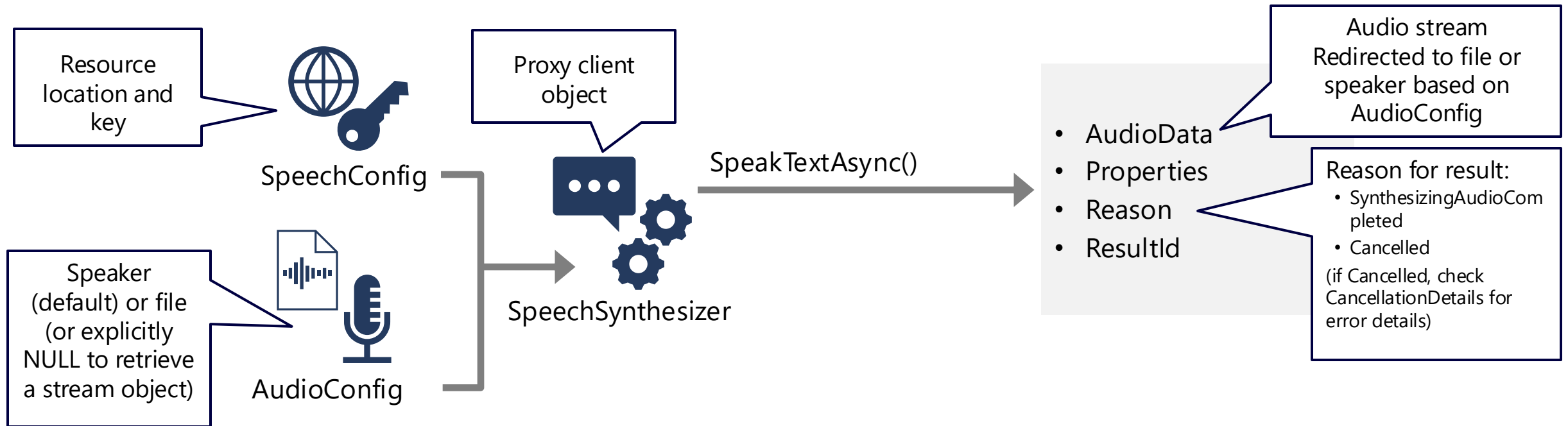


## Two REST APIs:

- **Speech-to-text API** – Used by Azure AI Speech SDK – preferred for most scenarios
- **Speech-to-text Short Audio API** – Useful for short (up to 60s) of audio

**Azure AI Speech SDK (.NET, Python, JavaScript, etc.)**

# Text-to-Speech

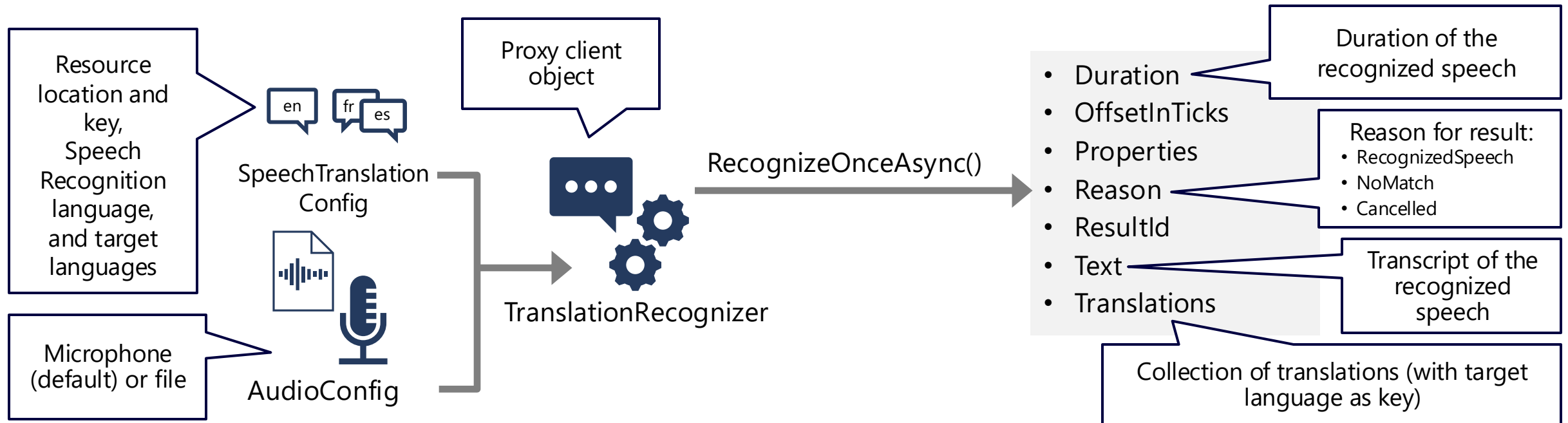


## Two REST APIs:

- Text-to-speech API – Suitable for most scenarios
- Batch synthesis API – Convert large volumes of text to audio files

Azure AI Speech SDK (.NET, Python, JavaScript, etc.)

# Translating Speech to Text



## Translation builds on speech recognition:

1. Recognize and transcribe spoken input in speech recognition language
2. Return translations for one or more target languages

# Knowledge check



**1** Which object should you use to specify that the speech input to be transcribed to text is in an audio file?

- ☐ SpeechConfig
- ☒ AudioConfig
- ☐ SpeechRecognizer

**2** You have analyzed text that contains the word "Paris". How might you determine if this word refers to the French city or the character in Homer's *The Iliad*?

- ☐ Use the Azure AI Language service to extract key phrases.
- ☐ Use the Azure AI Language service to analyze sentiment.
- ☒ Use the Azure AI Language service to extract linked entities.

**3** When translating speech, in which cases can you use the Synthesizing event to synthesize the translations and speech?

- ☒ topIntent
- ☐ kind
- ☐ query

# Knowledge check



**4** Your app must interpret a command to book a flight to a specified city, such as “Book a flight to Paris.” How should you model the city element of the command?

- ☐ As an intent.
- ☐ As an utterance.
- ☒ As an entity.

**5** Your language model needs to detect an email when present in an utterance. What is the simplest way to extract that email?

- ☐ Use Regular Expression entities.
- ☒ Use Prebuilt entity components
- ☐ Use Learned entity components.

**6** How should you create an application that monitors the comments on your company’s web site and flags any indication that customers are unhappy?

- ☒ Use the Azure AI Translator service to detect profanities in comments.
- ☐ Use the Azure AI Language service to perform sentiment analysis of the comments.
- ☐ Use the Azure AI Language service to extract named entities from the comments



# Develop solutions with Azure AI Document Intelligence

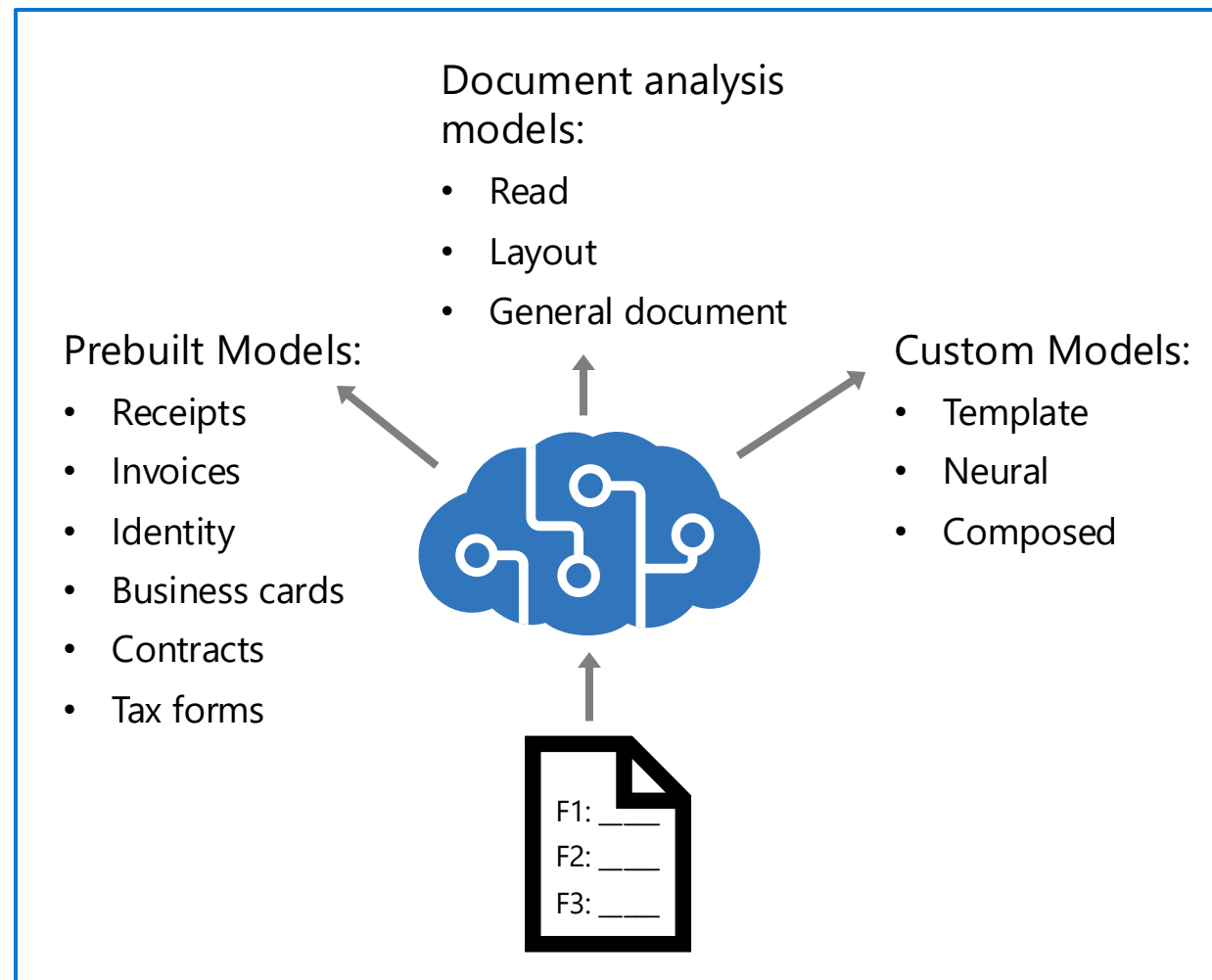


# The Document Intelligence Service

Data extraction from forms and documents:

- Document analysis from general documents  
Read: OCR for printed and written text  
Layout: Extract text and structure  
General document: Extract text, structure, and key-value pairs
- Prebuilt models for common form types
- Train custom models for your own forms  
Custom template: Extract data from static layouts  
Custom neural: Extract data from mixed-type documents  
Custom composed: Collection of multiple models assigned to a single model

Provision as single-service **Document Intelligence** resource or multi-service **Azure AI Services** resource



# Prebuilt models

## Receipt

Fourth Coffee		
1/1/2021: 09:34		
Latte	1	\$1.29
Cake	1	\$2.46
-----		
Total:		\$3.75

Analyze Receipt

Get Analyze Receipt Result

```
{
  "MerchantName": "Fourth Coffee",
  "TransactionDate": 2021-01-01,
  "TransactionTime": 09:34,
  "Items" [
    ...],
  "Total": 3.75
}
```

## Invoice

Contoso		
Invoice No: 1234		
Date: 1/1/2021		
Item	Qty	Unit
X12	1	1.00
B38	1	2.99
Total: 3.99		

Analyze Invoice

Get Analyze Invoice Result

```
{
  "VendorName": "Contoso",
  "InvoiceNumber": 1234,
  "InvoiceDate": 2021-01-01
  "Tables" [
    ...],
  "TotalInvoiceAmount": 3.99
}
```

## Business Card

Fabricam	
Hank Zoeng	
Sales director	
hank@fabrikam.com	
555-123-4567	

Analyze Business Card

Get Analyze Business Card Result

```
{
  "ContactNames": [
    {
      "FirstName": "Hank",
      "LastName": "Zoeng"
    }
  ],
  ...
}
```



# Knowledge check



**1** You have scanned a letter into PDF format and need to extract the text it contains. What should you do?

- ☐ Use the Image Analysis feature in Azure AI Vision.
- ☒ Use the Read model in the Document Intelligence service.
- ☐ Use a custom model in the Document Intelligence service.

**2** You need to build an application that submits expense claims, extracting the merchant, date, and amount from scanned receipts. What's the best way to do this?

- ☐ Use the general document model.
- ☐ Use the prebuilt Contract model.
- ☒ Use the prebuilt Receipt model.

**3** You need to extract only data from specific fields in cargo manifest forms using Document Intelligence. What should you do?

- ☐ Use a prebuilt model.
- ☐ Build a custom composed model from several custom models.
- ☒ Train custom template model with labeled documents.

# Creating a Knowledge Mining Solution



# Azure AI Search

## AI-Powered Knowledge Mining

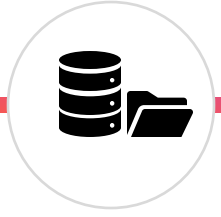
- Index documents and data from a range of sources
- Use skills to enrich index data
- Store extracted insights in a knowledge store for analysis and integration

## Azure Resources:

- **Azure AI Search** for core indexing and querying
- **Azure AI Services** for index enrichment
- **Storage account** for knowledge store persistence



# Core Components of a AI Search Solution



## Data Source

The data store to be searched:

- **Blob storage container**
- **SQL Database**
- **Cosmos DB**

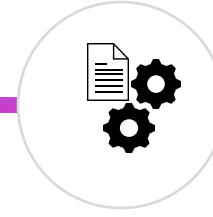
You can also push JSON documents directly into an index



## Skillset

Defines an enrichment pipeline of AI skills to enhance data during indexing:

- **Built-in AI skills**
- **Custom skills**



## Indexer

Maps data source fields and skillset outputs to index fields

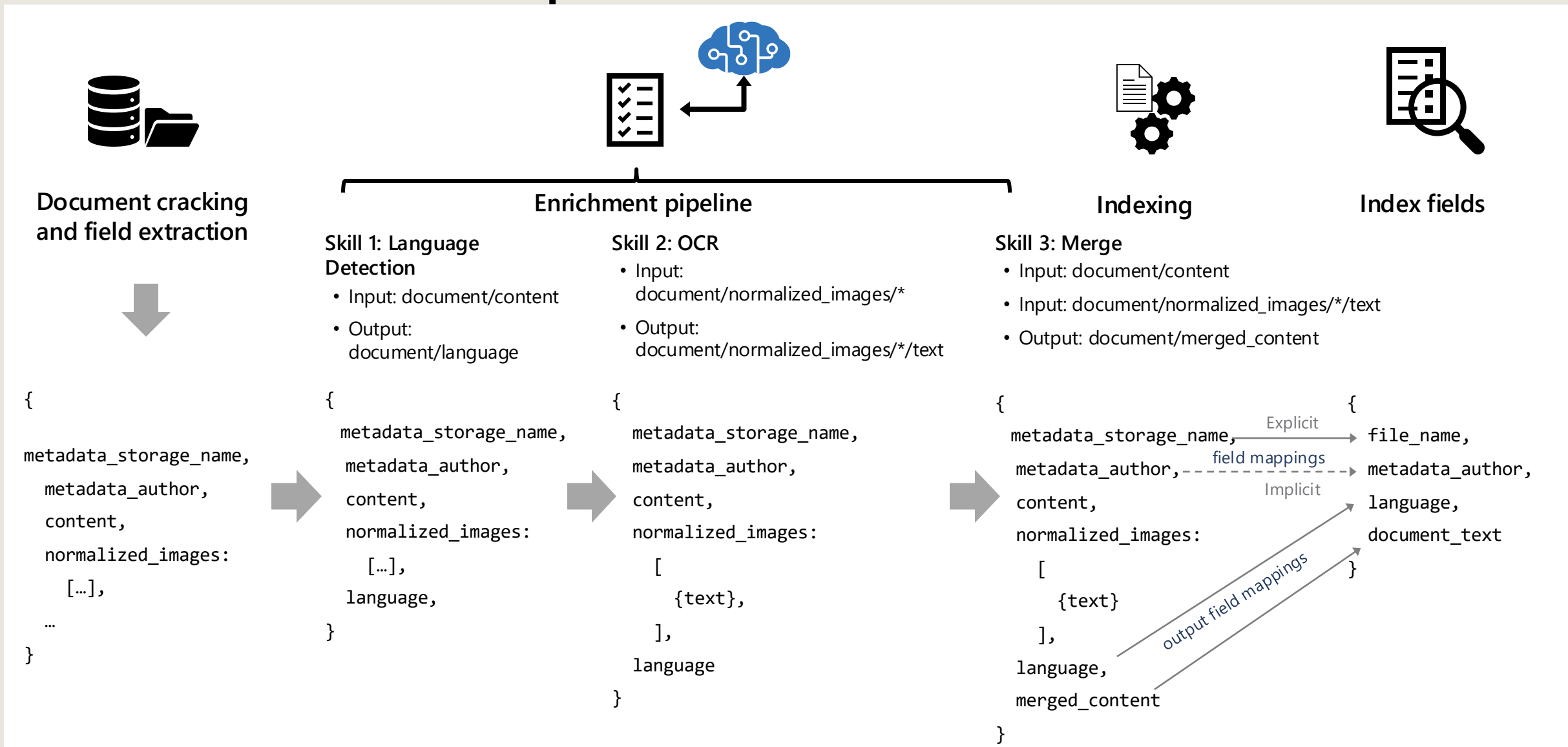
- **Running the indexer builds the index**



## Index

Searchable collection of JSON documents containing extracted and enriched fields

# How an Enrichment Pipeline Works



# Introduction to Custom Skills

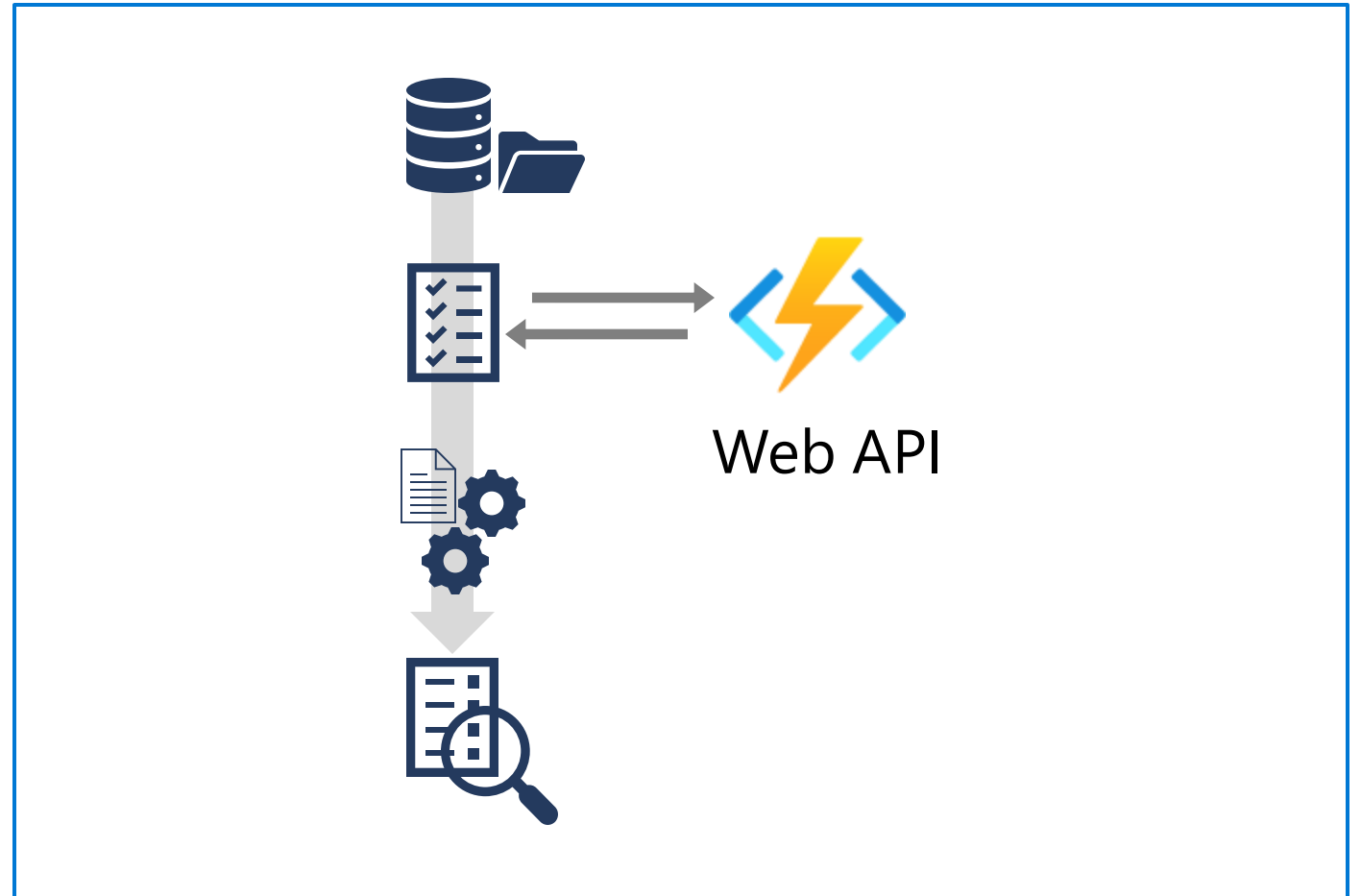
When built-in skills don't provide what you need...

Create a custom skill, for example:

- Integrate Document Intelligence
- Consume an Azure Machine Learning model
- Any other custom logic

Custom skills are implemented as Web APIs

- Commonly Azure Functions



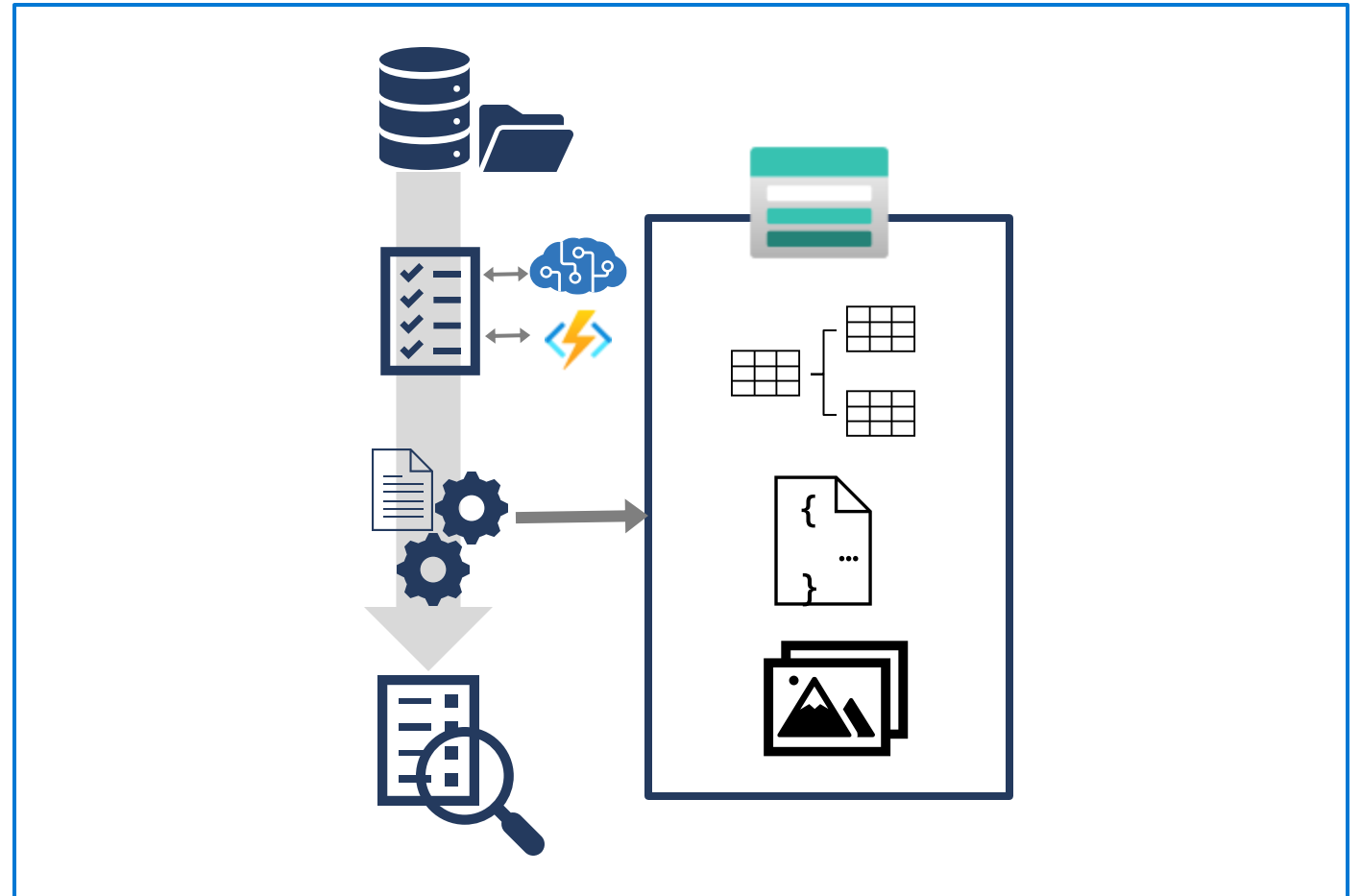
# What is a Knowledge Store?

Persisted insights extracted by indexing process

Stored as *projections* in *Azure Storage*

- **Tables:** Relational tables with keys for joining
- **Objects:** JSON structures of document fields
- **Files:** Extracted images saved in JPG format

Used for analysis or integration into data processing workflows



# Knowledge check



**1** You want to enrich an index by extracting any geographical locations mentioned in the source data. Which built-in skill should you use?

- ☒ Entity Recognition
- ☐ Key Phrase Extraction
- ☐ Language Detection

**2** You have implemented a custom skill as an Azure function. How can you include the custom skill in your indexing process?

- ☐ Add a Merge skill to the skillset to combine output from built-in skills with your custom skill.
- ☒ Add a WebApiSkill to a skillset, referencing the Azure function's URI
- ☐ Add a Shaper skill to the skillset to create a collection of records with unique IDs generated by your custom

**3** You want to create a knowledge store that contains JSON representations of the extracted data. What kind of projection should you define?

- ☐ File
- ☐ Object
- ☒ Table

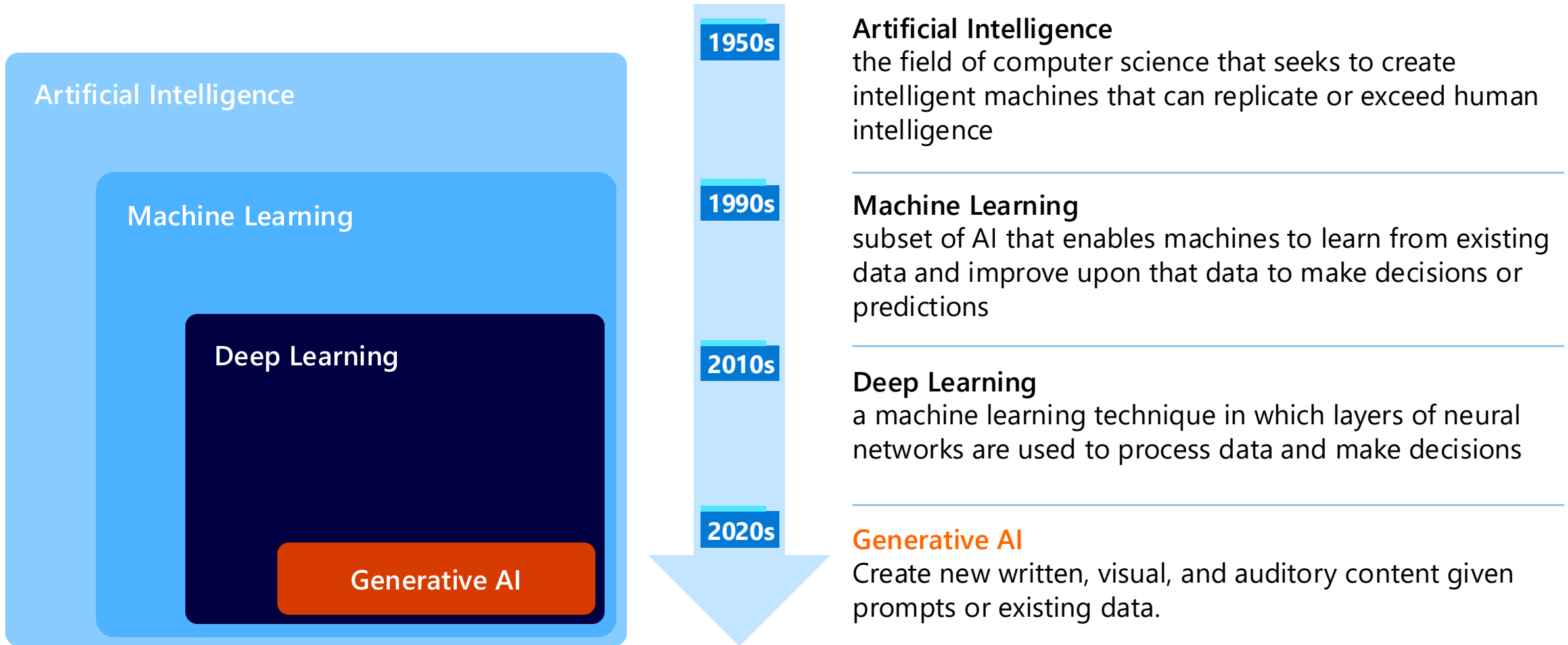




# Develop Generative AI Solutions with Azure OpenAI Service



# What is generative AI?



# Provision an Azure OpenAI resource in Azure

Deploy a model in Azure OpenAI Studio to use it

1. **Apply for access to the Azure OpenAI service:** <https://aka.ms/oaiapply>
2. **Create an Azure OpenAI resource in the Azure portal**

```
az cognitiveservices account create \  
-n MyOpenAIResource \  
-g MyResourceGroup \  
-l eastus \  
--kind OpenAI \  
--sku s0 \  
--subscription subscriptionID
```

[Home](#) > [Azure AI services](#) | [Azure OpenAI](#) >

## Create Azure OpenAI ...

**1 Basics** 2 Network 3 Tags 4 Review + submit

Enable new business solutions with OpenAI's language generation capabilities powered by GPT-3 models. These models have been pretrained with trillions of words and can easily adapt to your scenario with a few short examples provided at inference. Apply them to numerous scenarios, from summarization to content and code generation.

[Learn more](#)

### Project Details

Subscription \* ⓘ

Resource group \* ⓘ

[Create new](#)

### Instance Details

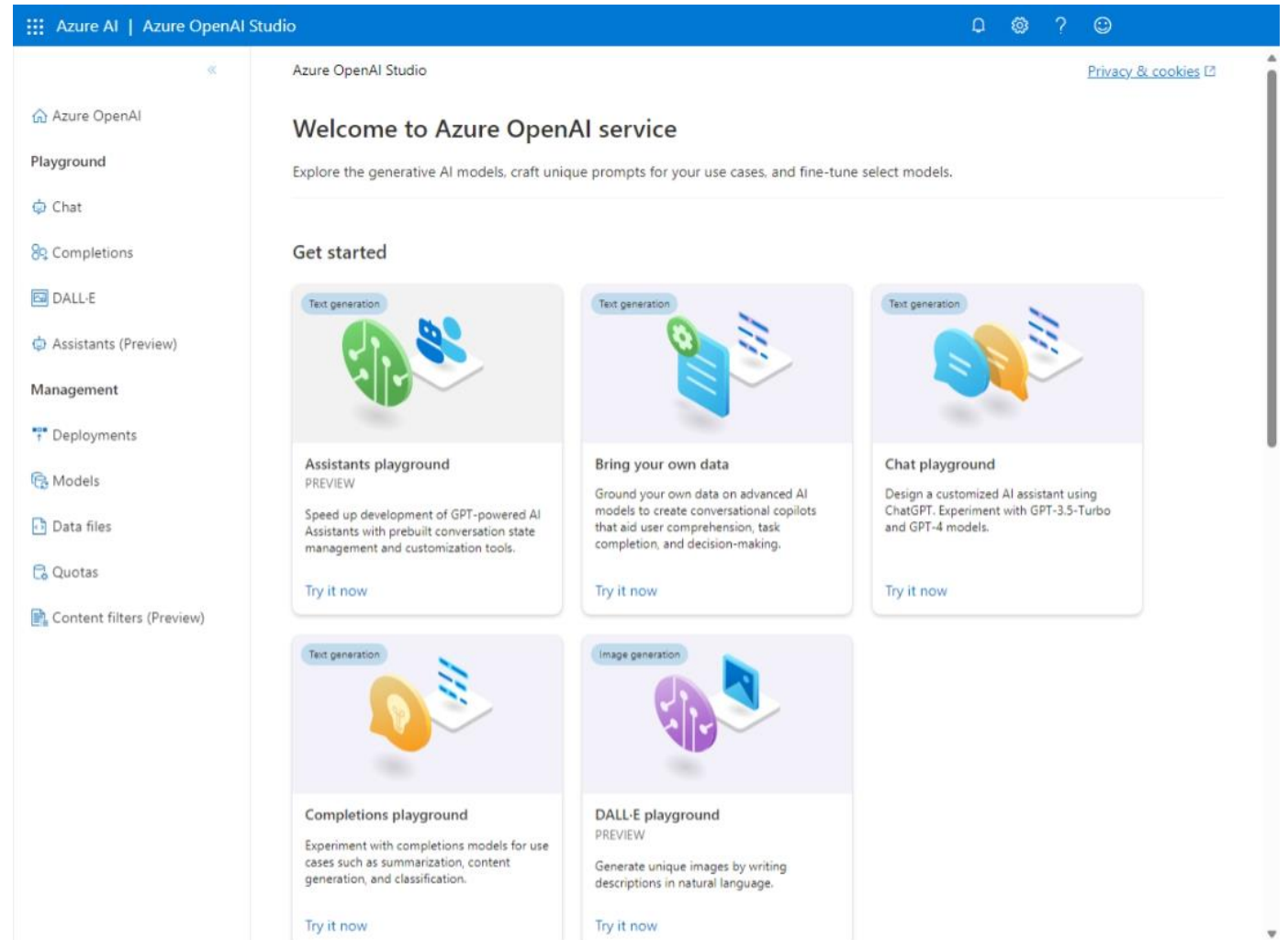
Region ⓘ

Name \* ⓘ

Pricing tier \* ⓘ

# Azure OpenAI Studio

- Web portal for working with Azure OpenAI models:  
<https://oai.azure.com/>
- View and deploy base models
- Connect your own data source
- Manage fine tuning and data files for custom models
- Test models in visual playgrounds:
  - **Chat** (GPT-3.5-Turbo and later models)
  - **Completions** (GPT-3 and earlier models)
  - **DALL-E** (Image generations)
  - **Assistants** (Custom and Copilot-like experiences)



# Testing models in Azure OpenAI Studio playground

The screenshot displays the Azure OpenAI Studio Chat playground interface. The top navigation bar includes the Azure OpenAI logo and a 'Deploy to' button. The left sidebar contains a 'Playground' section with a 'Chat' tab selected, and a 'Management' section with links to Deployments, Models, Data files, Quotas, and Content filters. The main area is titled 'Chat playground' and features a 'Setup' panel on the left, a central chat area, and a 'Configuration' panel on the right. The 'Setup' panel includes a 'Prompt' section with a 'Add your data' button, an 'Apply changes' button, and a 'Use a system message template' section with a 'Select a template' dropdown. The 'Configuration' panel shows 'Parameters' for 'Max response' (800), 'Temperature' (0.7), 'Top P' (0.95), 'Stop sequence' (Stop sequences), 'Frequency penalty' (0), and 'Presence penalty' (0). The central chat area has a 'Start chatting' button and a text input field with the placeholder 'Type user query here. (Shift + Enter for new line)'. The bottom right corner shows the 'Current token count' as 11/4000.

Azure OpenAI | Azure OpenAI Studio

Chat playground

Playground

Chat

Completions

DALL-E

Assistants (Preview)

Management

Deployments

Models

Data files

Quotas

Content filters (Preview)

Setup

Prompt Add your data

Apply changes

Use a system message template

Using templates

Use a template to get started, or just start writing your own system message below. Want some tips? [Learn more](#)

Select a template

System message

You are an AI assistant that helps people find information.

Examples

Using examples

Add examples to show the chat what responses you want. It will try to mimic any responses you add here so make sure they match the rules you laid out in the system message.

Start chatting

Test your assistant by sending queries below. Then adjust your assistant setup to improve the assistant's responses.

Type user query here. (Shift + Enter for new line)

Configuration

Deployment Parameters

Max response 800

Temperature 0.7

Top P 0.95

Stop sequence Stop sequences

Frequency penalty 0

Presence penalty 0

Learn more

Current token count 11/4000

Input tokens progress indicator

# Integrating Azure OpenAI into your app

Applications submit prompts to deployed models. Responses are completions.

Three REST API endpoints:

- **Completion** - model takes an input prompt, and generates one or more predicted completions
- **Embeddings** - model takes input and returns a vector representation of that input
- **ChatCompletion** - model takes input in the form of a chat conversation (where roles are specified with the message they send), and the next chat completion is generated

Use **Completion** and **Embeddings** with GPT-3 based models

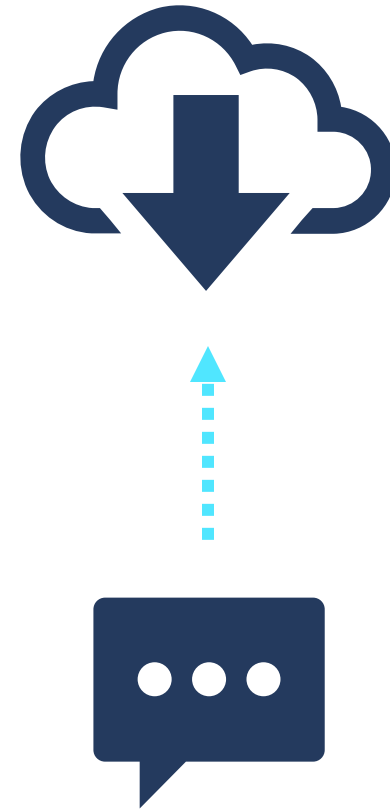
Use **ChatCompletion** with GPT-3.5-Turbo and later models

**ChatCompletion will be the endpoint we focus on for this course**

# What is Prompt Engineering?

Constructing prompts to:

- Maximize relevancy and accuracy of completions
- Specify formatting and style of completions
- Provide conversational context
- Mitigate bias and improve fairness



# *Primary, supporting, and grounding content*

Section markers  
(--- or ###)

---

Thanks for your interest in our summer school program.

We're looking for your ideas for webinars on topics such as AI, web development, ... *<more...>*

---

*Primary* content to be  
summarized, translated, etc.

Topics I'm very interested in: AI, webinar dates, submission deadlines

*Supporting* content to provide  
clarity / specificity

Extract the key points from the above email, and put them in a bulleted list

*Grounding* content to define  
scope for questions

---

Artificial Intelligence (AI) has evolved over many years ... *<more...>*

---

Where and when did the field of AI start?



# How Azure OpenAI can use your data



## Set up your data source

- Use an existing data source, such as an Azure search resource
- Use the Azure OpenAI studio to create that data source, if you don't already have one
- When creating the data source, you can use data already in your account such as blob storage



## Configure the studio or your app to connect to that data source

- In the studio, set up the connection by pointing it to the data source
- In your app, specify the data source in the prompt parameters
- Both configurations allow the search resource to augment the prompt



## Use the Azure OpenAI model, which now uses your data for grounding

- Chat with the AI models like normal
- If the data source has relevant information about the prompt, it will use that data
- You can specify if the AI model is limited to just your data source

# Knowledge check



- 1 What is the purpose of providing conversation history to an AI model?
  - ☐ Providing conversation history to an AI model is irrelevant and has no effect on the AI's performance.
  - ☐ To limit the number of input tokens used by the model
  - ☒ To enable the model to continue responding in a similar way and allow the user to reference previous content in subsequent queries
- 2 Which parameter could you adjust to change the randomness or creativeness of completions?
  - ☒ Temperature
  - ☐ Frequency penalty
  - ☐ Stop sequence
- 3 You plan to implement a multi-turn conversation with Azure OpenAI. Which endpoint should you use?
  - ☐ Completions
  - ☒ Chat
  - ☐ Embeddings

