



Let systems
communicate
using Azure
Integration
Services

@SteefJan



Me



codit | Azure Technology Consultant



Microsoft MVP – Azure



InfoQ Cloud Editor



WAZUG NL board member



Azure Lowlands Organizer



Writer

A close-up photograph of several wooden Scrabble tiles spelling out "AGENDA". The tiles are arranged on a dark wooden surface. Some tiles are part of a larger word, while others are separate. The letters visible include A, G, E, N, D, A, H, R, and O.

The Cloud Integration Story

- Integration
- Architecture
- Technology
- Real-world cases
- Best practices
- Power Automate
- Market
- Take-aways

Tower of Babel



Systems instead of people



servicenow®



ORACLE®



SAP Business One®

SAP HANA

MathWorks®

splunk®

AFAS software

zendesk

Dropbox

paycom

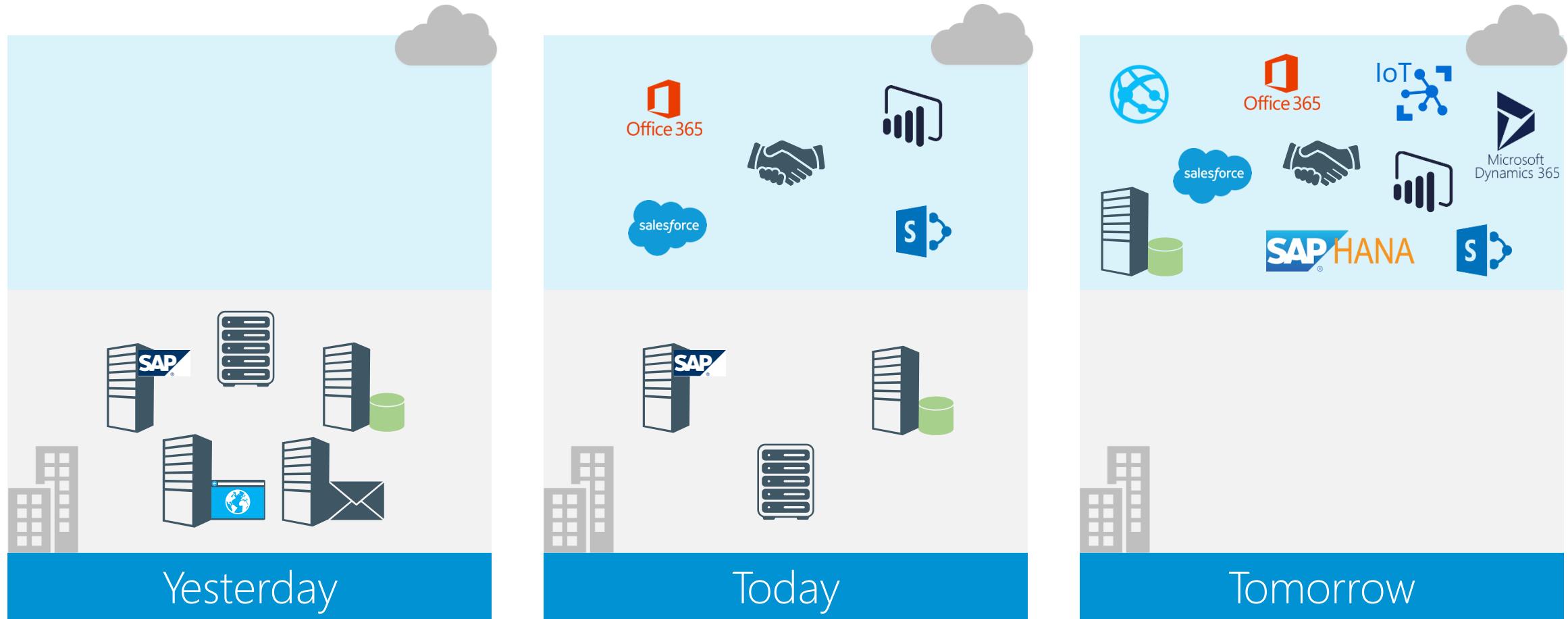
twilio

Microsoft Dynamics 365

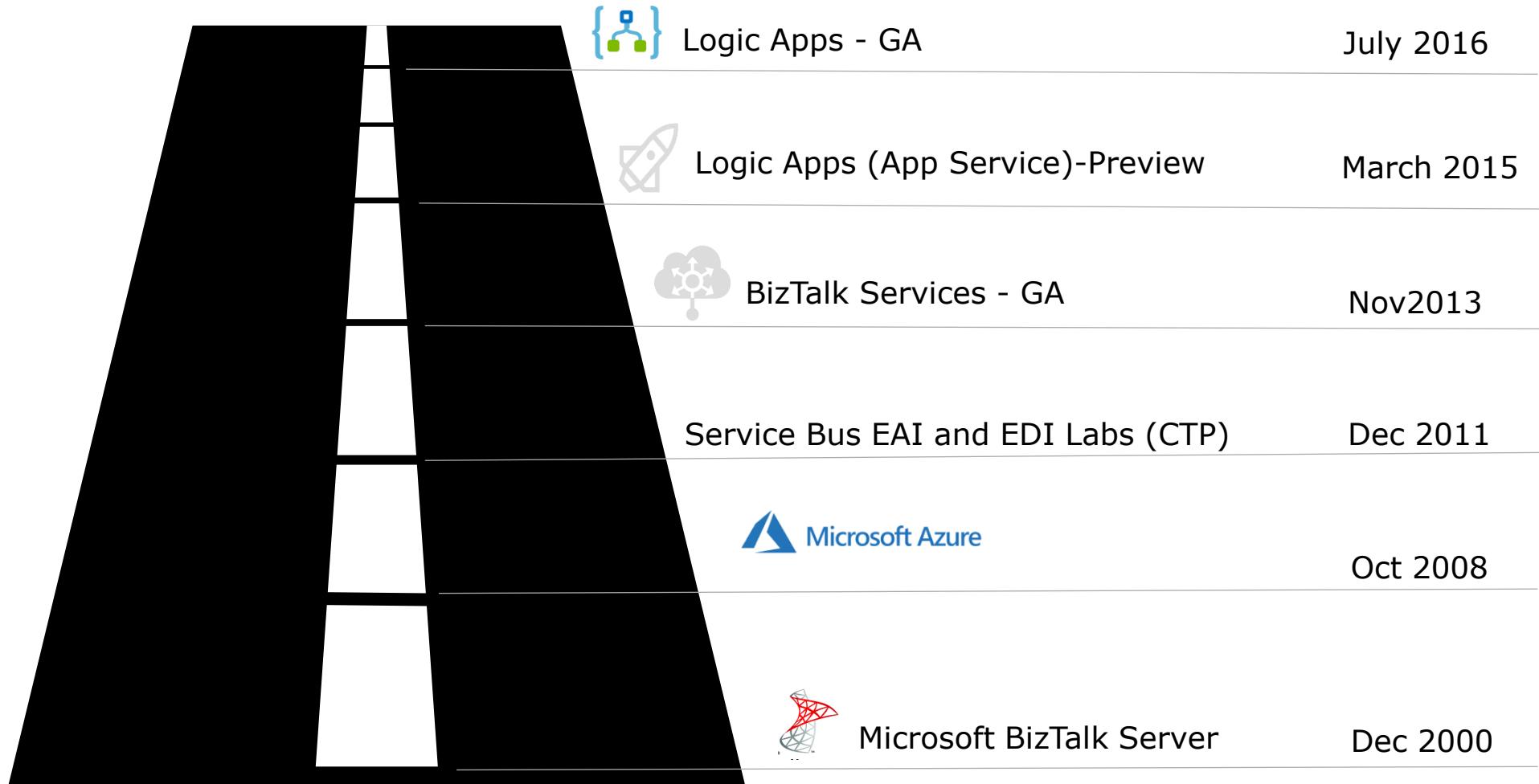
workday

zoom

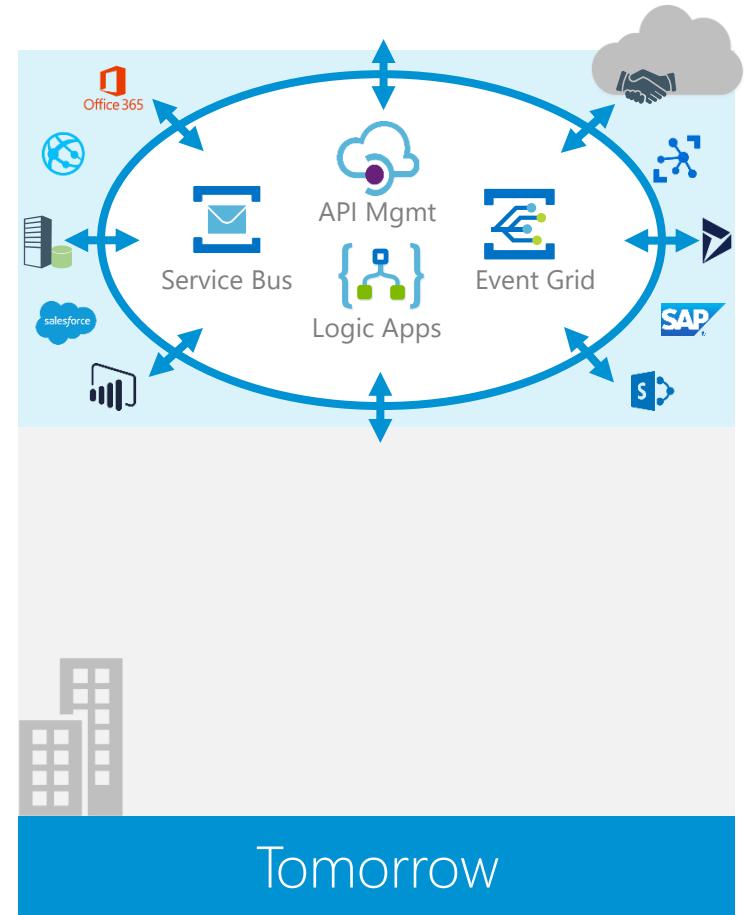
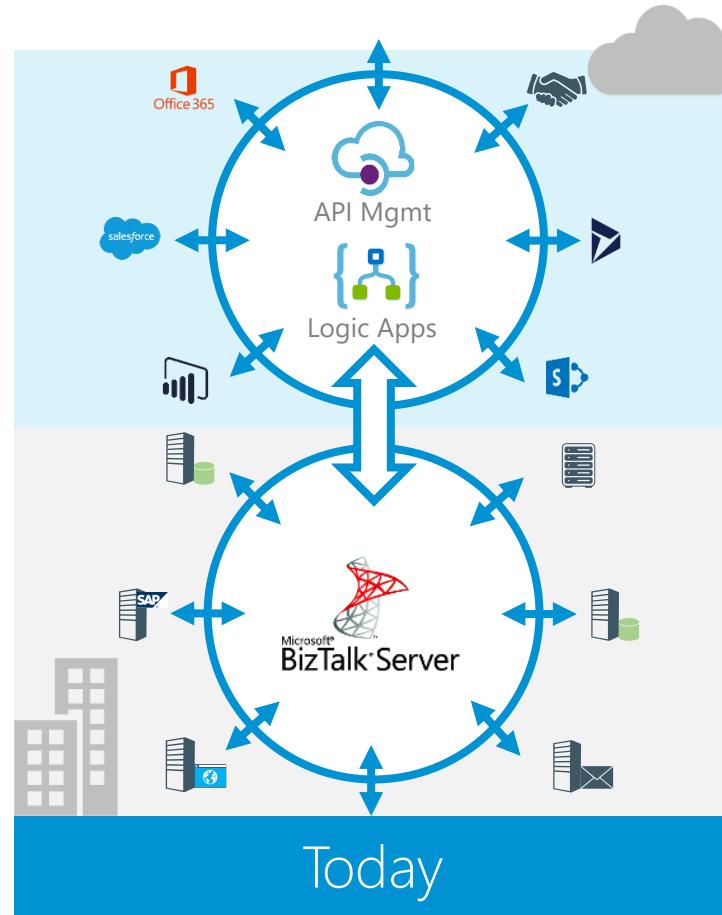
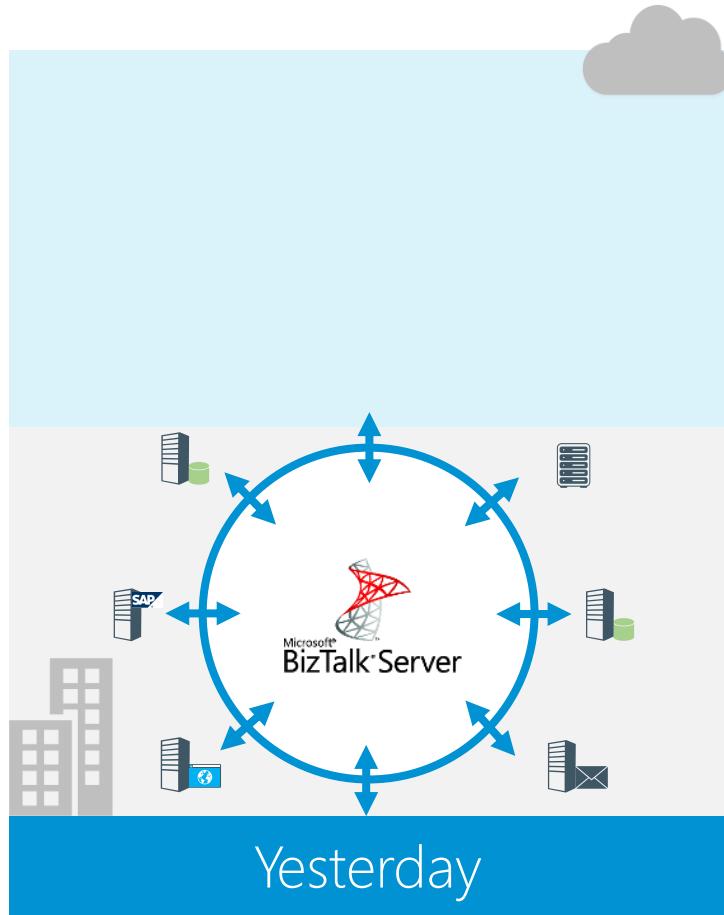
Application Landscape



The Journey

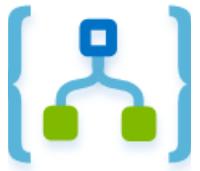


Integration Landscape



Integration Tech

Azure Integration Services



Logic Apps: create workflows and orchestrate business processes to connect hundreds of services in the cloud and on-premises.



Service Bus: connect on-premises and cloud-based applications and services to implement highly secure messaging workflows.



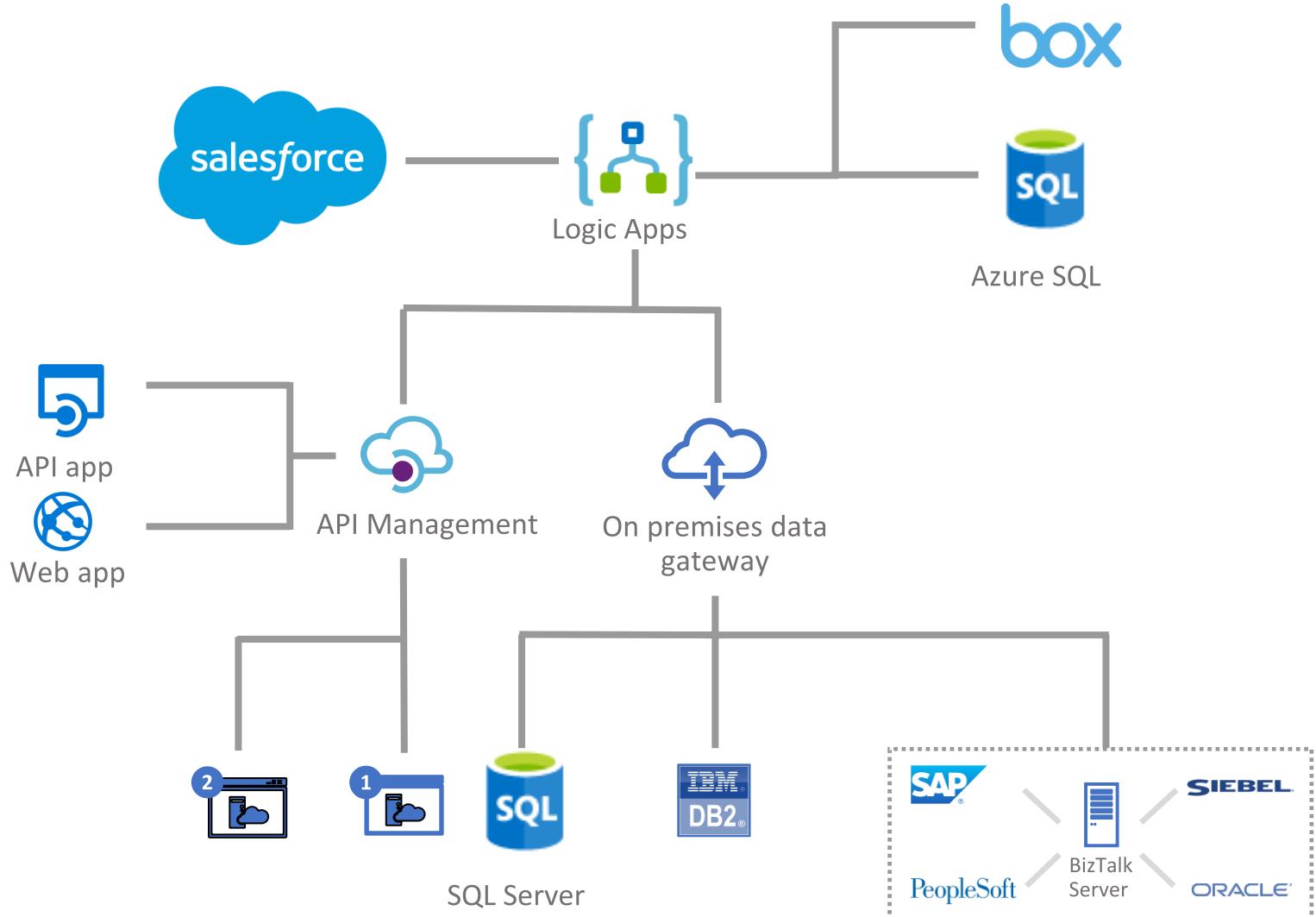
API Management: publish your APIs securely for internal and external developers to use when connecting to backend systems hosted anywhere.



Event Grid: connect supported Azure and third-party services using a fully managed event-routing service with a publish-subscribe model that simplifies event-based app development

What can Logic Apps do?

- Connect to on-premises, hybrid, and cloud applications
- Run mission critical, complex integration scenarios with ease
- Build smart integrations leveraging machine learning, cognitive services



Connectors

Cloud APIs and platform functionality

- | Hundreds of out of box connectors
 - | SaaS, on-prem, protocols, B2B and message manipulation
- | Hybrid connectivity
- | Hosted and managed within the platform
- | Scales to meet your needs
- | First class designer experience



Custom Connectors

- | Access any REST/SOAP API
- | Cloud or on-premises
- | Simple creation wizard
- | Connections and managed secrets
- | First class designer experience

API connections

- | Authenticate once and reuse
- | Differentiate connection configuration
- | Simple to deploy
- | Portal experience for managing API Connections

Component Architecture

- **Logic Apps RP**
Reads the workflow definition and breaks down into a composition of tasks with dependencies
- **Logic Apps Runtime**
Distributed compute/workers are coordinated to complete tasks on-demand
- **Connection Manager**
Manages connection configuration, credentials and token refreshment
- **Connector Runtime**
API abstraction via Open API descriptions

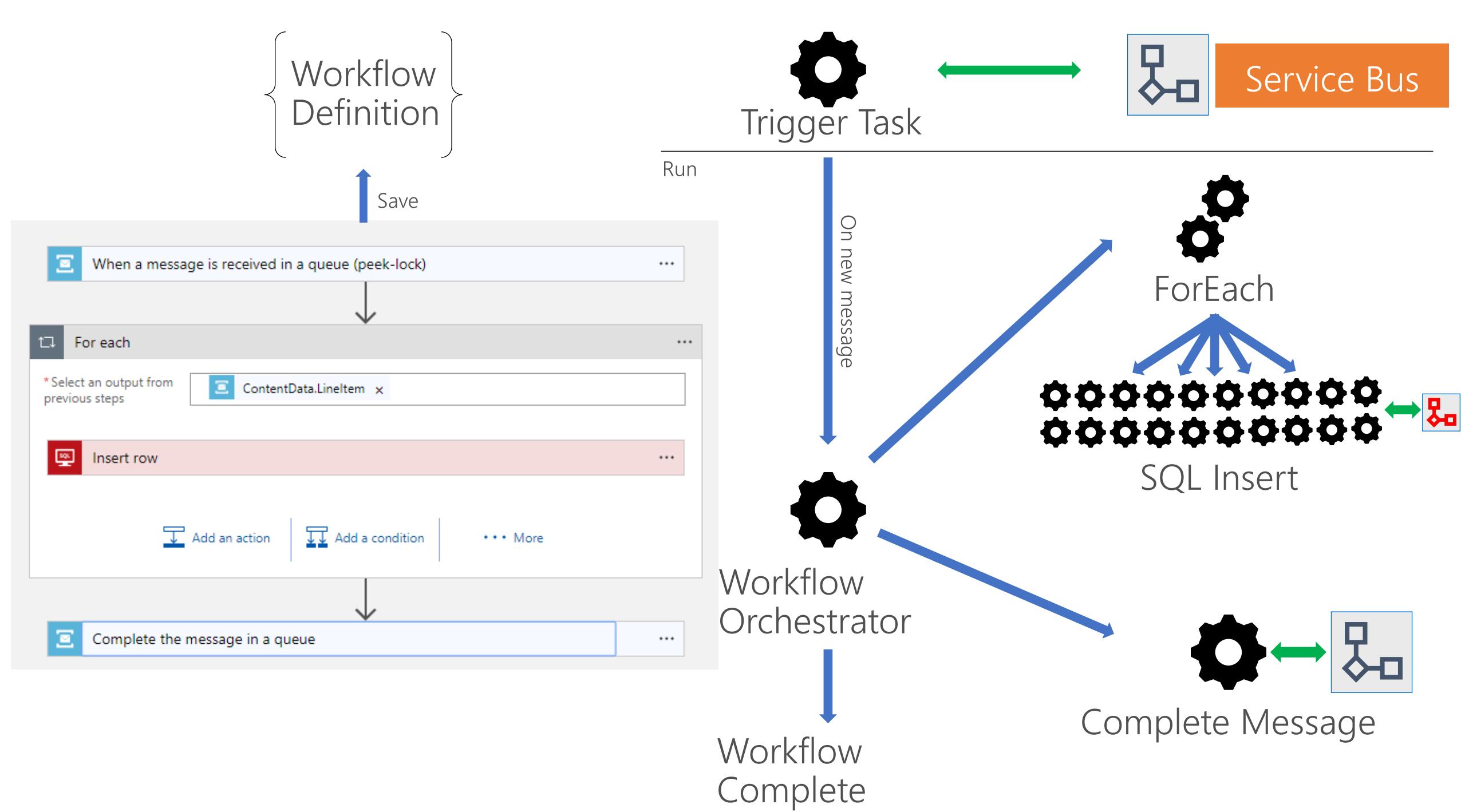
Logic Apps Service

Logic
Apps RP

Connection
Manager

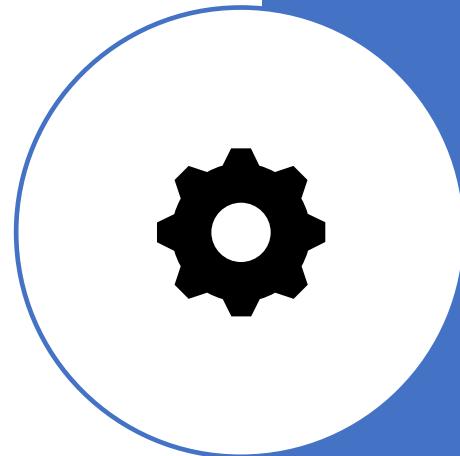
Logic
Apps
Runtime

Connector
Runtime

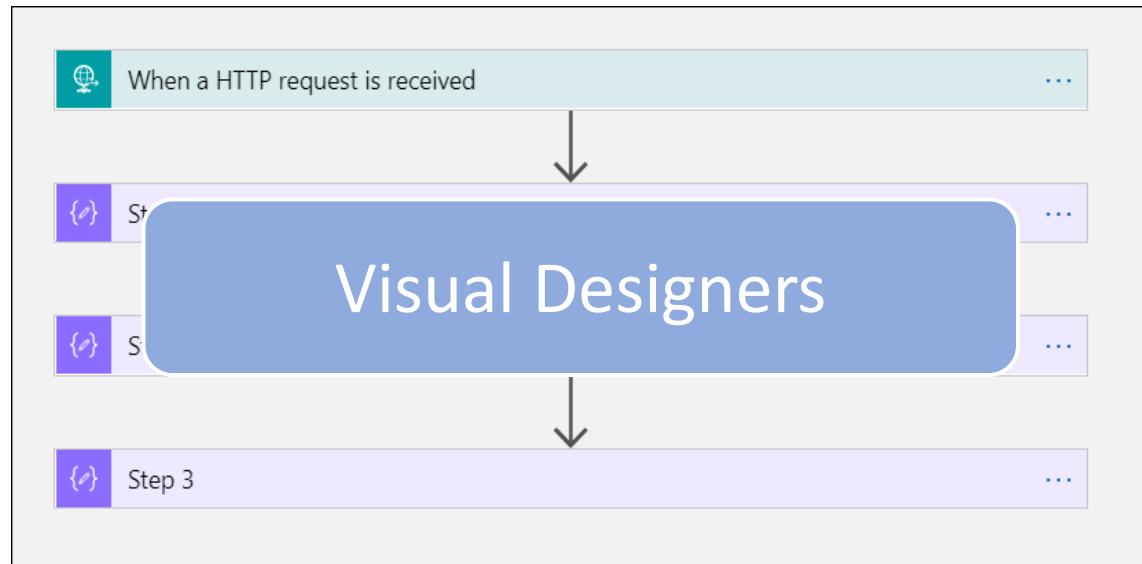


Task Resiliency

- No active thread management – tasks and runs can exist in parallel and at massive scale
- At least once guaranteed execution
- Transient failures invoke retry-policies (DNS issues, throttles, or 5xx responses)
- If the task doesn't respond, workflow orchestrator will assign a new task (at least once guarantee)



Declarative workflow solutions



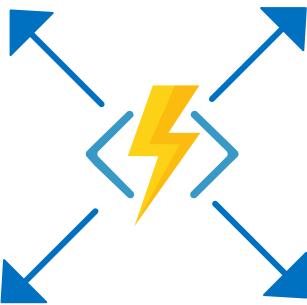
These are cool, but...

- Perhaps not developer friendly
- Less control
- (Unit) testing

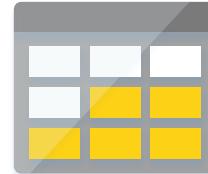
Markup

```
{ "Comment": "A Catch example of the Amazon States Language using an AWS Lambda function", "StartAt": "CreateAccount", "States": { "CreateAccount": { "Type": "Task", "Resource": "arn:aws:lambda:us-east-1:123456789012:function:createAccount", "Catch": [ { "ErrorEquals": "States.ALL", "Next": "ReservedTypeFallback" }, { "ErrorEquals": ["States.ALL"], "Next": "CatchAllFallback" } ], "End": true }, "CustomErrorFallback": { "Type": "Pass", "Result": "This is a fallback from a custom Lambda function exception", "End": true }, "ReservedTypeFallback": { "Type": "Pass", "Result": "This is a fallback from a reserved error code", "End": true }, "CatchAllFallback": { "Type": "Pass", "Result": "This is a fallback from any error code", "End": true } }}
```

Writing flexible workflows



Azure Function Extension

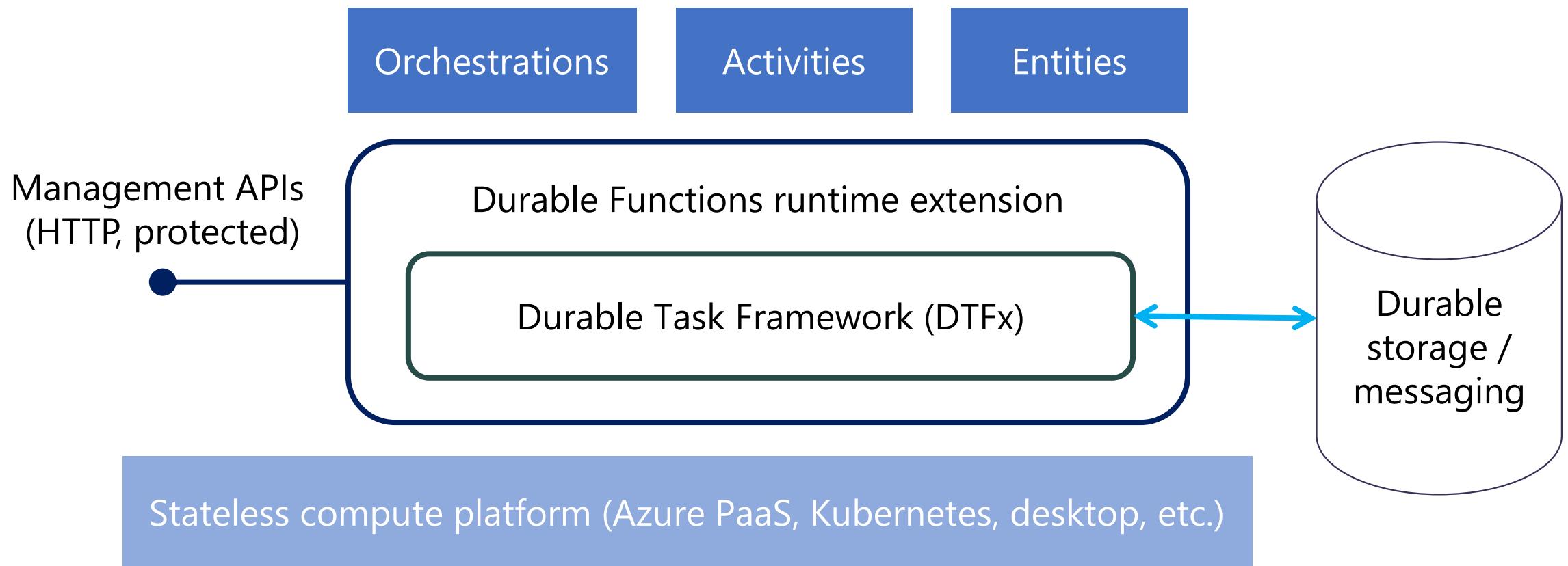


Based up on the Durable Task Framework – OSS library since 2014.
Persistence on Azure Storage



Implementation of stateful workflow-as-code

Durable Functions



Chaining functions – Workflow as code

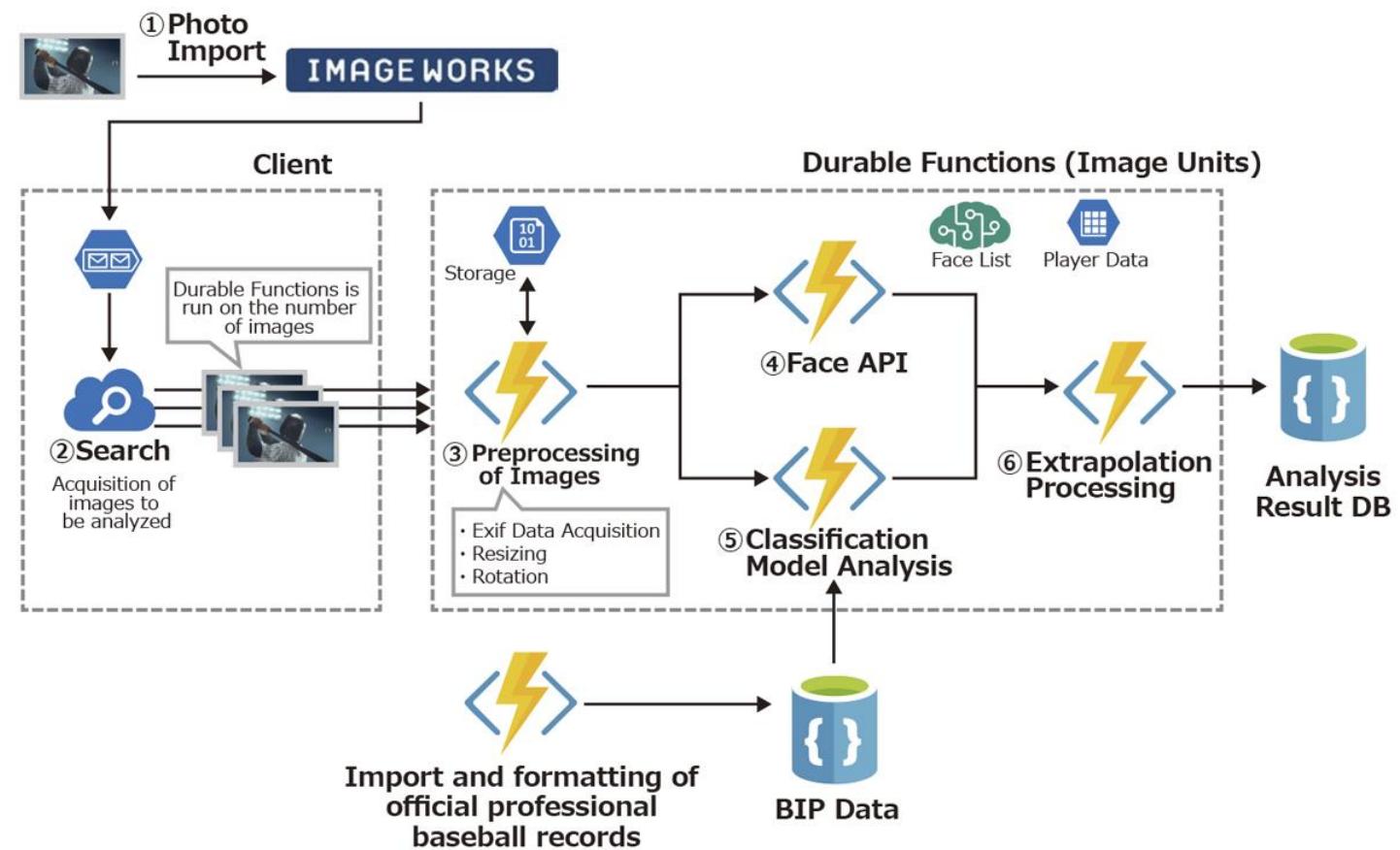
Orchestrator Function

```
// calls functions in sequence
public static async Task<object> Run(IDurableOrchestrationContext ctx)
{
    try
    {
        var x = await ctx.CallActivityAsync("F1");
        var y = await ctx.CallActivityAsync("F2", x);
        return await ctx.CallActivityAsync("F3", y);
    }
    catch (Exception)
    {
        // error handling/compensation can go here (or anywhere)
    }
}
```

Activity Functions

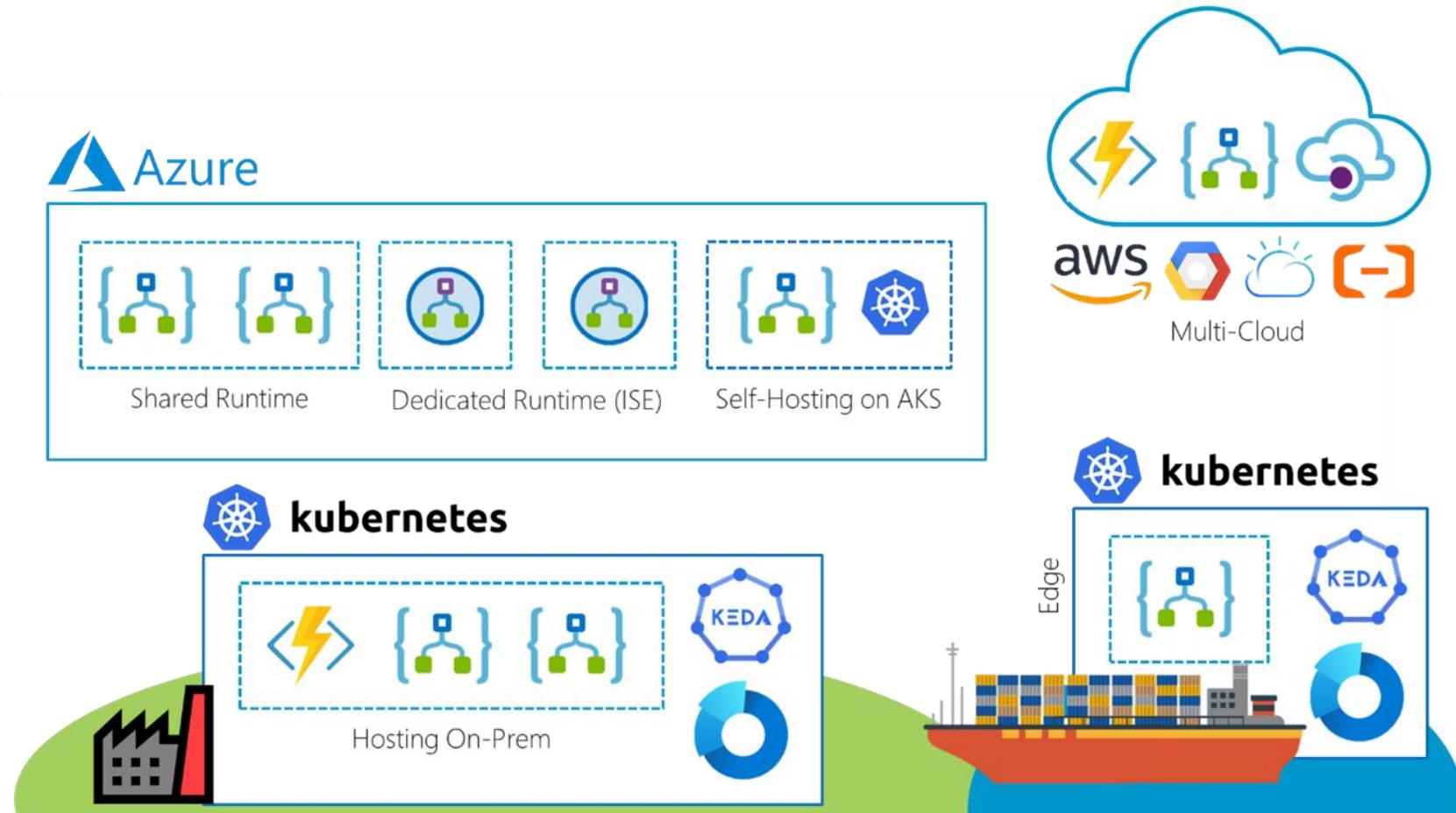


FUJIFILM



The processing flow for the player name auto-tagging function provided to NPB. Multiple classification models created with Cognitive Toolkit are combined with Face API processing to extrapolate player names. In addition, running Durable Functions on the number of images has greatly reduced processing time.

Latest developments – Ignite 2020



<https://www.codit.eu/blog/why-running-azure-logic-apps-anywhere-is-a-game-changer/>

What does service bus deliver?

Fully **managed** service in Azure offering a **reliable** and **secure** platform for asynchronous transfer of data and state

- Communication backbone for many sophisticated cloud solutions
- Entities like relay, queues, topics and subscriptions
- Enables hybrid cloud solutions
- Compliance with AMQP
- Richer application semantics like
 - FIFO
 - Deduplication
 - Transactional behavior and atomicity



Azure Service Bus

Service Bus Relay:

Scenario: You have on-premise systems that you need to communicate with directly from outside your organization...

Solution: Internal Web Services are exposed securely via the Relay which passes calls into the on-premise service and back to the calling clients

Service Bus Queues:

Scenario: Multiple systems and remote clients need to send business events to head office which processes these messages under varying load.

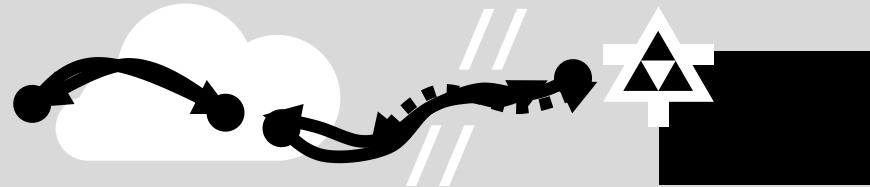
Solution: Queues decouple senders from receivers, multiple receivers can handle varying load, simple to add new senders without impact.

Service Bus Topics:

Scenario: Multiple actions must be taken as a result of incoming messages from external systems, but these actions frequently change.

Solution: Topics are special queues that have subscriptions which contain rules to determine which messages a subscription will contain.

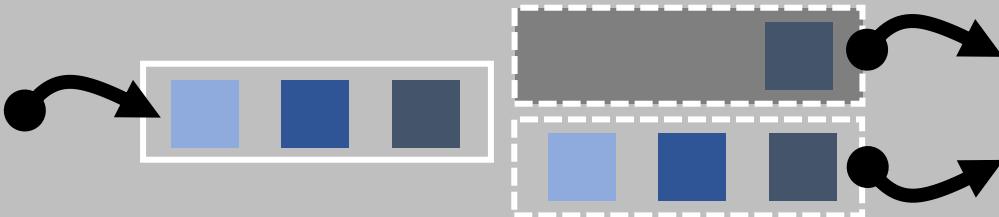
Relay: Two Way Call into On-Premise Service



Message Queue: FIFO Resilient Queue



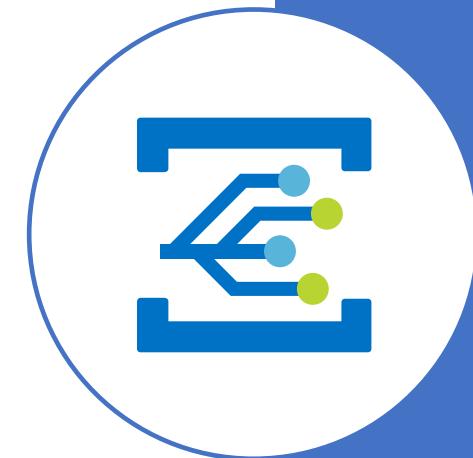
Topic: Queue with 1:n rule-based subscriptions



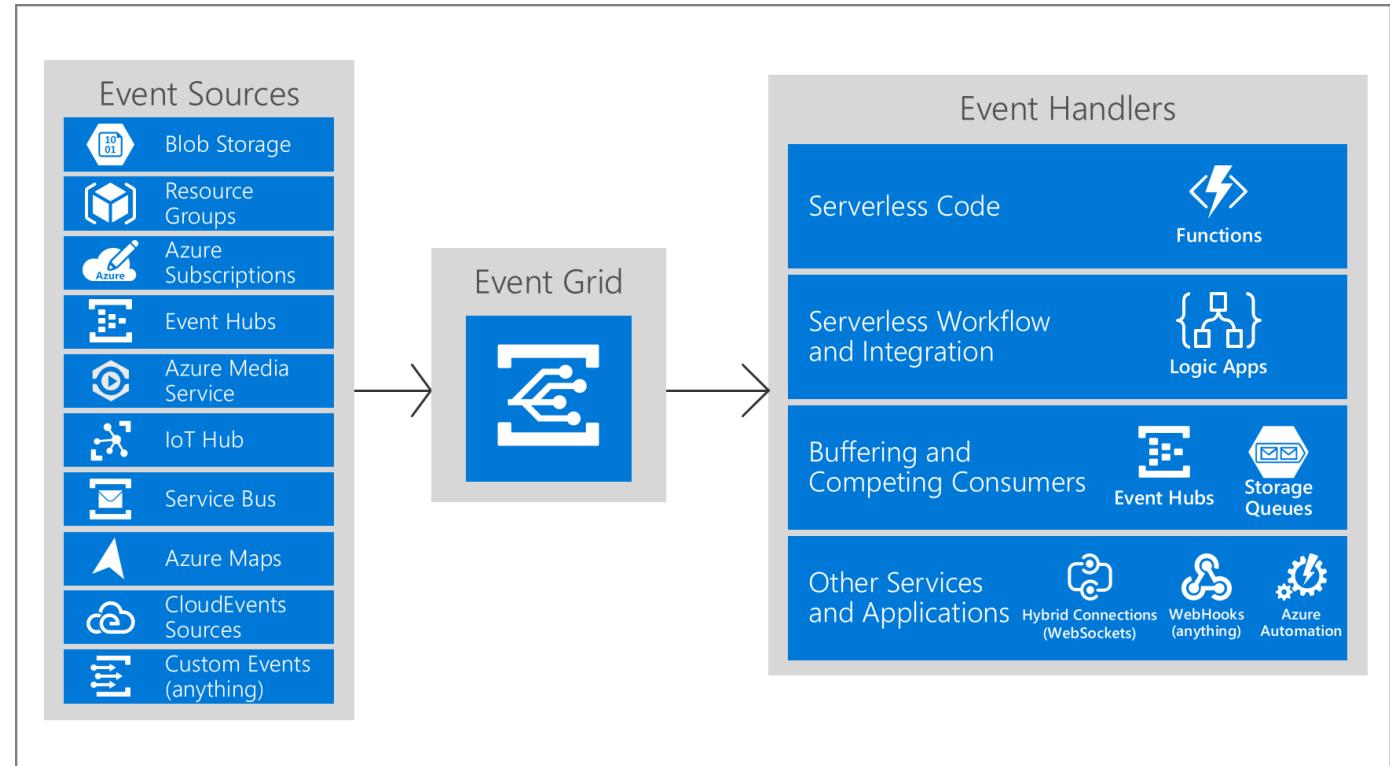
What is Azure Event Grid?

Eventing **backplane** that enables event-driven reactive programming

- Event consumption of Azure and Non-azure resources
- Allows reactive programming, and events are discrete facts
- The event message has the information you need to react to changes in services and applications
- Light weight
- Low cost

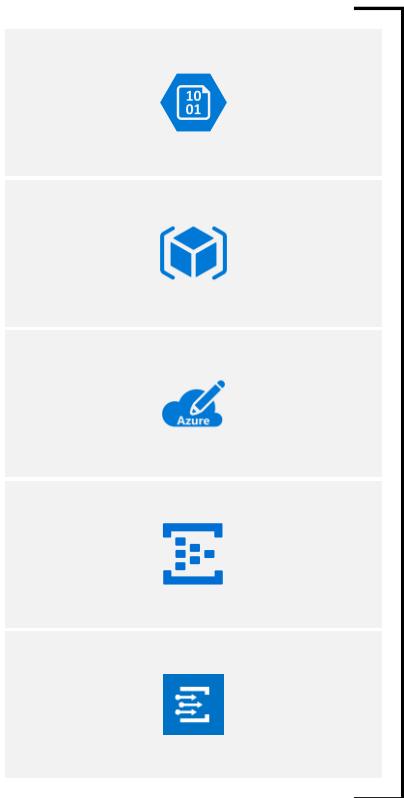


Azure Event Grid



Manage all events in one place

Event publishers



Subscribe to pre-defined system events in Azure or create your own custom topics

Route events to any end-points, Azure or even beyond

Enable filtering and efficient routing of events

Create Event Subscription
Event Grid - PREVIEW

Name:

Subscription: Azure Event Grid - Test

Resource group: Use existing

Topic Type: Storage Accounts

Event Types: Raised when a blob is created.

Subscriber Type: Web Hook

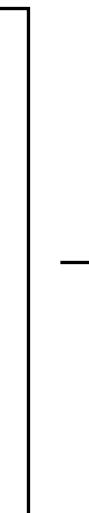
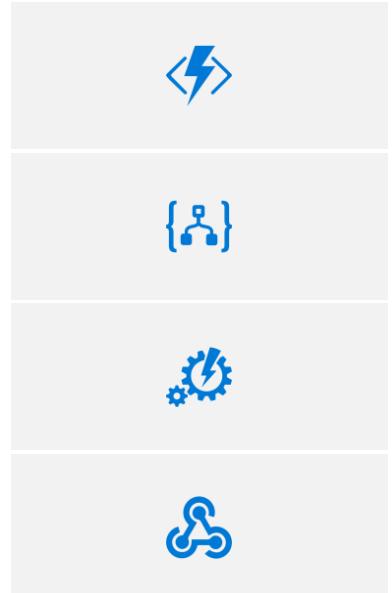
Prefix Filter: Sample-workitems/{name}

Suffix Filter: .jpg

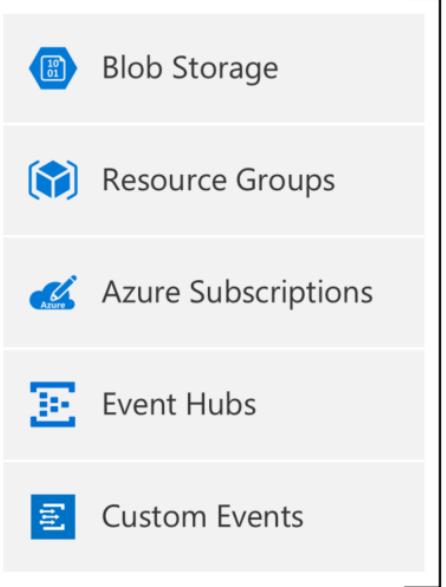
Filter Case Sensitive

Create

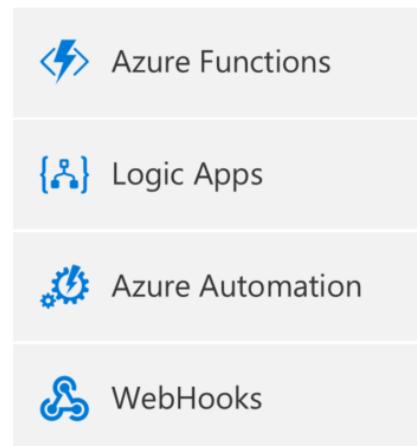
Event handlers



Event publishers



Event handlers



Concepts

- Events: what happened
- Event Publishers: where it took place
- Topics: where publishers send events
- Event Subscriptions: how you receive events
- Event Handlers: the app or service reacting to the event

Event Grid Schema

Proprietary Schema:

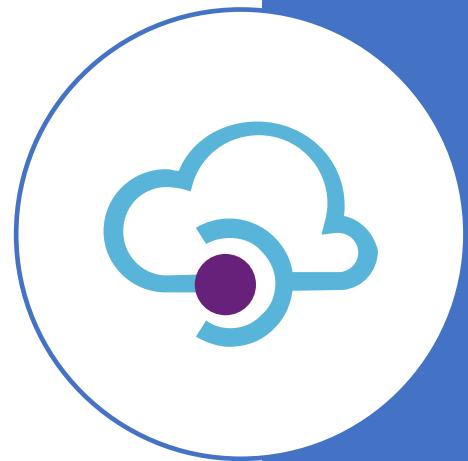
```
[  
 {  
   "topic": string,  
   "subject": string,  
   "id": string,  
   "eventType": string,  
   "eventTime": string,  
   "data":{  
     object-unique-to-each-publisher  
   },  
   "dataVersion": string,  
   "metadataVersion": string  
 }  
 ]
```

CloudEvent Schema:

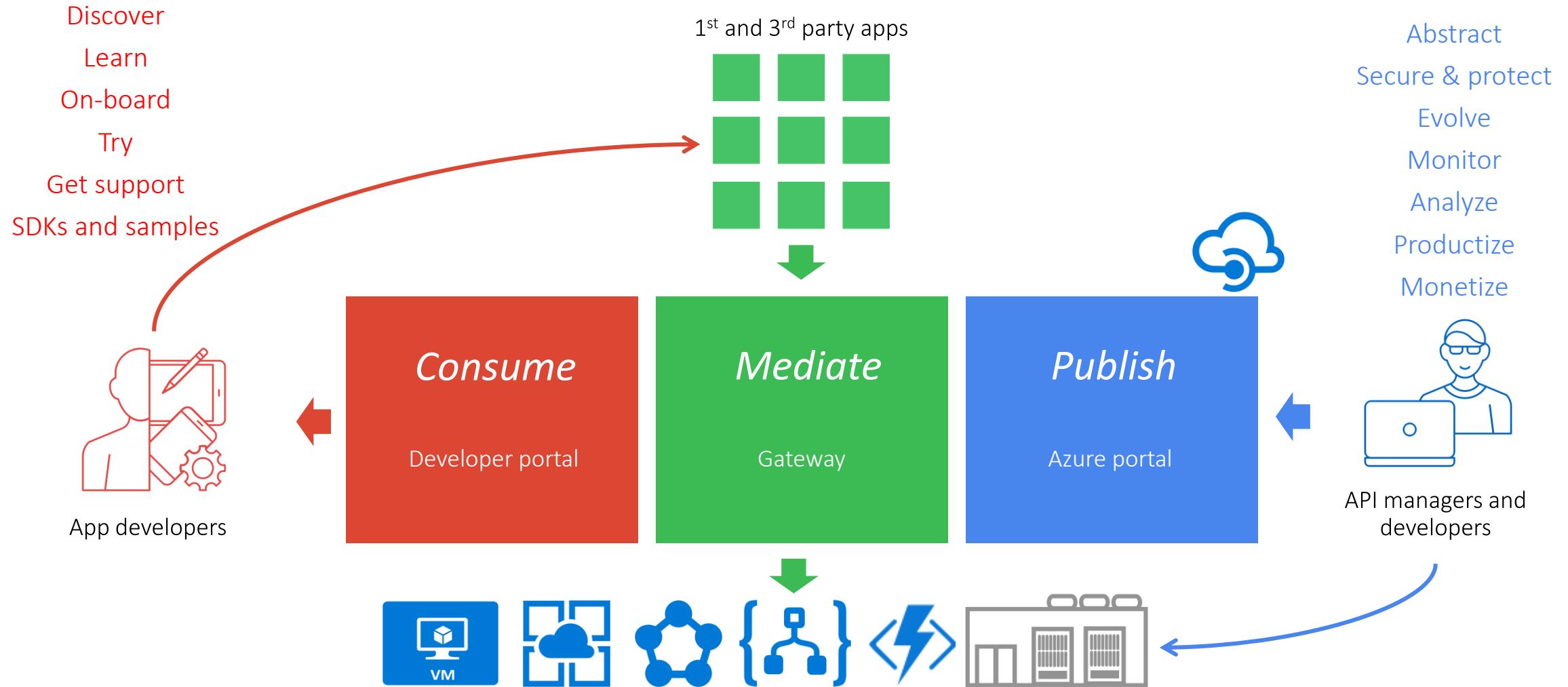
```
[  
 {  
   "specversion": string,  
   "type": string,  
   "source": string,  
   "id": string,  
   "time": string,  
   "subject": string,  
   "dataschema": string  
   "data":{  
     object-unique-to-each-publisher  
   },  
 }  
 ]
```

What value does API Management bring?

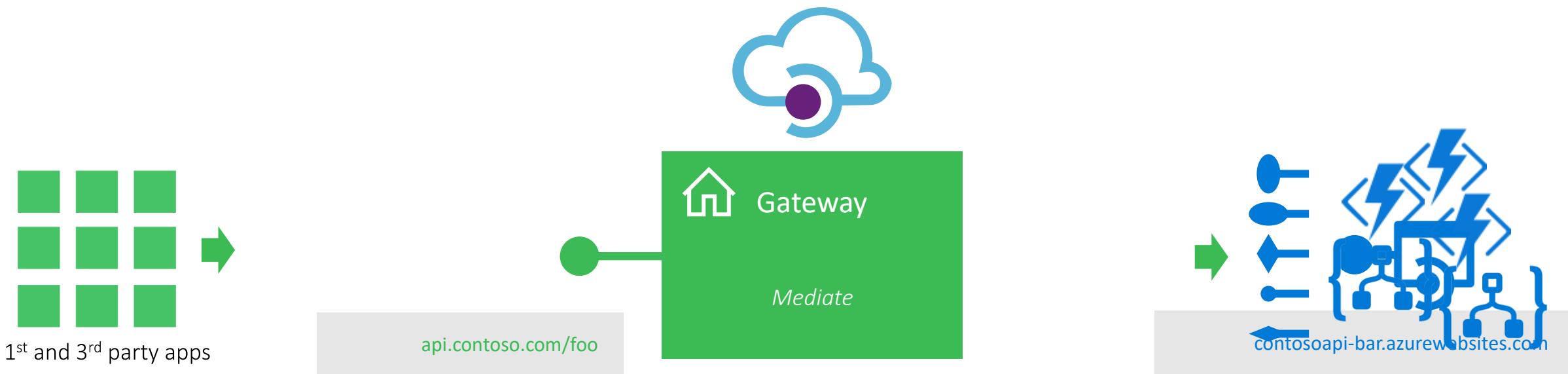
- A fully **managed** service that enables customers to publish, secure, transform, maintain, and monitor APIs.
- **API gateway** providing a simplified and secure façade for serverless Azure resources such as Logic Apps, APIs, and Functions.



API Management - a hub for enterprise APIs



Façade and front door



Policies

 Expand  Form view

- Encapsulate common API management functions
 - Access control, Protection, Transformation, Caching, ...
- Chained together into a pipeline
- Mutate request context or change API behavior
- Set in the inbound and outbound directions
- Can be triggered on error
- Applied at a variety of scopes

Access restriction policies

- + Check HTTP header
- + Limit call rate per key
- + Limit call rate per subscription
- + Restrict caller IPs
- + Set usage quota per key
- + Set usage quota per subscription
- + Validate JWT

Advanced policies

- + Control flow
- + Forward request to backend service
- + Log to EventHub
- + Output trace information
- + Retry
- + Return response
- + Send one way request

Calculate effective policy



apimsjw | APIs API Management service

Search (Ctrl+ /) <> [Developer portal](#) [Developer portal \(legacy\)](#)

REVISION 1 CREATED Oct 31, 2018, 1:42:39 PM

Design Settings Test Revisions Change log

Search APIs Filter by tags Group by tag Add API

All APIs Basic Calculator ... Echo API ... ErrorQueue ... EventHandler ... FeedbackLogicApp2 ... myfunctionsdemo1.azurewebsites.net ... RobustLogicApp ... SoapTest ... Star Wars API ... WS_Integration [SOAP] ... insurance/policy

Frontend GET /people/

Inbound processing Modify the request before it is sent to the backend service.

Policies </>

base ... + Add policy

Backend HTTP(s) endpoint http://swapi.co/api Policies </>

base ... + Add policy

Outbound processing Modify the response before it is sent to the client.

Policies </>

base ... + Add policy

Overview Activity log Access control (IAM) Tags Diagnose and solve problems

General

Quickstart Properties

APIs

APIs Named values Subscriptions Products Tags

Developer portal

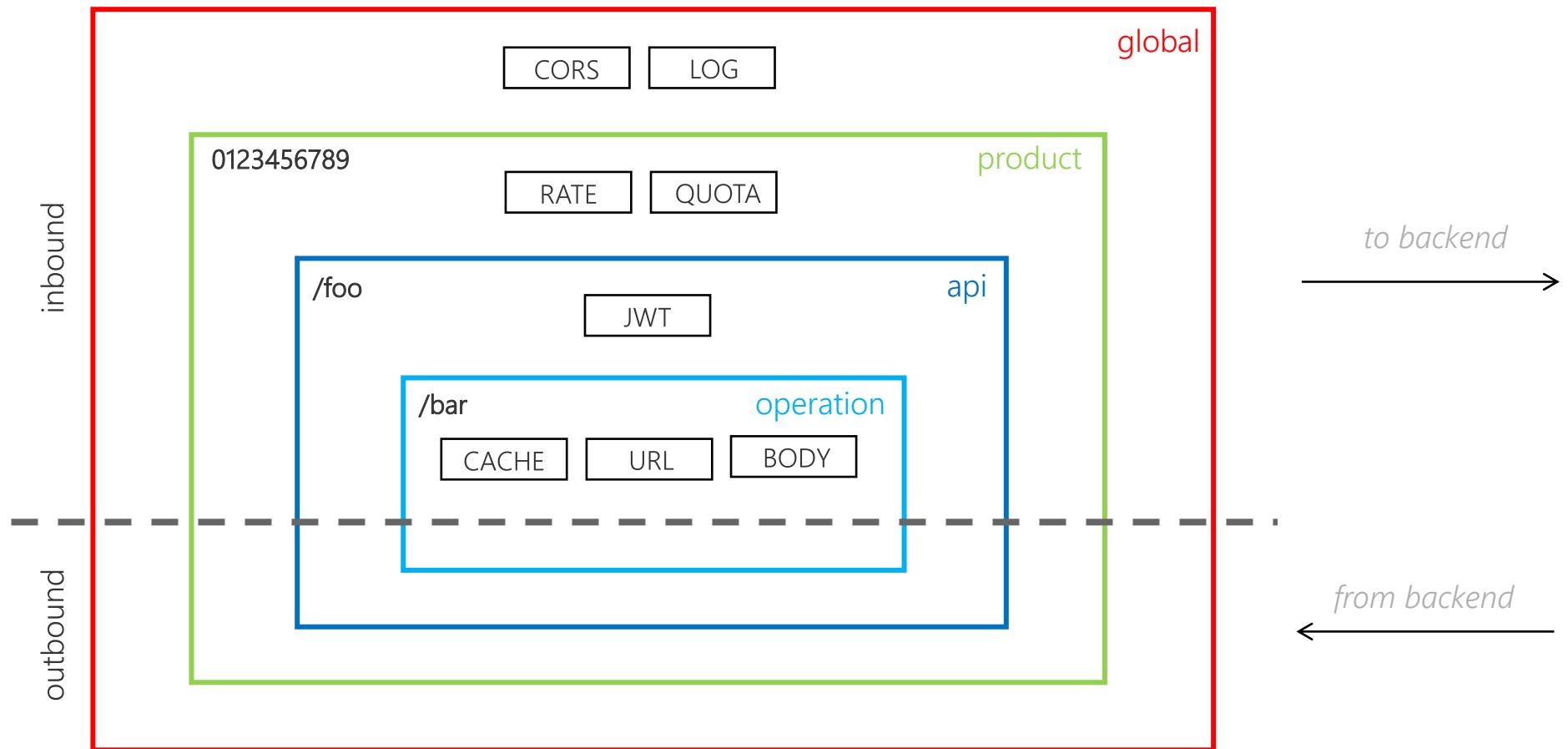
Portal overview Users Groups Identities Delegation OAuth 2.0 OpenID Connect

```
1  <!--
2      IMPORTANT:
3          - Policy elements can appear only within the <inbound>, <outbound>, <backend> section elements.
4          - To apply a policy to the incoming request (before it is forwarded to the backend service), place a correspon
5          - To apply a policy to the outgoing response (before it is sent back to the caller), place a corresponding p
6          - To add a policy, place the cursor at the desired insertion point and select a policy from the sidebar.
7          - To remove a policy, delete the corresponding policy statement from the policy document.
8          - Position the <base> element within a section element to inherit all policies from the corresponding sectio
9          - Remove the <base> element to prevent inheriting policies from the corresponding section element in the end
10         - Policies are applied in the order of their appearance, from the top down.
11         - Comments within policy elements are not supported and may disappear. Place your comments between policy el
12     -->
13 <policies>
14     <inbound>
15         |     <base />
16     </inbound>
17     <backend>
18         |     <base />
19     </backend>
20     <outbound>
21         |     <base />
22     </outbound>
23     <on-error>
24         |     <base />
25     </on-error>
26 </policies>
```

Policy scopes

GET /foo/bar HTTP/1.1
Host: api.constoso.com
Key: 0123456789

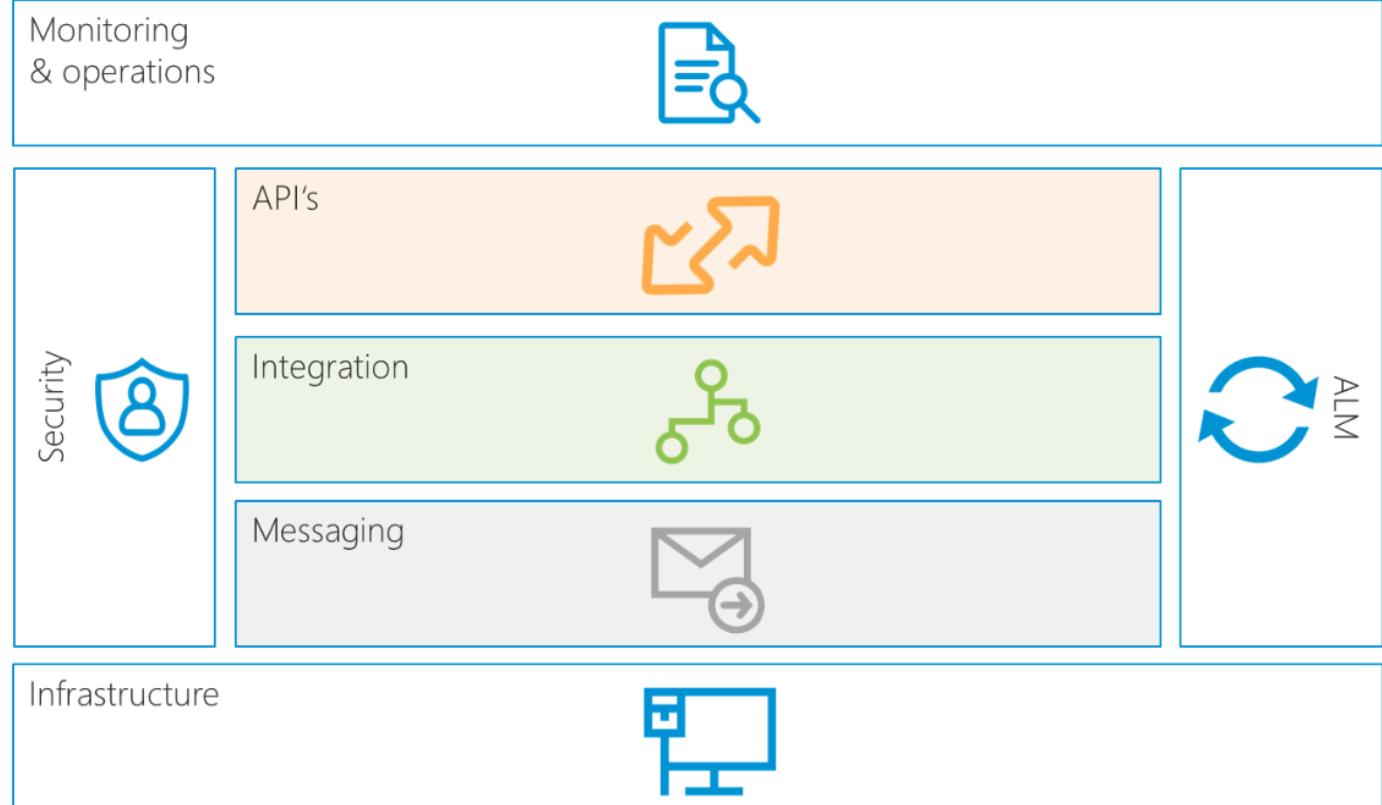
from caller →
→ *to caller*

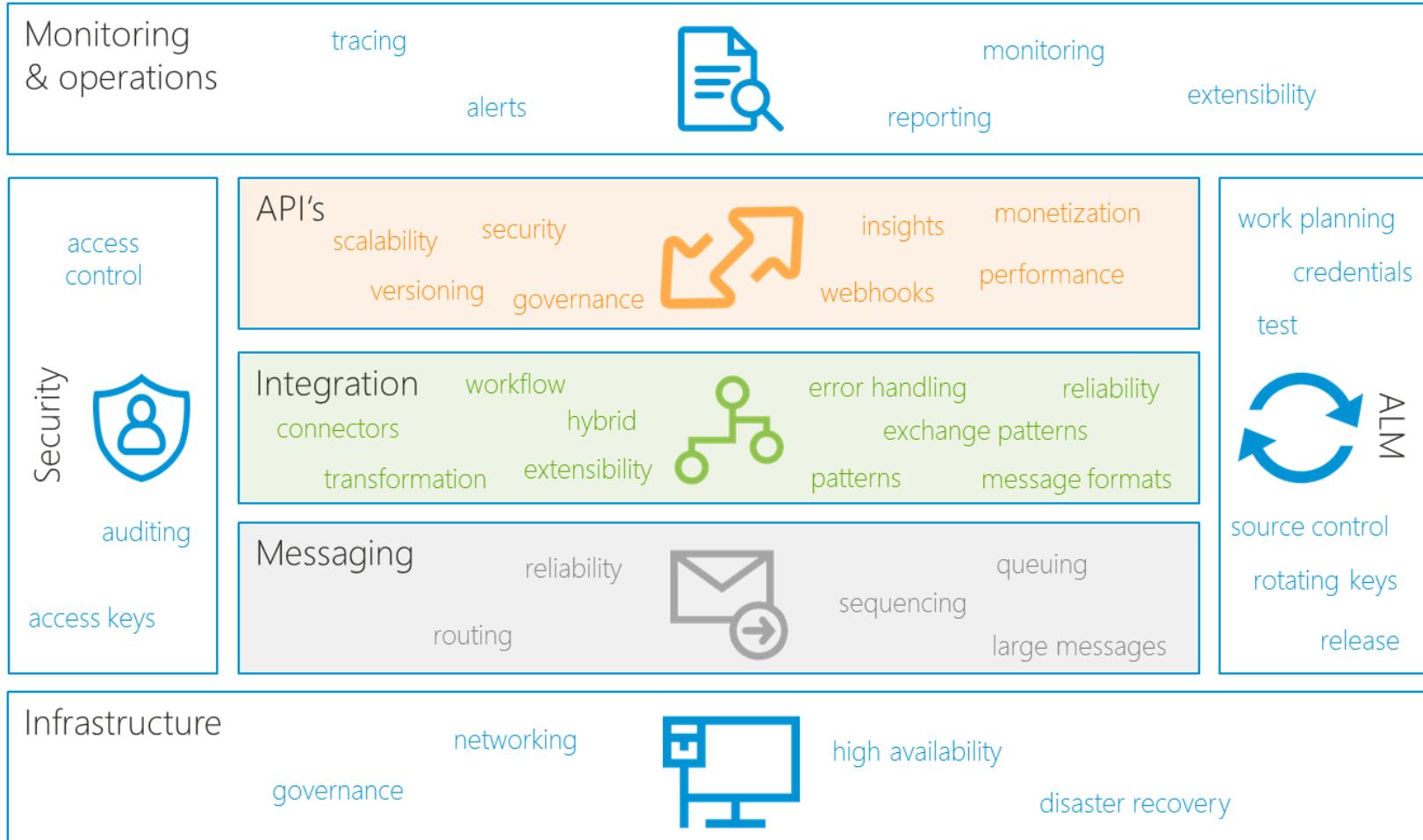




Solution Architecture

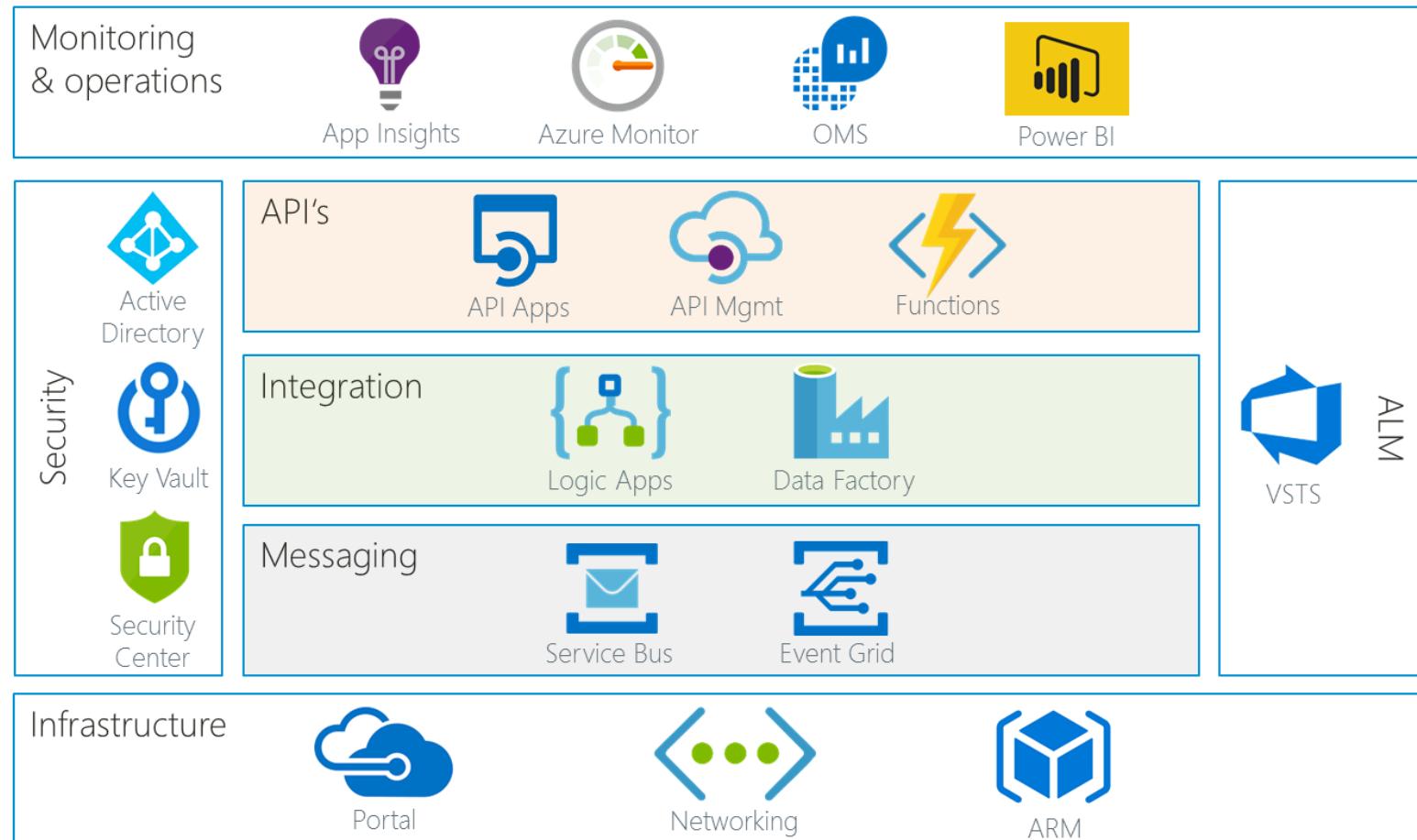
Architectural Building Blocks



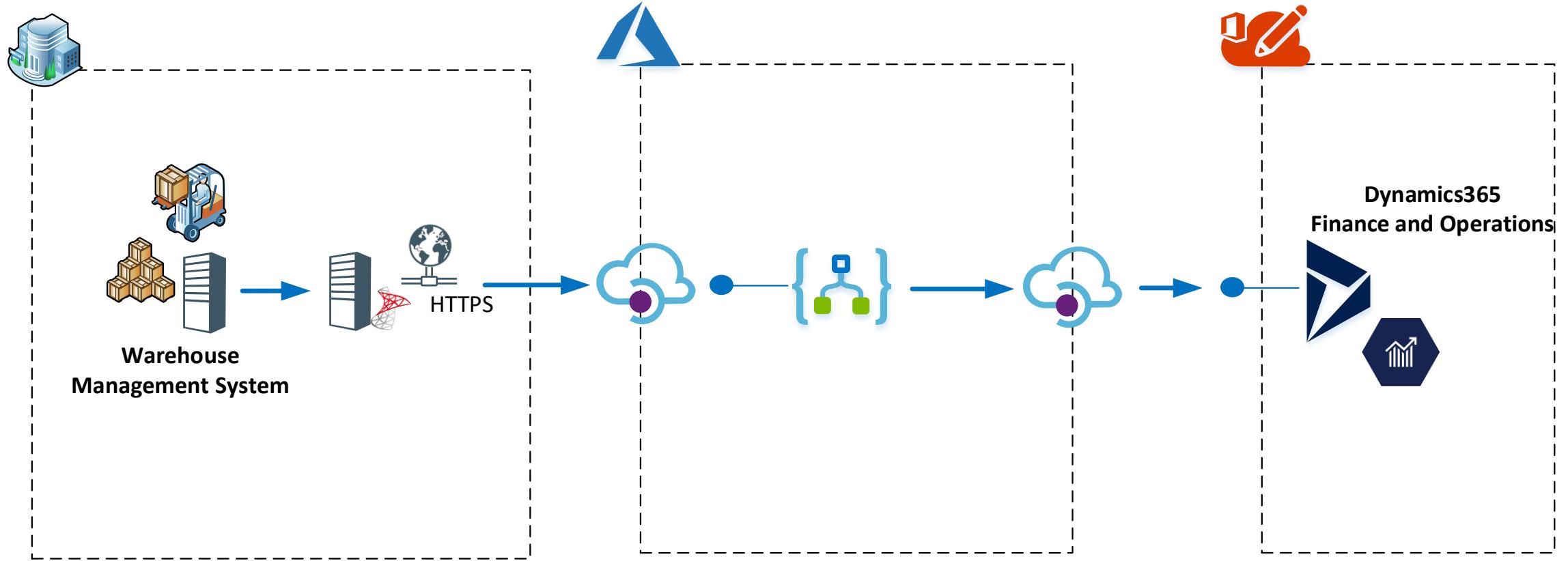


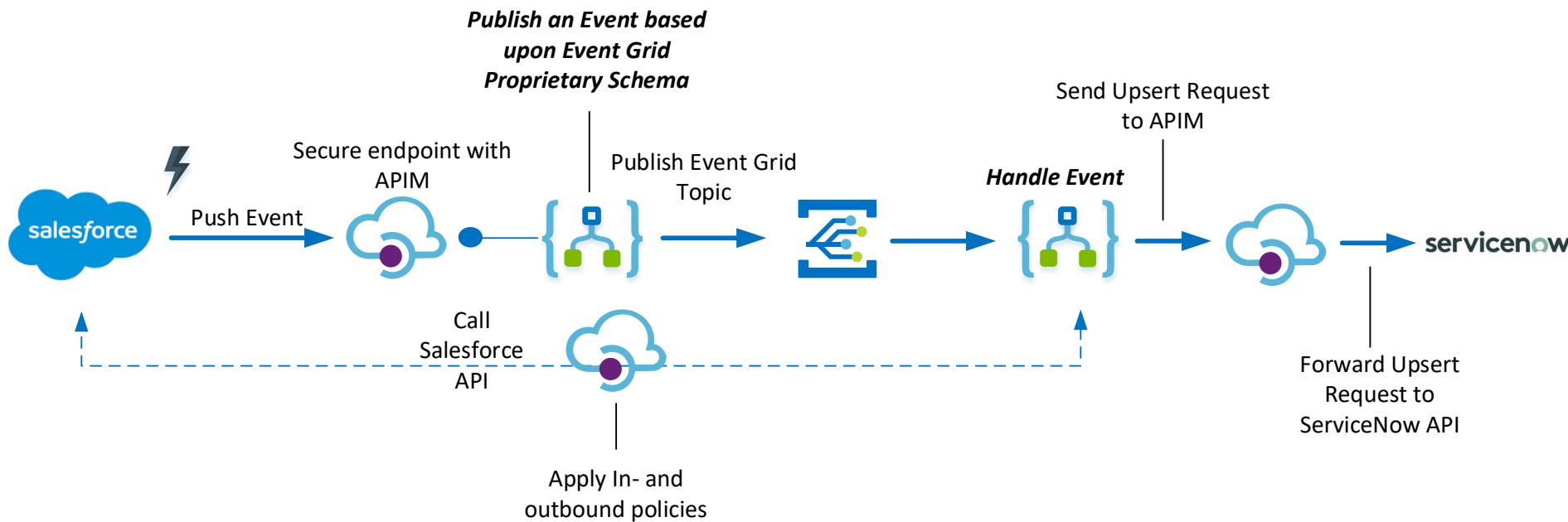
Responsibilities

Azure Integration Solution Building Blocks



Real World Integration Cases





```

<outbound>
  <base />
  <set-body template="liquid">{
    "Project": {
      "Description": "{{body.Description__c}}",
      "Account_ID": "{{body.Account__c}}",
      "Project_Placeholder_ID": "{{body.Id}}"
    }
  }</set-body>
</outbound>
  
```

```

<inbound>
<base />

<send-request ignore-error="true" timeout="20" response-variable-name="bearerToken">
  <set-url>{{salesForceAuthorizationServer}}</set-url>
  <set-method>POST</set-method>
  <set-header name="Content-Type" exists-action="override">
    <value>application/x-www-form-urlencoded</value>
  </set-header>
  <set-body>@{
    | return "grant_type=password&client_id={{salesForceClientId}}&client_secret={{salesForceClientSecret}}";
  }</set-body>
</send-request>
<set-header name="Authorization" exists-action="override">
  <value>@("Bearer " + (String)((IResponse)context.Variables["bearerToken"]).Body)</value>
</set-header>

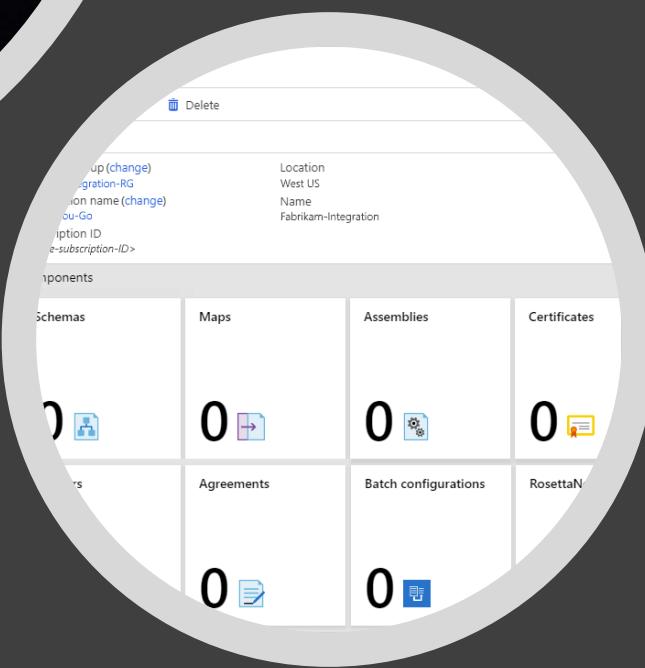
<set-header name="Ocp-Apim-Subscription-Key" exists-action="delete" />
</inbound>
  
```



The Magic - Transformation

Tech:

- Integration Account
- API (Function)
- API Management Policy

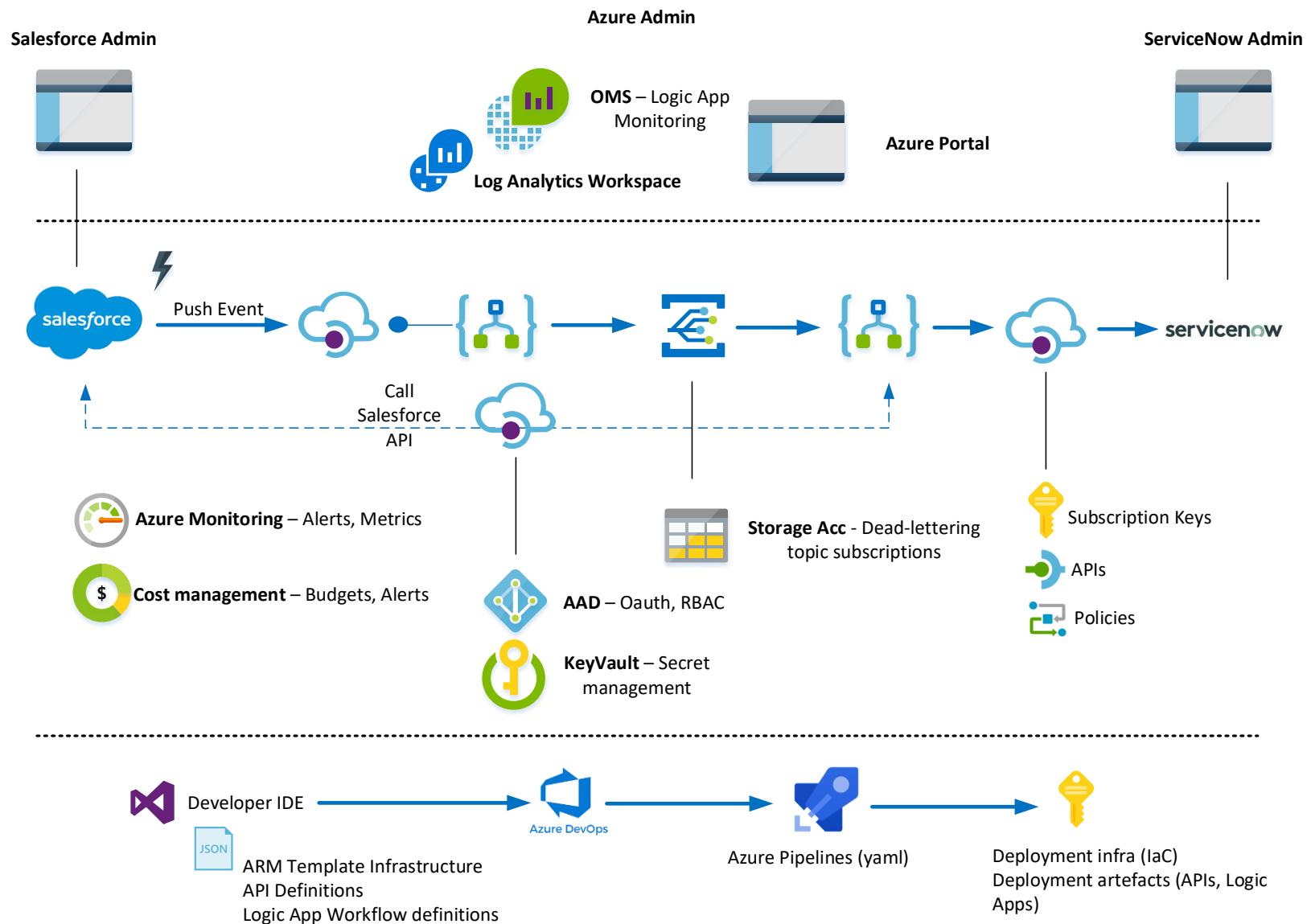
A circular inset image showing a screenshot of an XSLT Mapping editor. The code defines a variable 'class' and a template for 'hh:class'. A red oval highlights a 'choose' block that maps 'class' values to numerical indices (1, 2, 3) based on their value. The code uses namespaces like 'xsl' and 'ak'.

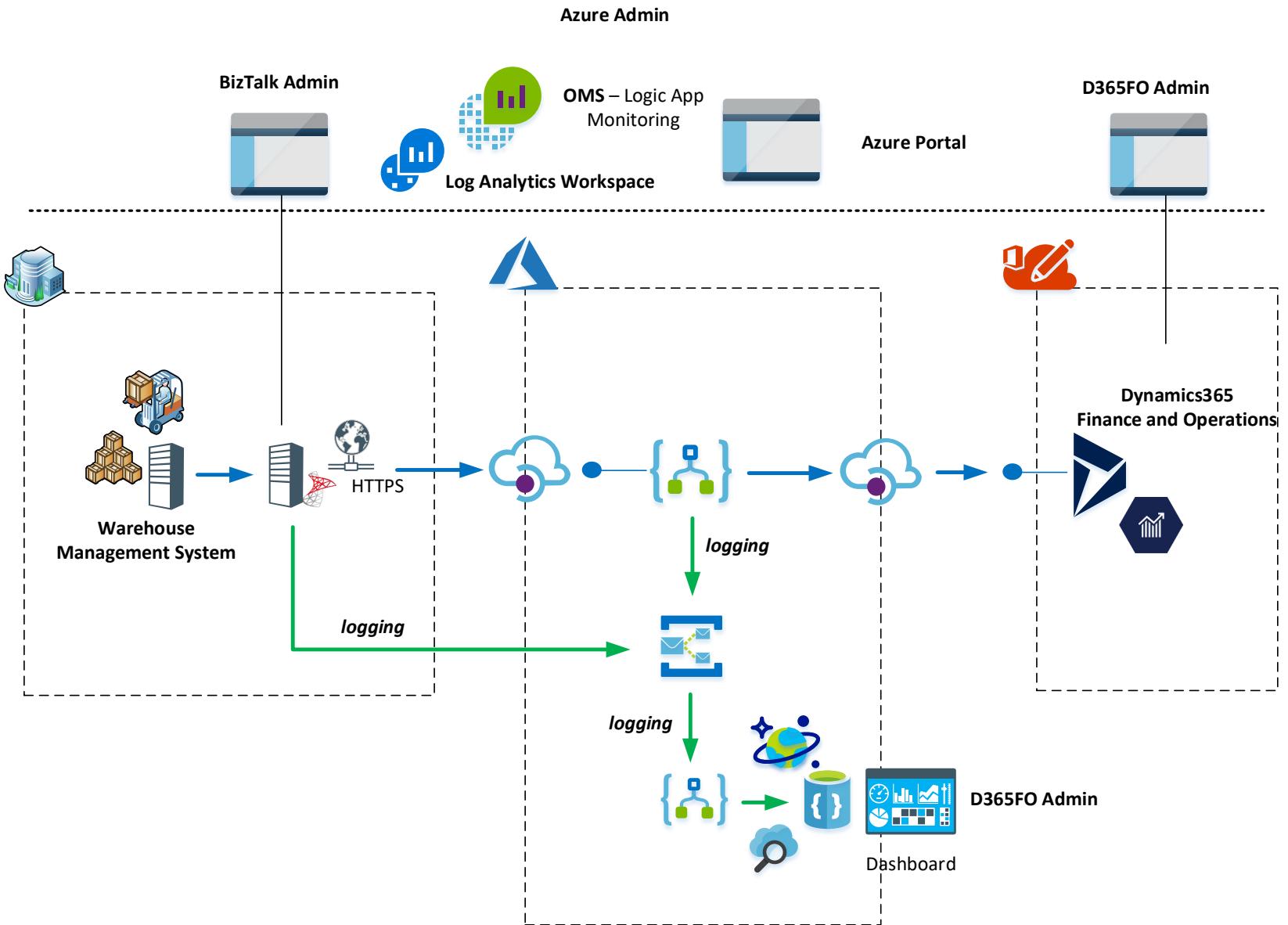
Format:

- XML (XSLT)
- JSON (Liquid)
- Custom (.NET)

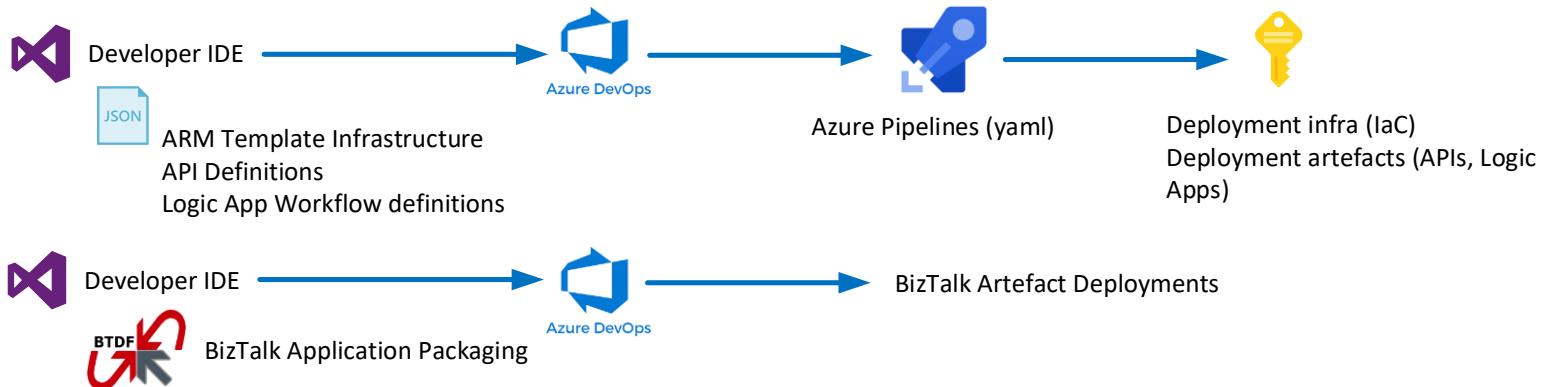
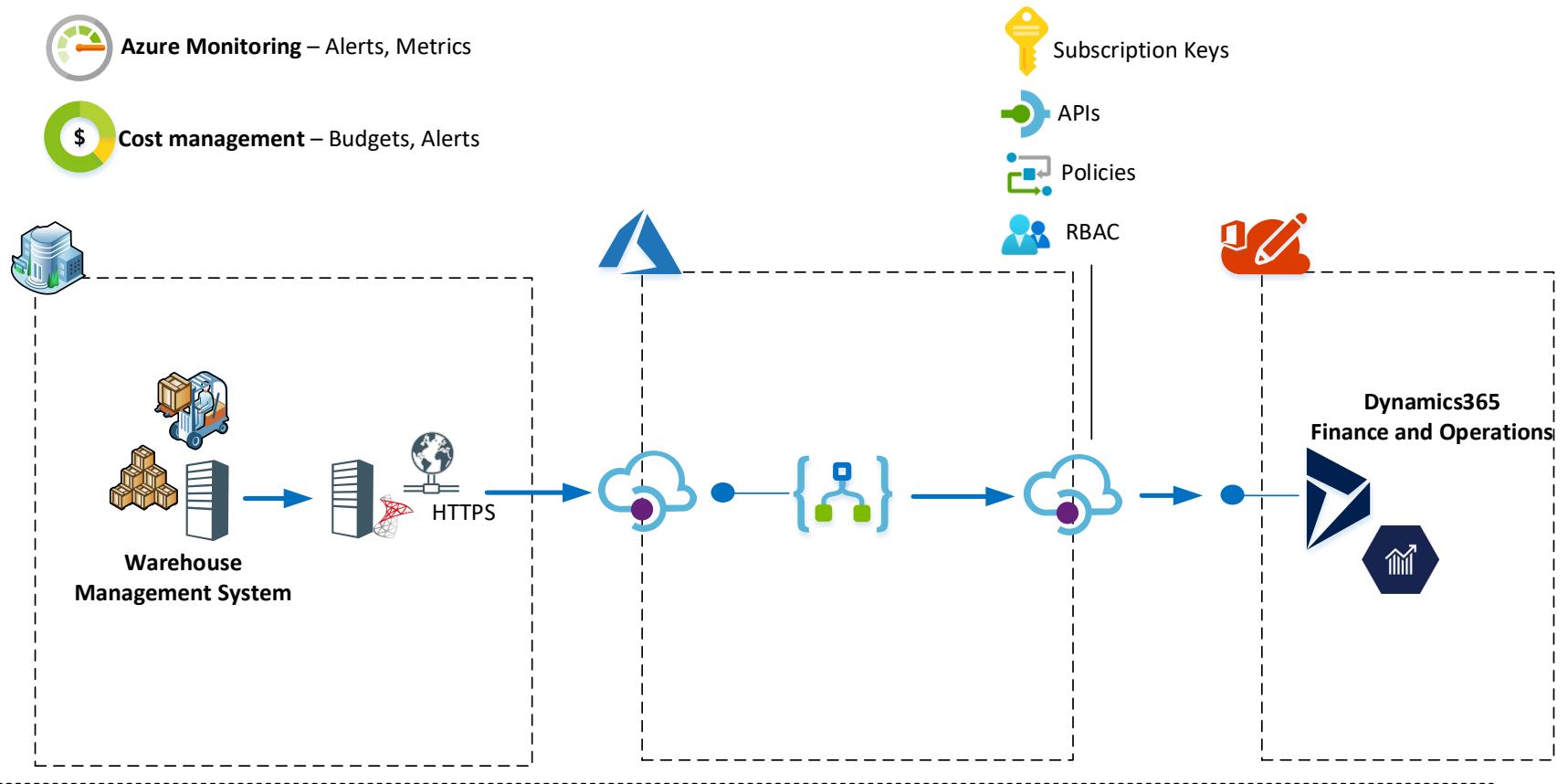
Best Practices

- Loose coupling
- Monitoring
- Event driven
- Cost management
- Versioning
- Governance
- DevOps (automation)





Other aspects

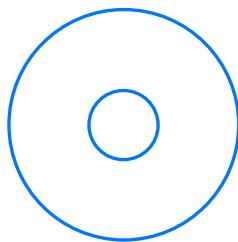


Where does Power Automate fit in?

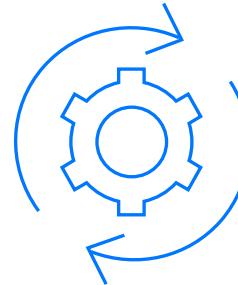
Intelligent Automation

Robotic Process Automation (RPA)

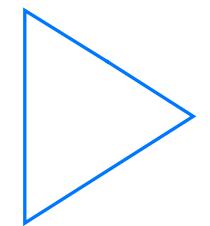
An RPA tool can learn to automate a task by watching the user perform that task in a graphical user interface (GUI), and then perform the automation by repeating those tasks directly in the GUI.



Record the Task

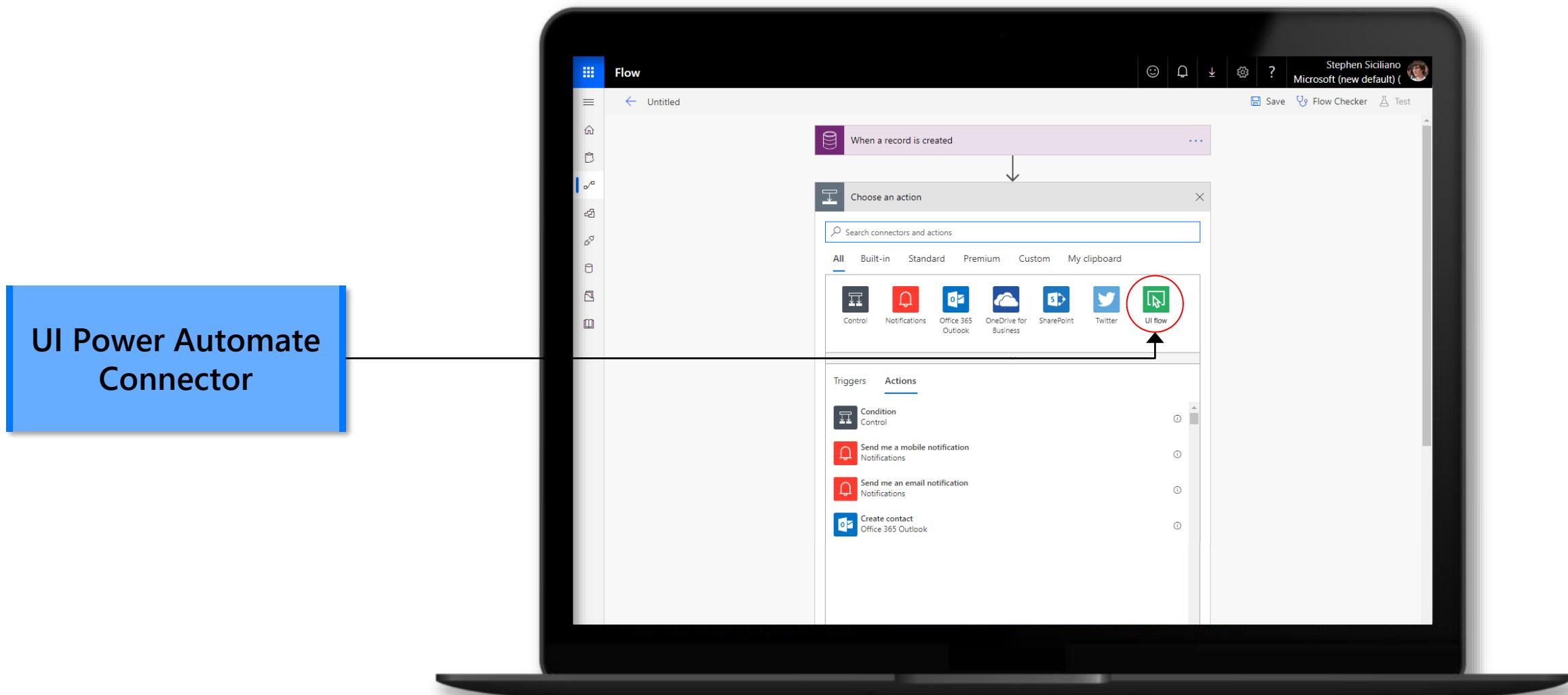


Automate the Task



Playback Task

UI Flows Connector for RPA



UI Flows Records User Actions of Legacy Apps



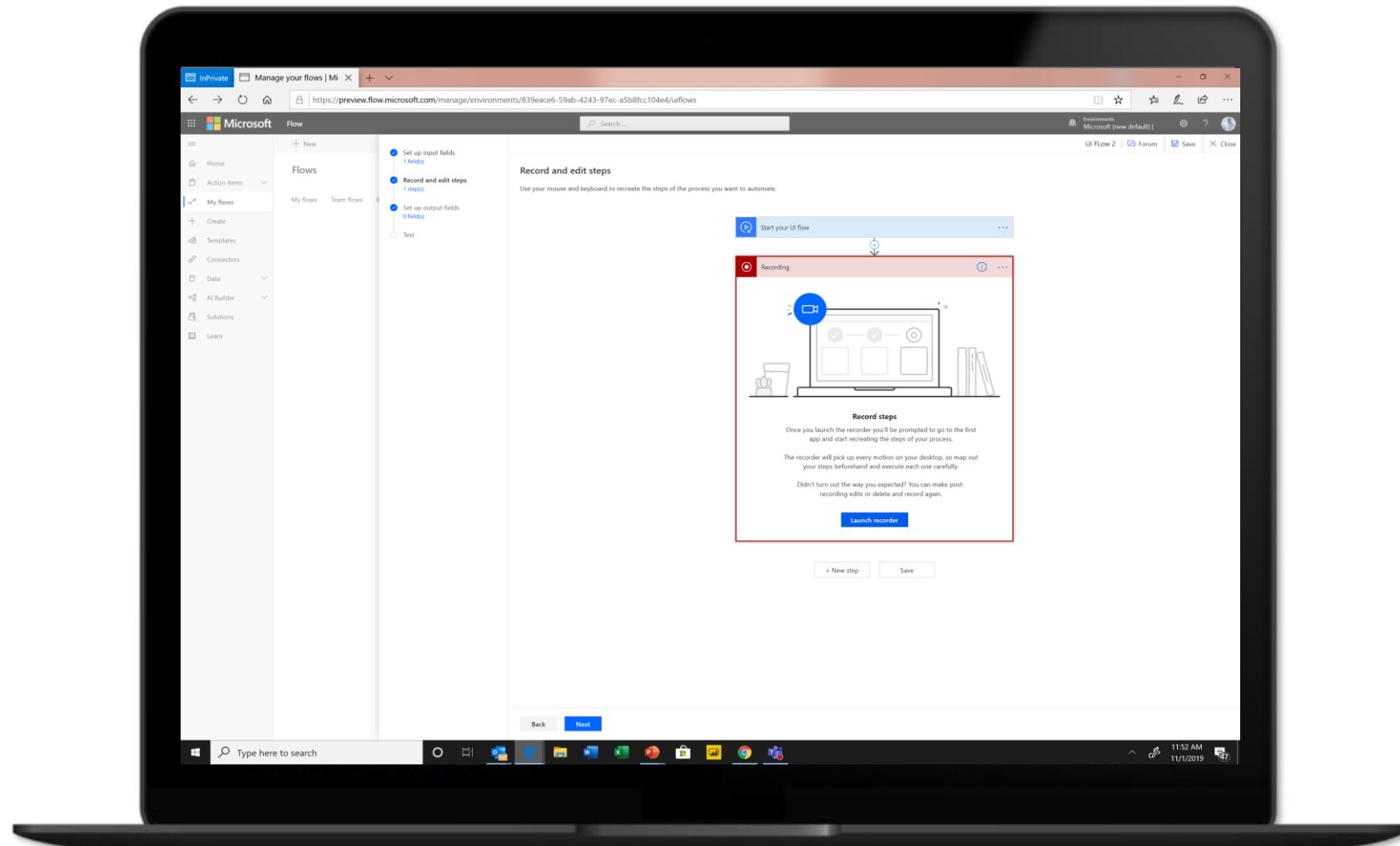
Launch the recorder



Record your click-steps



Build your flow



Scrape Energy Prices and Write to Excel - Process Designer

File Edit Debug Tools View Help

Main

1 Create Folder
Create folder C:\Demo\2020-06\

2 Region of Autogenerated, Web Automation Actions for 'Daily Average'
Launch New Internet Explorer
Extract Data from Web Page
End Region of Autogenerated, Web Automation Actions for 'Daily Average'

3 Close Web Browser
Get First Free Row On Column from Excel Worksheet
Select Cells in Excel Worksheet
Send Keys
Select Cells in Excel Worksheet
Decrease Variable
Send Keys
Send Keys
Send Keys
Send Keys
Send Keys
GIF

Functions

AutoSave Off

File Home Insert Draw Page Layout Formulas Data Review View Help

Paste Calibri 11

Font Alignment Number Styles

Clipboard

General Conditional Formatting

Format as Table Cell Styles

UPDATES AVAILABLE Updates for Office are ready to be installed, but first we need to close some apps. Update now

Book1 - Excel

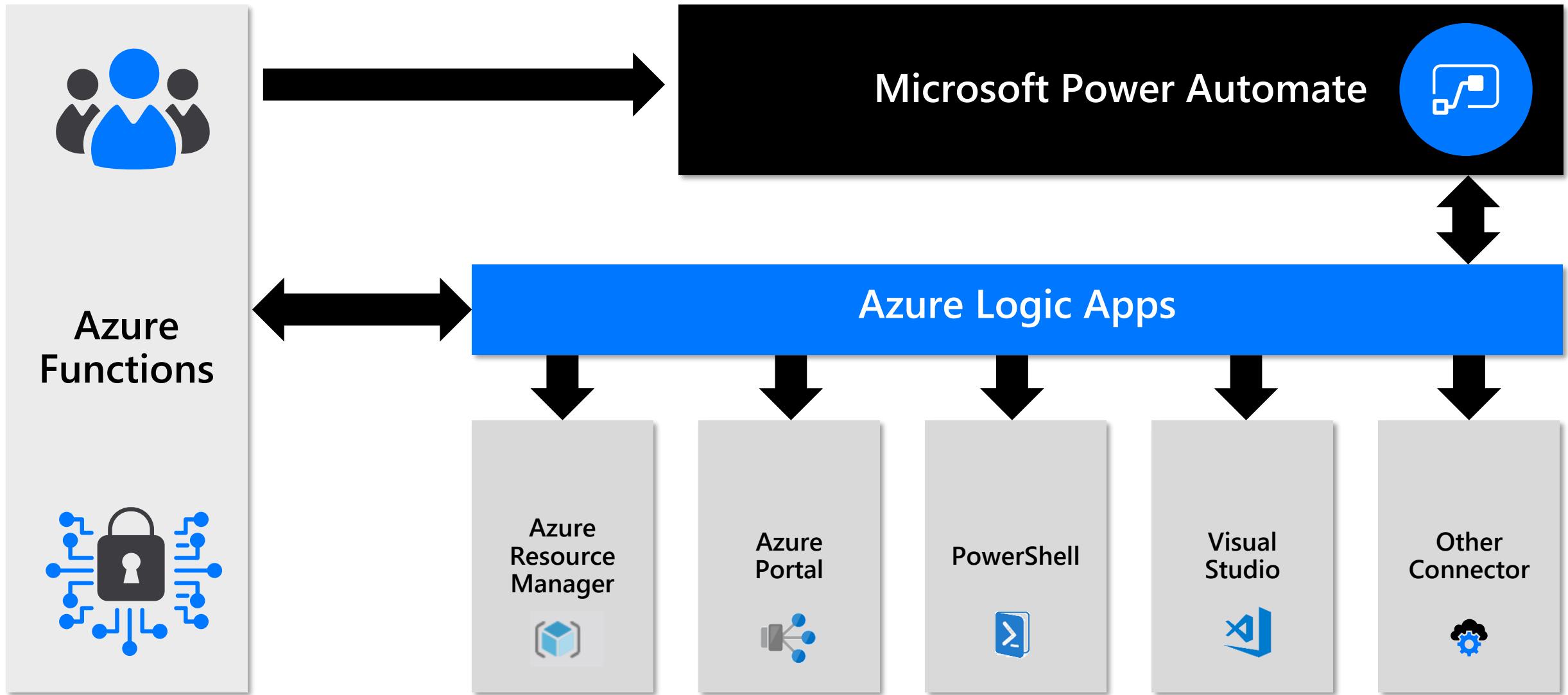
G9

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Date	Average	On Peak	Off Peak	Average	On Peak	A Off Peak	Average								
2	#####	25.97	28.48	20.97	26.26	28.7		21.38								
3	#####	32.33	33.09	30.8	26.34	28.69		21.64								
4	#####	34.77	35.31	33.7	26.22	28.62		21.41								
5	#####	29.31	32.17	23.6	25.95	28.4		21.03								
6	#####	20.28	25.4	10.05	25.96	28.35		21.18								
7	#####	23.05	25.82	17.52	26.19	28.45		21.68								
8	#####	20.16	28.06	4.36	26.02	28.12		21.81								
9	Monthly A	26.55286	29.76143	20.14286	26.13429	28.47571										
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Sheet1

<https://www.youtube.com/watch?v=5745NyIUSX8>

Power Automate, Logic Apps, Functions



What do the analysts say?



August 2019

A Leader in Enterprise Low-Code Application Platforms*



*Gartner "Magic Quadrant for Enterprise Low-Code Application Platforms," by Paul Vincent, Kimihiko Iijima, Mark Driver, Jason Wong, Yefim Natis, 08 August 2019

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August 2020

A Leader in Enterprise Integration Application Platform as a Service*

Magic Quadrant

Figure 1. Magic Quadrant for Enterprise Integration Platform as a Service



Source: Gartner (August 2020)

As of August 2020

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*Gartner "Magic Quadrant for Enterprise Integration Platform as a Service," by Eric Thoo, Bindu Bhullar, Massimo Pezzini, Keith Guttridge Abhishek Singh Shaheem Pillai 21 September 2020

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September 2020

A Leader in Full Life Cycle API Management*

Figure 1. Magic Quadrant for Full Life Cycle API Management



Source: Gartner (September 2020)

*Gartner "Magic Quadrant for Full Life Cycle API Management," by Paolo Malinverno, Kimihiko Iijima, Mark O'Neill, John Santoro, Shameen Pillai, Akash Jain 22 September 2020

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Key Takeaways



Choose technology based upon your requirements



Power Automate, Logic Apps and Azure (Durable) Functions are NOT competing technologies. Same applies for Event Grid and Service Bus!



Apply the best practices and leverage Azure Well-Architected Framework

Sources to explore!

- [Azure Integration Services](#)
- [Serverless Notes](#)
- [Azure Well-Architected Framework](#)
- [Codit Blog](#)
- [Power Automate](#)
- [Enterprise Integration Patterns](#)
- [Integration Usergroup](#)
- [Microsoft Learn](#)





Thanks for attending!



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<https://twitter.com/StefJan>



sj.wiggers@gmail.com



<https://github.com/stefjan>



Q&A

EXCELLENT ESPRESSO IS BEST SERVED WITH WHITE SUGAR