

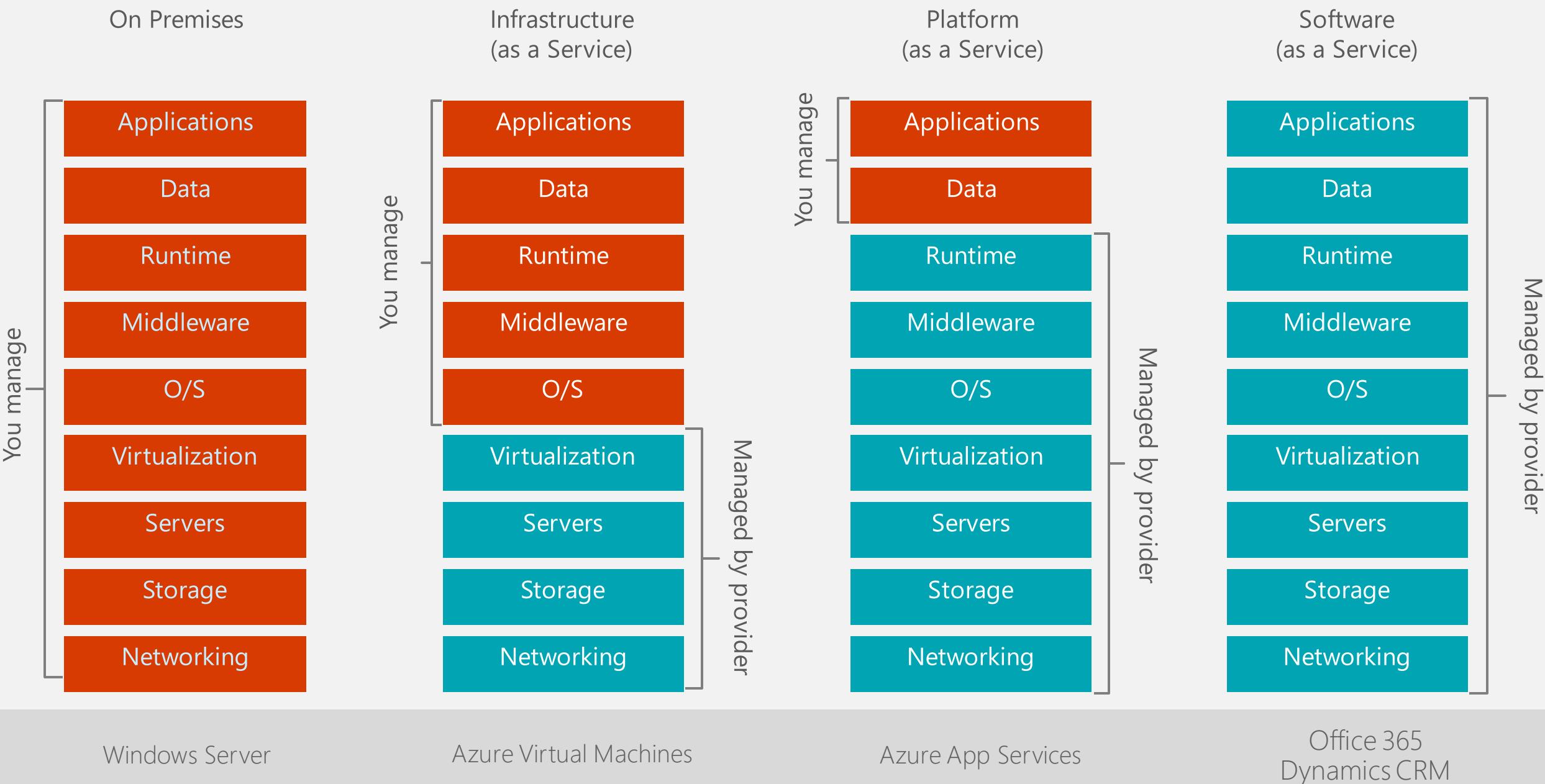
# Building serverless architecture using Azure Functions

Wely Lau  
Sr Cloud Solution Architect  
Microsoft APAC

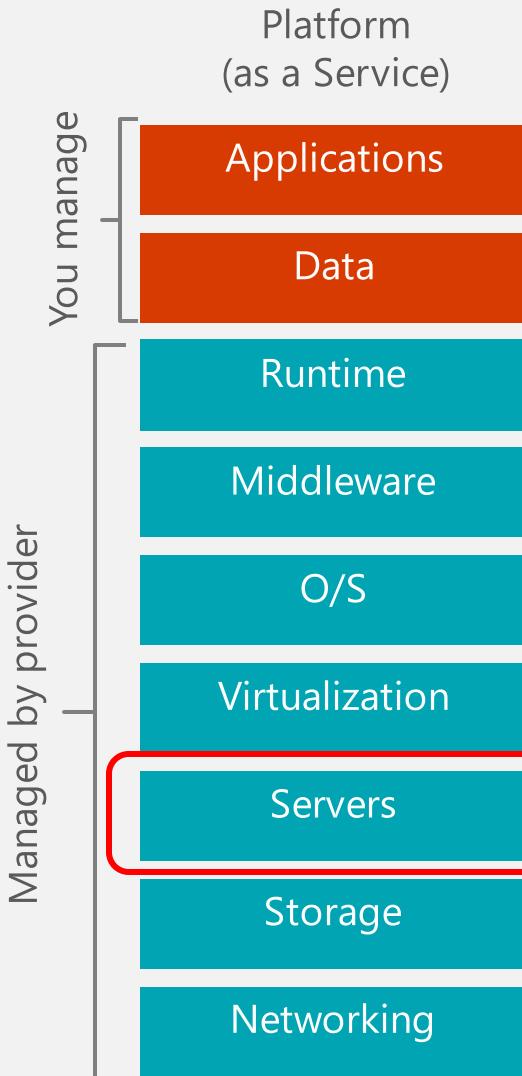
# Agenda

- Overview of serverless computing
- Azure Functions overview
- Demo 1 (Creating the first Azure Functions)
- Azure Functions Basics: Programming Model
- Feature highlights
- Demo 2 (Trigger & binding)
- Various Scenarios
- Case study: Fujifilm Software
- Demo 3 (Load testing Function + App Insights Live Stream)
- Learn more

# Typical cloud service model



# Let's take a deeper look into PaaS (App Service)



- You define (**scale**) the cluster size or hosting plan
- You pay for what you “**reserve**” (regardless how much the utilization is)

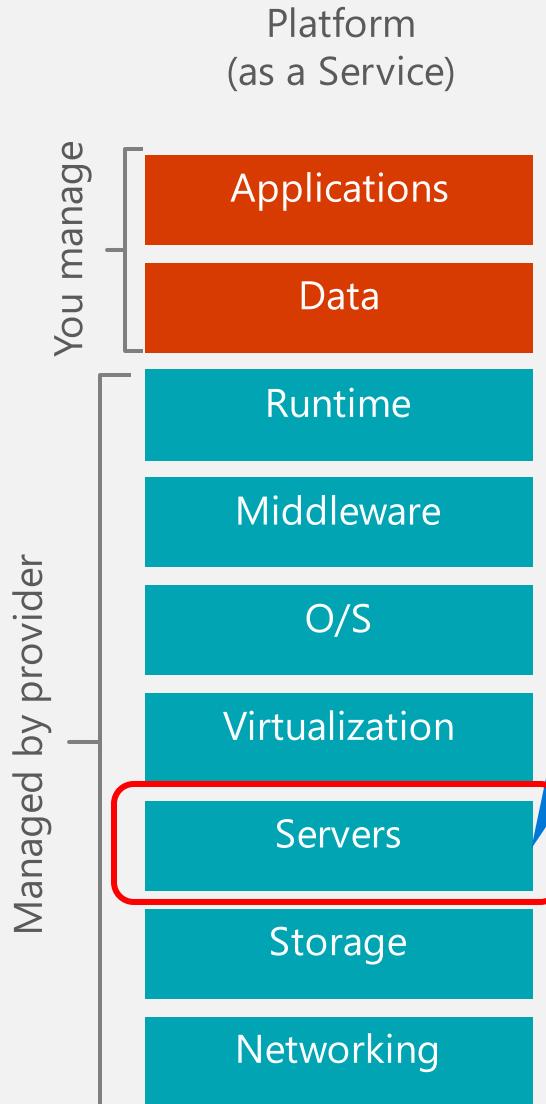
The screenshot shows the Azure App Service pricing and configuration interface:

- Recommended pricing tiers:** S1, P1V2 (selected), P2V2, P3V2.
- Included features:** Custom domains / SSL, Azure Compute Units (ACU), Memory, Storage.
- Included hardware:** Every instance of your App Service plan will include the following hardware configuration: Azure Compute Units (ACU), Memory, Storage.
- Instance Count:** Set to 3.
- Auto-scaling:** Manual scale selected, with an option for Custom autoscale.

You can auto-scale

You reserve (and pay) for **3 x of P1v2**

# Serverless – the evolution of PaaS



The screenshot shows the Azure portal interface. On the left, a table lists various App Service Plans (Plans) with columns for Name, Location, Apps, and Pricing Tier. Two specific plans are highlighted with red boxes and labeled "Dynamic (Y1: 0)": "serverlessnotification-plan" and "serverlessnotificationdem...". To the right, a red box highlights the "Dynamic (Y1: 0)" entry for "serverlessnotification-plan".

Name ↑↓	Location ↑↓	Apps ↑↓	Pricing Tier ↑↓
appSvcPlanPv2	Southeast Asia	0	Premium V2 (P1v2: 1)
ASP-wely-ai-demo-bba4	Southeast Asia	2	
AwesomeWebWelyPlan	Southeast Asia	24	
egwely-plan	Southeast Asia	1	
FunctionApp1-Fresh2019...	Southeast Asia	3	
hotel-coupon-mgmtd259...	Southeast Asia	1	
PracticalAzureFunctionsC...	Southeast Asia	3	
serverlessnotification-plan	Southeast Asia	1	
serverlessnotificationdem...	Southeast Asia	1	

On the right, a detailed view of the "serverlessnotification-plan" resource group is shown. A red box highlights the "Scale up (App Service plan)" and "Scale out (App Service plan)" options under the "Settings" section.

**Resource group (change)  
serverlessnotification**

Status Ready  
Location Southeast Asia  
Subscription (change) Internal Consumption  
Subscription ID 86306f52-a93a-48f2-a3f2-d34b242a37c9  
Tags (change) Click here to add tags

App Service Plan serverlessnotification-pl...  
App(s) / Slots 1 / 0

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

Settings

Apps  
File system storage  
Networking

Scale up (App Service plan)  
Scale out (App Service plan)

Resource explorer  
Properties



# What is serverless?



## Full abstraction of servers

Developers can just focus on their code—there are no distractions around server management, capacity planning, or availability.



## Instant, event-driven scalability

Application components react to events and triggers in near real-time with virtually unlimited scalability; compute resources are used as needed.



## Pay-per-use

Only pay for what you use: billing is typically calculated on the number of function calls, code execution time, and memory used.\*

# What are the benefits?



## Focus

Solve business problems—not technology problems related to undifferentiated heavy lifting



## Efficiency

- Shorter time to market
- Fixed costs converted to variable costs
- Better service stability
- Better development and testing management
- Less waste



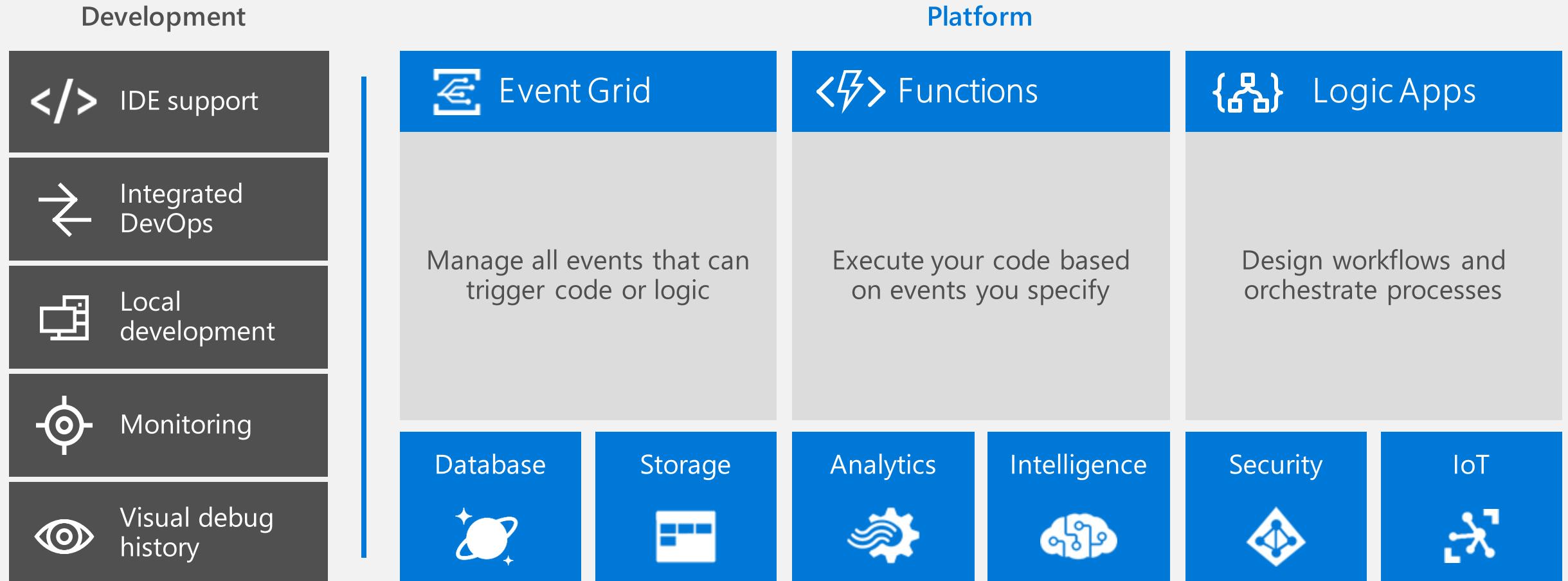
## Flexibility

- Simplified starting experience
- Easier pivoting means more flexibility
- Easier experimentation
- Scale at your pace—don't bet the farm on Day 1
- Natural fit for microservices



# Full integration with Azure ecosystem

Functions is the center piece of the Serverless platform



# What is Azure Functions?

An event-based, serverless compute experience that accelerates app development



## Integrated programming model

Use built-in triggers and bindings to define when a function is invoked and to what data it connects



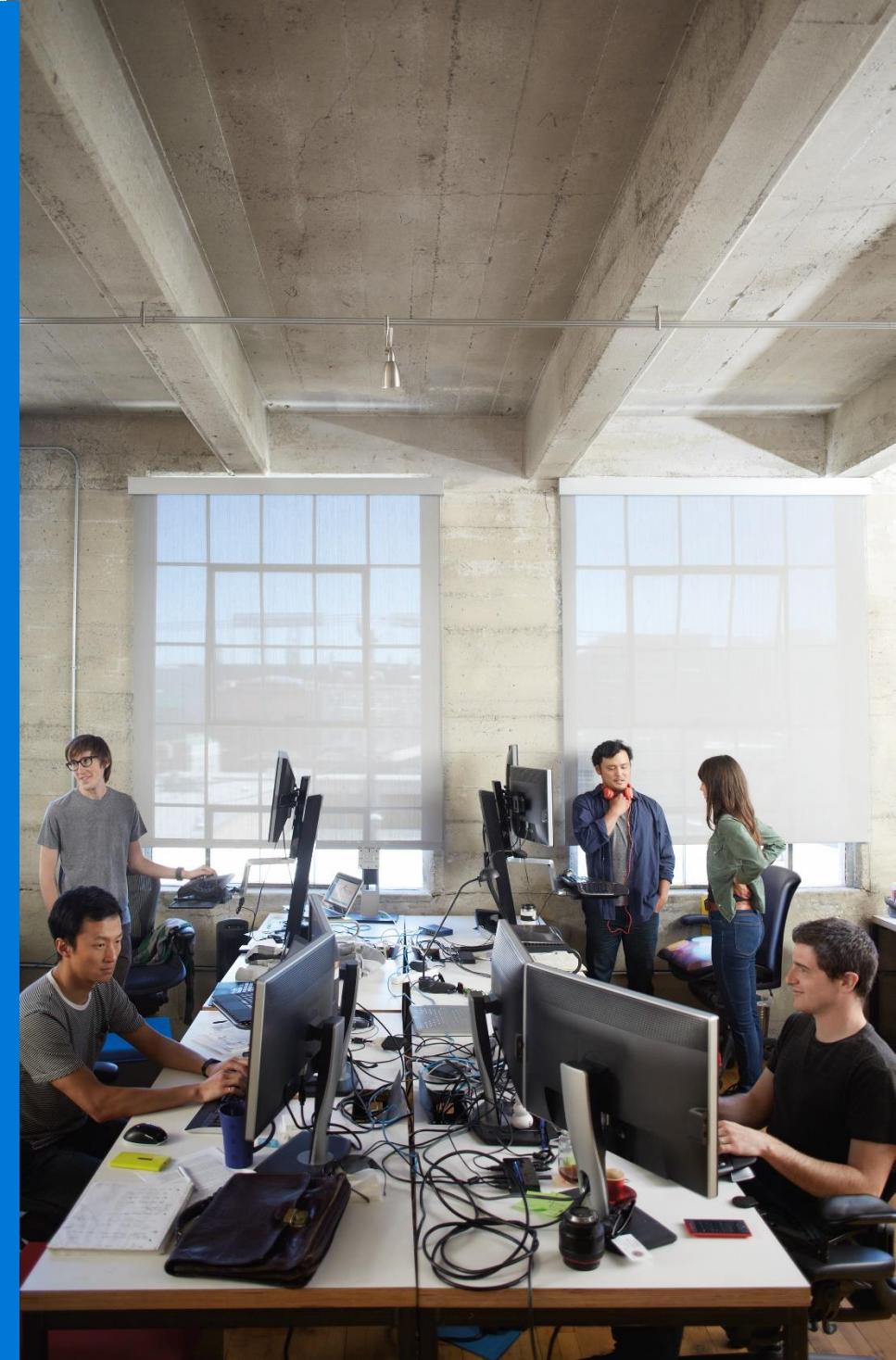
## Enhanced development experience

Code, test and debug locally using your preferred editor or the easy-to-use web based interface including monitoring

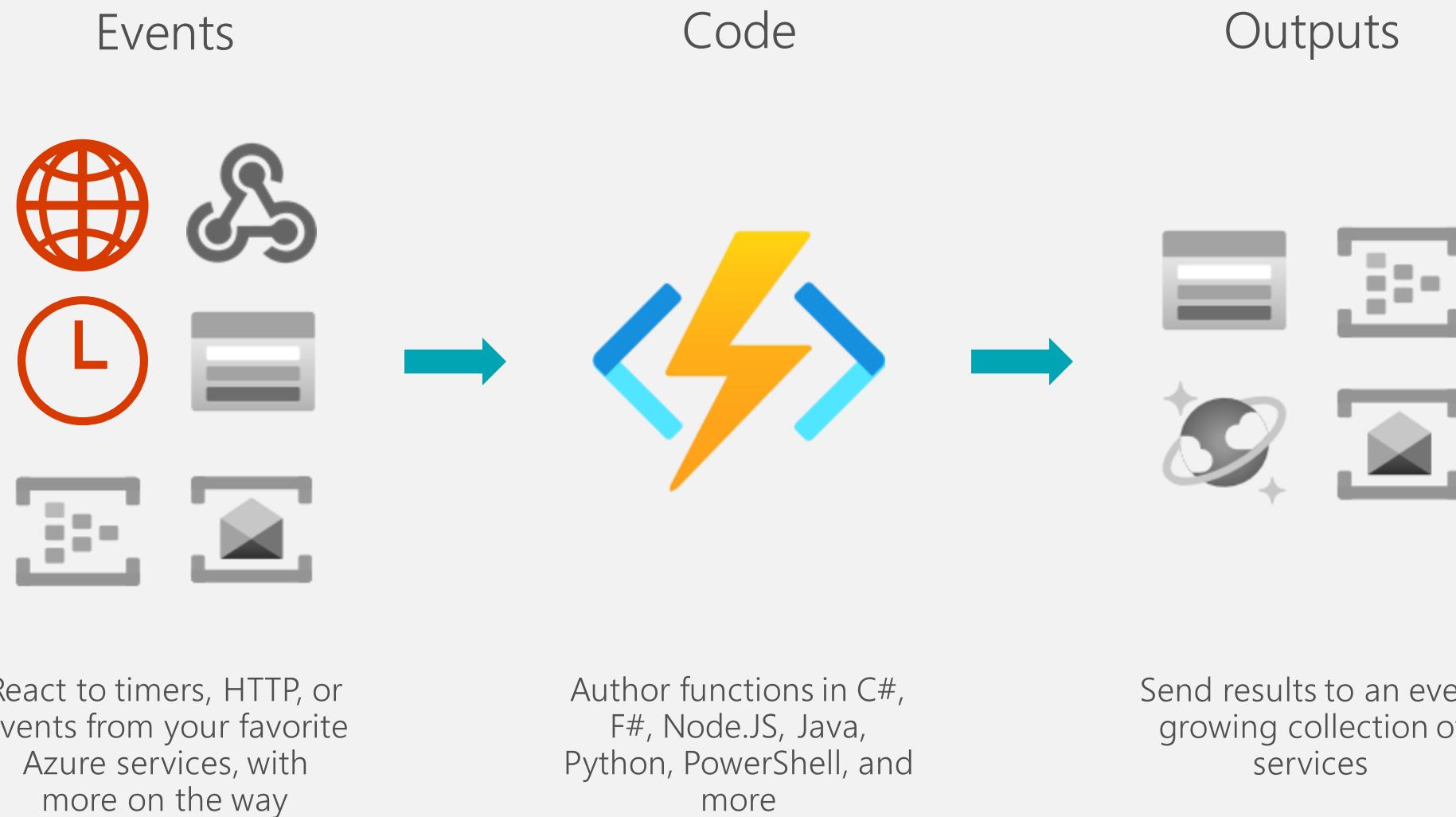


## Hosting options flexibility

Choose the deployment model that better fits your business needs without compromising development experience



# Azure Functions



# Demo 1

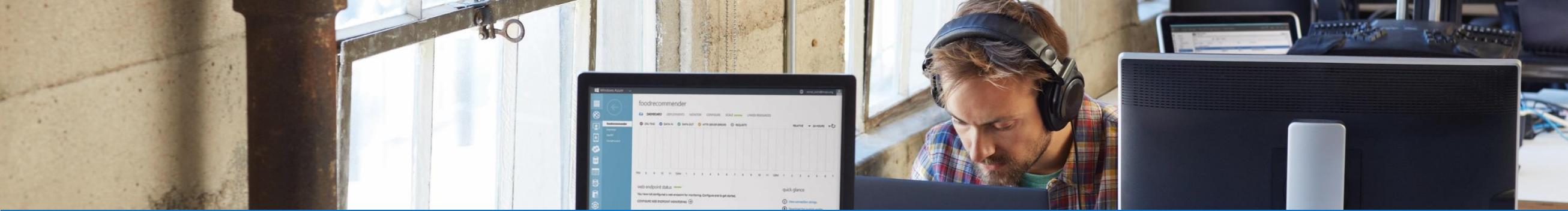
Creating the first Azure Function

# Azure Functions Programming Model

```
public static class SimpleExampleWithOutput
{
    [FunctionName("CopyQueueMessage")]
    public static void Run(
        [QueueTrigger("myqueue-items-source")] string myQueueItem, | Function Trigger
        [Queue("myqueue-items-destination")] out string myQueueItemCopy, | Output Binding
        ILogger log)
    {
        // Business logic goes here.
    }
}
```

**function.json**

```
{
  "generatedBy": "Microsoft.NET.Sdk.Functions-1.0.0.0",
  "configurationSource": "attributes",
  "bindings": [
    {
      "type": "queueTrigger",
      "queueName": "%input-queue-name%",
      "name": "myQueueItem"
    }
  ],
  "disabled": false,
  "scriptFile": "..\\bin\\FunctionApp1.dll",
  "entryPoint": "FunctionApp1.QueueTrigger.Run"
}
```



# Boost development efficiency



## Triggers

Use triggers to define how functions are invoked  
Avoid hardcoding with preconfigured JSON files  
Build serverless APIs using HTTP triggers



## Proxies

Define one API surface for multiple function apps  
Create endpoints as reverse proxies to other APIs  
Condition proxies to use variables



## CI/CD

Save time with built-in DevOps  
Deploy functions using App Service for CI  
Leverage Microsoft, partner services for CD



## Bindings

Connect to data with input and output bindings  
Bind to Azure solutions and third-party services  
Use HTTP bindings in tandem with HTTP triggers



## Local debugging

Debug C# and JavaScript functions locally  
Use debugging tools in Azure portal, VS, and VS Code



## Monitoring

Integrate with Azure Application Insights  
Get near real-time details about function apps  
See metrics around failures, executions, etc.



# Gain flexibility and develop your way



## Multiple languages

Write code in C#, JavaScript, F#, and Java  
Continuous investment in new, experimental languages



## Hosting options

Choose from six consumption plans to run Functions  
Run your first million function executions for free



## Durable Functions

Write stateful functions in a serverless environment  
Simplify complex, stateful coordination problems  
Add the extension to enable advanced scenarios



## Dev options

Simplify coding for new users with native Azure portal  
Select from popular editors, like VS, VS Code, CLI, Maven\*



# Gain flexibility and develop your way

## Hosting options

### Consumption

*Serverless*



Only pay for what you use; charges apply per execution and per GB second

### AS Plan

*Basic, Standard, Premium*



Gain all the advantages of Functions along with Microsoft's financially-backed SLA and the always-on features of an App Service Plan

### AS Environment

*Network isolation*



Use a dedicated App Service cloud environment (ASE) that comes with network isolation for apps, greater scale, and secure connectivity to local vNets

### Azure Stack

*On-premises*



Bring the power of the entire Azure stack to your own data centers

### Runtime

*Functions on your server*



Run Functions on your local server; does not include the entire Azure stack

### IoT Edge

*On devices*



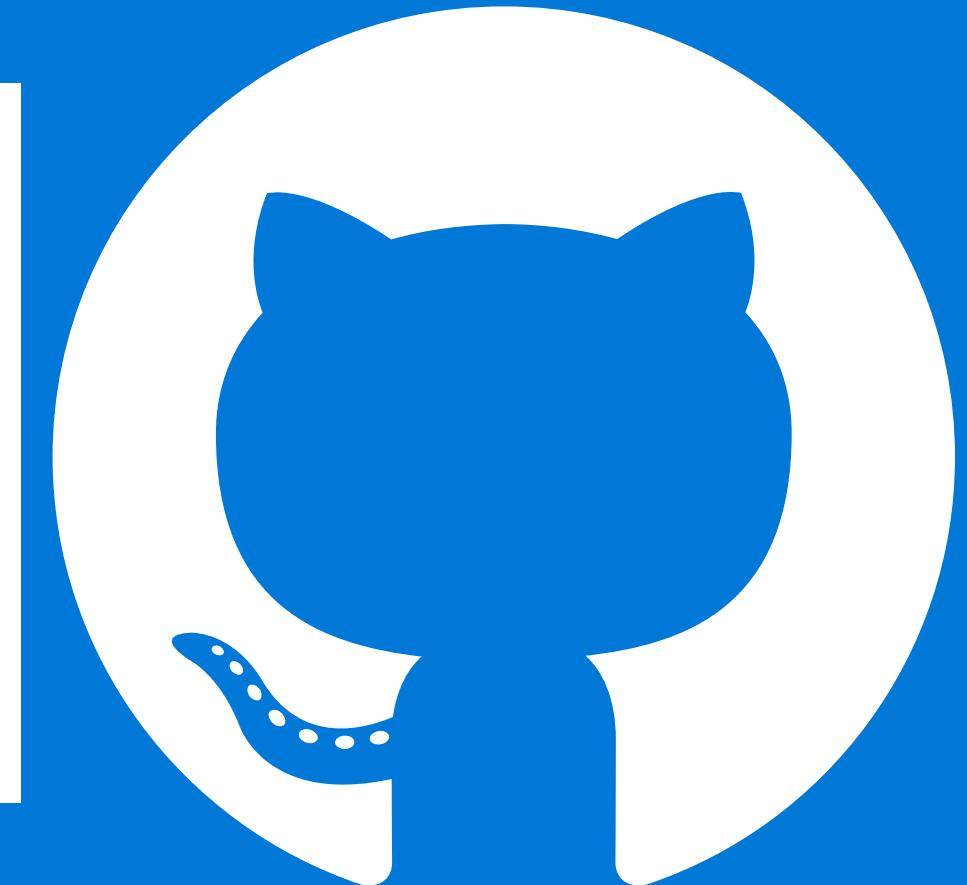
Deploy custom Azure modules on IoT devices

# Azure Functions is an open-source project

Functions runtime and all extensions are fully open source

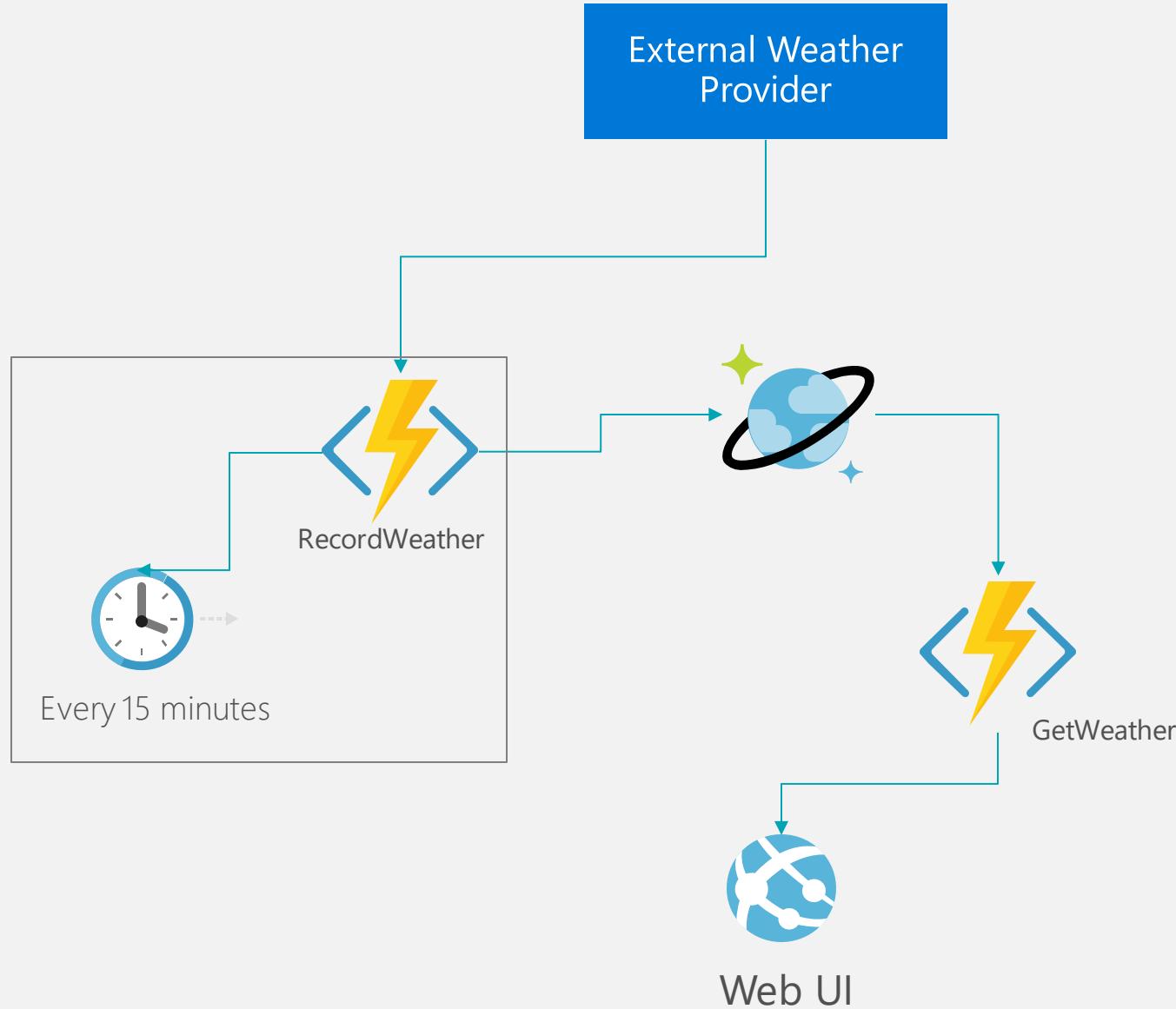
## GitHub repositories

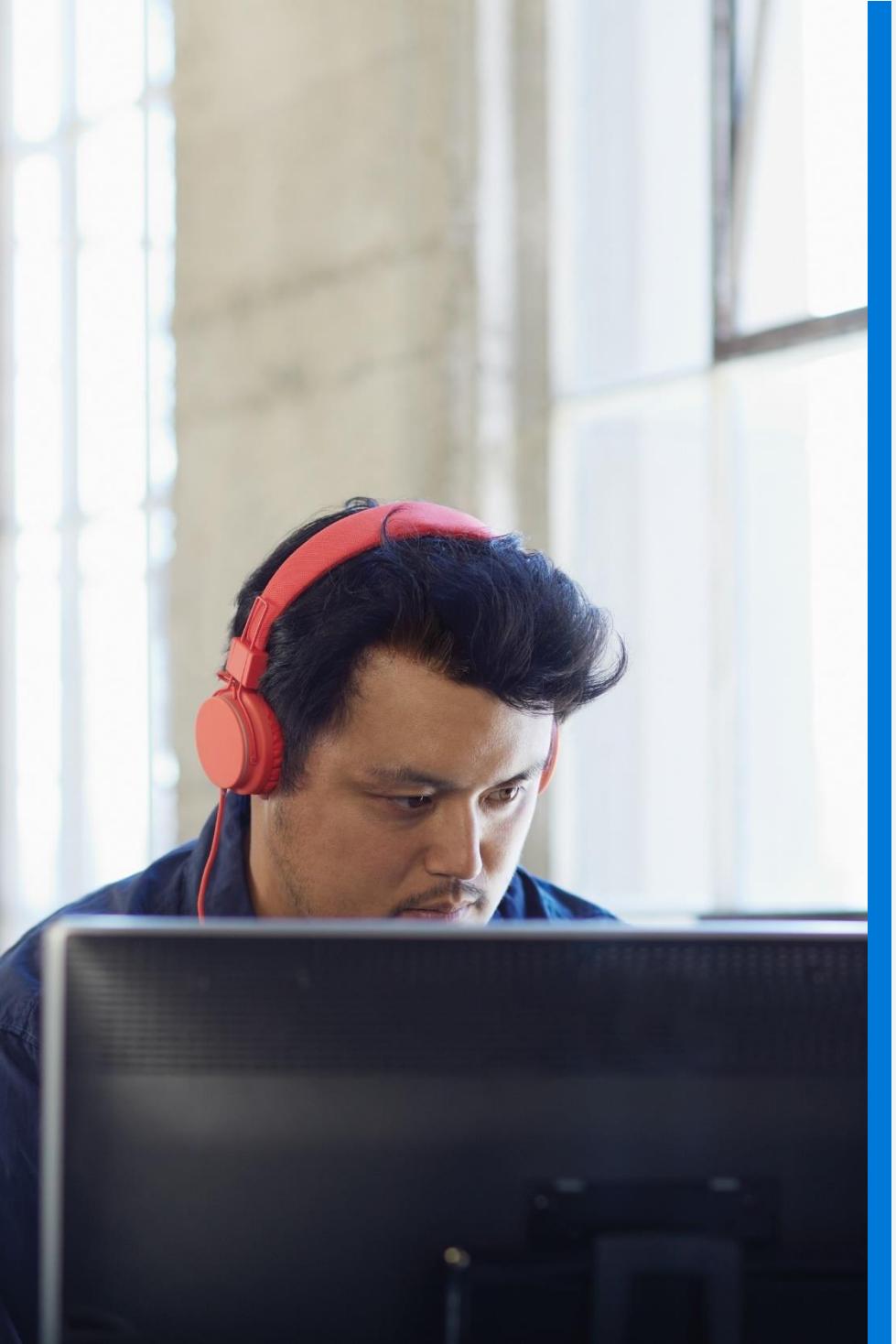
- [Azure Functions Host](#) - the Azure Functions runtime/host
- [Azure WebJobs SDK](#) - the "core" of the Azure Functions runtime and many bindings
- [Azure WebJobs SDK extensions](#) - the repositories of many bindings
- [Durable Functions](#) - the Durable Functions binding extension
- [Durable Functions for JavaScript](#) - the durable-functions npm module
- [Azure Functions Core Tools](#) - the command line tool for Azure Functions
- [Azure Functions NodeJS Worker](#) - support for running JavaScript functions
- [Azure Functions Java Worker](#) - support for running Java functions
- [Azure Functions Python Worker](#) - support for running Python functions
- [Azure Functions UX](#) - the UX for the Functions development portal
- [Azure Functions templates](#) - the templates which show up in the Azure Functions portal, Visual Studio, Visual Studio Code, etc
- [Azure Functions samples](#) - repository for some samples on how the runtime works
- [Azure Functions VS Tooling](#) - msbuild tasks for precompiled functions



<https://github.com/Azure/Azure-Functions>

# Demo 2



A photograph of a young man with dark hair and a beard, wearing a blue shirt and red headphones, looking down at a computer monitor. He is positioned on the left side of the slide, with a vertical blue bar separating him from the text on the right.

# Sample scenarios for Functions

[Web](#) application backends

[Mobile](#) application backends

[IoT-connected](#) backends

[Conversational bot](#) processing

Real-time [file](#) processing

Real-time [stream](#) processing

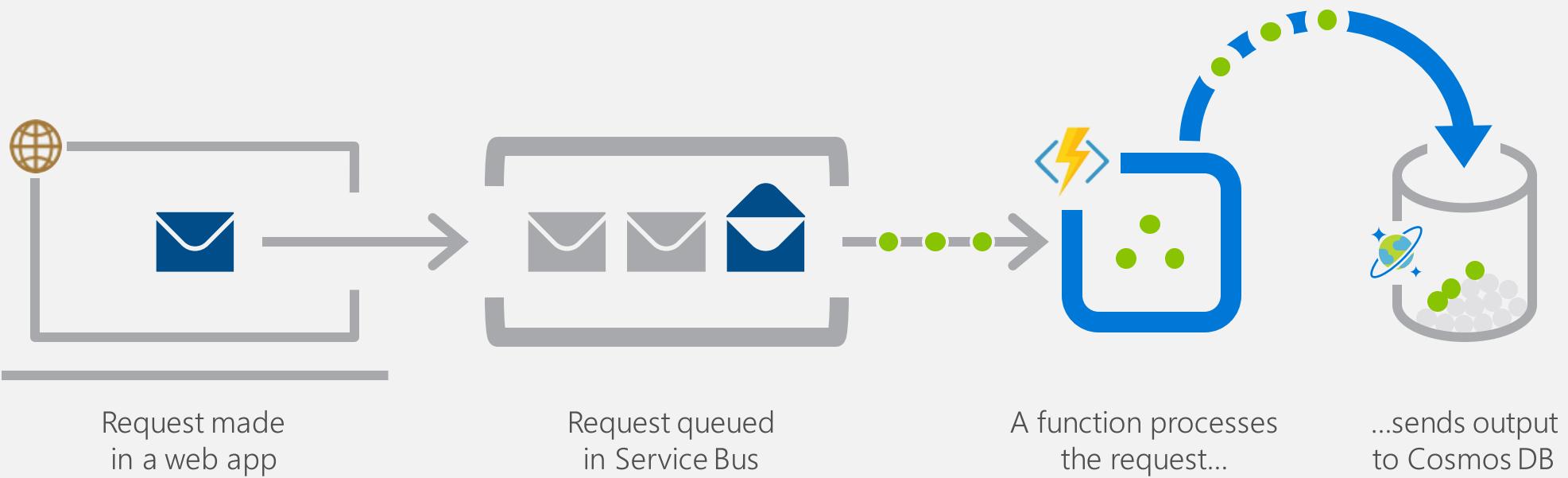
Automation of [scheduled tasks](#)

[Extending SaaS](#) Applications

## Scenario Example

### Retail

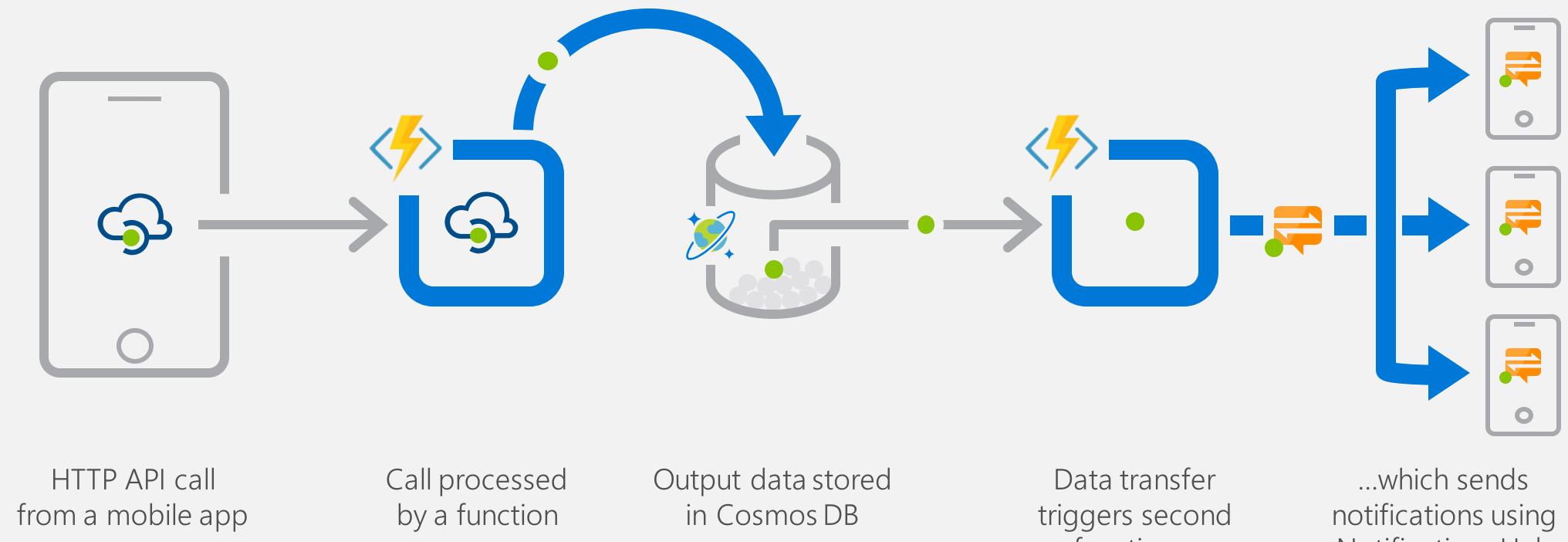
Online orders are picked up from a queue, processed and the resulting data is stored in a database.

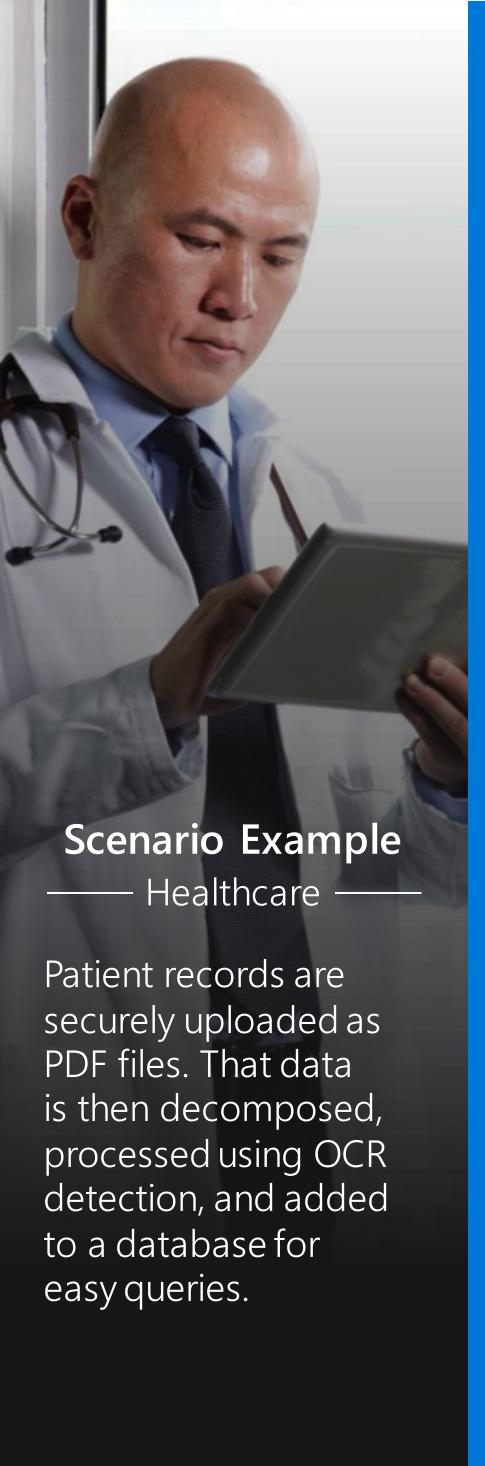




**Scenario Example**  
— Financial Services —  
  
Colleagues use mobile banking to reimburse each other for lunch: the person who paid for lunch requests payment through his mobile app, triggering a notification on his colleagues' phones.

# Mobile application backends





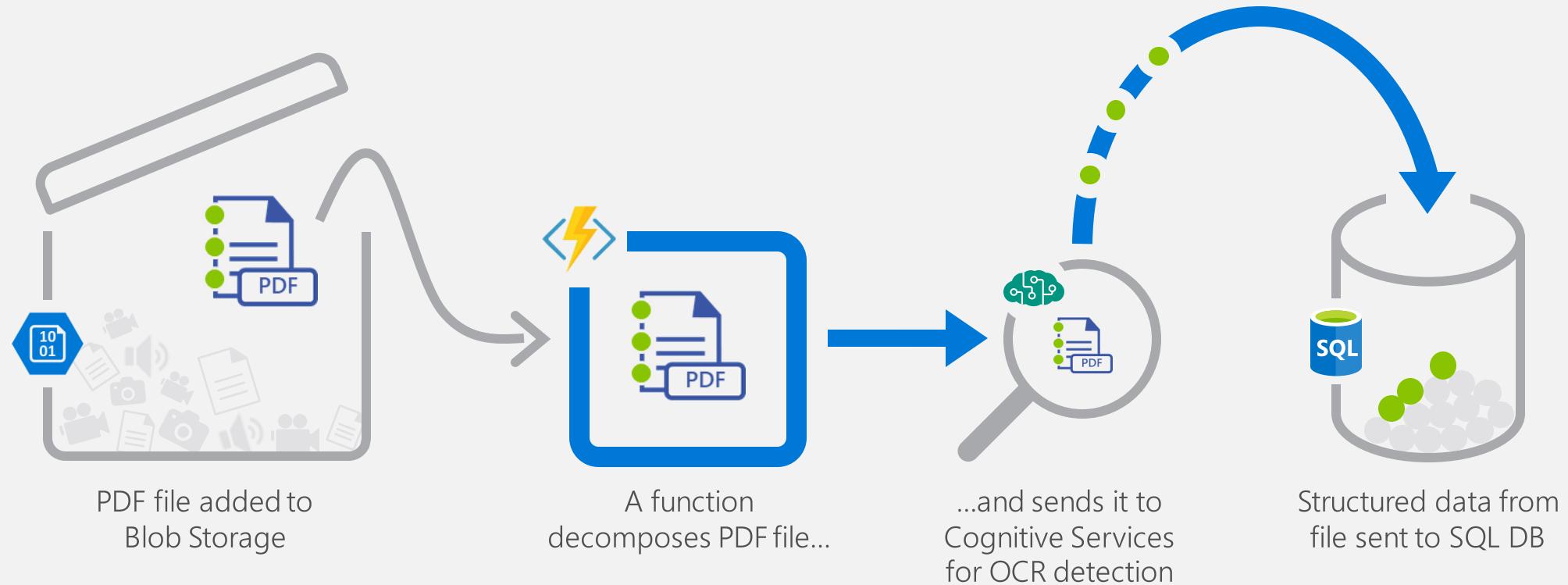
## Scenario Example

---

Healthcare

Patient records are securely uploaded as PDF files. That data is then decomposed, processed using OCR detection, and added to a database for easy queries.

# Real-time file processing



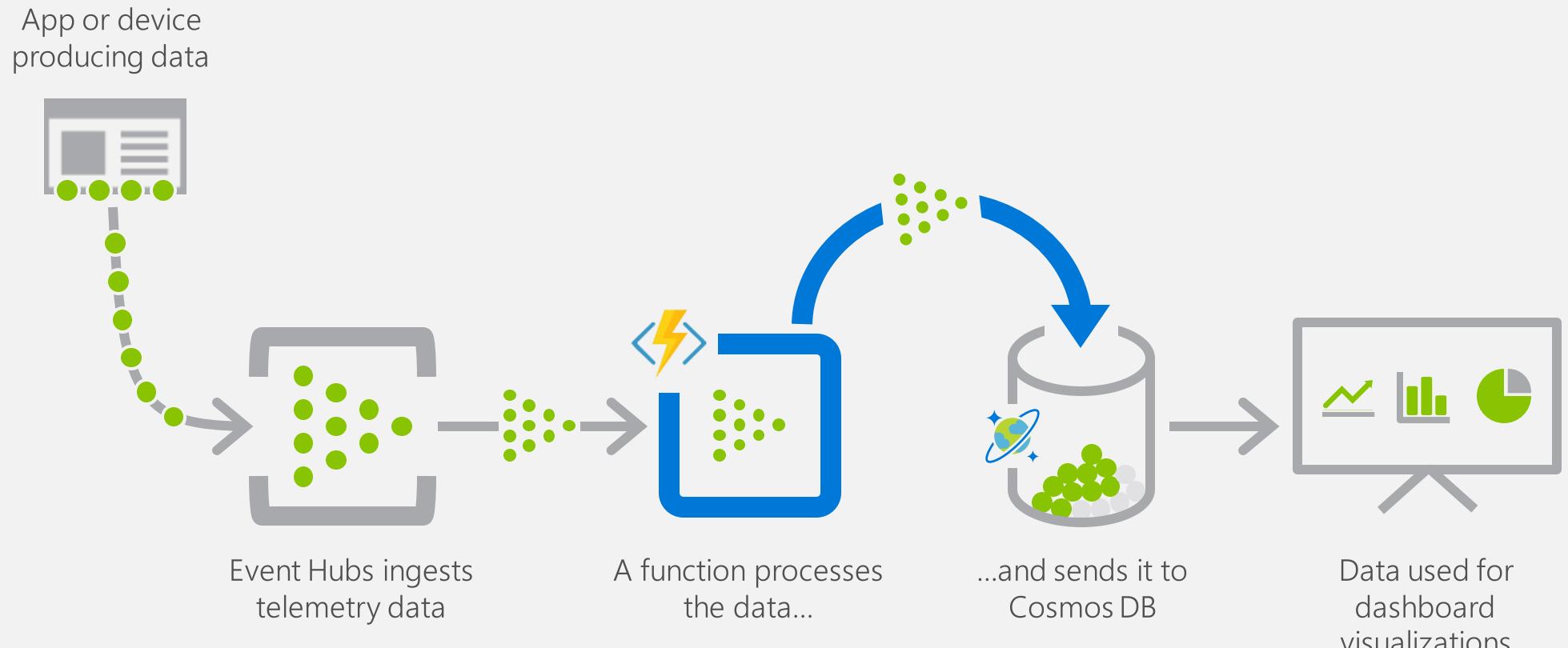
# Real-time stream processing



## Scenario Example

ISV

Huge amounts of telemetry data is collected from a massive cloud app. That data is processed in near real-time and stored in a DB for use in an analytics dashboard.



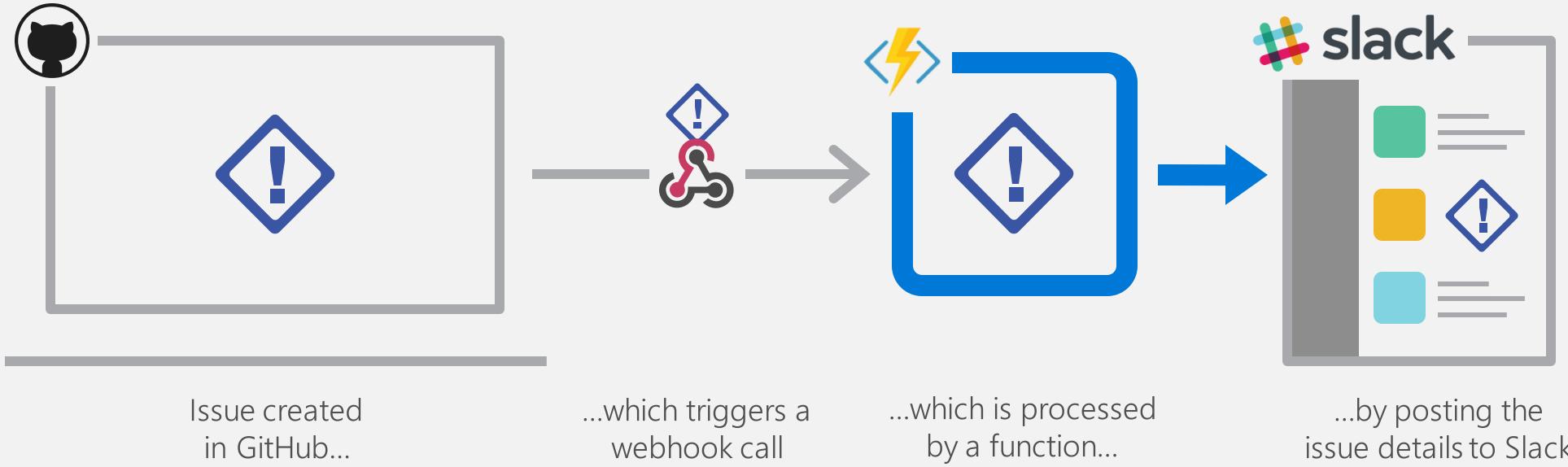
## Scenario Example

—Professional Services—

A SaaS solution provides extensibility through webhooks, which can be implemented through Functions, to automate certain workflows.



# Extending SaaS applications





FUJIFILM Software, the software arm of the multinational photography and imaging company, started using Functions to develop its file management solution, called IMAGE WORKS, in separate service units. This, along with implementing microservices with Functions, boosted the solution's stability and helped FUJIFILM cut development time for new functions by 75%.

“ A long development and build period can lead to missed business opportunities. So Azure deserves high praise for helping us get to a fully validated release in six months. ”

Daichi Hayata  
Design Leader  
Advanced Solutions Group, IMAGE WORKS Team  
FUJIFILM Software

<https://customers.microsoft.com/en-us/story/fujifilm-manufacturing-azure-ai-functions-japan>

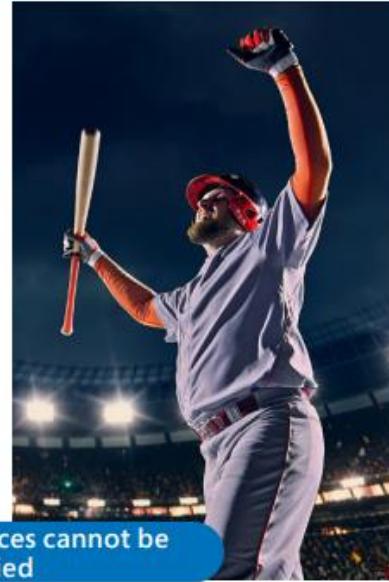


# Nippon Professional Baseball Organization (NPB) using IMAGE WORKS

ファイル名	フォルダ名	作成者	ランク	その他	操作
	未分類	すべての画像から選択	<input checked="" type="checkbox"/> 打撃	<input type="checkbox"/> オスコット	日付変更
	未分類	すべての画像から選択	<input checked="" type="checkbox"/> 打撃	<input type="checkbox"/> デアリーター	日付変更
	未分類	すべての画像から選択	<input checked="" type="checkbox"/> 打撃	<input type="checkbox"/> テリエニ	日付変更

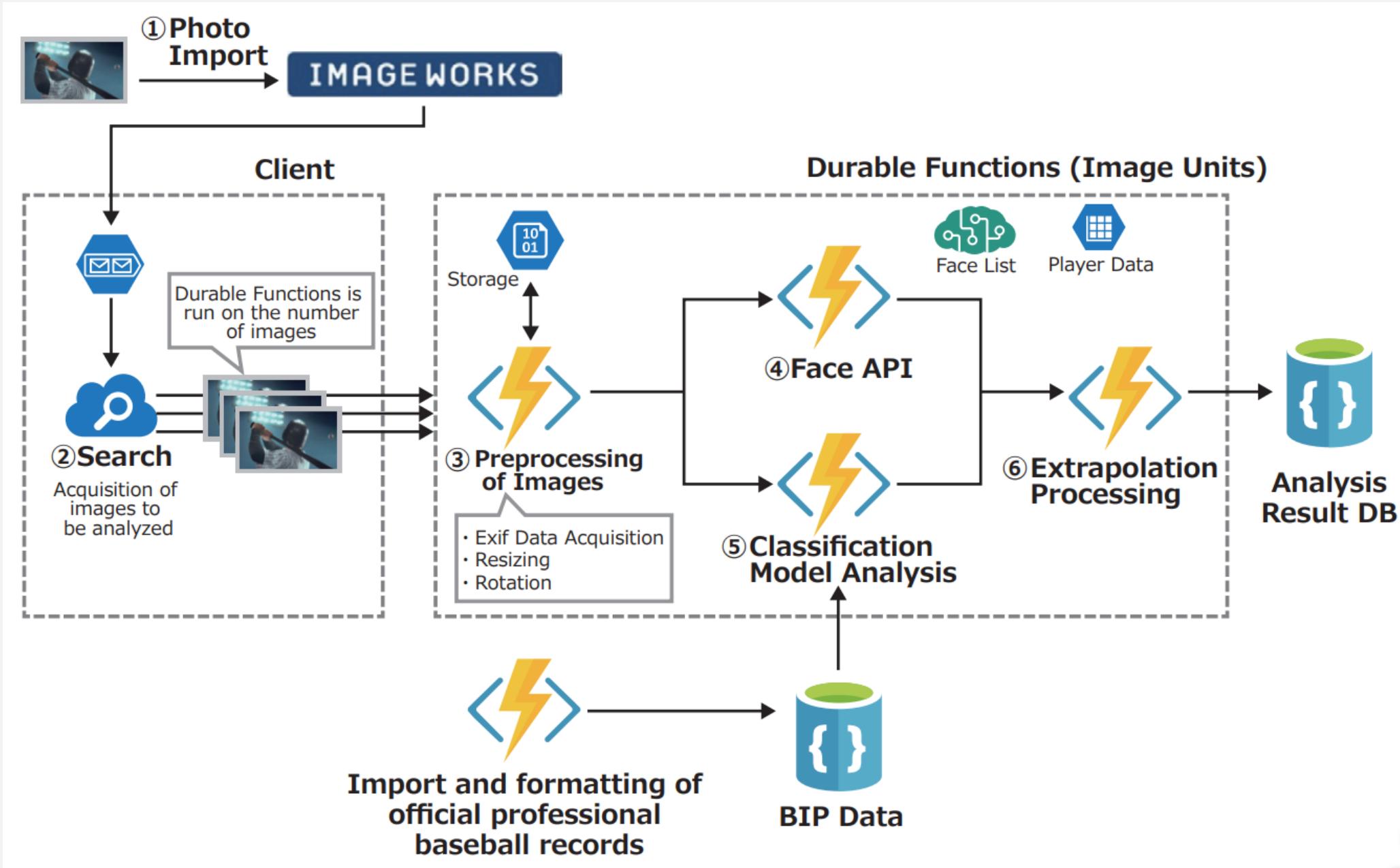


## Samples where faces cannot be identified

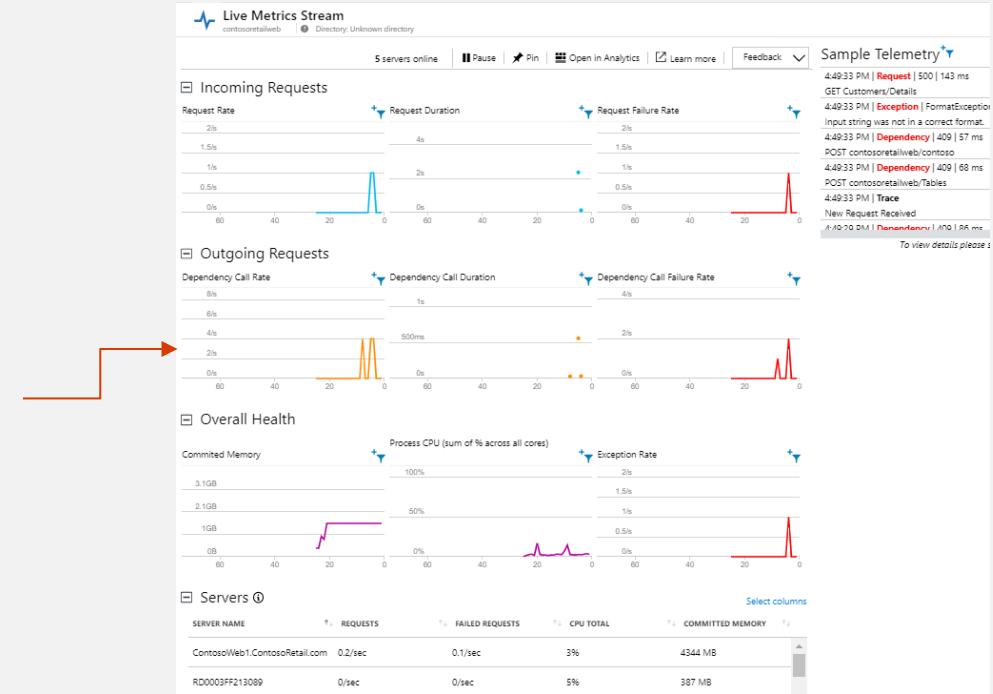
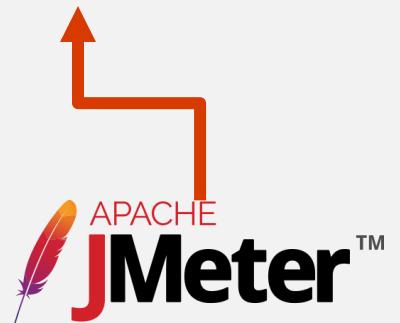
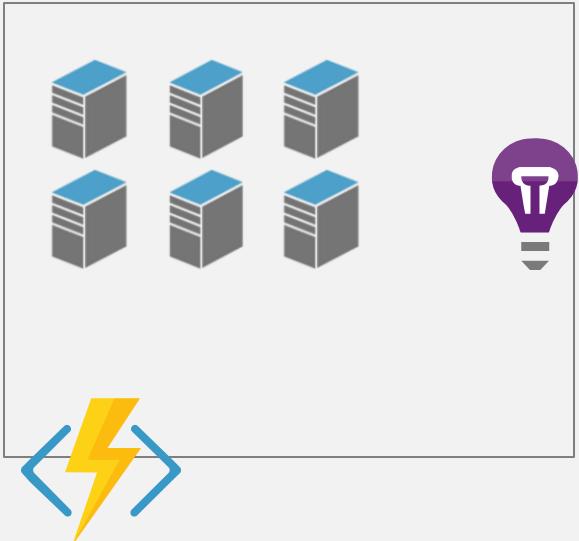


## Samples where numbers cannot be identified





# Demo 3



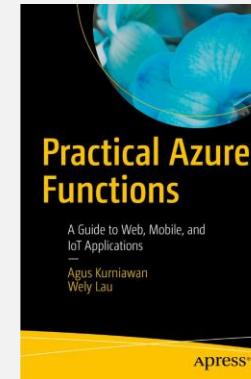
<http://www.geekwire.com/2017/serverless-nirvana-microsoft-azure-cto-mark-russinovich-future-cloud/>

Azure CTO's thought?



# Learn More

- Azure Functions Doc
  - <https://docs.microsoft.com/en-us/azure/azure-functions/>
- Book: Practical Azure Functions
  - <https://aka.ms/paf-book>
  - To learn Azure Functions in practical way with the step by step guide
- Sample Code:
  - <https://github.com/wely/WeatherServiceSolution>
- Case studies:
  - <https://microsoft.github.io/techcasestudies/#technology=Azure%20Functions&sortBy=featured>



# Thank you!

Wely Lau  
Sr Cloud Solution Architect  
Microsoft APAC