Microsoft

Azure Functions - Principles, Patterns and Practices

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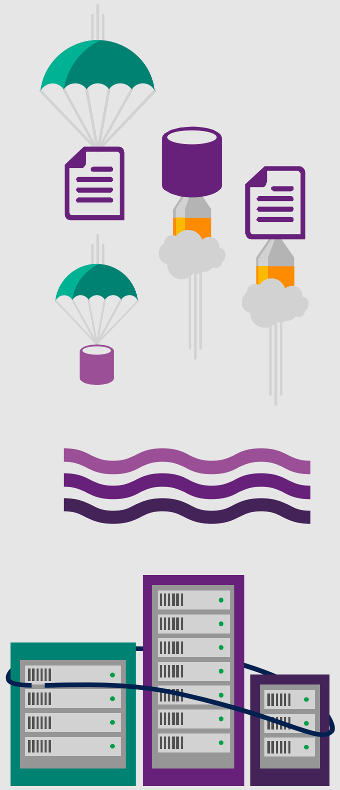
Agenda

- Security
- Best Practices
- Performance

What is serverless?

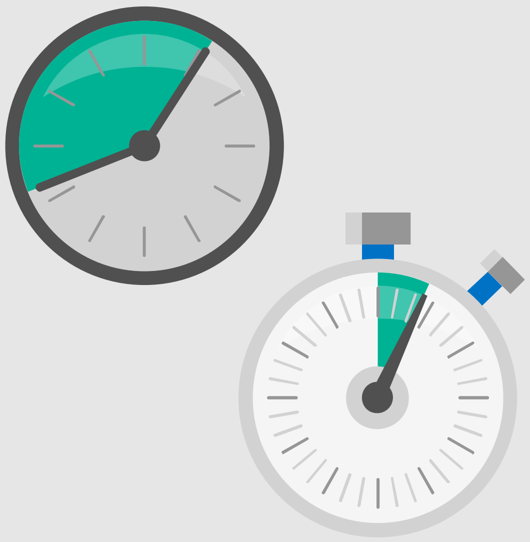


Abstraction of servers

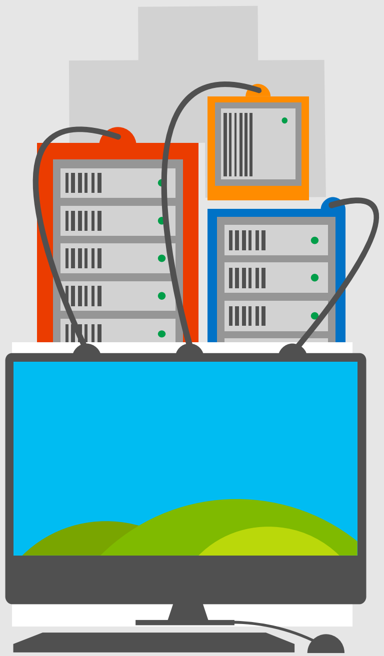
Event-driven scale

Sub-second billing

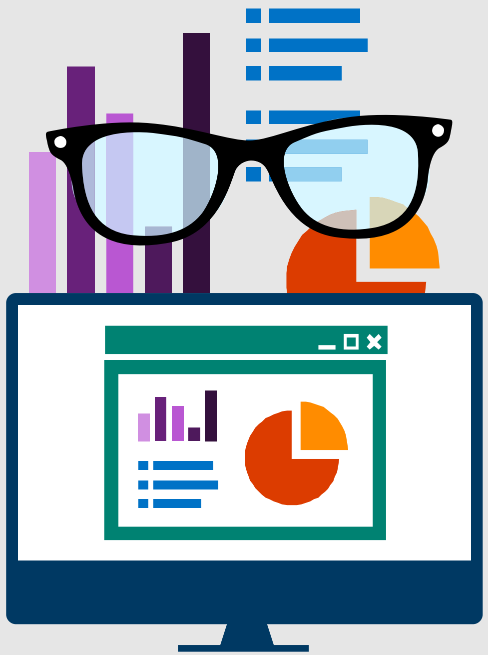
Benefits



Micro-pricing

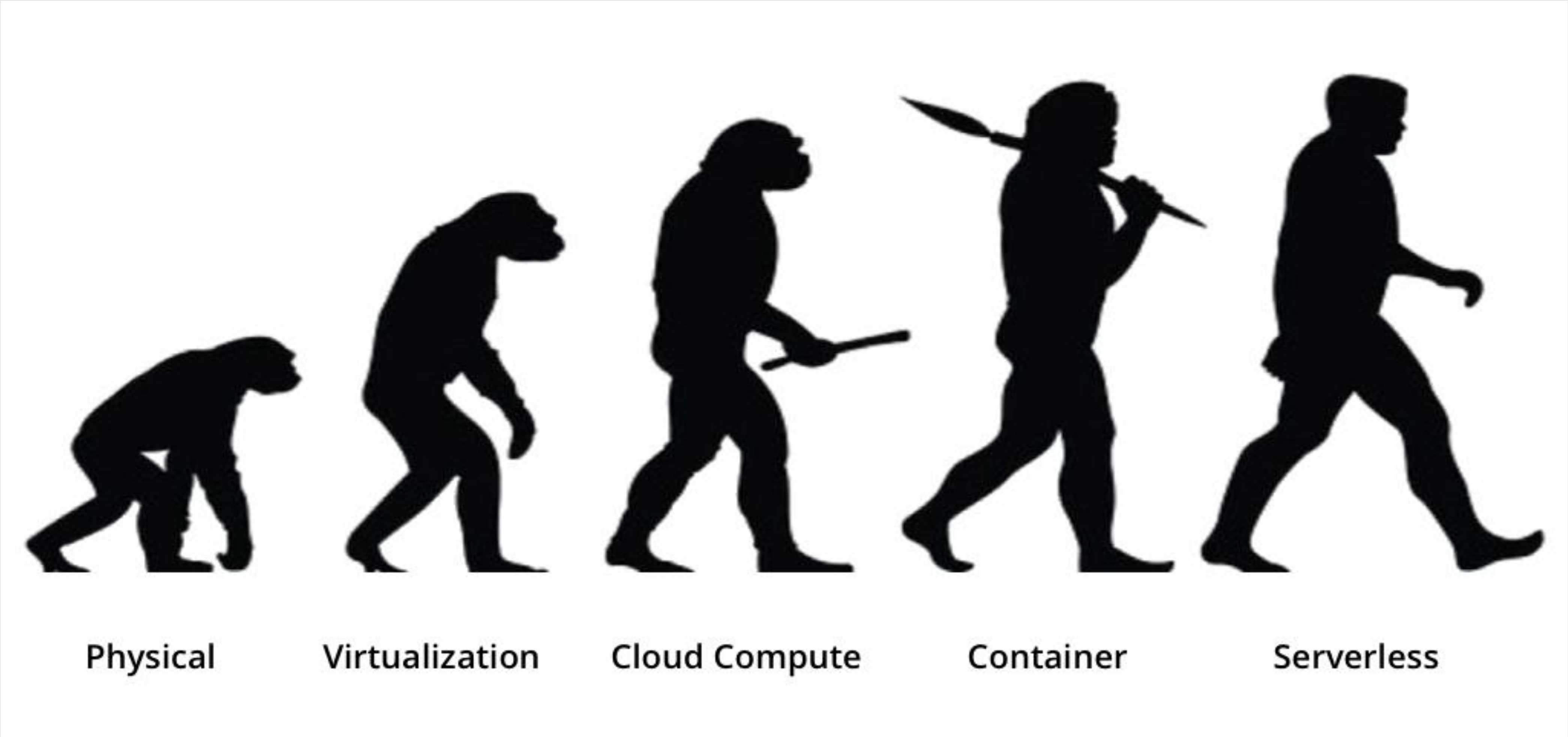


Ease of scale

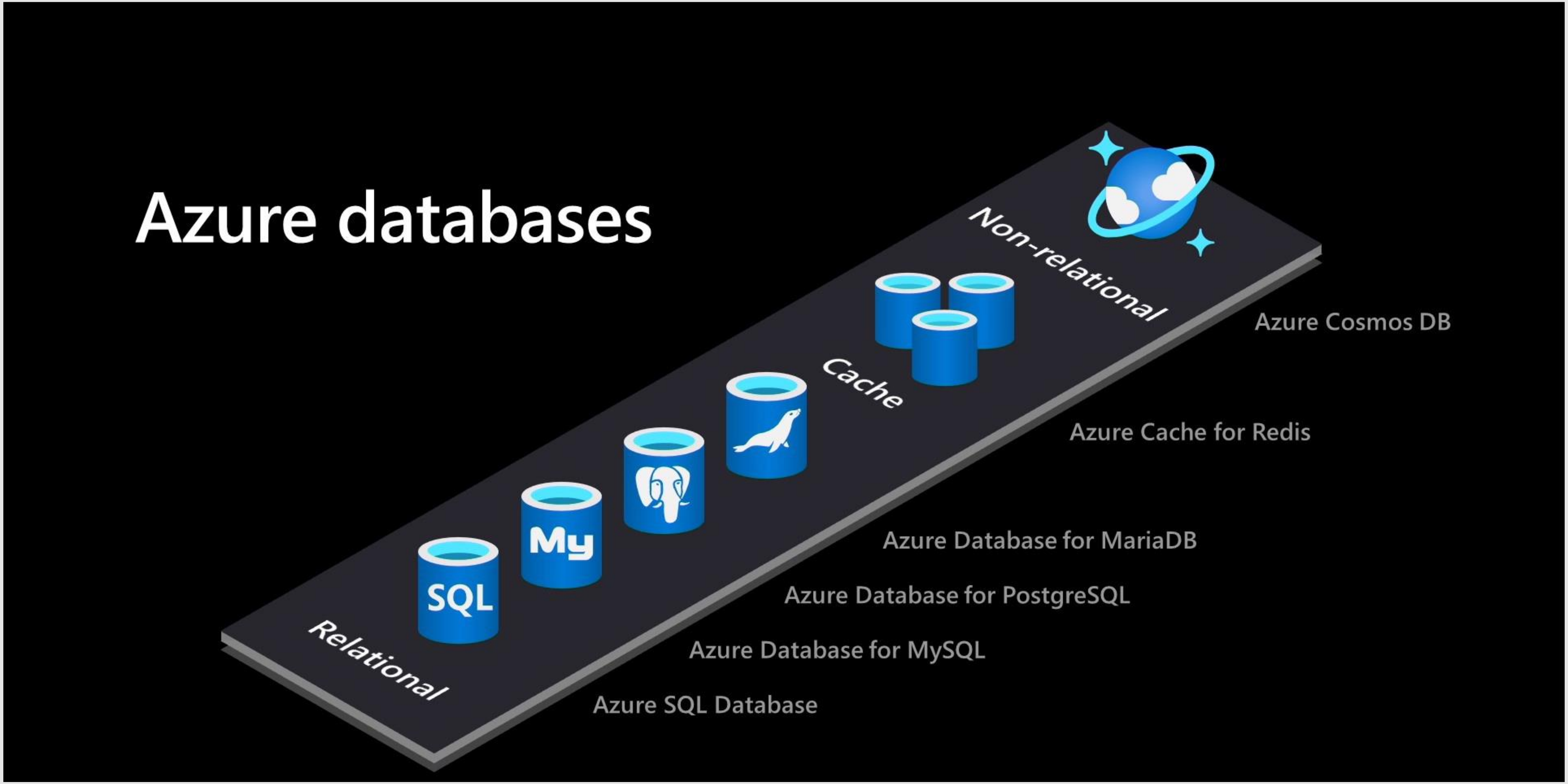


Business Focus

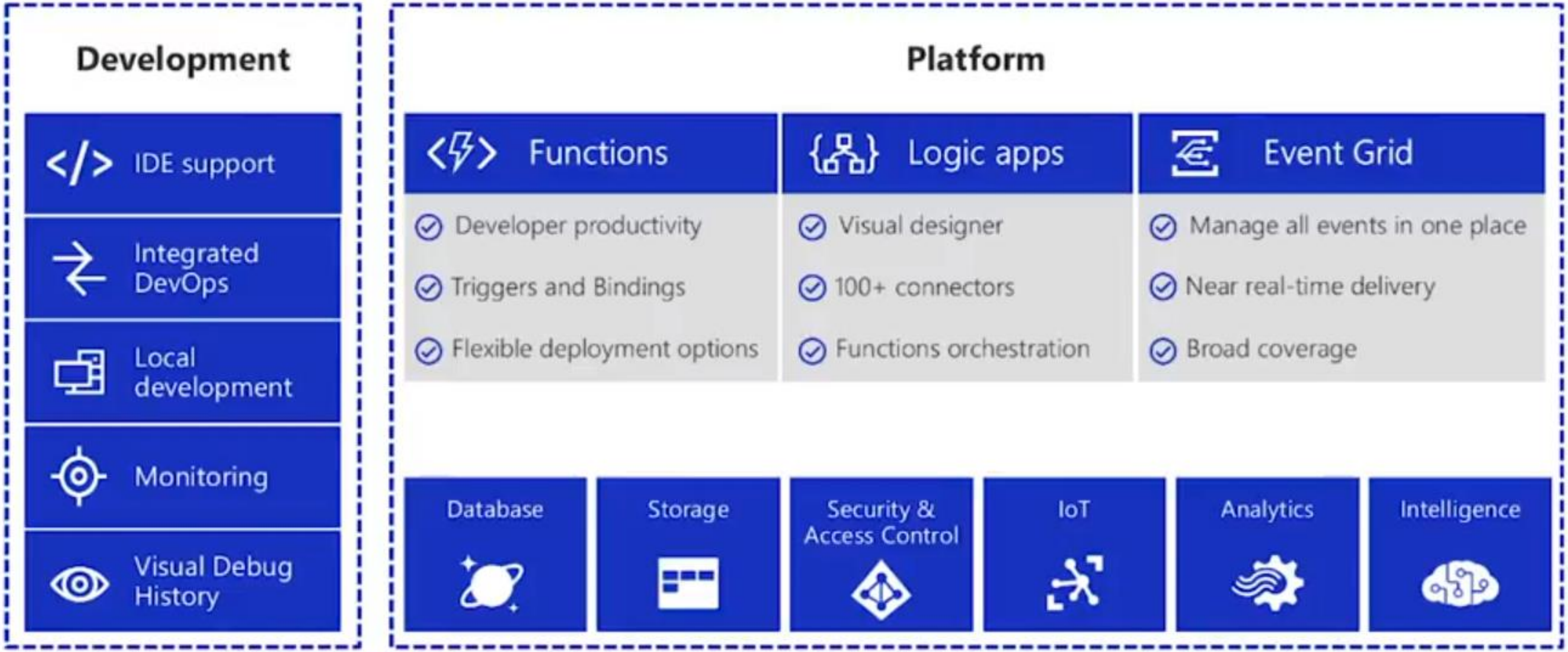
Serverless is the natural evolution



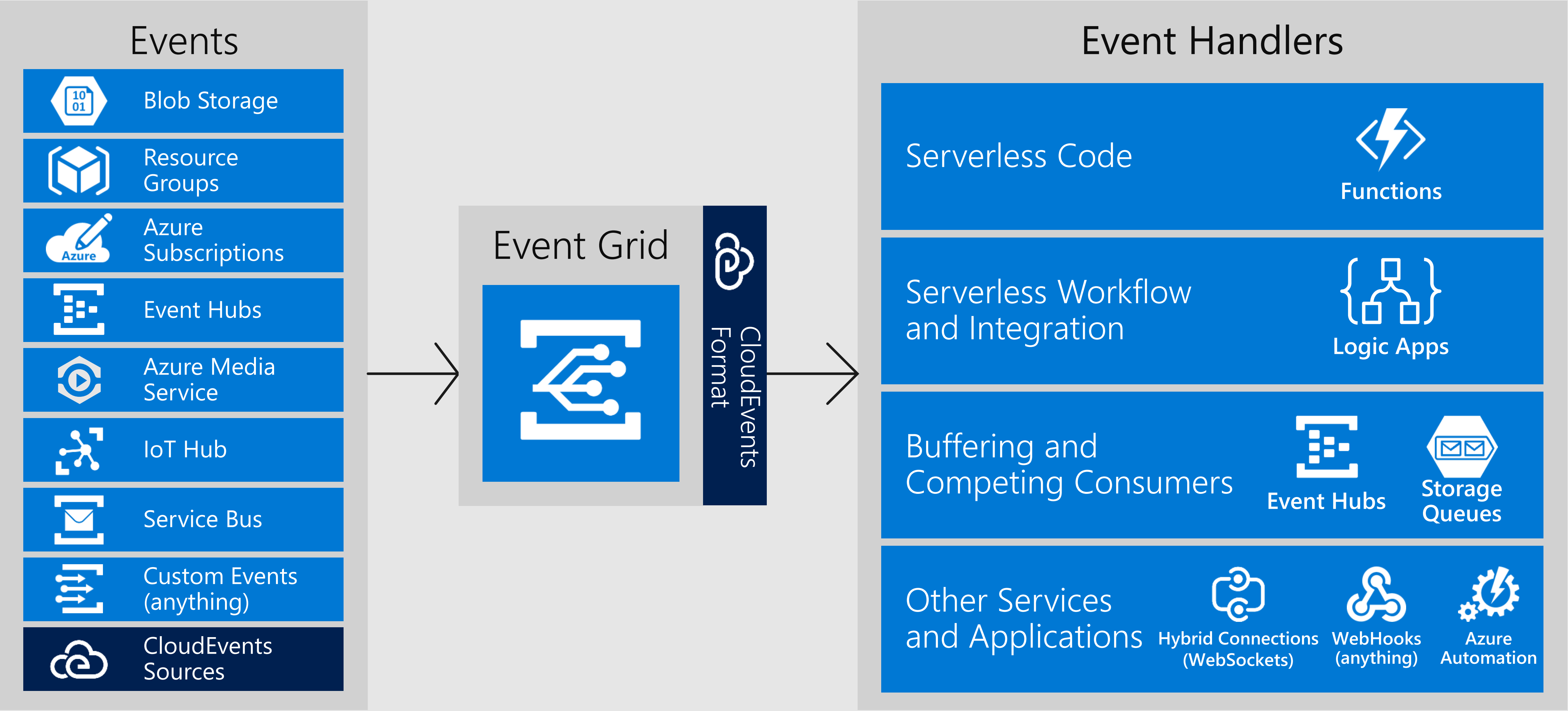
PaaS / Serverless Databases



Serverless on Azure



Event grid in action



Azure Functions

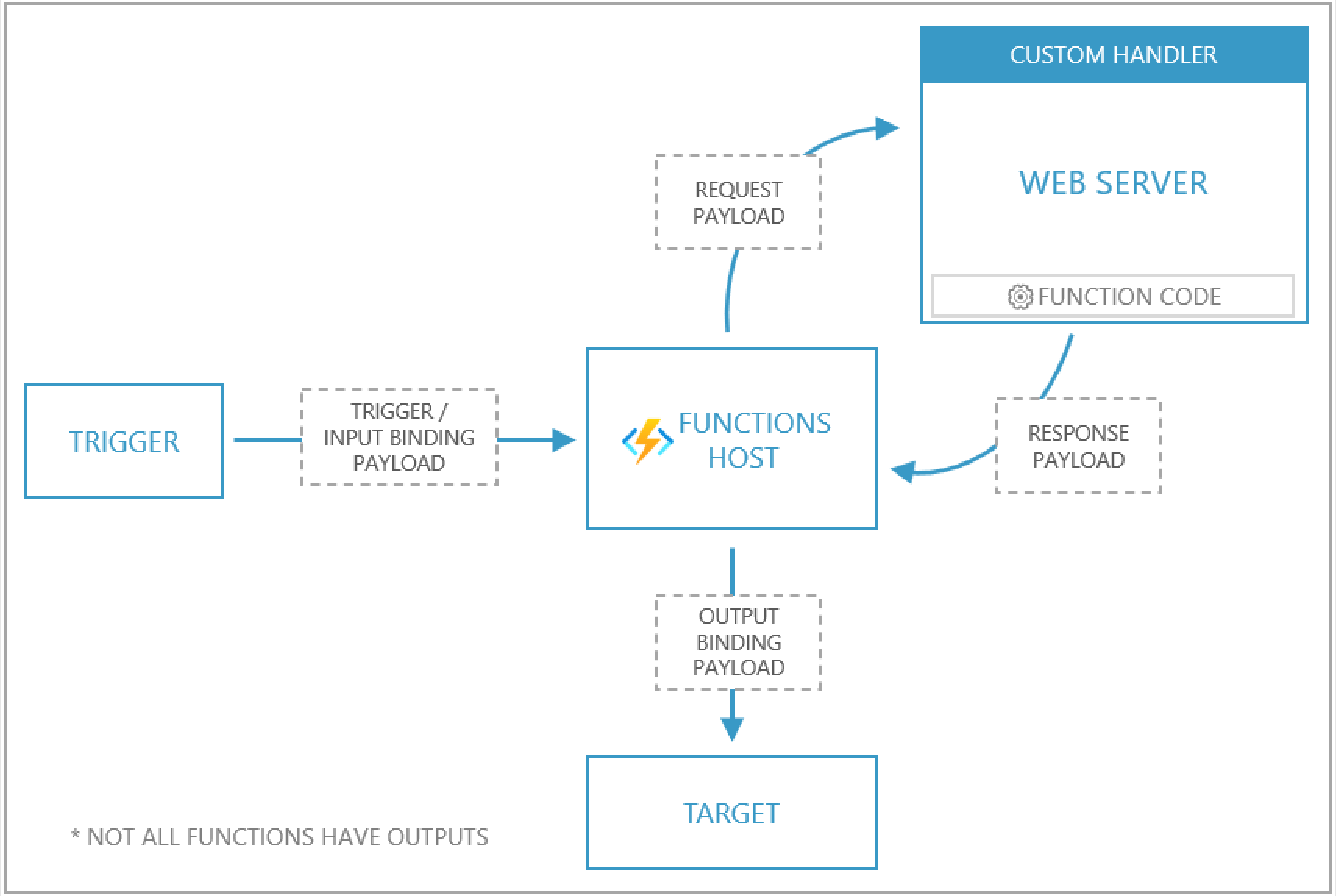
Bindings and triggers

Type	1.x	2.x and higher[1]	Trigger	Input	Output
Blob storage	✓	✓	✓	✓	✓
Cosmos DB	✓	✓	✓	✓	✓
Event Grid	✓	✓	✓		✓
Event Hubs	✓	✓	✓		✓
HTTP & webhooks	✓	✓	✓		✓
IoT Hub	✓	✓	✓		✓
Microsoft Graph Excel tables		✓		✓	✓
Microsoft Graph OneDrive files		✓		✓	✓
Microsoft Graph Outlook email		✓			✓
Microsoft Graph events		✓	✓	✓	✓
Microsoft Graph Auth tokens		✓		✓	
Mobile Apps	✓			✓	✓
Notification Hubs	✓				✓
Queue storage	✓	✓	✓		✓
SendGrid	✓	✓			✓
Service Bus	✓	✓	✓		✓

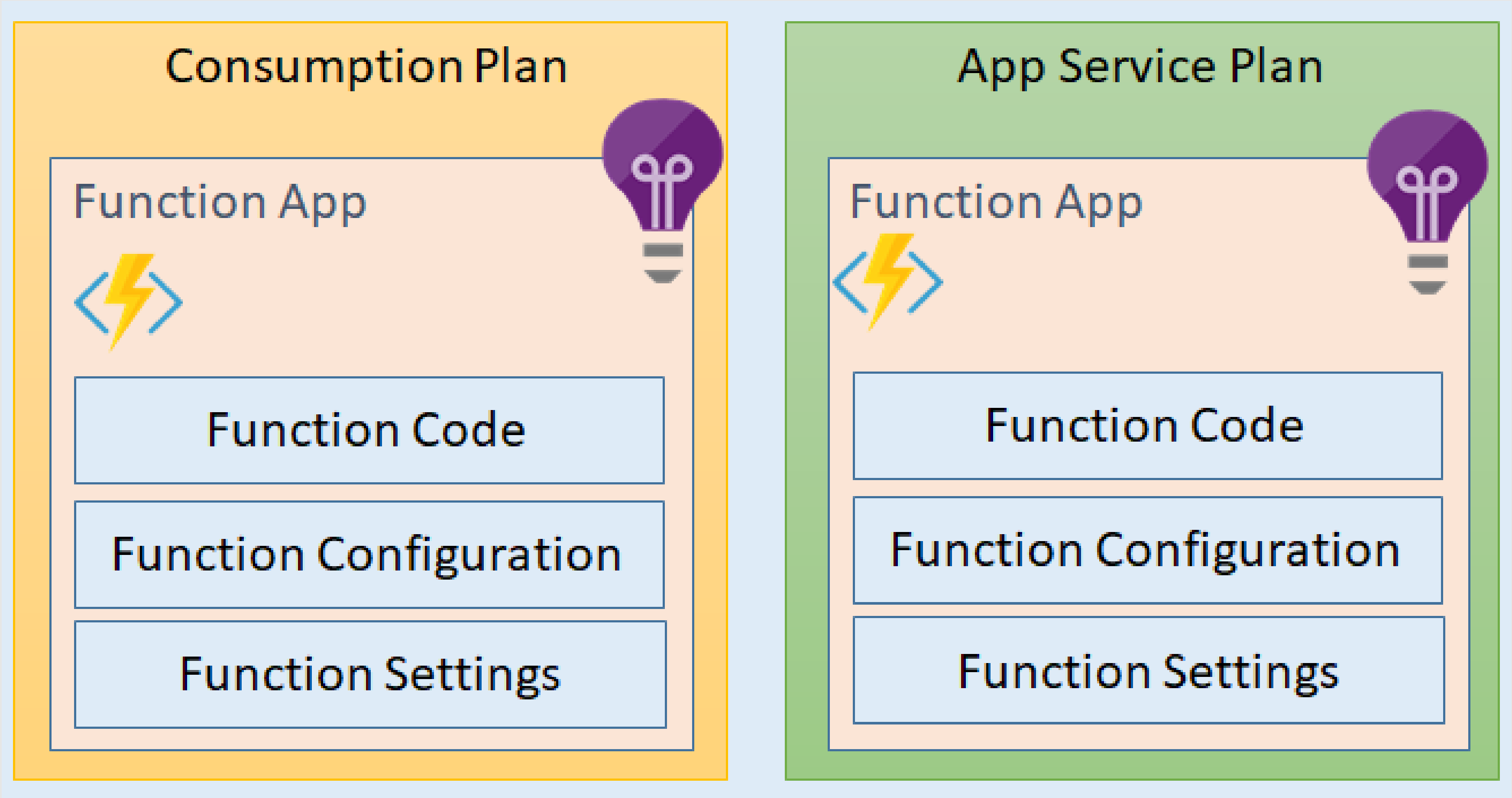
Programming Languages

Language	1.x	2.x	3.x
C#	GA (.NET Framework 4.7)	GA (.NET Core 2.2)	GA (.NET Core 3.1)
JavaScript	GA (Node 6)	GA (Node 8 & 10)	GA (Node 10 & 12)
F#	GA (.NET Framework 4.7)	GA (.NET Core 2.2)	GA (.NET Core 3.1)
Java	N/A	GA (Java 8)	GA (Java 8)
PowerShell	N/A	GA (PowerShell Core 6)	GA (PowerShell Core 6)
Python#python-version	N/A	GA (Python 3.6 & 3.7)	GA (Python 3.6, 3.7, & 3.8)
TypeScript	N/A	GA[1]	GA[1]

Custom handlers

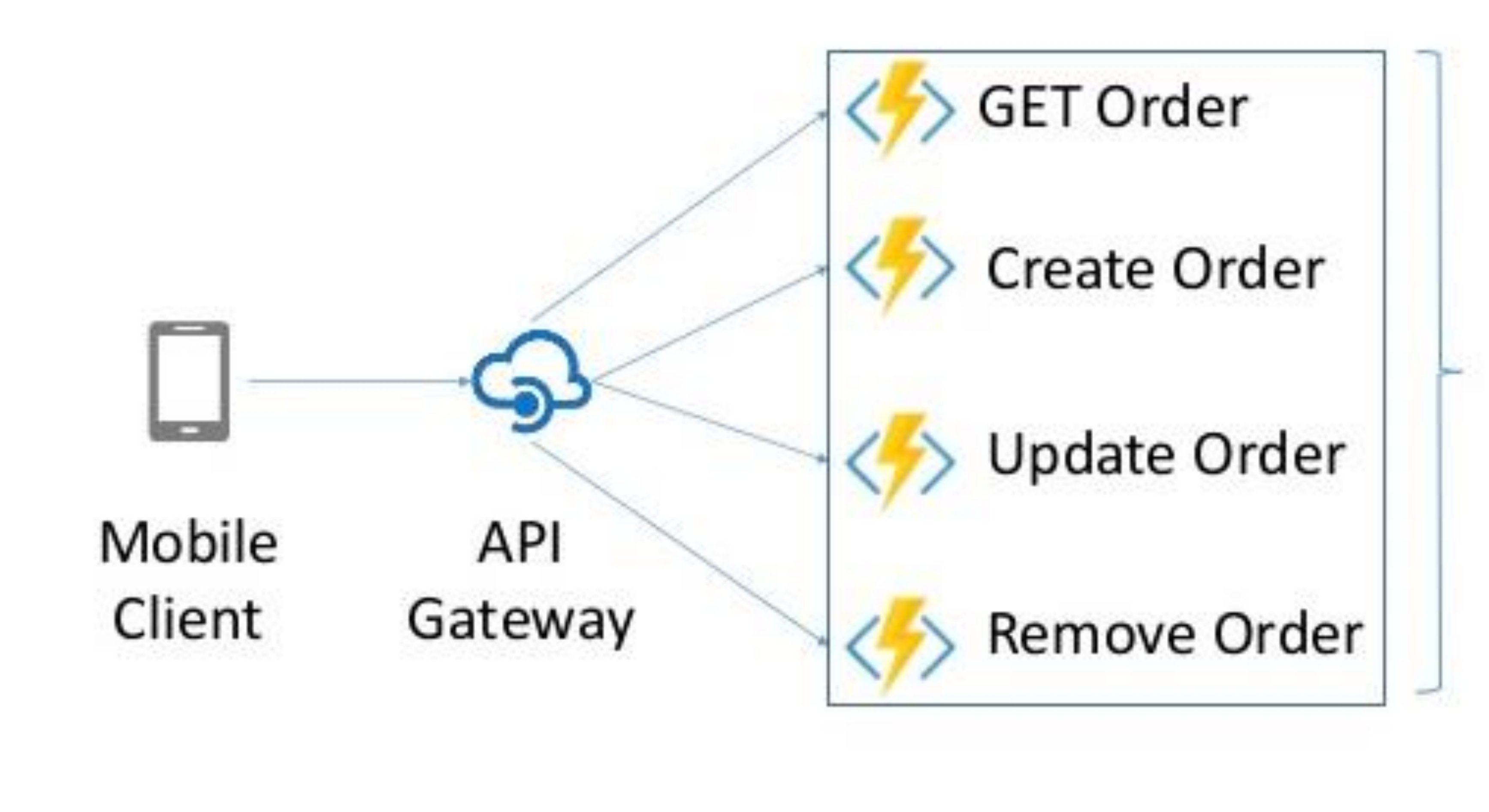


Consumption / App Service Plan



Security

API Gateway

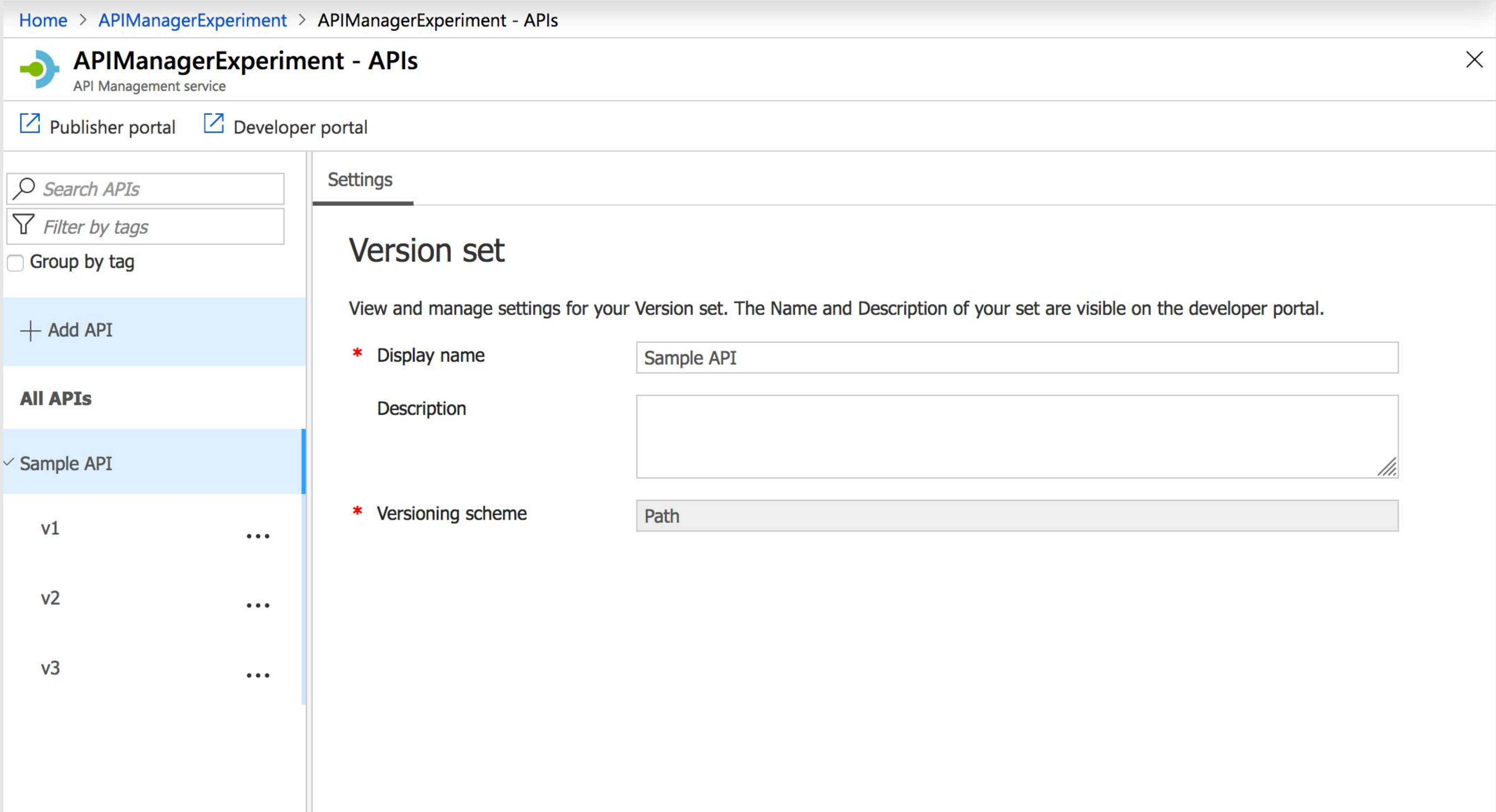


GET Order
Create Order
Update Order
Remove Order
Mobile Client
API Gateway

API Gateway

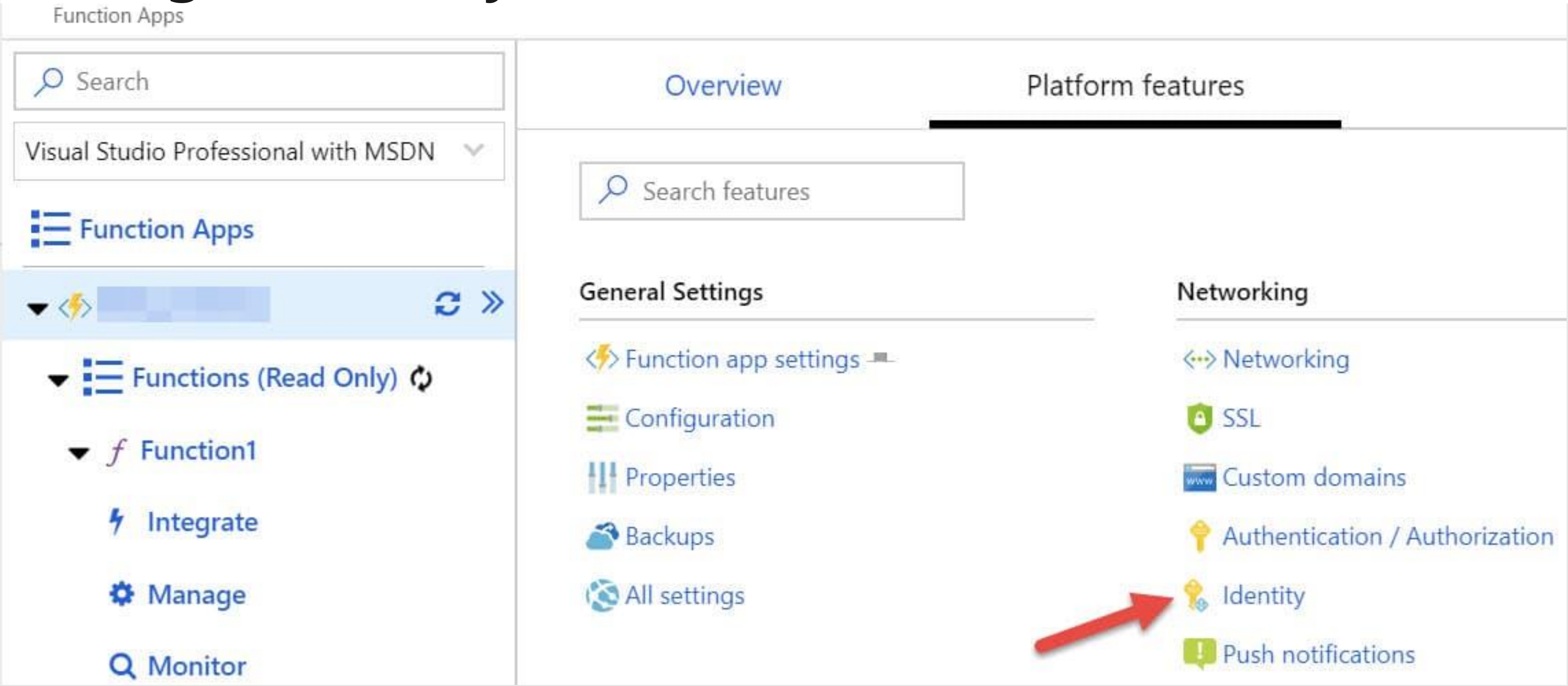
- Block unauthorized requests
- Block requests based on IP-Address
- Logging / Audit
- Authentication / Authorization
- Encryption in-transit

Versioning

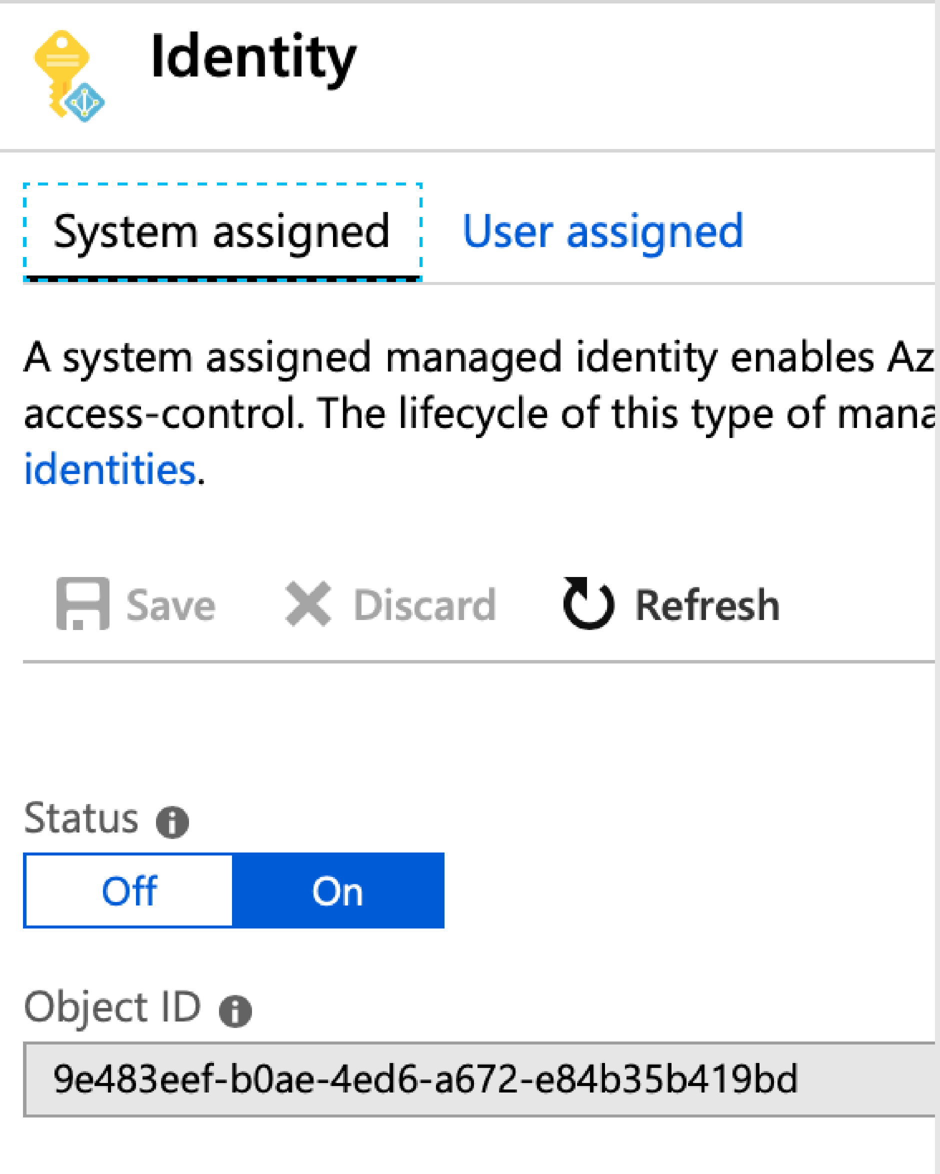


Home > APIManagerExperiment > APIManagerExperiment - APIs
APIManagerExperiment - APIs
API Management service
Publisher portal
Developer portal
Search APIs
Filter by tags
Group by tag
Add API
All APIs
Sample API
v1
v2
v3
Settings
Version set
View and manage settings for your Version set. The Name and Description of your set are visible on the developer portal.
* Display name
Sample API
Description
* Versioning scheme
Path

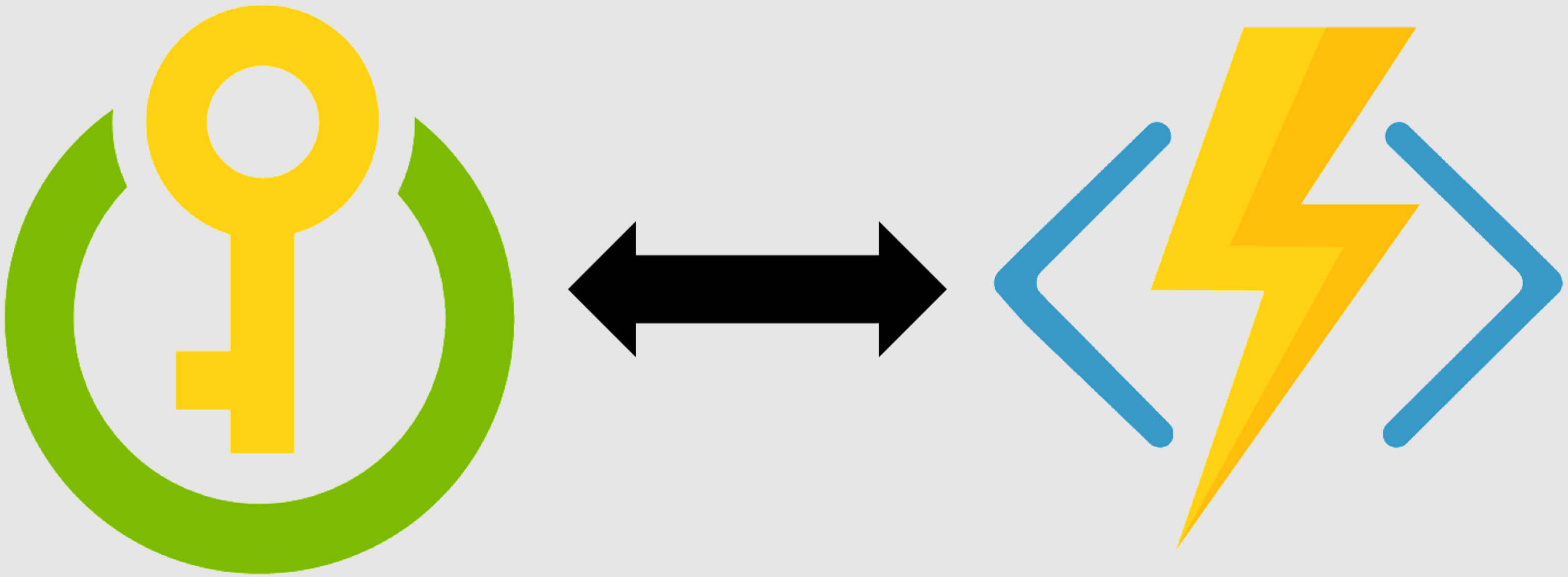
Managed Identity



Managed Identity



Key Vault



Read from Key Vault

Refresh Save Discard

Application settings are encrypted at rest and transmitted over an encrypted channel. You can choose to display them in plain text in your browser by using the controls below. Application Settings are exposed as environment variables for access by your application at runtime. Learn more

New application setting Show values Advanced edit Filter

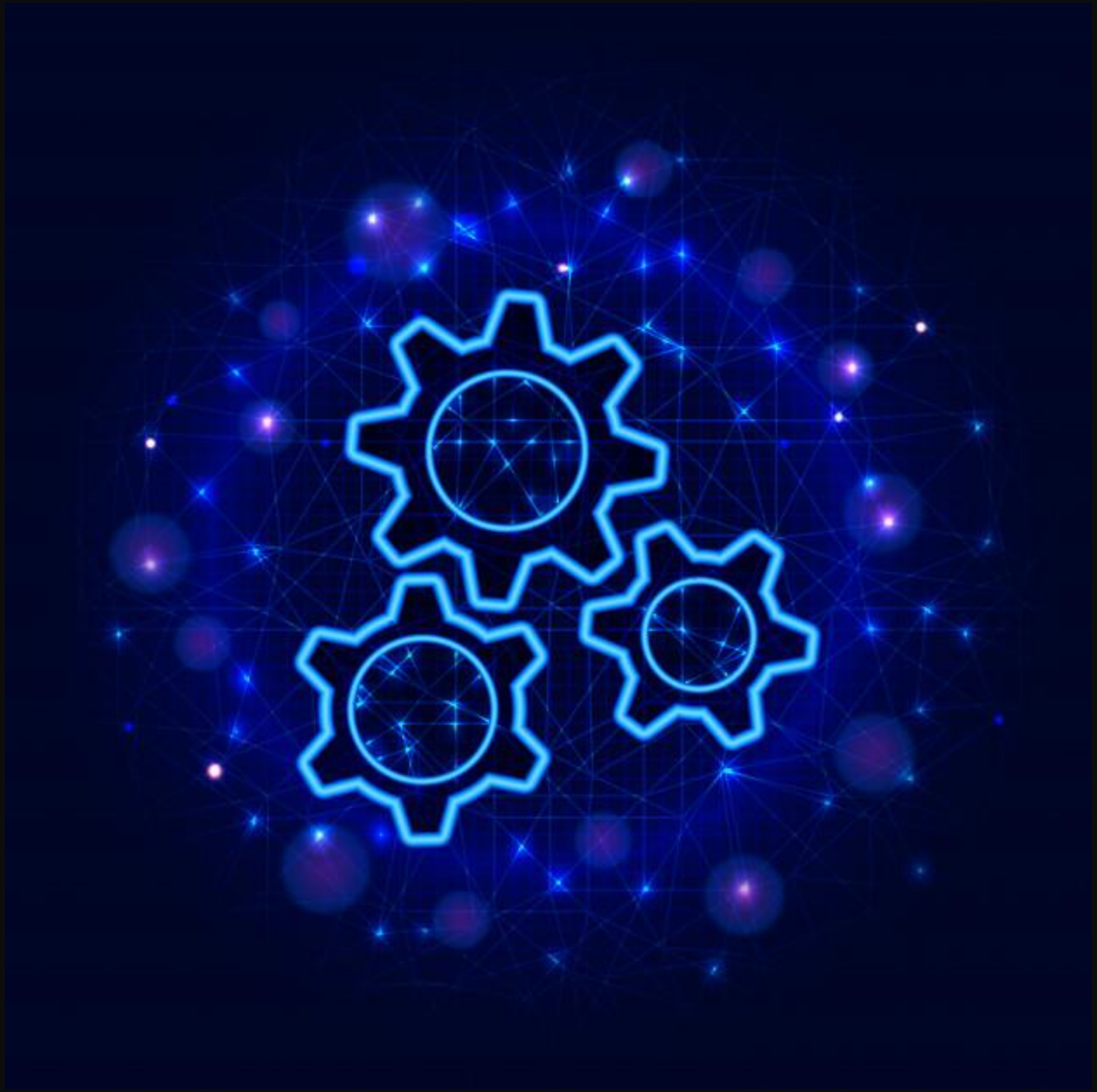
Name	Value	Source	Deployment slot setting	Delete	Edit
APPINSIGHTS_INSTRUMENTATIONKEY	Hidden value. Click show values button above to view	App Config			
APPLICATIONINSIGHTS_CONNECTION_STRING	Hidden value. Click show values button above to view	App Config			
AzureWebJobsStorage	Hidden value. Click show values button above to view	App Config			
FUNCTIONS_EXTENSION_VERSION	Hidden value. Click show values button above to view	App Config			
FUNCTIONS_WORKER_RUNTIME	Hidden value. Click show values button above to view	App Config			
SuperSecret	1234@asdf	App Config			
WEBSITE_CONTENTAZUREFILECONNECTIONSTRING	Hidden value. Click show values button above to view	App Config			
WEBSITE_CONTENTSHARE	Hidden value. Click show values button above to view	App Config			

Read from Key Vault

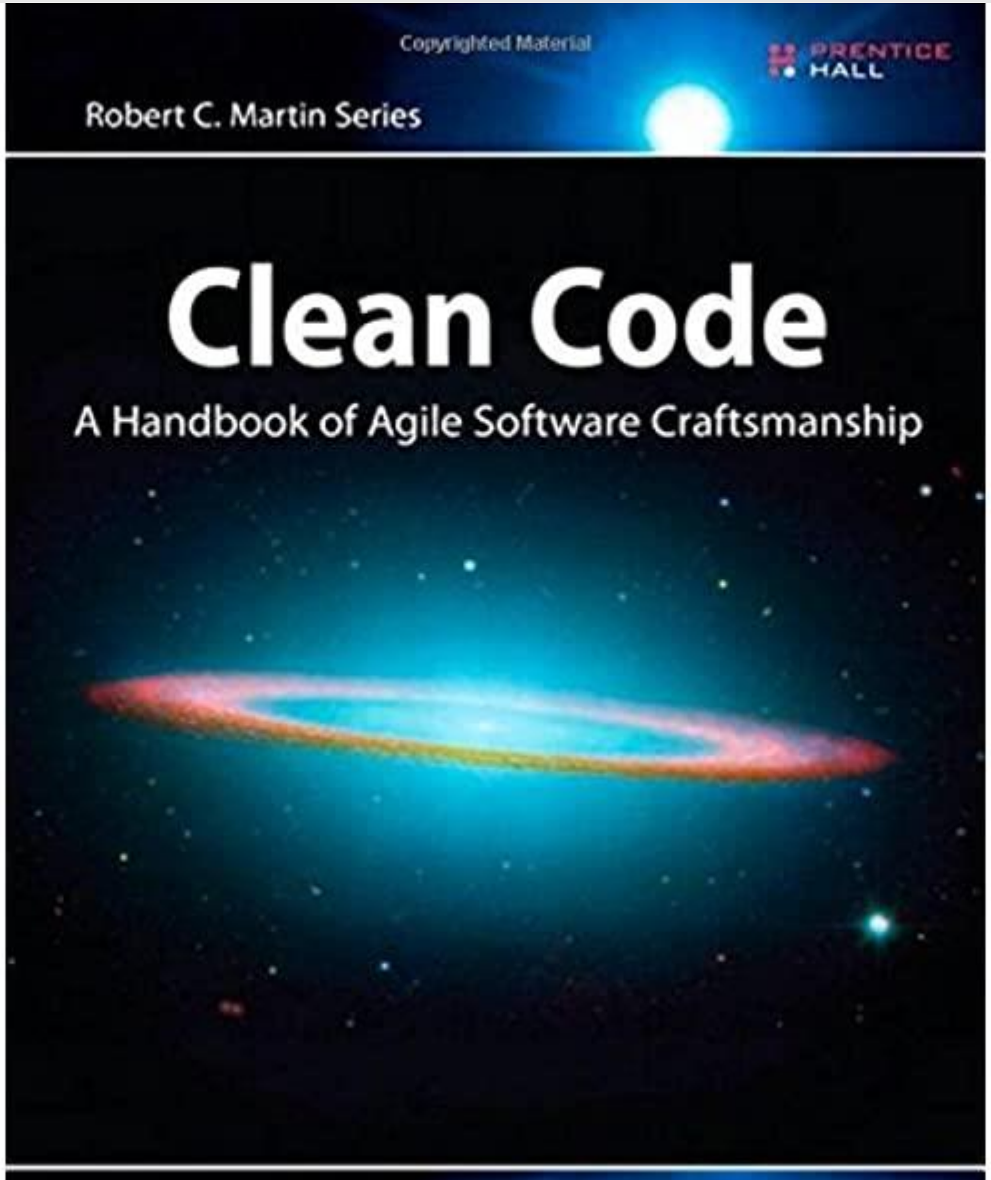
@Microsoft.KeyVault(SecretUri={SECRET_URL})

Name	Value	Source	Deployment slot setting	Delete	Edit
APPINSIGHTS_INSTRUMENTATIONKEY	Hidden value. Click show values button above to view	App Config			
APPLICATIONINSIGHTS_CONNECTION_STRING	Hidden value. Click show values button above to view	App Config			
AzureWebJobsStorage	Hidden value. Click show values button above to view	App Config			
FUNCTIONS_EXTENSION_VERSION	Hidden value. Click show values button above to view	App Config			
FUNCTIONS_WORKER_RUNTIME	Hidden value. Click show values button above to view	App Config			
SuperSecret	@Microsoft.KeyVault(SecretUri=https://keyvaultdemoserverless.va	App Config			
WEBSITE_CONTENTAZUREFILECONNECTIONSTRING	Hidden value. Click show values button above to view	App Config			
WEBSITE_CONTENTSHARE	Hidden value. Click show values button above to view	App Config			

Best Practices



S.O.L.I.D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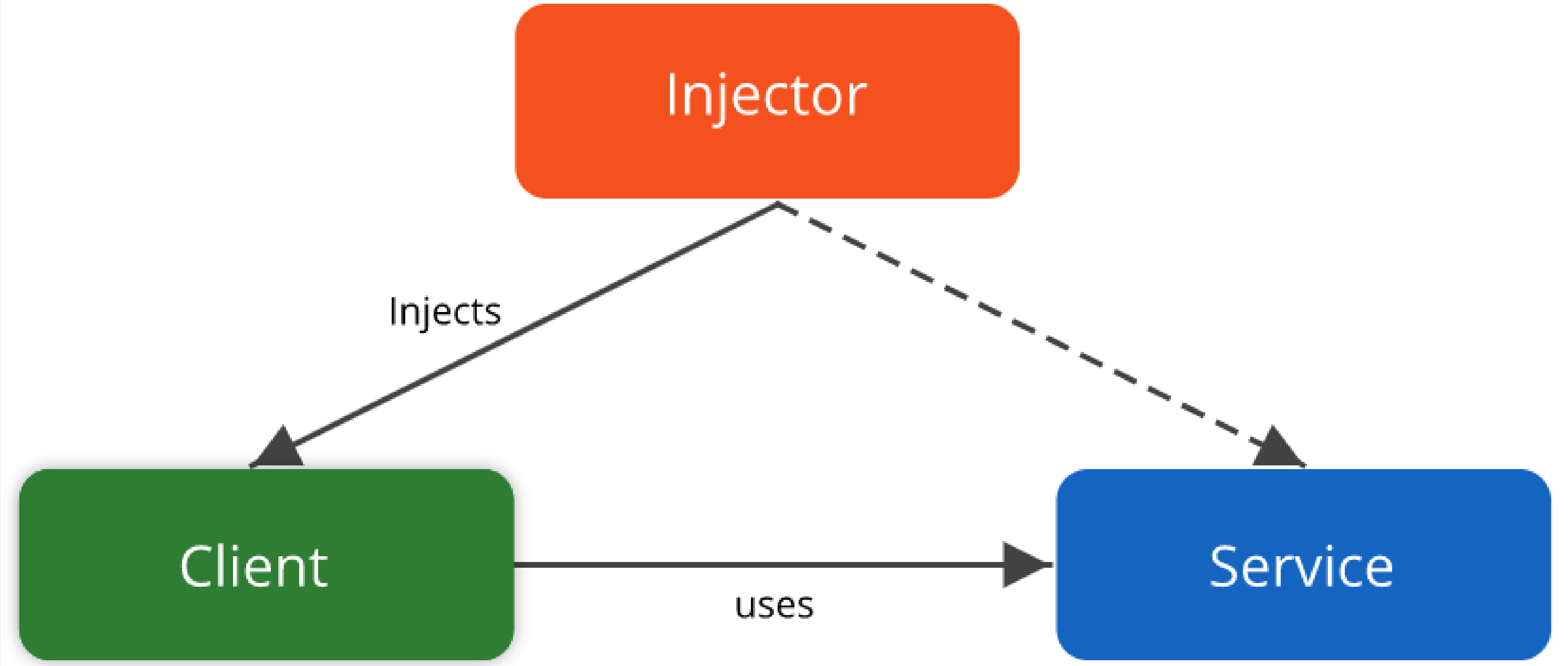
Robert C. Martin Series
Clean Code
A Handbook of Agile Software Craftsmanship

Functions

"Functions should do something, or answer something, but not both."

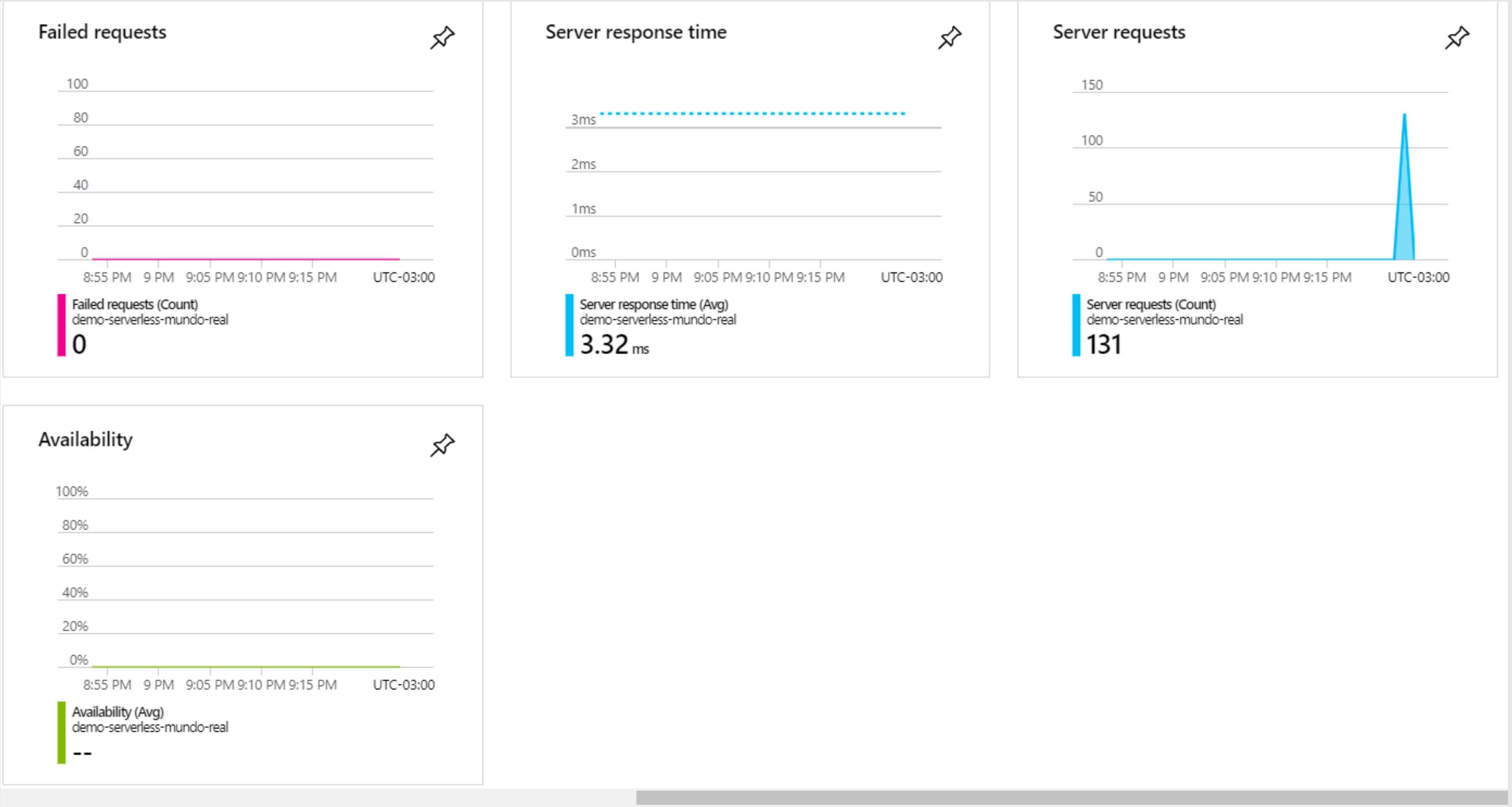
"One way to know that a function is doing more than 'one thing' is if you can extract another function from it with a name that is not merely a restatement of its implementation."

Dependency Injection

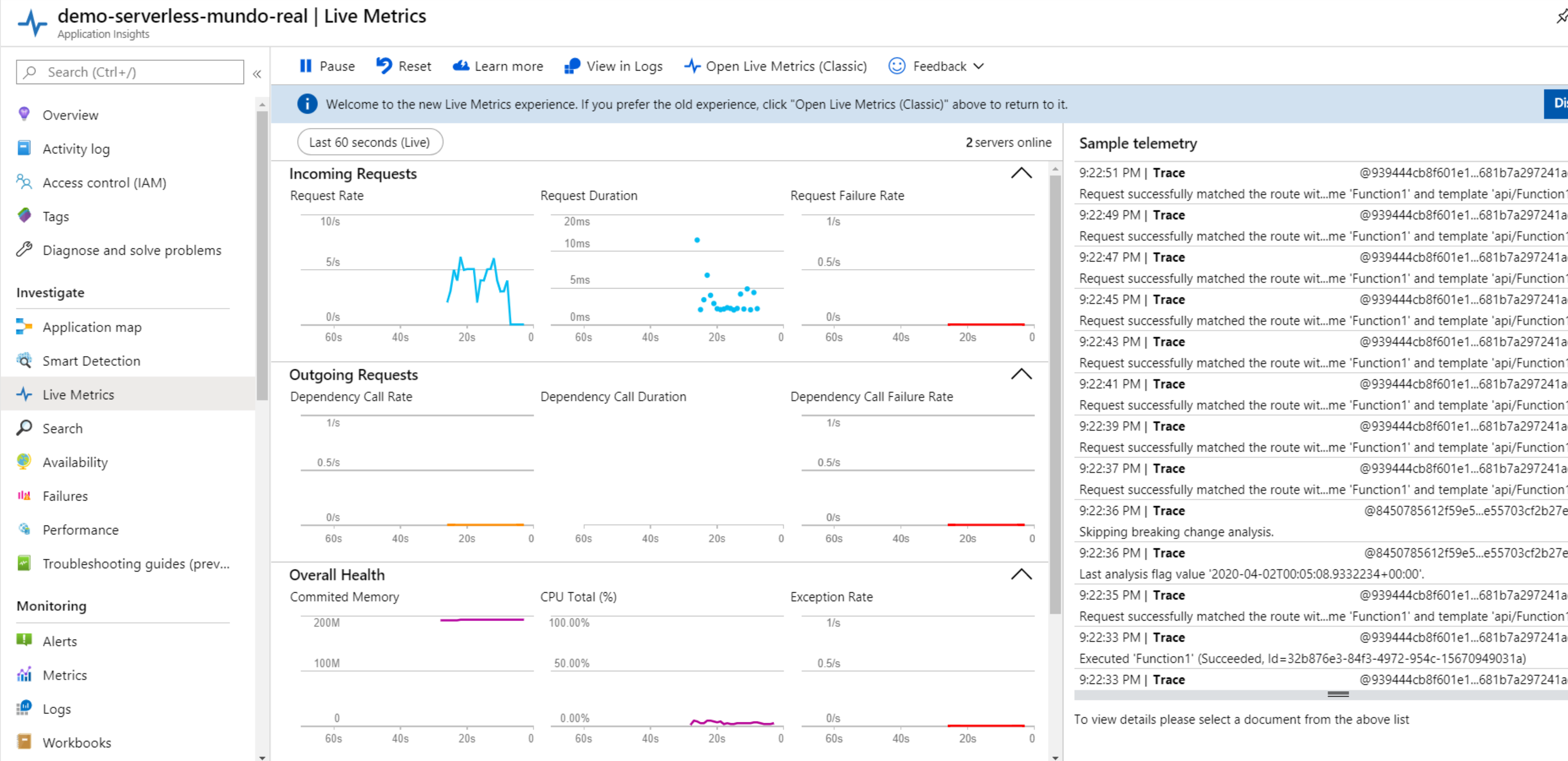


Performance

Application Insights

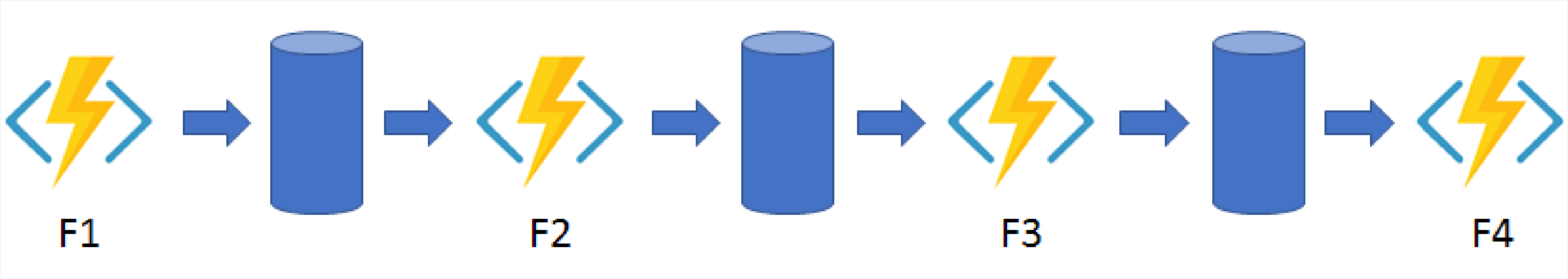


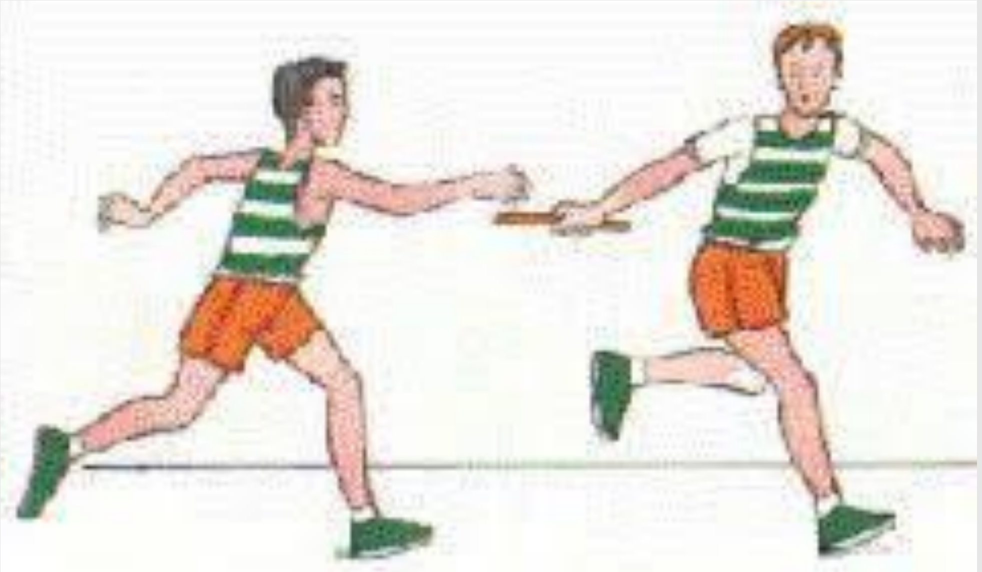
Application Insights



Durable Functions

Durable Functions (Function chain)





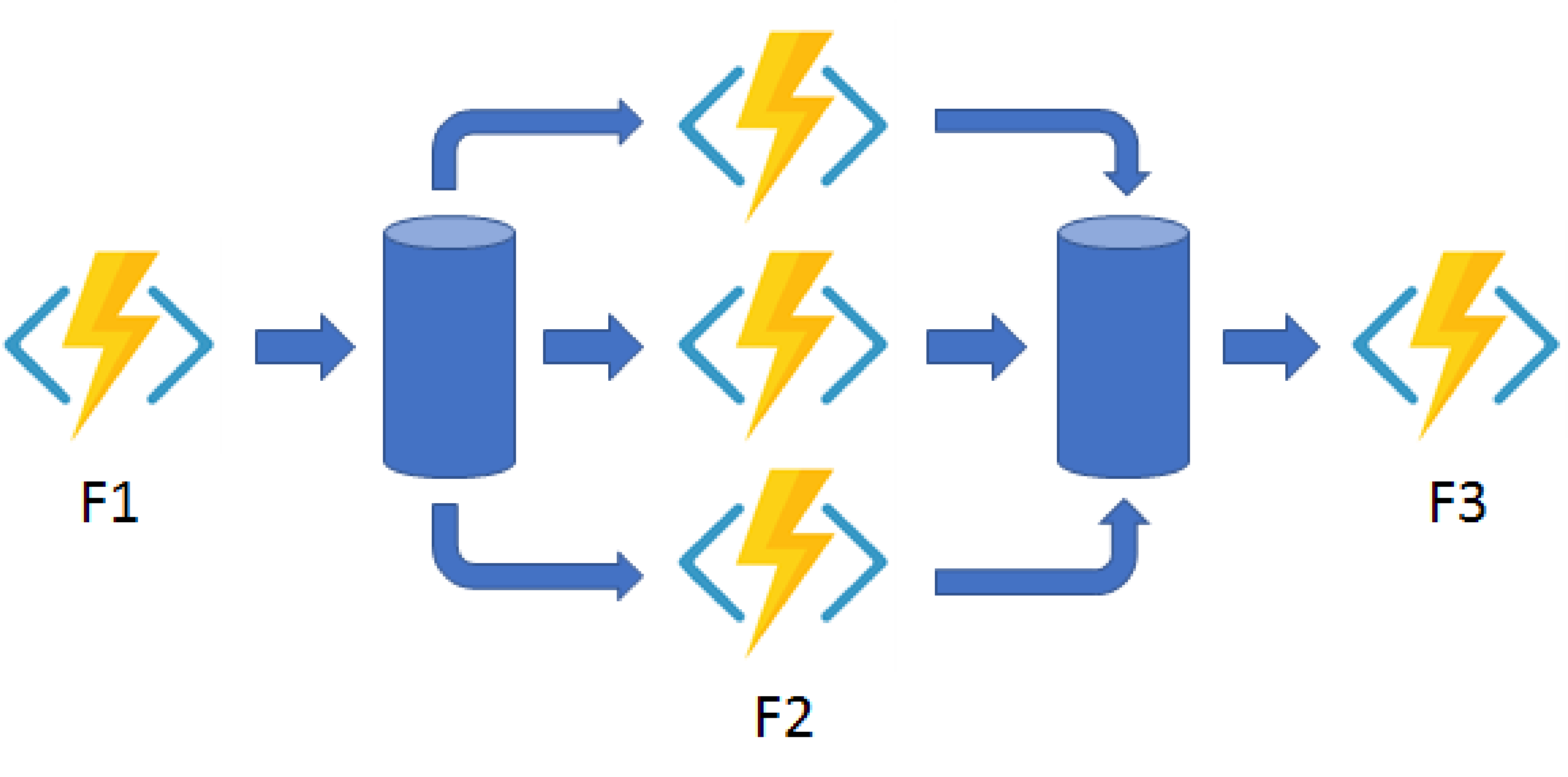
Durable Functions (function chain)

C#

Copy

```
[FunctionName("Chaining")]
public static async Task<object> Run(
    [OrchestrationTrigger] IDurableOrchestrationContext context)
{
    try
    {
        var x = await context.CallActivityAsync<object>("F1", null)
        var y = await context.CallActivityAsync<object>("F2", x);
        var z = await context.CallActivityAsync<object>("F3", y);
        return  await context.CallActivityAsync<object>("F4", z);
    }
    catch (Exception)
    {
        // Error handling or compensation goes here.
    }
}
```

Durable Functions (fan out / fan in)



Durable functions (fan out / fan in)

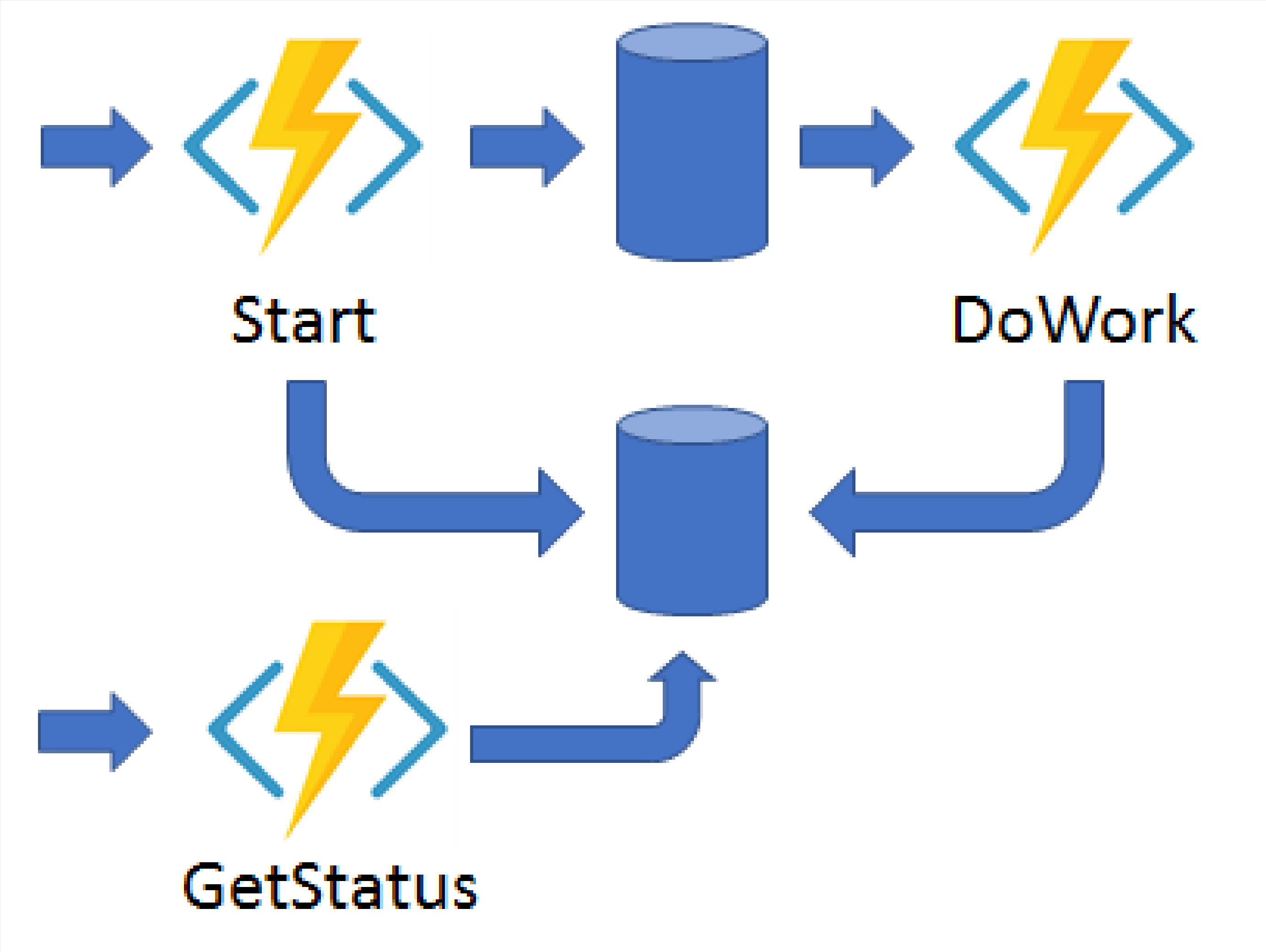
```
[FunctionName("FanOutFanIn")]
public static async Task Run(
    [OrchestrationTrigger] IDurableOrchestrationContext context)
{
    var parallelTasks = new List<Task<int>>();

    // Get a list of N work items to process in parallel.
    object[] workBatch = await context.CallActivityAsync<object[]>("F1", null);
    for (int i = 0; i < workBatch.Length; i++)
    {
        Task<int> task = context.CallActivityAsync<int>("F2", workBatch[i]);
        parallelTasks.Add(task);
    }

    await Task.WhenAll(parallelTasks);

    // Aggregate all N outputs and send the result to F3.
    int sum = parallelTasks.Sum(t => t.Result);
    await context.CallActivityAsync("F3", sum);
}
```

Durable Functions (Async HTTP APIs)

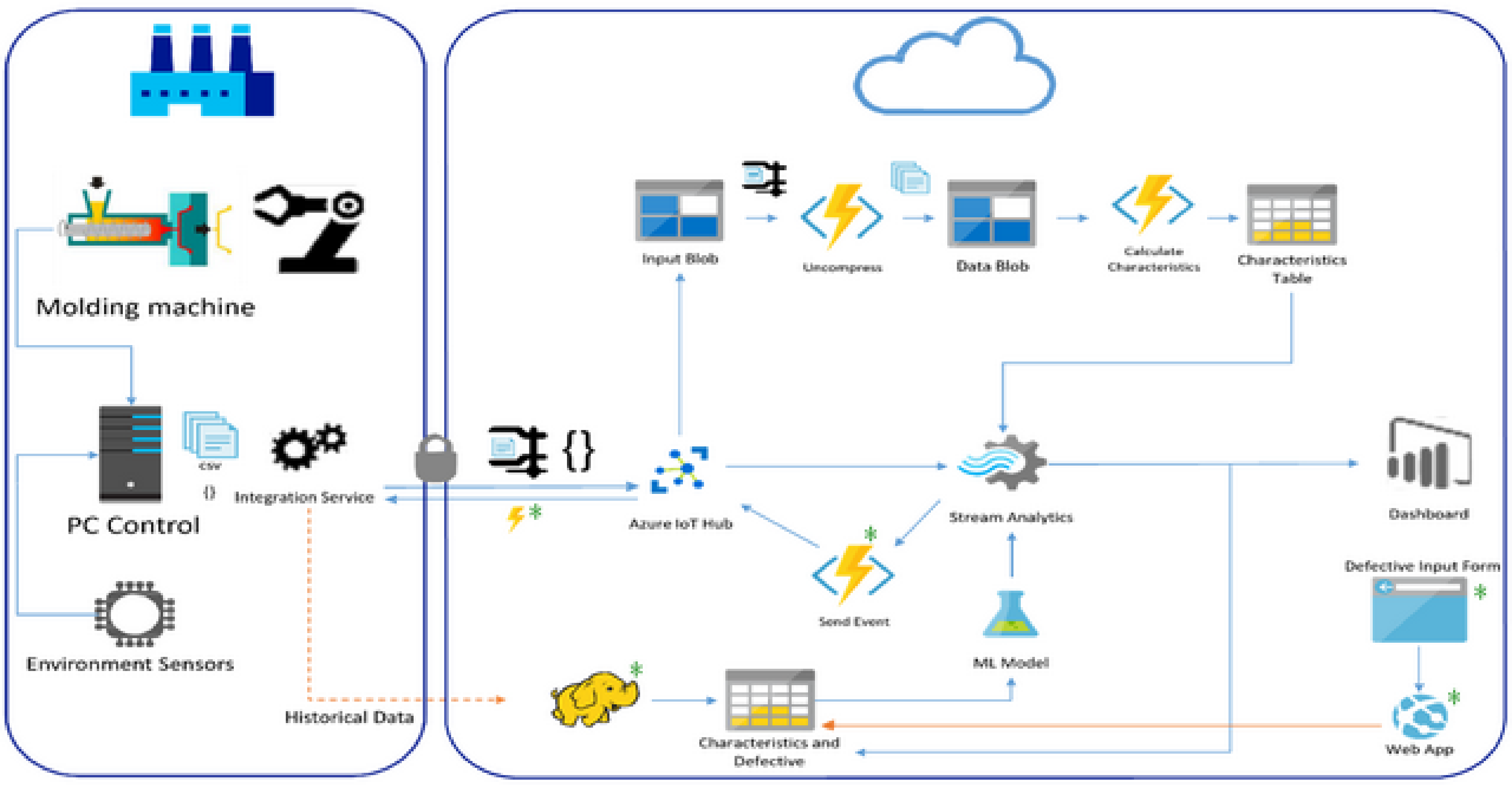


Durable Functions (External Event)

Cases

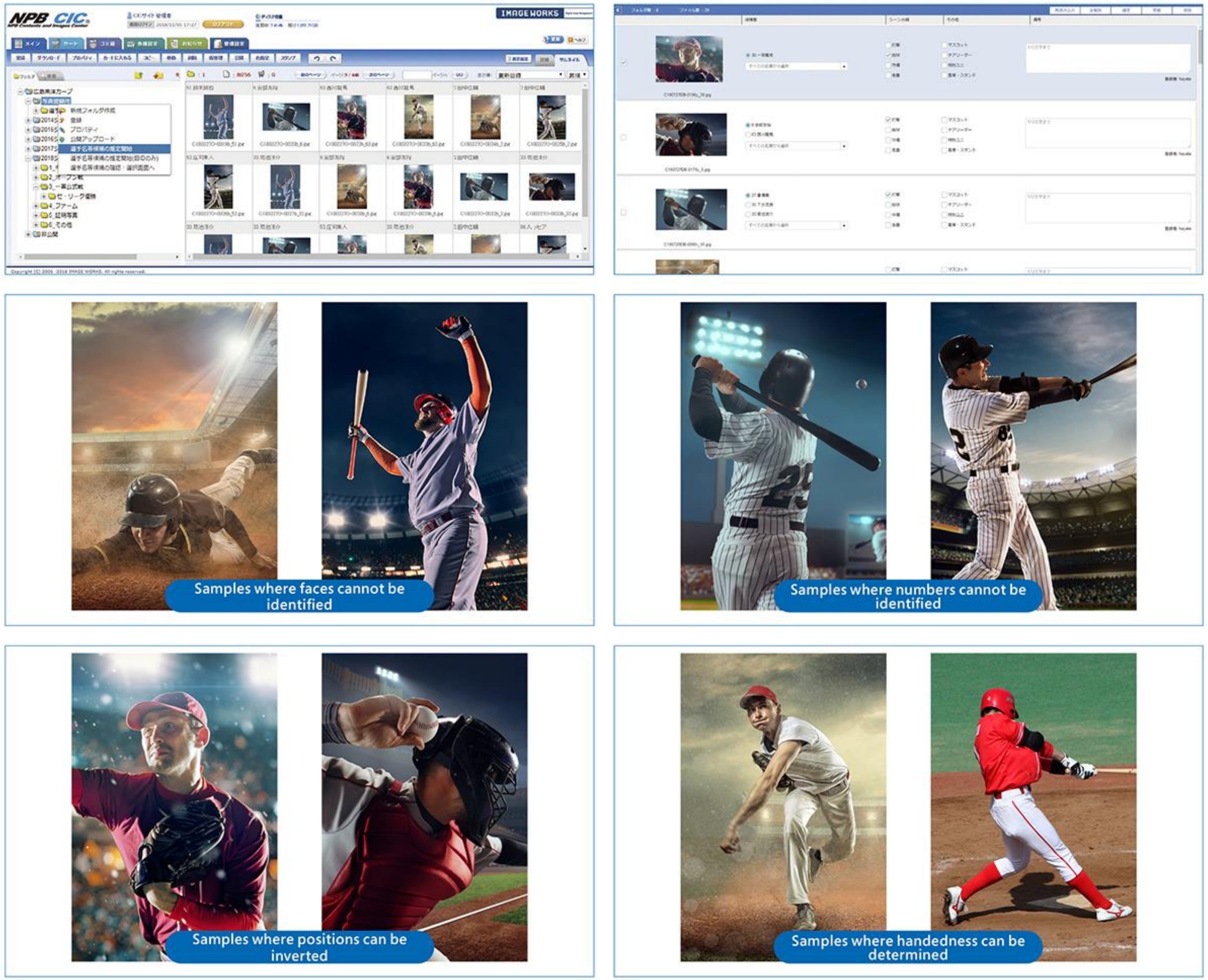
#1 Fagor Ederlan

#1 Fagor Ederlan



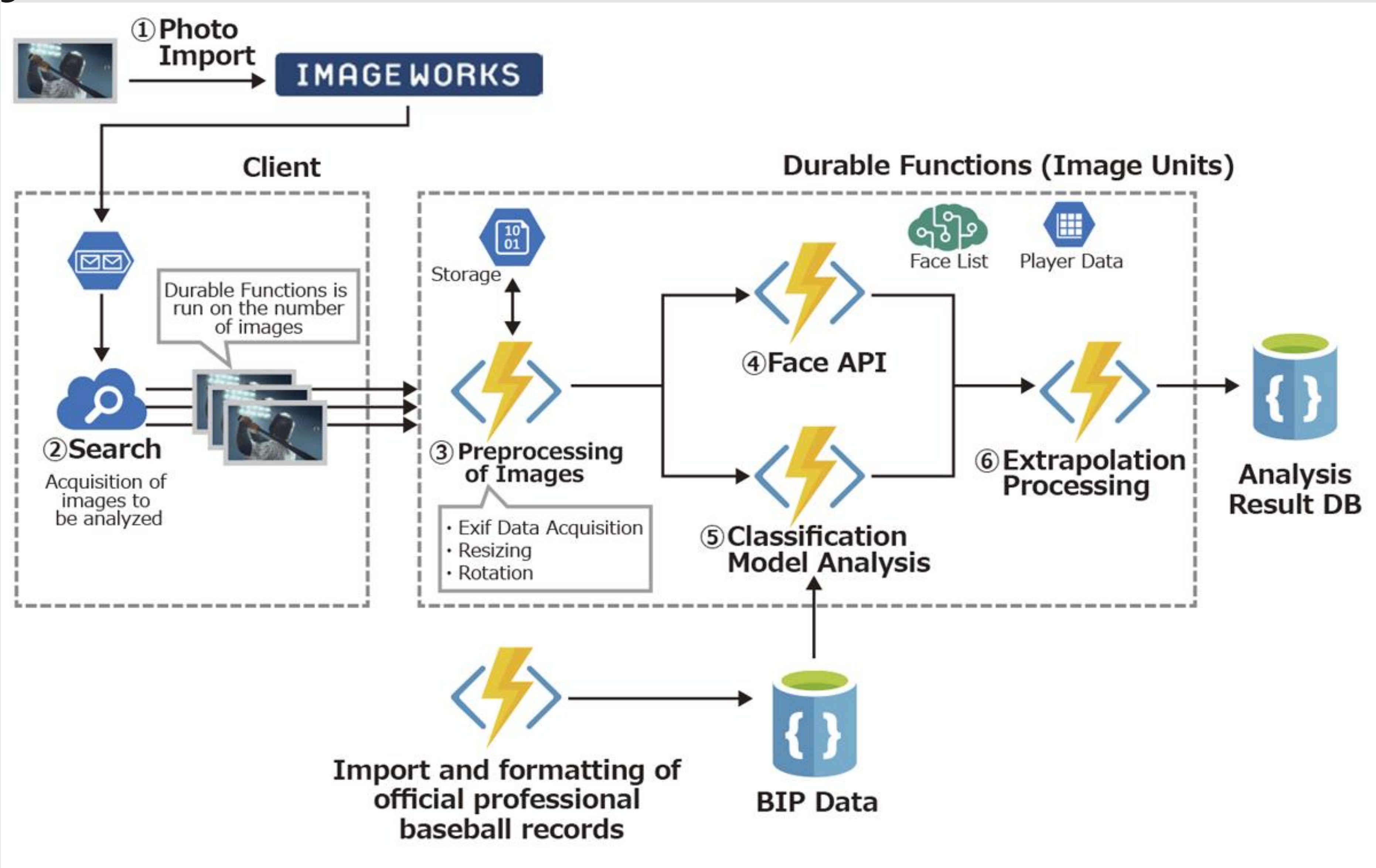
#2 Fuji Film

<IMAGE WORKS Screen>



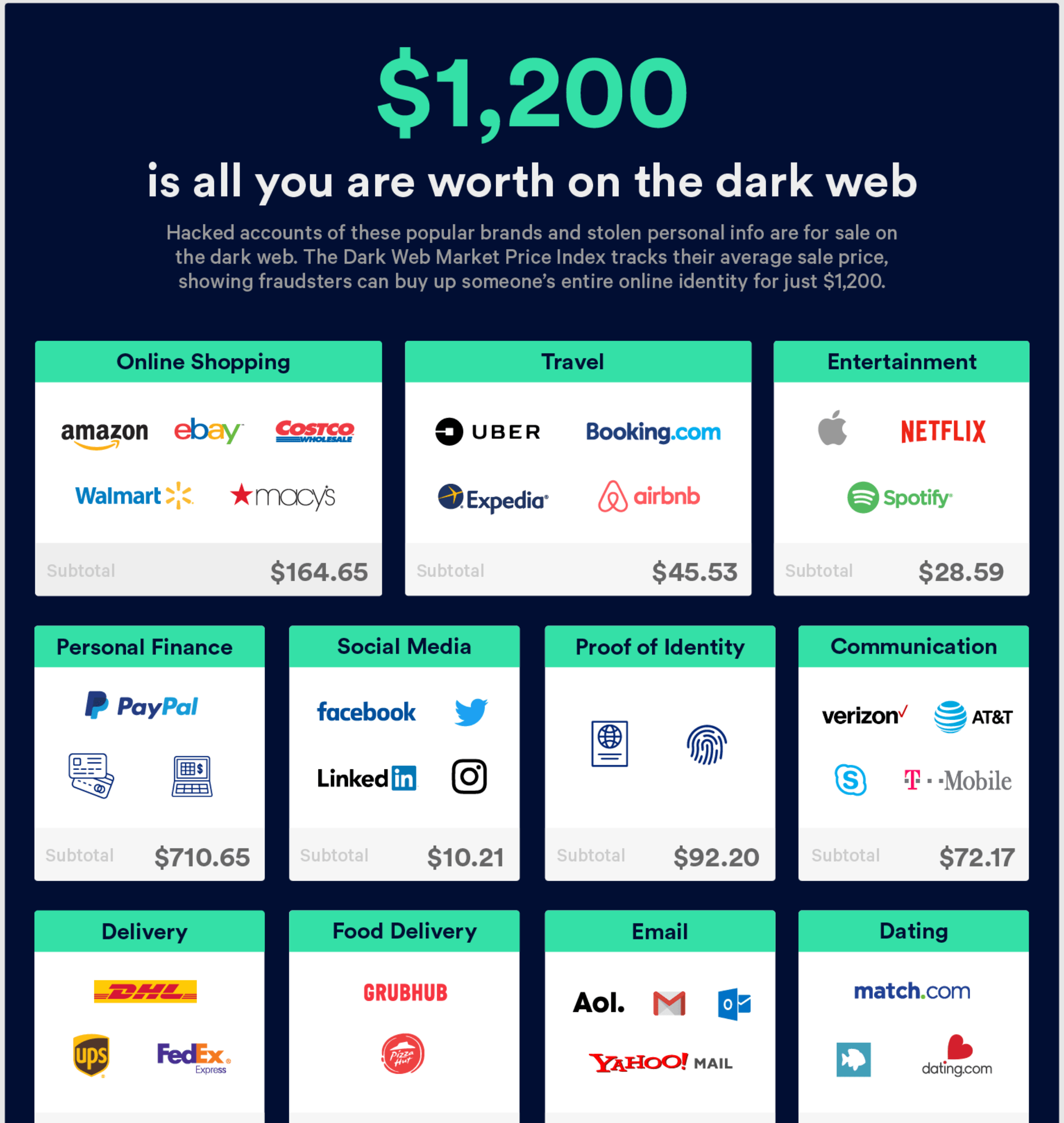
※ This pictures is for sample image. Actual product may vary.

#2 Fuji Film

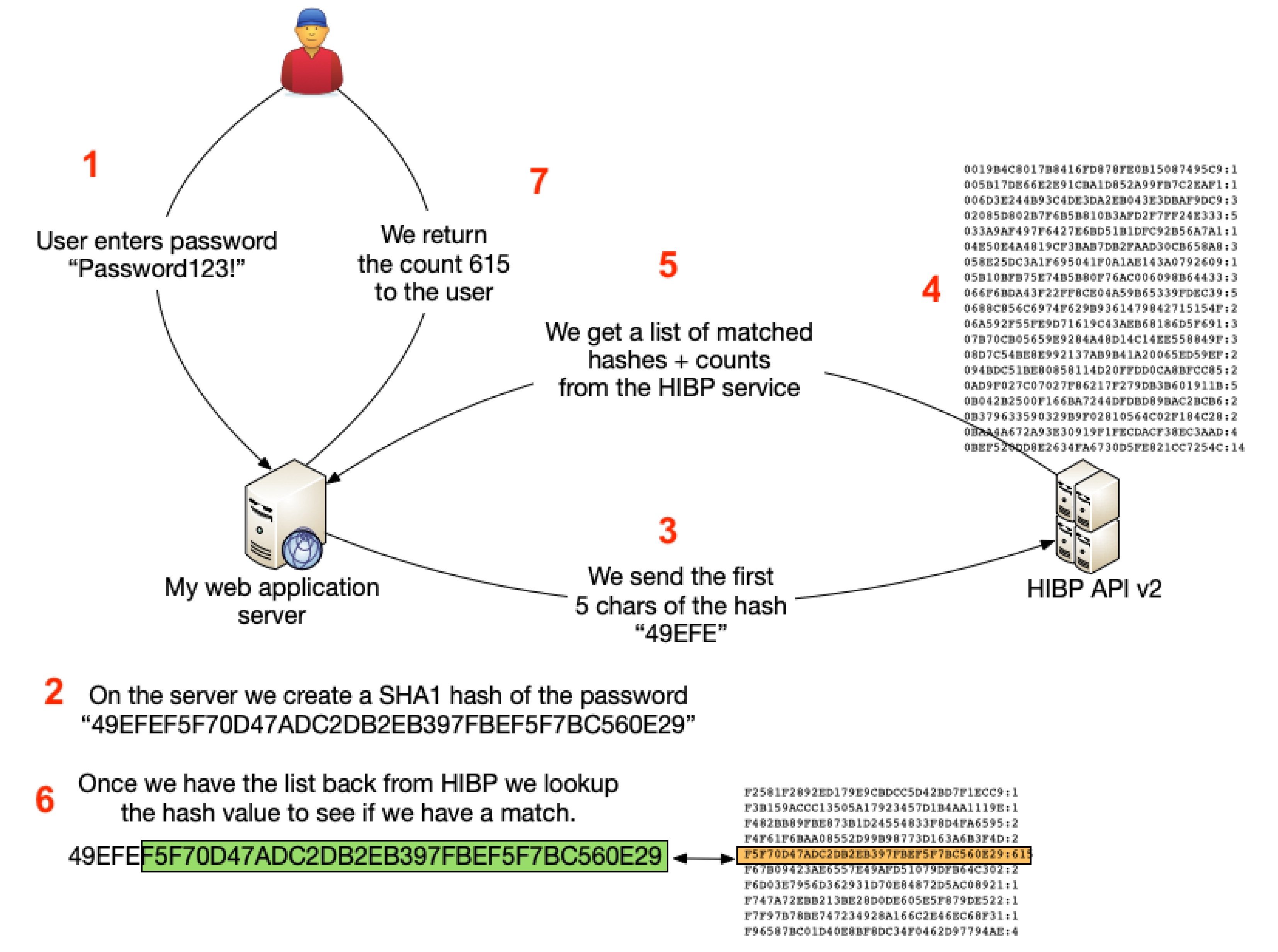


①Photo Import
IMAGE WORKS
Client
Durable Functions (Image Units)
Durable Functions is run on the number of images
②Search
Acquisition of images to be analyzed
Storage
③Preprocessing of Images
· Exif Data Acquisition
· Resizing
· Rotation
Face List
Player Data
④Face API
⑤Classification Model Analysis
⑥Extrapolation Processing
Analysis Result DB
Import and formatting of official professional baseball records
BIP Data

#3 HIBP


$1,200
is all you are worth on the dark web
Hacked accounts of these popular brands and stolen personal info are for sale on the dark web. The Dark Web Market Price Index tracks their average sale price, showing fraudsters can buy up someone's entire online identity for just $1,200.
Online Shopping
Subtotal $164.65
Travel
Subtotal $45.53
Entertainment
Subtotal $28.59
Personal Finance
Subtotal $710.65
Social Media
Subtotal $10.21
Proof of Identity
Subtotal $92.20
Communication
Subtotal $72.17
Delivery
Food Delivery
Email
Dating

#3 HIBP


1
User enters password
“Password123!”
7
We return
the count 615
to the user
5
We get a list of matched
hashes + counts
from the HIBP service
4
My web application
server
3
We send the first
5 chars of the hash
“49EFE”
HIBP API v2
2
On the server we create a SHA1 hash of the password
“49EFEF5F70D47ADC2DB2EB397FBEF5F7BC560E29”
6
Once we have the list back from HIBP we lookup
the hash value to see if we have a match.
49EFEF5F70D47ADC2DB2EB397FBEF5F7BC560E29
F5F70D47ADC2DB2EB397FBEF5F7BC560E29:615

#3 HIBP

METER	PRICE	FREE GRANT (PER MONTH)
Execution Time*	$0.000016/GB-s	400,000 GB-s
Total Executions*	$0.20 per million executions	1 million executions

#3 HIBP - Cost

	A	B	C	D	E	F
1	**Function Execution Units**				**Function Execution Count**	
2	Per week	1,660,000,000	MB-ms		Per week	114,710
3		1,621	GB-s		Per month	508,001
4	Per month	7,179	GB-s		Free grant per month	1,000,000
5	Free grant per month	400,000	GB-s		Billable units	0
6	Billable units	0	GB-s		Price per million	$0.20
7	Cost per GB/s	$0.000016			**Total**	**$0.00**
8	**Total**	**$0.00**				
9						
10	**Blob Storage**				**Blob Reads**	
11	Total	19.27	GB		Count	508,001
12	Cost per GB	$0.0208			Cost per 10,000	$0.0044
13	**Total**	**$0.40**			**Total**	**$0.22**
14						
15	**Bandwidth**					
16	Average response size	14	KB			
17	Responses per month	508,001				
18	Total bandwidth	7,112,020	KB			
19		7	GB			
20	Free grant per month	5	GB			
21	Billable units	2				
22	Cost per GB	$0.087				
23	**Total**	**$0.16**				
24						
25	**Grand Total**	**$0.779**	**per month**			
26		**$0.179**	**per week**			
27		**$0.026**	**per day**			

#3 HIBP - Cost

	A	B	C	D	E	F
1	**Function Execution Units**				**Function Execution Count**	
2	Per week	468,995,439,805	MB-ms		Per week	32,408,715
3		458,003	GB-s		Per month	140,920,038
4	Per month	2,028,301	GB-s		Free grant per month	1,000,000
5	Free grant per month	400,000	GB-s		Billable units	139,920,038
6	Billable units	1,628,301	GB-s		Price per million	$0.20
7	Cost per GB/s	$0.000016			**Total**	**$27.98**
8	**Total**	**$26.05**				
9						
10	**Blob Storage**				**Blob Reads**	
11	Total	19.27	GB		Count	140,920,038
12	Cost per GB	$0.0208			Cost per 10,000	$0.0044
13	**Total**	**$0.40**			**Total**	**$62.00**
14						
15	**Bandwidth**					
16	Average response size	14	KB			
17	Responses per month	140,920,038				
18	Total bandwidth	1,972,880,526	KB			
19		1,881	GB			
20	Free grant per month	5	GB			
21	Billable units	1,876				
22	Cost per GB	$0.087				
23	**Total**	**$163.25**				
24						
25	**Grand Total**	**$279.697**	**per month**			
26		**$64.324**	**per week**			

Q&A

Links

https://docs.microsoft.com

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https://microsoft.github.io/techcasestudies

Microsoft

That’s all folks!

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