



Chad Green

Serverless in Action

TechBash

November 14, 2019



Who is Chad Green



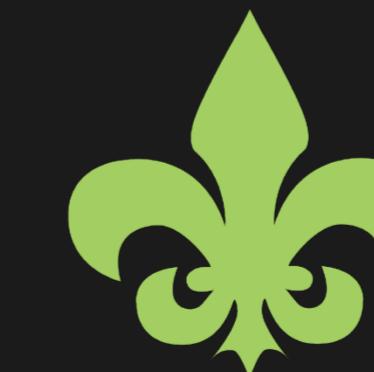
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 chadgreen.com

ChadGreen

ChadwickEGreen



{Code PaLOUSA}
IT'S SOFTWARE DEVELOPMENT MADNESS

Agenda

- What is Serverless Computing
- Functions as a Service
- Serverless Options
- Azure Functions Overview
- Azure Functions in Action
- Pricing
- Best Practices

What is Serverless Computing

Serverless in Action

The evolution of application platforms

What media should I use to keep **backups**?

What is the right **size** of **servers** for the business needs?

Which packages should be on my **server**?

What size of **servers** should I **buy**?

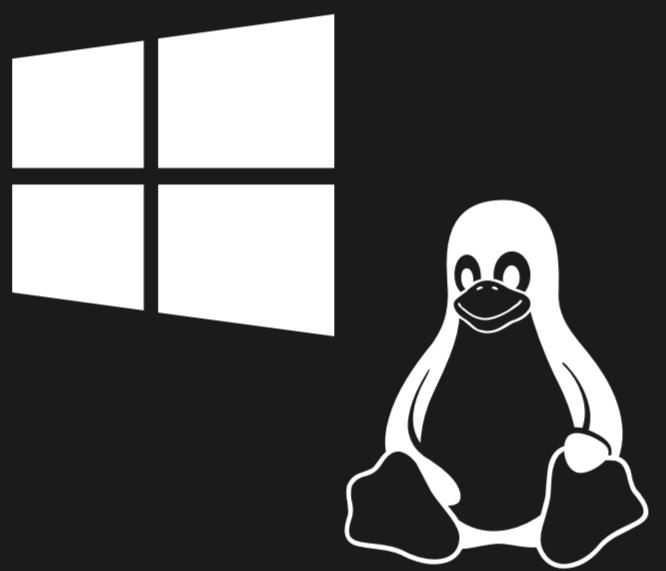
How can / scale my app?

Do I need a secondary network connection?

How many **servers** do I need?

Who monitors my servers?

It takes how long to provision a new **server**?



Who has **physical** access to my **servers**?

Do I need a **UPS**?



How do I **deploy** new code to my **servers**?

Who monitors my App?



What happens in case of **server hardware** failure?

How often should I backup my **server**?



Which **Operating System** should I use?

How often should I patch my **servers**?

Are my **servers** in a secure location?

What happens if the power goes out?

What storage do I need to use?

How can I dynamically configure my app?

On-Premises

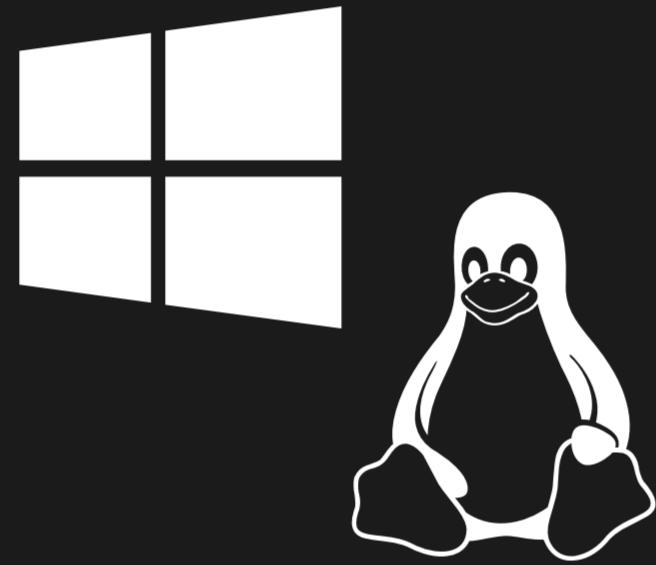
The evolution of application platforms

What is the right **size** of servers for my business needs?

How can I increase **server** utilization?

How many **servers** do I need?

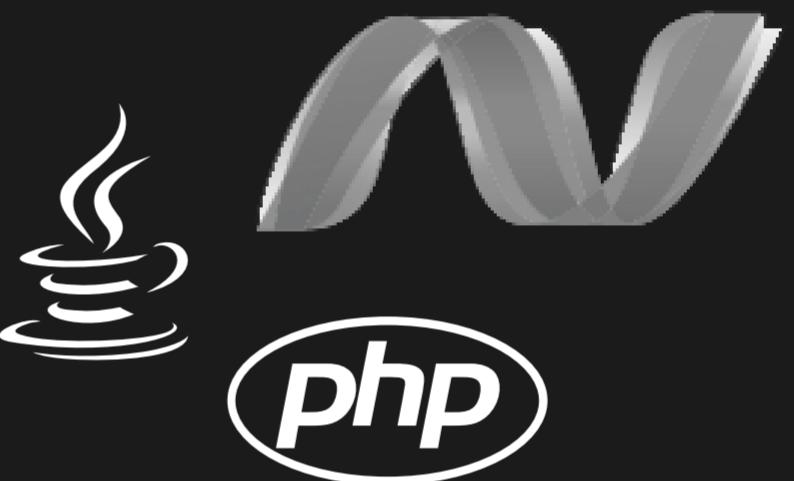
How can I **scale** my application?



How often should I **patch** my **servers**?

How often should I backup my **server**?

Which packages should be on my **server**?



How do I **deploy** new **code** to my **server**?

Which **Operating System** should I use?

Who **monitors** my application?



o

On-Premises

IaaS

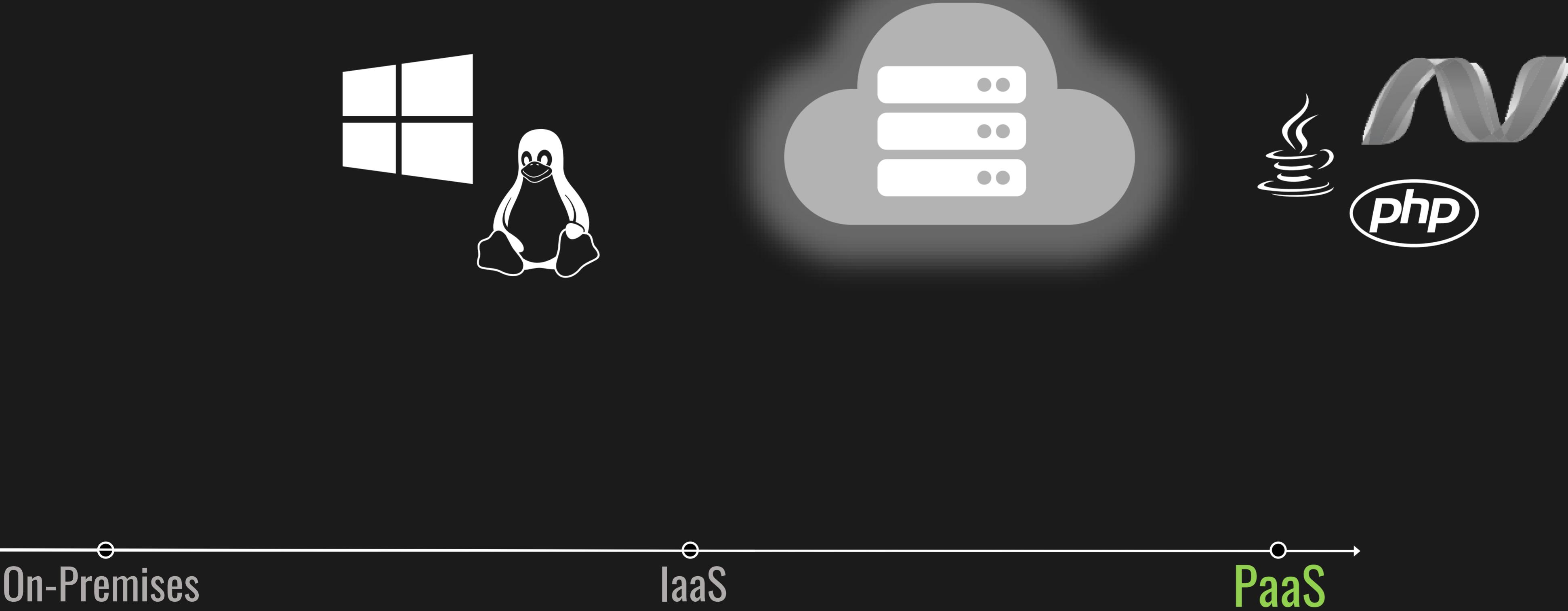
The evolution of application platforms

What is the right **size** of servers for my business needs?

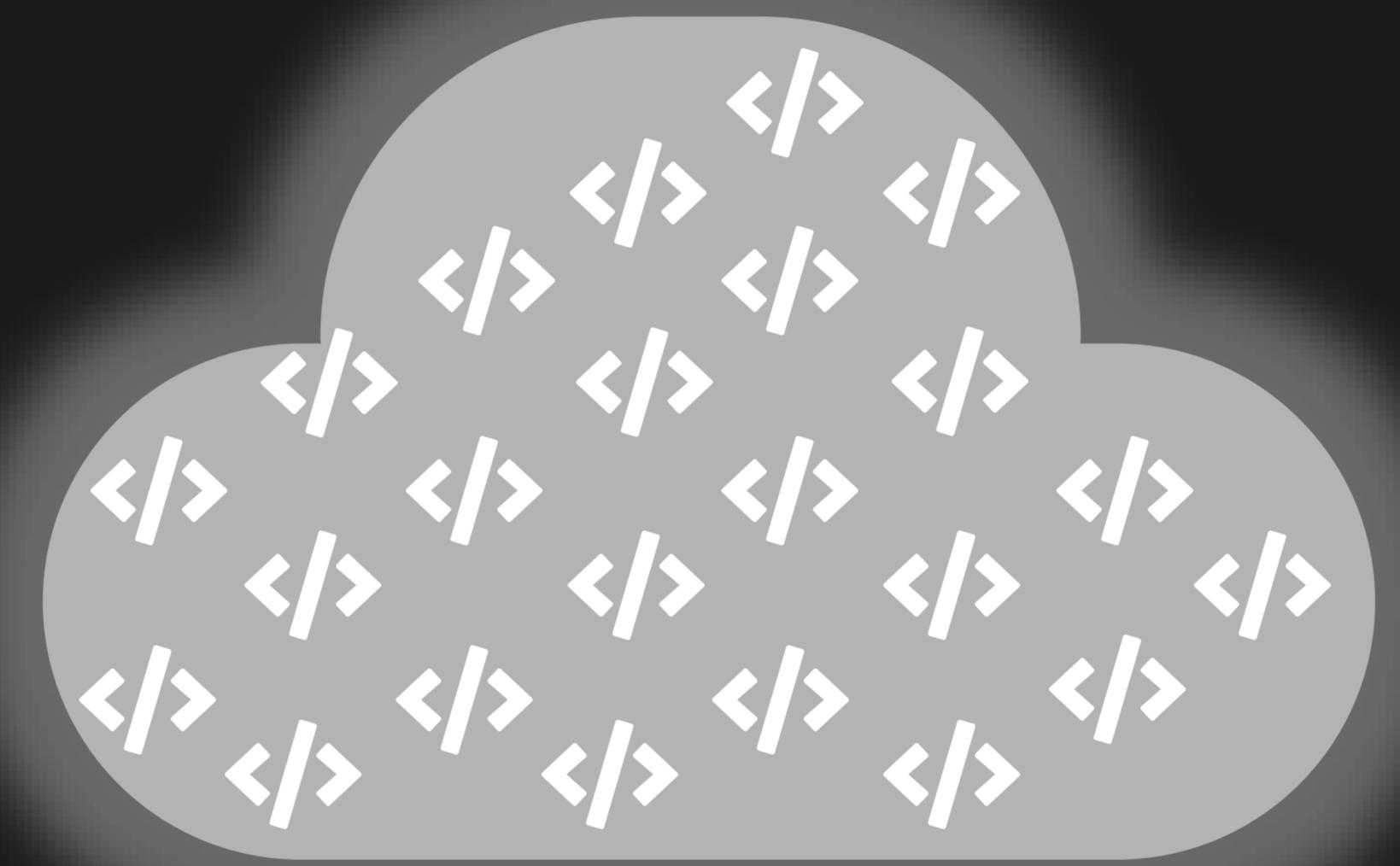
How can I increase **server** utilization?

How many **servers** do I need?

How can I **scale** my application?



The evolution of application platforms



The platform for next generation applications

On-Premises

IaaS

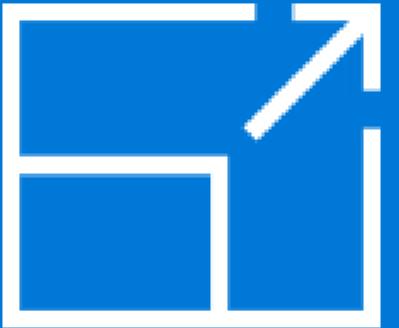
PaaS

Serverless

What is Serverless?



Abstraction of Servers



Event-Driven/Instant Scale



Micro-Billing

Benefits of Serverless



Manage apps not servers



Reduced DevOps



Faster Time to Market

Challenges of Serverless Architecture



Function as a Service

Serverless in Action

Serverless is more than just one thing

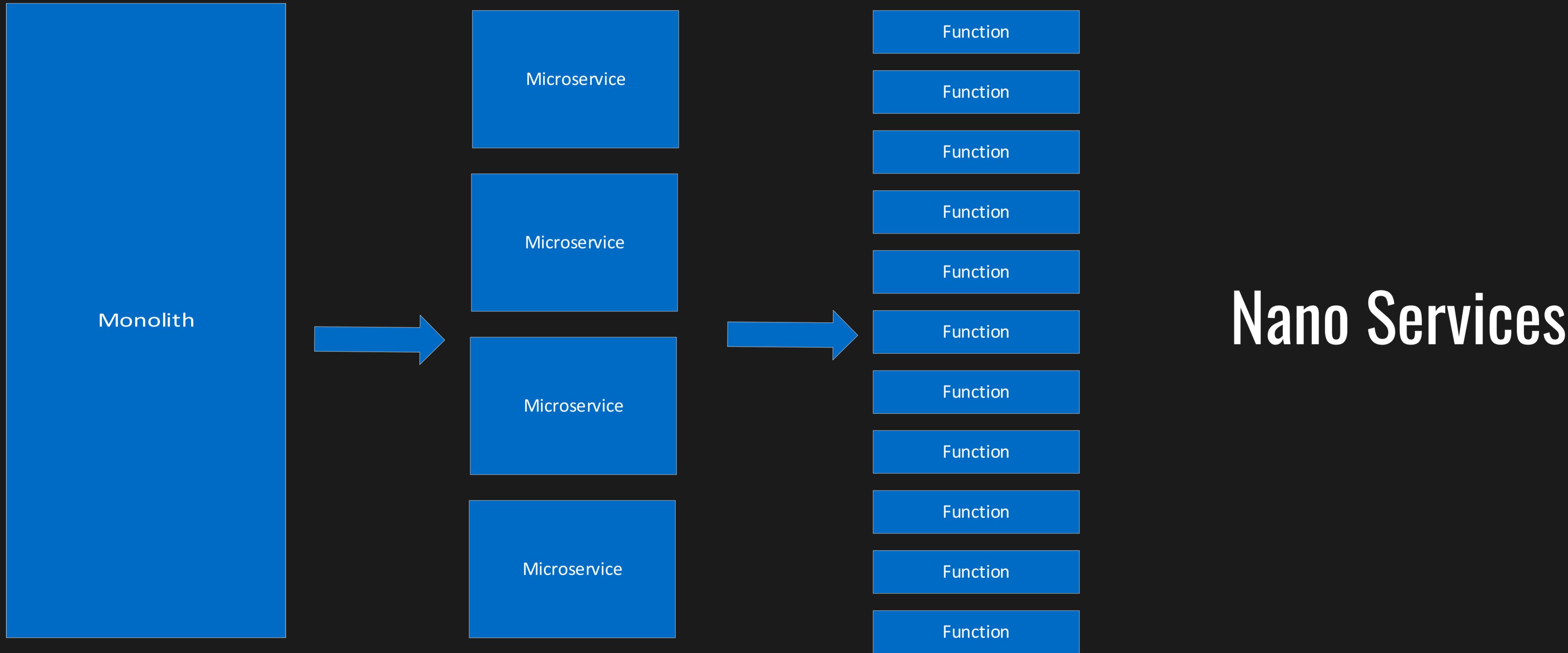
Backend as a Service (BaaS)

- Applications that significantly or fully depend on services (in the cloud) to manage server-side logic and state

Functions as a Services (FaaS)

- Application run in stateless compute containers that are event-triggered, ephemeral, and fully managed by a 3rd party

Function Scale



FaaS is at the center of serverless



Single responsibility

Functions are single-purposed, reusable pieces of code that process an input and return a result



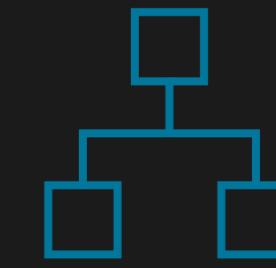
Short lived

Functions don't stick around when finished executing, freeing up resources for further executions



Stateless

Functions don't hold any persistent state and don't rely on the state of any other processes



Event driven & scalable

Functions respond to predefined events, and are instantly replicated as many times as needed

Functions-as-a-Service programming model use functions to achieve true serverless compute

Serverless Options

Serverless in Action

Market Landscape



AWS
Lambda

Run code without thinking about servers. Pay only for the compute time you consume.

Market Landscape



AWS
Lambda



Google
Cloud Functions

Event-driven serverless compute platform

Market Landscape



AWS
Lambda



Google
Cloud Functions



IBM
Cloud Functions

Execute code on demand in a highly scalable serverless environment

Market Landscape



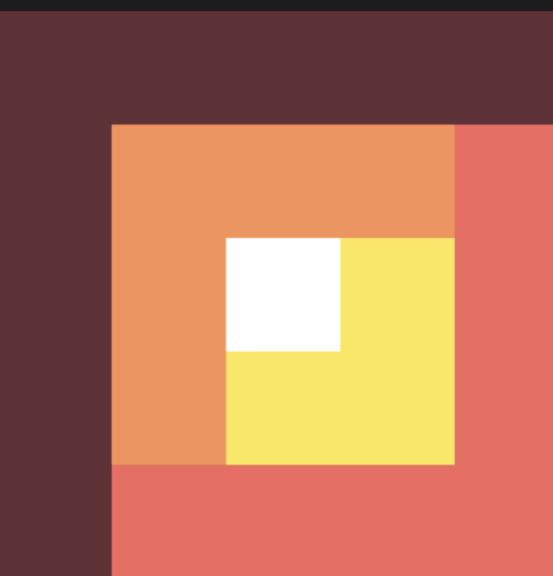
AWS
Lambda



Google
Cloud Functions



IBM
Cloud Functions



Auth0
WebTask

All you need is code

Market Landscape



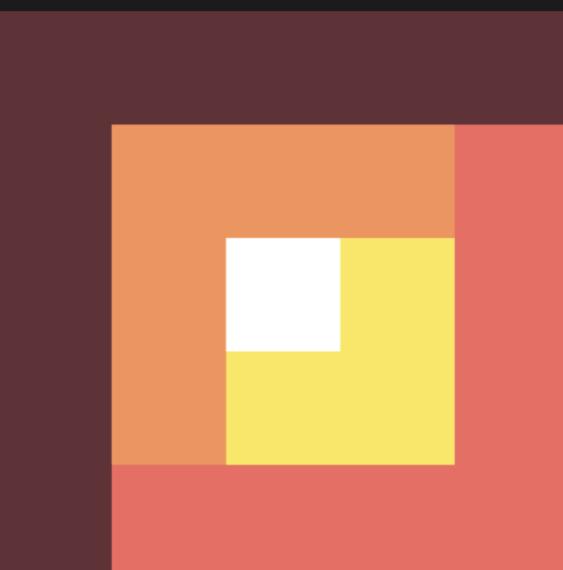
AWS
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Cloud Functions



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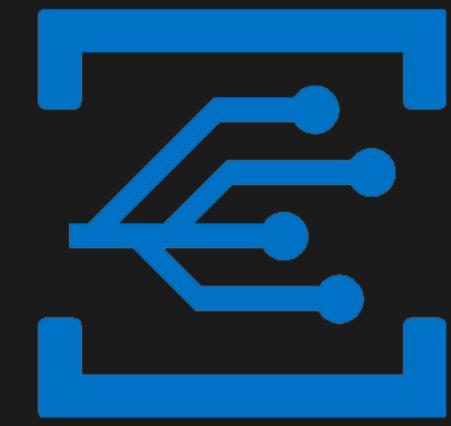
Auth0
WebTask



Azure

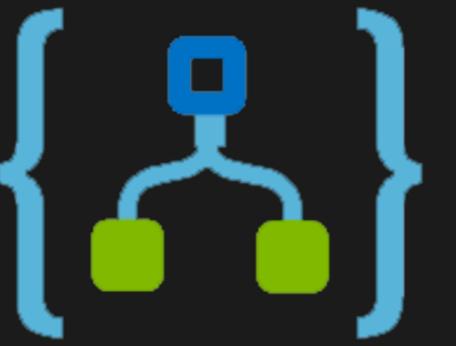
Your vision. Your cloud.

Azure Serverless Offerings



Event Grid

Manage all events that can trigger code or logic



Logic Apps

Design workflows and orchestrate processes



Functions

Execute your code based on events you specify



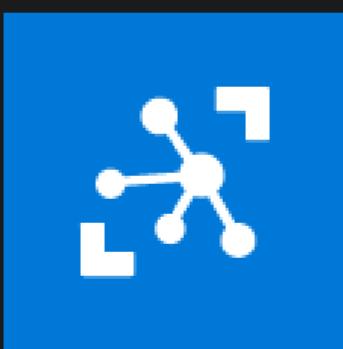
Database



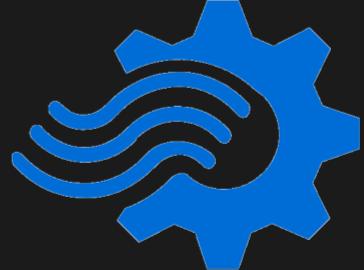
Storage



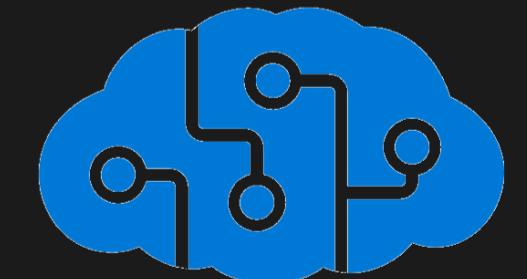
Security



IoT



Analytics



Intelligence

Code

Events + data

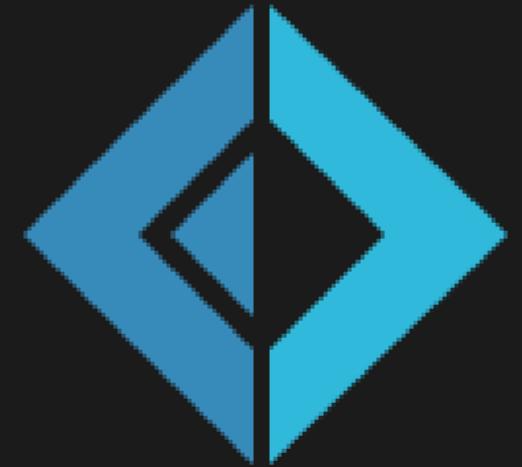
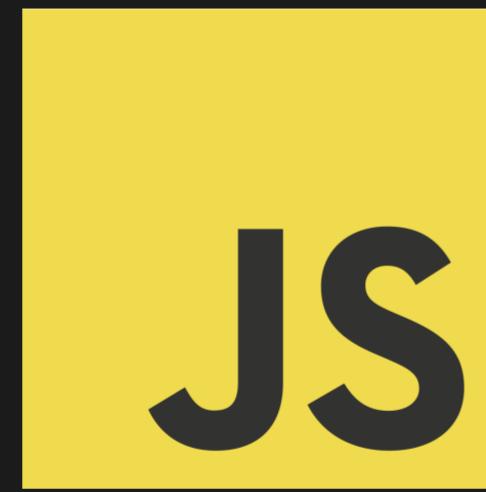
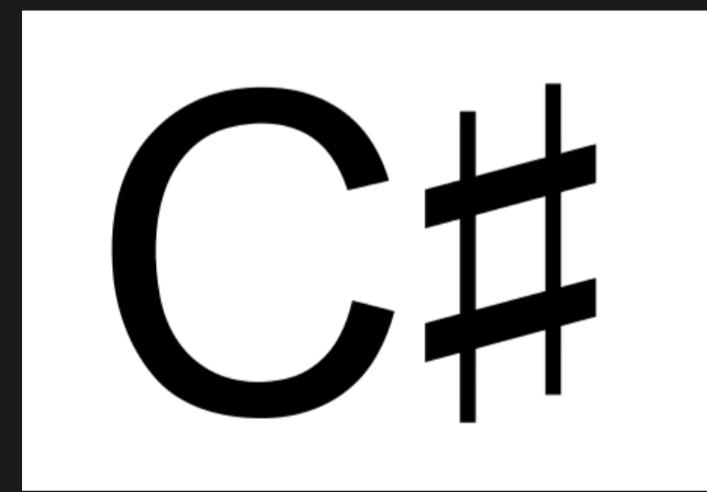


Azure Functions

Serverless in Action

Features of Azure Functions

- Choice of language

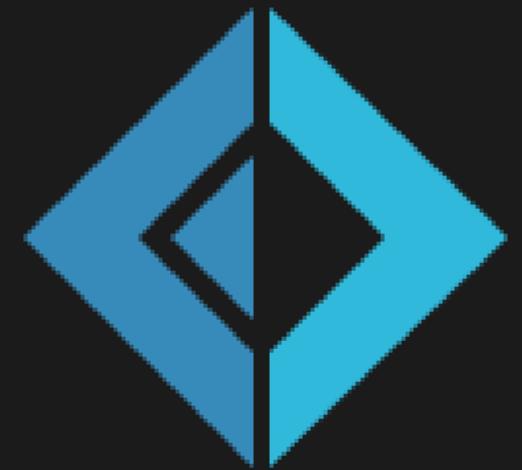
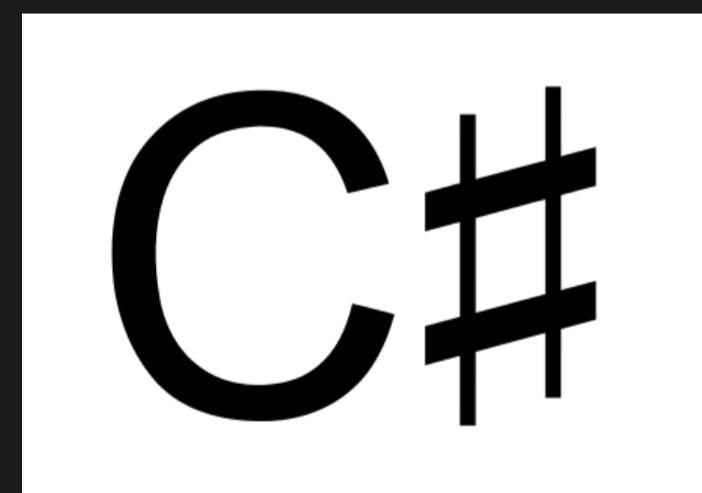


Batch



Features of Azure Functions

- Choice of language
- Pay-per-use pricing model



Batch



Features of Azure Functions

- Choice of language
- Pay-per-use pricing model
- Bring your own dependencies



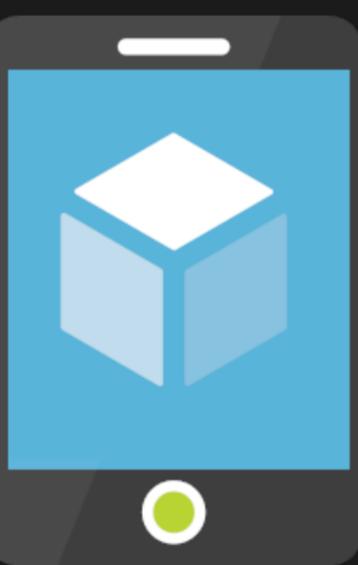
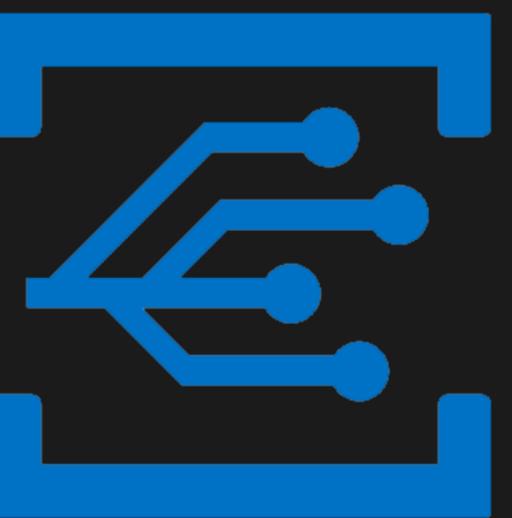
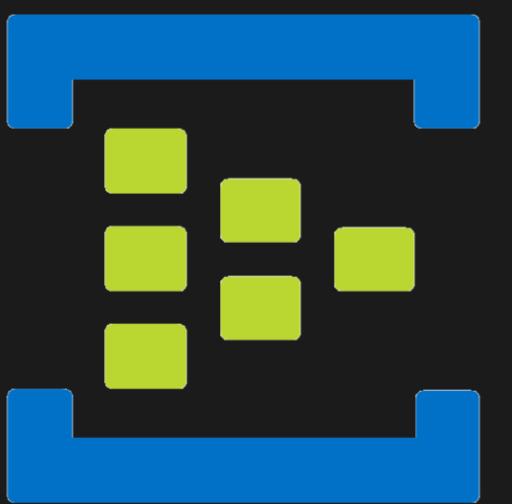
Features of Azure Functions

- Choice of language
- Pay-per-use pricing model
- Bring your own dependencies
- Integrated security



Features of Azure Functions

- Choice of language
- Pay-per-use pricing model
- Bring your own dependencies
- Integrated security
- Simplified integration



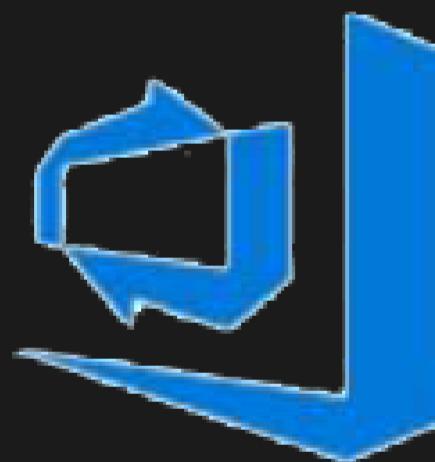
Features of Azure Functions

- Choice of language
- Pay-per-use pricing model
- Bring your own dependencies
- Integrated security
- Simplified integration
- Flexible development



Features of Azure Functions

- Choice of language
- Pay-per-use pricing model
- Bring your own dependencies
- Integrated security
- Simplified integration
- Flexible development
- Open-source



Screenshot of the Azure / Azure-Functions GitHub repository page. The repository has 56 commits, 3 branches, 0 releases, and 9 contributors. The latest commit was on Jun 25. The repository description is: "Azure Functions is an event driven, compute-on-demand experience that extends the existing Azure application platform with capabilities to implement code triggered by events occurring in virtually any Azure or 3rd party service as well as on-premises systems. Azure Functions allows developers to take action by connecting to data sources or messaging solutions, thus making it easy to process and react to events. Azure Functions scale based on demand and you pay only for the resources you consume." A green 'Clone or download' button is visible at the bottom right.

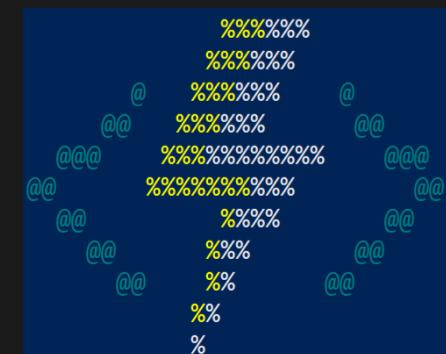
Triggers and Bindings

Type	1.x	2.x	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					
SignalR					
Table Storage					
Timer					
Twilio					

Develop How You Want



- Azure Portal
 - Quickly get started without having to install anything else
- Visual Studio 2017
 - First class C# development experience
- Visual Studio Code
 - First class Node.js development experience
 - Edit any function project generated via CLI
- Azure Functions Core Tools (CLI)
 - Build any kind of function and edit in IDE of your choice



Runtime Versions

Runtime 1.x

- .NET Framework 4.6

Runtime 2.x

- .NET Core 2.0
- Cross Platform
- Language Extensions
 - Java
- Binding Extensions
 - Microsoft Graph
 - Durable Functions

Runtime 3.x

- .NET Core 3.0

Runtime Version Languages

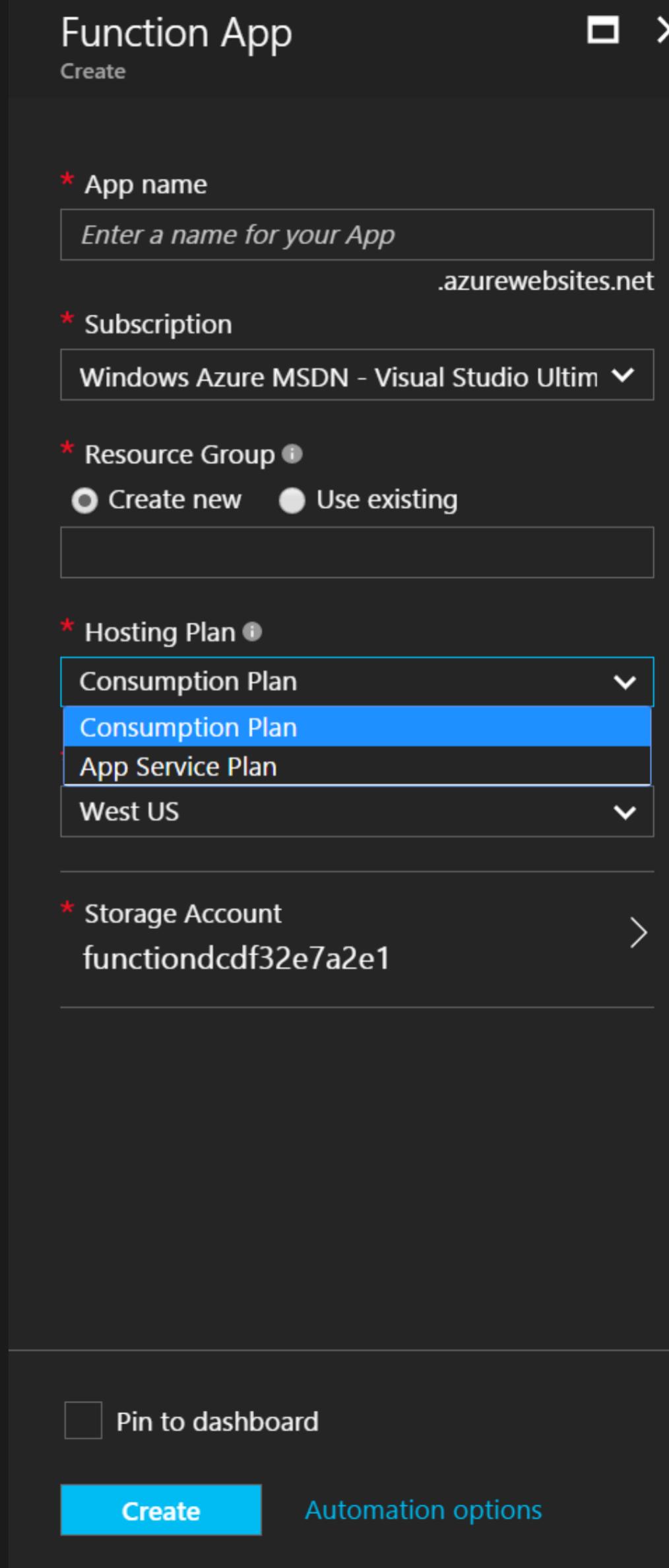
Language	1.x	2.x
C#	GA (.NET Framework 4.7)	GA (.NET Core 2.2)
JavaScript	GA (Node 6)	GA (Node 8 & 10)
F#	GA(.NET Framework 4.7)	GA (.NET Core 2.2)
Java	N/A	Preview (Java 8)
Python	Experimental	Preview (Python 3.6.x)
TypeScript	Experimental	GA (Supported through transpiling to JavaScript)
PHP	Experimental	N/A
Batch (.cmd, .bat)	Experimental	N/A
Bash	Experimental	N/A
PowerShell	Experimental	Preview (PowerShell Core 6)

Consumption Plan

- Pay for what you use without the need to reserve compute resources.
- Function Apps are assigned to compute processing instances that are scaled dynamically by the platform.
- Functions can have multiple parallel executions minimizing the total time needed to process requests.
- Cost is driven by the number of executions and by accounting for memory size used and total execution time across all functions in a Function App as measured in gigabyte-seconds.

Selection guidance

- Good option if your functions run at elastic scale with potentially intermittent executions.

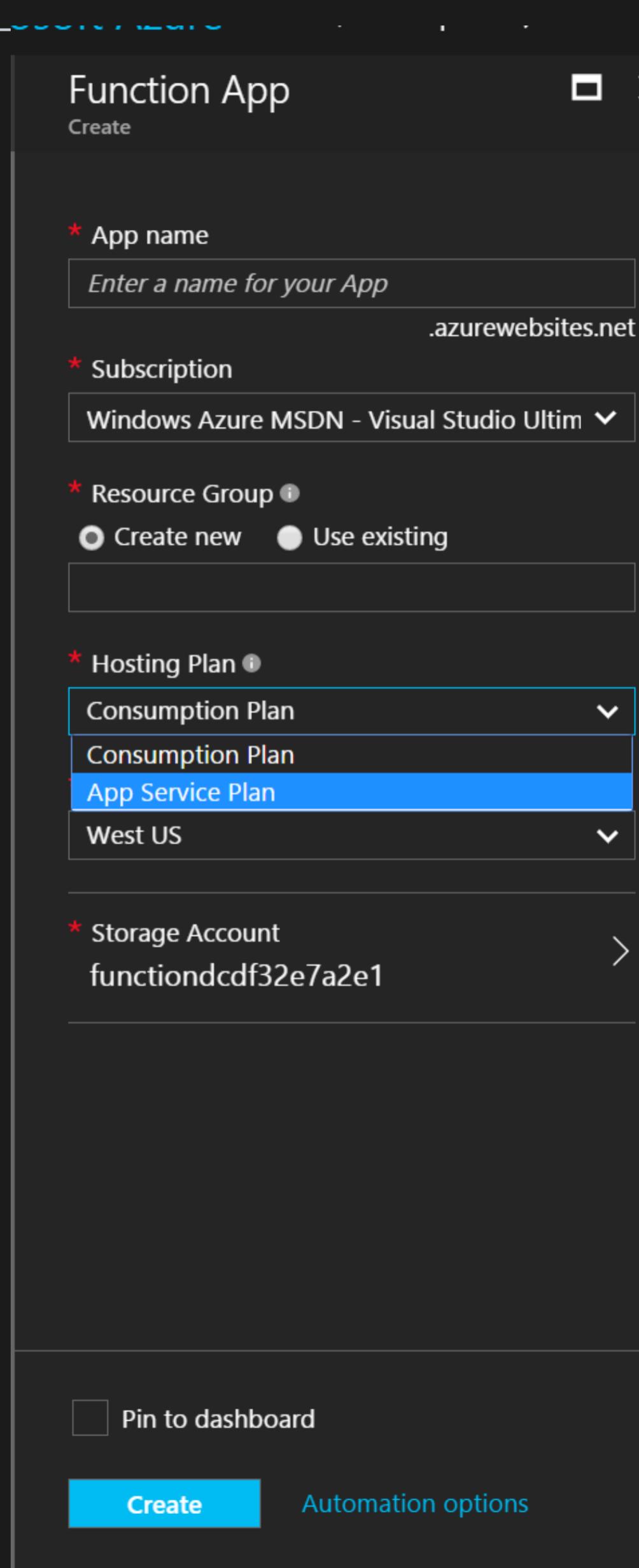


App Service Plan

- Function Apps run on dedicated VMs, just like Web Apps work today
- Dedicated VMs are allocated to your apps and they are always available whether code is being actively executed or not.

Selection guidance

- Good option if you have existing, under-utilized VMs that are already running other code
- Good option if you expect to run functions continuously or almost continuously



Premium Plan

	Consumption Plan	-New- Premium Plan (Preview)
Instance Size	Fixed at one core and 1.5Gb of memory	Configurable up to 4 cores and 14Gb of memory
Scaling	Event driven scaling	Event driven scaling
Scale Controls	None	Set min and max instances
Private Networking	None	VNET integration
Warmup Time (Cold Start)	Your app must be loaded after it is inactive	No delay after your app is inactive and scale instantly to pre-warmed instances
Cost	Consumption	Consumption and at least 1 pre-warmed instance per plan

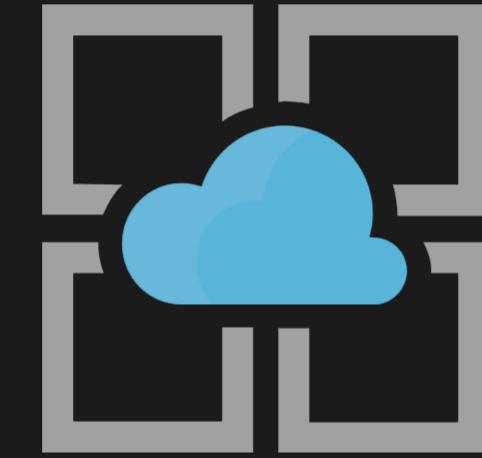
Ways to Run Functions

Consumption *Serverless*



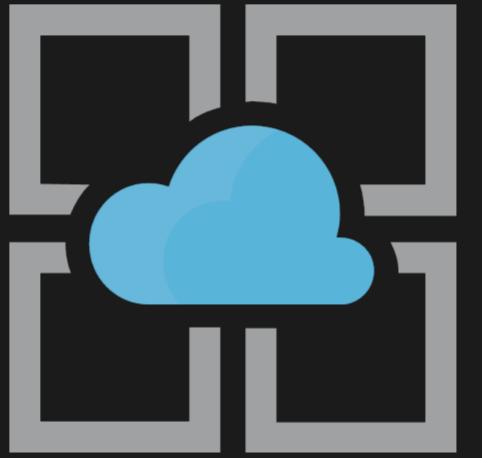
Pay only for what you use! Metering is per execution and per Gb second.

App Service Plan *Free, Basic, Standard, Premium*



All the advantages of Functions with the SLA and 'always on' feature of an App Service Plan

App Service Environment *Network Isolation*



Your own dedicated cloud environment with network isolation for apps, higher scale, and the ability to connect securely to local vNets.

Azure Stack *On Premises*



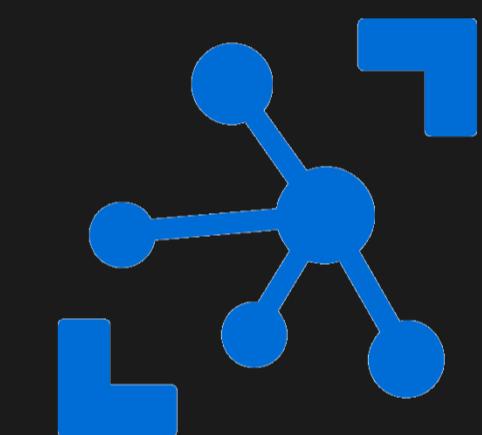
Leverage cloud innovations in on-premises infrastructure. Azure Stack brings the power of Azure to your data centers.

Azure Functions Runtime *Functions on your Server*



Run your Azure Functions on our local server (without the rest of Azure)

Azure IoT Edge *On Devices*



Run on IoT Devices by deploying custom modules.

Pricing

Serverless in Action

Pricing – General Information

- No upfront cost
- No termination fees
- Pay only for what you use

Consumption Plan Pricing

Meter	Price	Free Grant
Execution Time	\$0.000016 per Gb-s	400,000 GB-s
Executions	\$0.20 per million executions	1 million executions

- Gigabyte-second (GB-s) – Combination of memory size and execution time
- Executions – Each time a function is executed

Pricing Example

- Execution Time
 - 3 million executions x 1 second per execution = 3 million seconds
 - Resource consumption of 512-Mb → 1.5 million GB-s
 - 1.5 million GB-s minus grant of 400,000 Gb-s = 1.1 million Gb-s
 - Execution Total = \$17.60
- Executions
 - 3 million executions minus grant of 1 million executions = 2 million executions
 - 2 million transactions at 20 cents per million = \$0.40
- Grand Total: \$18.00

Azure Functions in Action

Serverless in Action



Demo: Create an Azure Function
from the Portal



Demo: Create an Azure Function
from Visual Studio

Visual Studio Installer

Products

Installed

Visual Studio Enterprise 2017

15.6.6

Microsoft DevOps solution for productivity and coordination across teams of any size

[Release notes](#)

[Modify](#)

[Launch](#)

More ▾

Welcome!

We invite you to go online to hone your skills and find additional tools to support your development workflow.

Learn

Whether you're new to development or an experienced developer, we have you covered with our tutorials, videos, and sample code.

Marketplace

Use Visual Studio extensions to add support for new technologies, integrate with other products and services, and fine-tune your experience.

Need some help?

Check out the [Microsoft Developer Community](#) where developers provide feedback and answers to many common problems.

Get help from Microsoft at [Visual Studio Support](#).

Visual Studio Installer

Modifying — Visual Studio Enterprise 2017 — 15.6.6

[Workloads](#)[Individual components](#)[Language packs](#)

Windows (3)



Universal Windows Platform development
Create applications for the Universal Windows Platform with C#, VB, JavaScript, or optionally C++.



.NET desktop development
Build WPF, Windows Forms, and console applications using C#, Visual Basic, and F#.



Desktop development with C++
Build Windows desktop applications using the Microsoft C++ toolset, ATL, or MFC.



Web & Cloud (7)



ASP.NET and web development
Build web applications using ASP.NET, ASP.NET Core, HTML/JavaScript, and Containers including Docker support.



Azure development
Azure SDKs, tools, and projects for developing cloud apps, creating resources, and building Containers including...



Python development
Editing, debugging, interactive development and source control for Python.



Node.js development
Build scalable network applications using Node.js, an asynchronous event-driven JavaScript runtime.



Location

c:\Program Files (x86)\Microsoft Visual Studio\2017\Enterprise

Total install size: 0 KB

By continuing, you agree to the [license](#) for the Visual Studio edition you selected. We also offer the ability to download other software with Visual Studio. This software is licensed separately, as set out in the [3rd Party Notices](#) or in its accompanying license. By continuing, you also agree to those licenses.

[Modify](#)

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Summary

- Visual Studio core editor
- Universal Windows Platform development *
- .NET desktop development
- ASP.NET and web development
- Azure development
- Data storage and processing
- .NET Core cross-platform development
- Individual components
 - Visual Studio C++ core features
 - PowerShell Tools for Visual Studio 2017
 - ReadyRoll for VS2017
 - SQL Prompt Core
 - TypeScript 2.3 SDK
 - Arduino IDE for Visual Studio
 - PowerShell Pro Tools for Visual Studio 2017
 - Windows Template Studio
 - VS Live Share - Preview



Demo: Monitoring a Rapidly
Scaling Function

Most Powerful Sith Lord



Darth Vader



Darth Sidious



Darth Maul



Darth Bane



Darth Vitiate



Darth Millennial



Exar Kun



Darth Revan



Darth Revan



Darth Traya

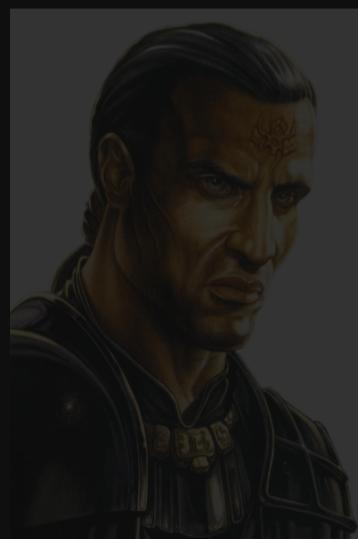
Most Powerful Sith Lord



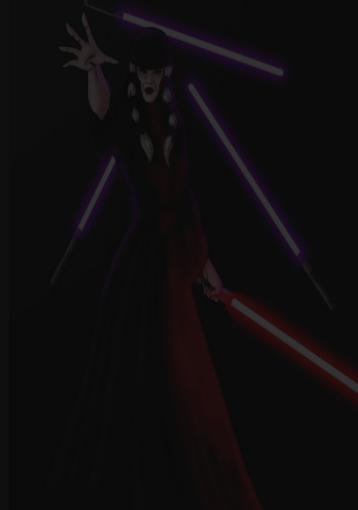
Darth Vader



Darth Barriss Offee



Exar Kun



Darth Traya



Darth Maul



Darth Millennial

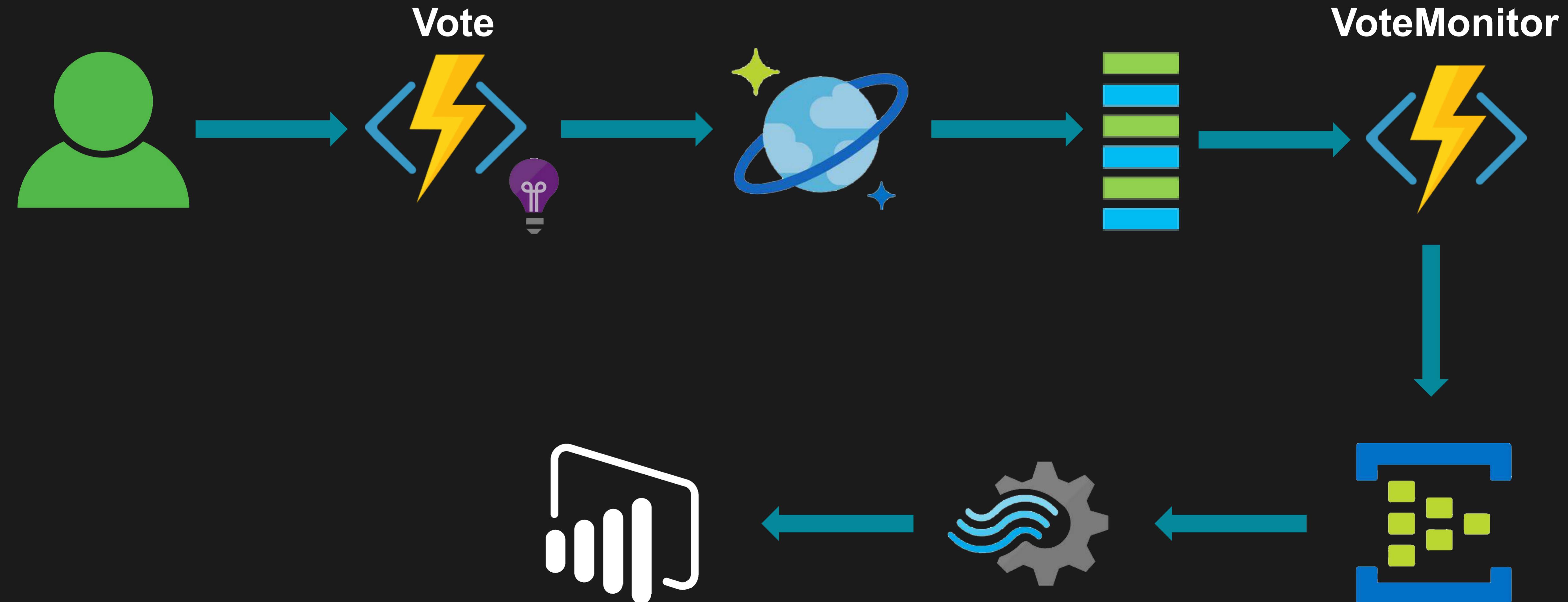


Darth Revan



Darth Jar Jar

Most Powerful Sith Lord



Best Practices

Serverless in Action

Function Timeouts

- Default timeout of 5 minutes
- Maximum timeout of 10 minutes
- For longer running functions use the App Service Plan and/or Durable Functions

The absolute minimum best practices

- Functions *should* do one thing
- Functions *should* be idempotent
- Functions *should* finish as quickly as possible

General Best Practices

- Avoid long running functions

General Best Practices

- Avoid long running functions
- Cross function communication

General Best Practices

- Avoid long running functions
- Cross function communication
- Write functions to be stateless

Durable Functions

More capabilities coming in near future

General Best Practices

- Avoid long running functions
- Cross function communication
- Write functions to be stateless
- Write defensive functions

Testing Your Functions

- Recommended Way
 - Abstract logic away from the Function and test that abstraction
- But I really need (want) to test the actual Function
 - Within test project, you will need to create a class that implements the ILogger which will be passed into the Functions

Scalability Best Practices

- Do not mix test and production code in the same function app

Scalability Best Practices

- Do not mix test and production code in the same function app
- Use async code but avoid blocking calls

Scalability Best Practices

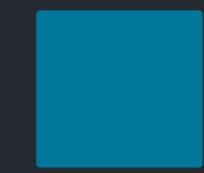
- Do not mix test and production code in the same function app
- Use async code but avoid blocking calls
- Receive messages in batch whenever possible

Scalability Best Practices

- Do not mix test and production code in the same function app
- Use async code but avoid blocking calls
- Receive messages in batch whenever possible
- Configure host behaviors to better handle concurrency

How to get started

- Start small, replace 1 API or background processing item
- Integration is a great place, often it's a new layer on top of old layers



Questions



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