



Chad Green

From Zero to Serverless

CodeMash
January 11, 2019



Who is Chad Green



- Data & Solutions Architect at ProgressiveHealth
- Community Involvement
 - Code PaLOUsa Conference Chair
 - Louisville .NET Meetup Organizer
 - Louisville Tech Leaders Meetup Co-Organizer
 - Louisville Tech Ladies Committee Member

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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

From Zero to Serverless

The evolution of application platforms

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

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

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

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

How can I increase **server** utilization?

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

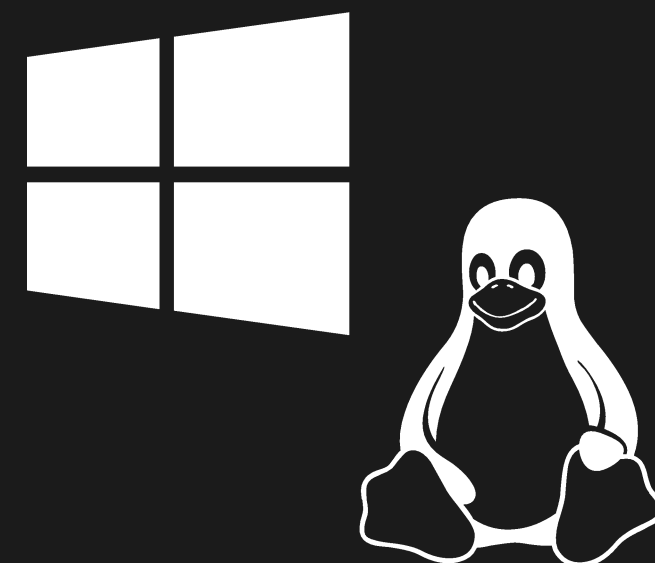
Which packages should be on my **server**?

Who **monitors** my **App**?

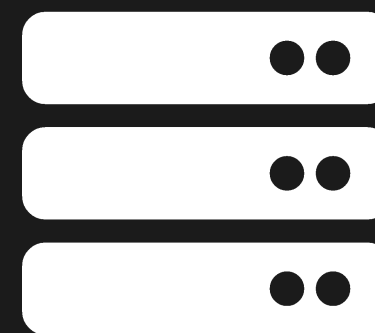
How often should I backup my **server**?

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

How can I **scale** my app?



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



Which **Operating System** should I use?

What **happens** if the power goes out?

What **storage** do I need to use?

Do I need a secondary **network connection**?

How many **servers** do I need?

Who **monitors** my **servers**?

Do I need a **UPS**?

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

How can I dynamically configure my app?

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



On-Premises

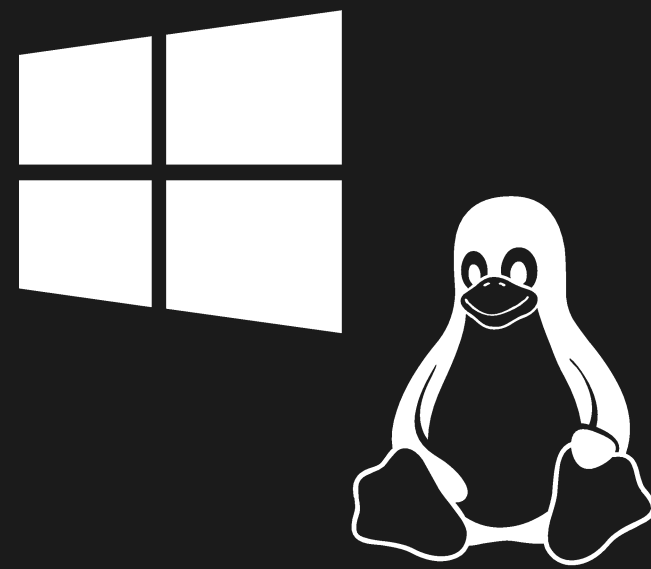
The evolution of application platforms

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?



On-Premises

IaaS

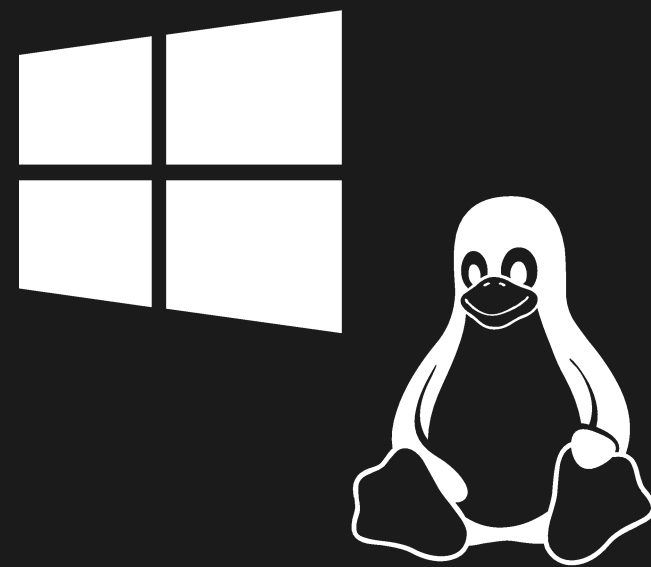
The evolution of application platforms

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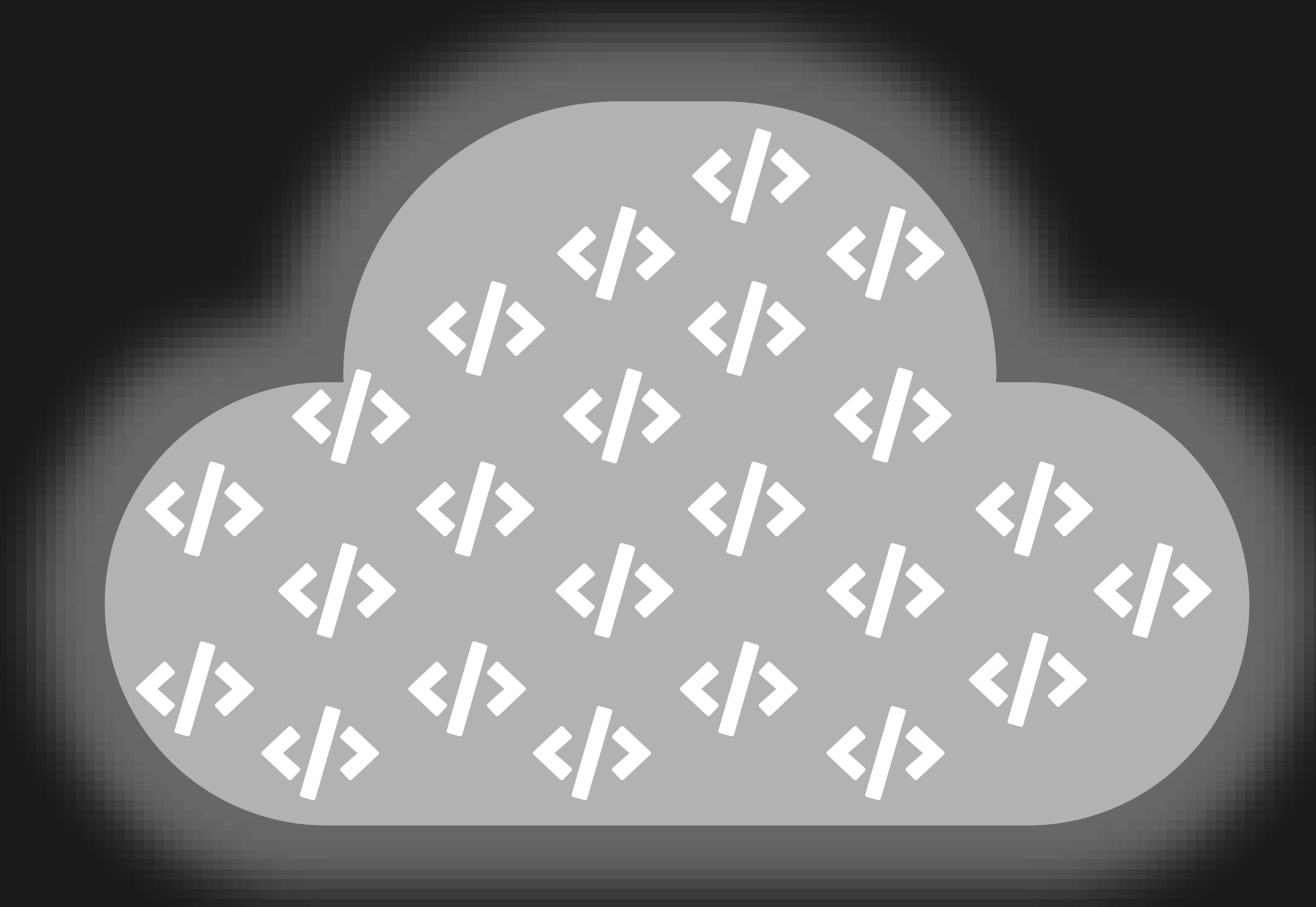


On-Premises

IaaS

PaaS

The evolution of application platforms



The platform for next generation applications

On-Premises

IaaS

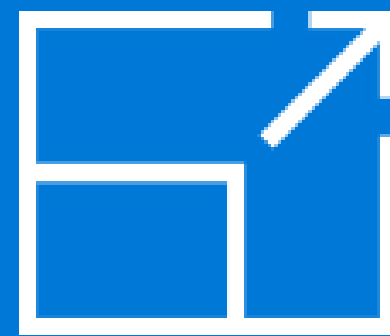
PaaS

Serverless

What is Serverless?



Abstraction of Servers



Event-Driven/Instant Scale

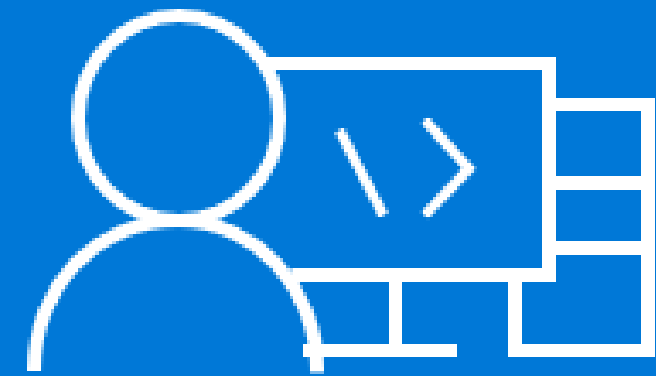


Micro-Billing

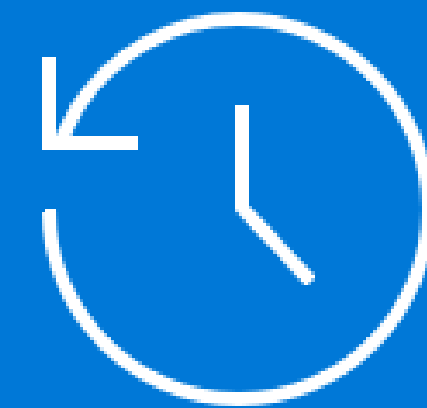
Benefits of Serverless



Manage apps not servers



Reduced DevOps



Faster Time to Market

Challenges of Serverless Architecture



Complexity

Organizational
Support

No Runtime
Optimization



Function as a Service

From Zero to Serverless

Serverless is more than just one thing

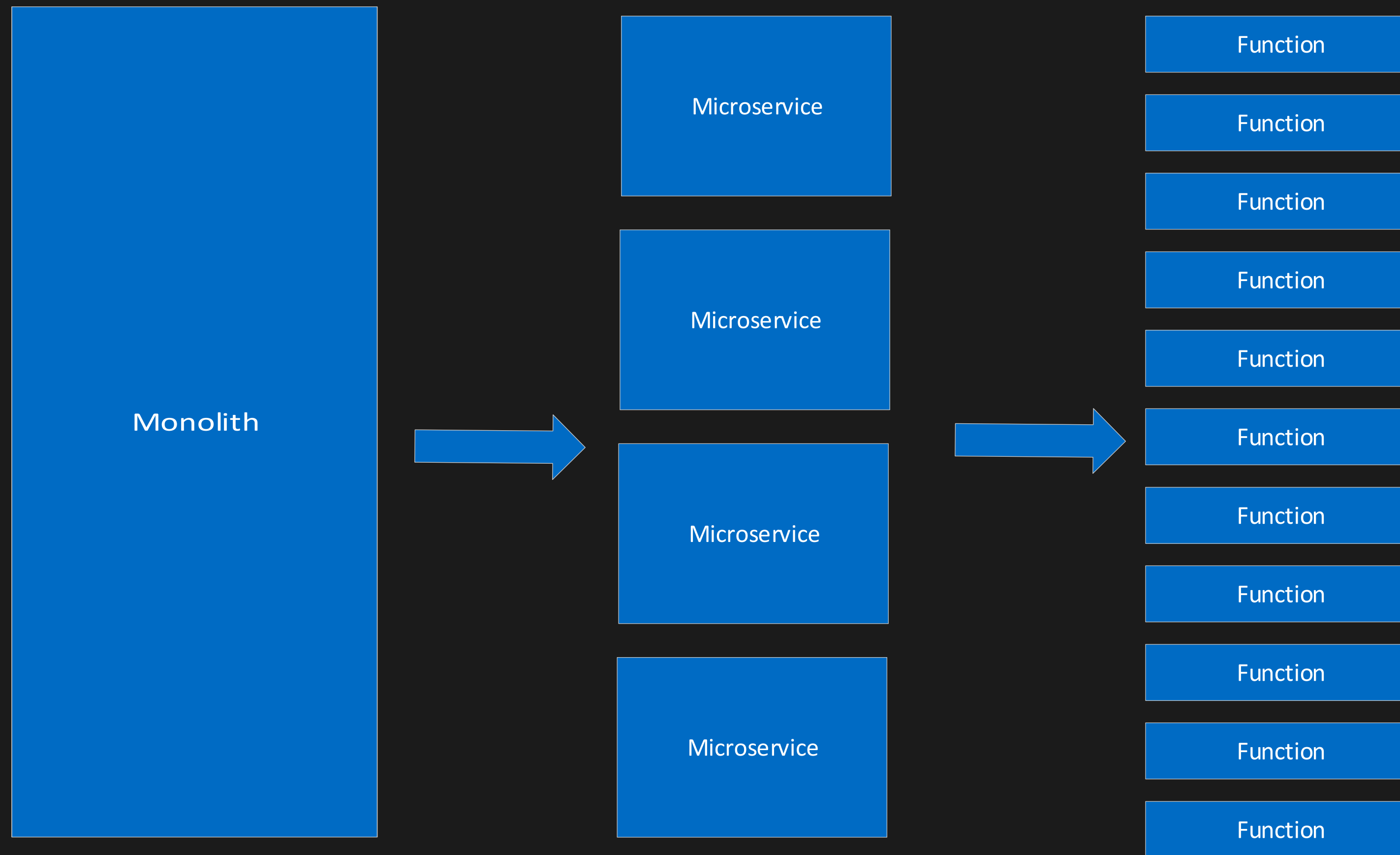
Backend as a Service (BaaS)

- 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



Nano Services

FaaS is at the center of serverless



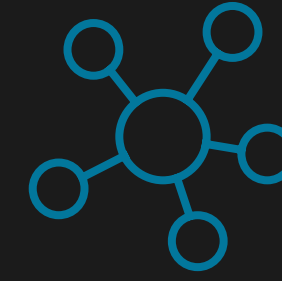
Single responsibility

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



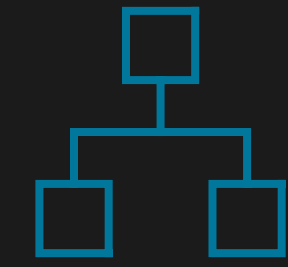
Short lived

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

From Zero to Serverless

Market Landscape



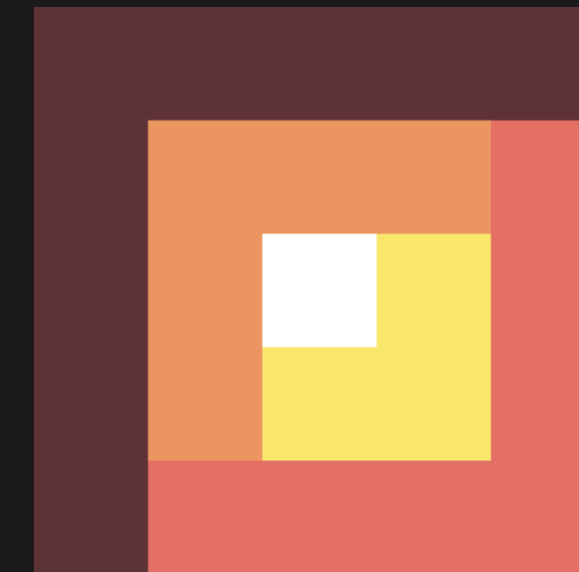
AWS
Lambda



Google
Cloud Functions



IBM
Cloud Functions



Auth0
WebTask



Azure

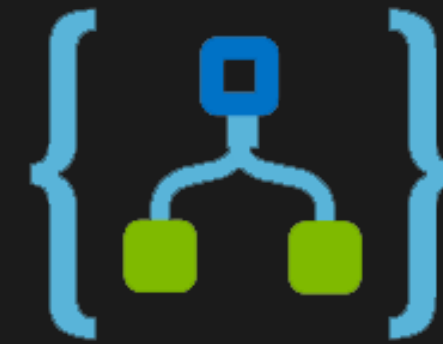
Event-driven development is making a big difference in the serverless ecosystem. It's a paradigm shift that allows developers to build applications that are more scalable and resilient. The complete environment is designed to consume the complete ecosystem.

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



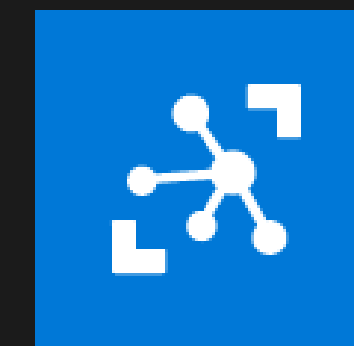
Database



Storage



Security



IoT



Analytics



Intelligence

Code

Events + data

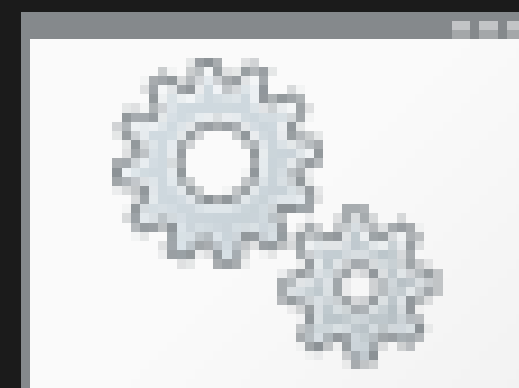
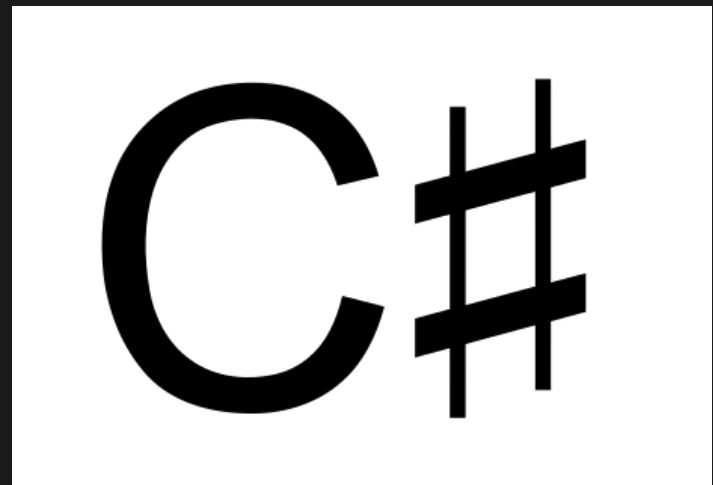


Azure Functions

From Zero to Serverless

Features of Azure Functions

- Choice of language

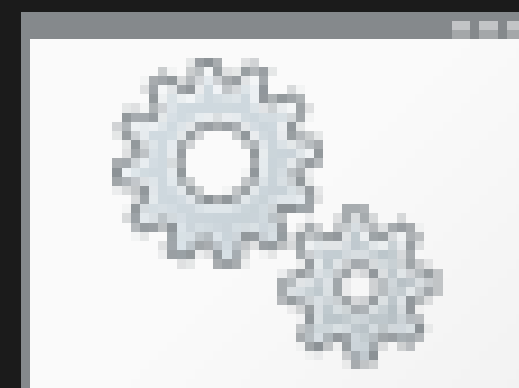
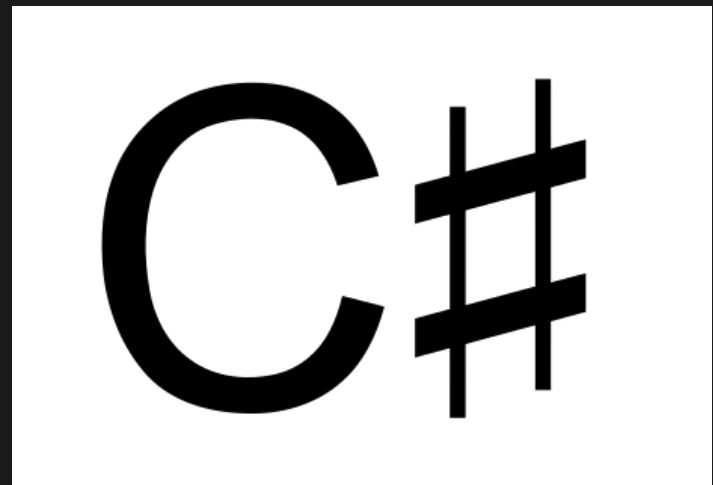


Batch



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



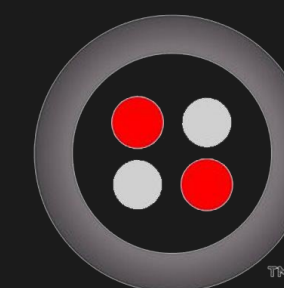
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Features of Azure Functions

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



twilio

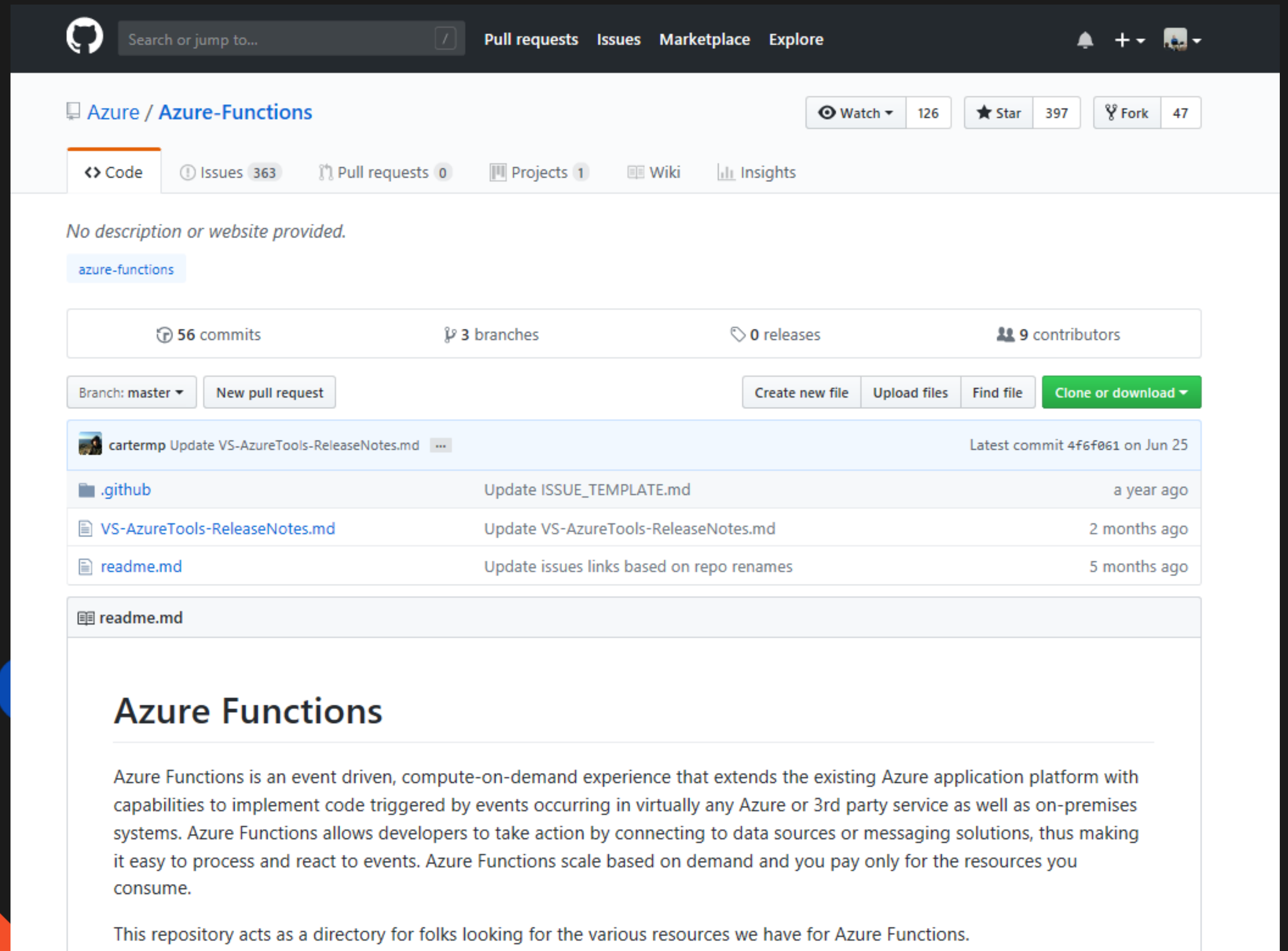
Features of Azure Functions

- Choice of language
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- 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



Triggers and Bindings

Type	1.x	2.x	Trigger	Input	Output
Blob Storage	✓	✓	✓	✓	✓
Cosmos DB	✓	✓	✓	✓	✓
Event Grid	✓	✓	✓		
Event Hubs	✓	✓	✓		✓
External File	✓			✓	✓
External Table	✓	✓		✓	✓
HTTP	✓	✓	✓		✓
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	✓	✓	✓		✓
Table Storage	✓	✓		✓	✓
Timer	✓	✓	✓		
Twilio	✓	✓			✓
Webhooks	✓		✓		✓

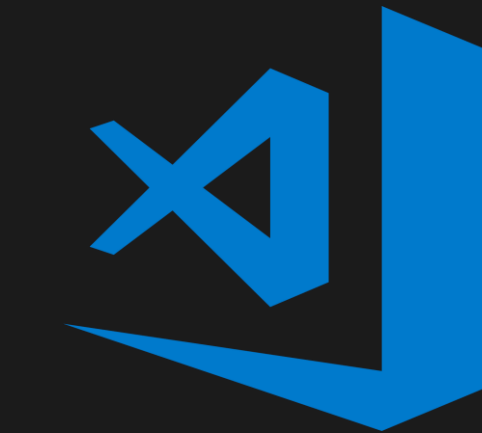
Develop How You Want



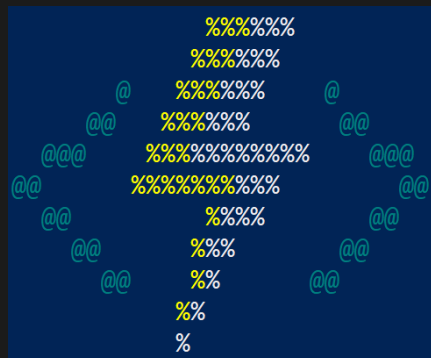
- Azure Portal
 - Quickly get started without having to install anything else



- 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 Version Languages

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

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.

Function App

Create

*

App name

Enter a name for your App

.azurewebsites.net

*

Subscription

Windows Azure MSDN - Visual Studio Ultim

*

Resource Group

Create new

Use existing

*

Hosting Plan

Consumption Plan

Consumption Plan

App Service Plan

West US

*

Storage Account

functiondcdf32e7a2e1

Pin to dashboard

Create

Automation options

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

Function App
Create

* App name
Enter a name for your App
azurewebsites.net

* Subscription
Windows Azure MSDN - Visual Studio Ultim

* Resource Group
☐ Create new ☐ Use existing

* Hosting Plan
Consumption Plan
Consumption Plan
App Service Plan
West US

* Storage Account
functiondcdf32e7a2e1

☐ Pin to dashboard

Create Automation options

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*



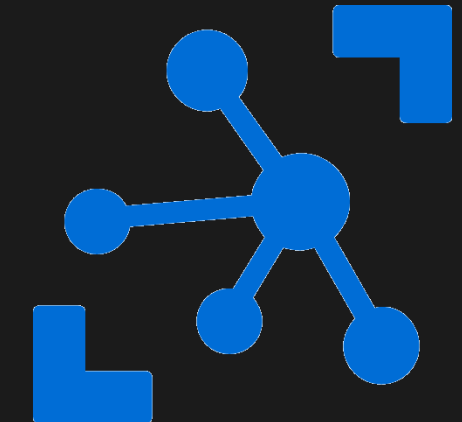
Leverage cloud innovations in on-premises infrastructure. Azure Stack brings the power of Azure to your data centers.

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.



Azure Functions in Action

From Zero to Serverless



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](#).

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.

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

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

Proxies

- Provide more control over all functions or just select methods
- Can point to any HTTP resource

Take our current function url:

<https://codemash.azurewebsites.net/api/HttpTriggerCSharp1?code=k9as3MKuD EAOyj3GbniZgJjWrn1cMqTAcDhzbzqgAldUcYk67EX8QVg==&name={name}>

Our function URL would then be like this:

<https://codemash.azurewebsites.net/HelloWorld/{name}>



Demo: Setting up routing and proxies

Deployment and Monitoring

Deployment Options

- Visual Studio
- Functions CLI
- Azure DevOps
- Azure Resource Manager
- Maven / Jenkins

Monitoring Options

- Azure App Insights
- Function Logs
- Azure Monitor (preview)



Demo: Monitoring a Rapidly
Scaling Function

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



Demo: Testing Your Azure Functions



Pricing

From Zero to Serverless

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



Best Practices

From Zero to Serverless

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

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- Cross function communication

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- Write functions to be stateless

General Best Practices

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

Scalability Best Practices

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

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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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Slides: bit.ly/CM19Functions