
Tulsa .NET
User Group
UNLEASHING EXTREME SCALABILITY
WITH AZURE FUNCTIONS

Who is Chad Green?

chadgreen@chadgreen.com

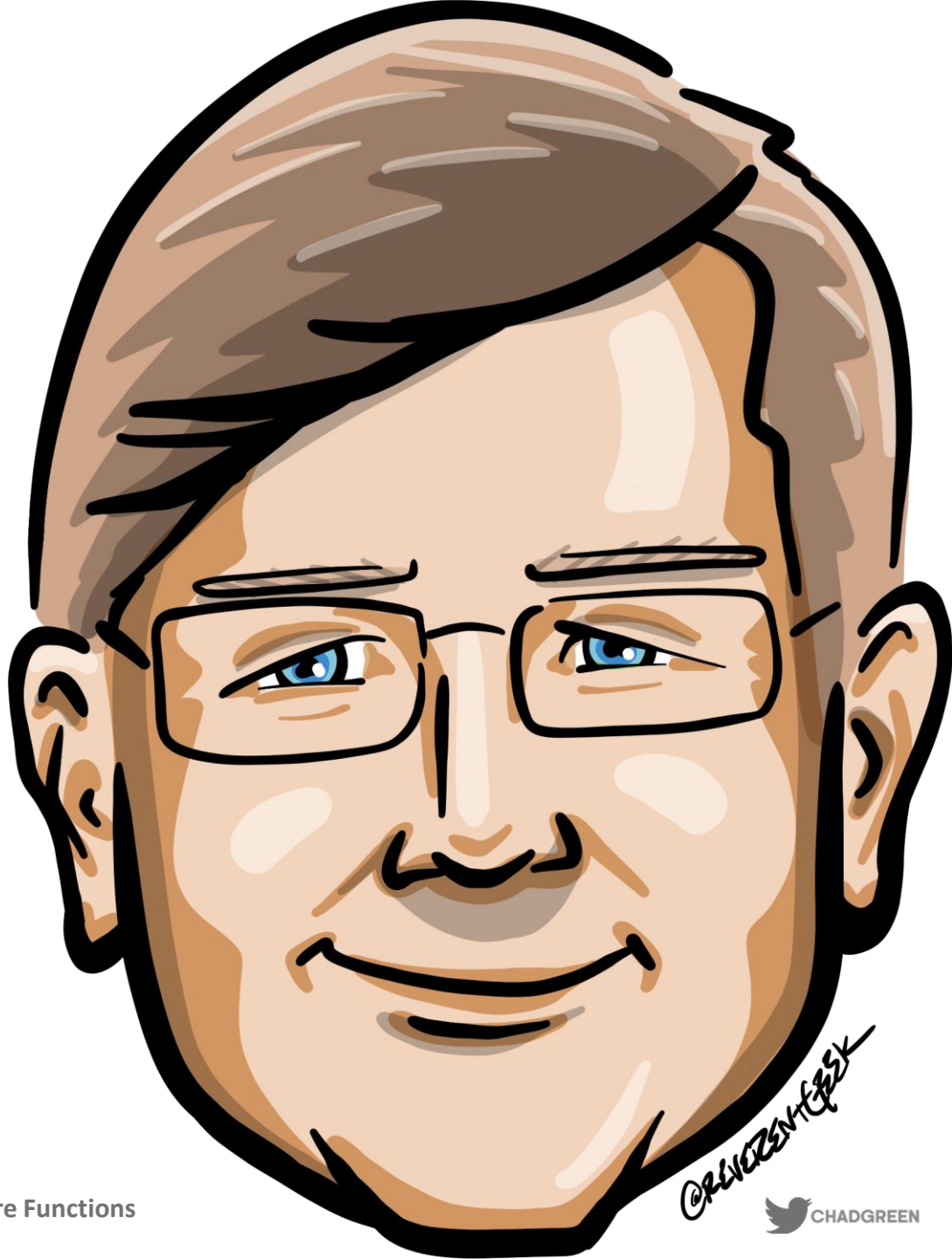
TaleLearnCode

ChadGreen.com

ChadGreen & TaleLearnCode

ChadwickEGreen

Microsoft® MVP Most Valuable Professional



Louisville .NET Meetup

July 18, 2024

August 22, 2024

Upcoming Events

Scenic City Summit
Chattanooga, TN
June 28, 2024
$99
sceniccitysummit.com

Cincy Deliver
Mason, OH
July 26, 2024
$65 through May; $75
cincydeliver.org

dev up
St. Charles, MO
August 14 – 16, 2024
$450 GA; $225 Workshop
devupconf.org

Join Me


Nebraska.Code()


DELIVER VALUE THROUGH
QUALITY SOFTWARE


dev up


LOUISVILLE
.NET MEETUP


PRAIRIE
DEV CON


API
CONFERENCE

Prelude

Unleashing Extreme Scalability
with Azure Functions

The evolution of application platforms

On-Premises

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

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

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

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

How can I increase **server** utilization?

Who **monitors** my **apps**?

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

How can I **scale** my app?

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

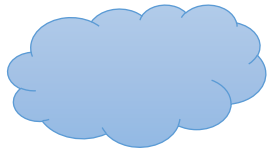
Are my **servers** in a **secure** location?

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

How do I keep the **operating system** up to date?

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

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



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

How **many** servers do I need?

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

How can I dynamically configure my app?

Do I need a **UPS**?

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

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

The evolution of application platforms

IaaS

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

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

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

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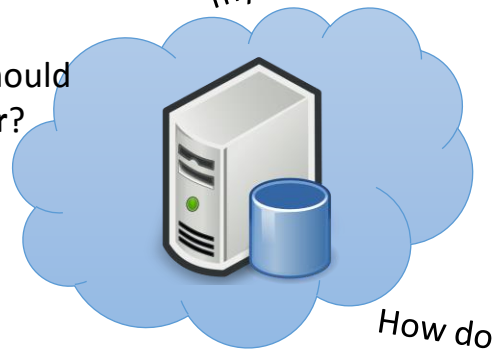

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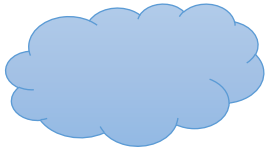

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The evolution of application platforms

PaaS

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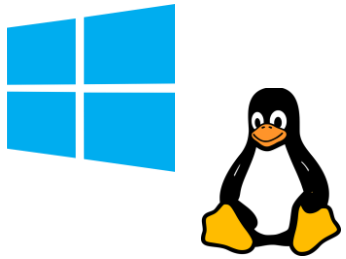

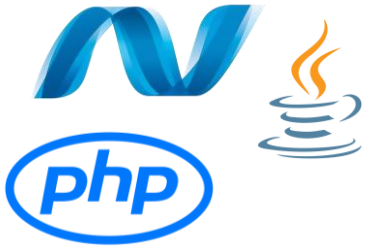

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The evolution of application platforms

Serverless

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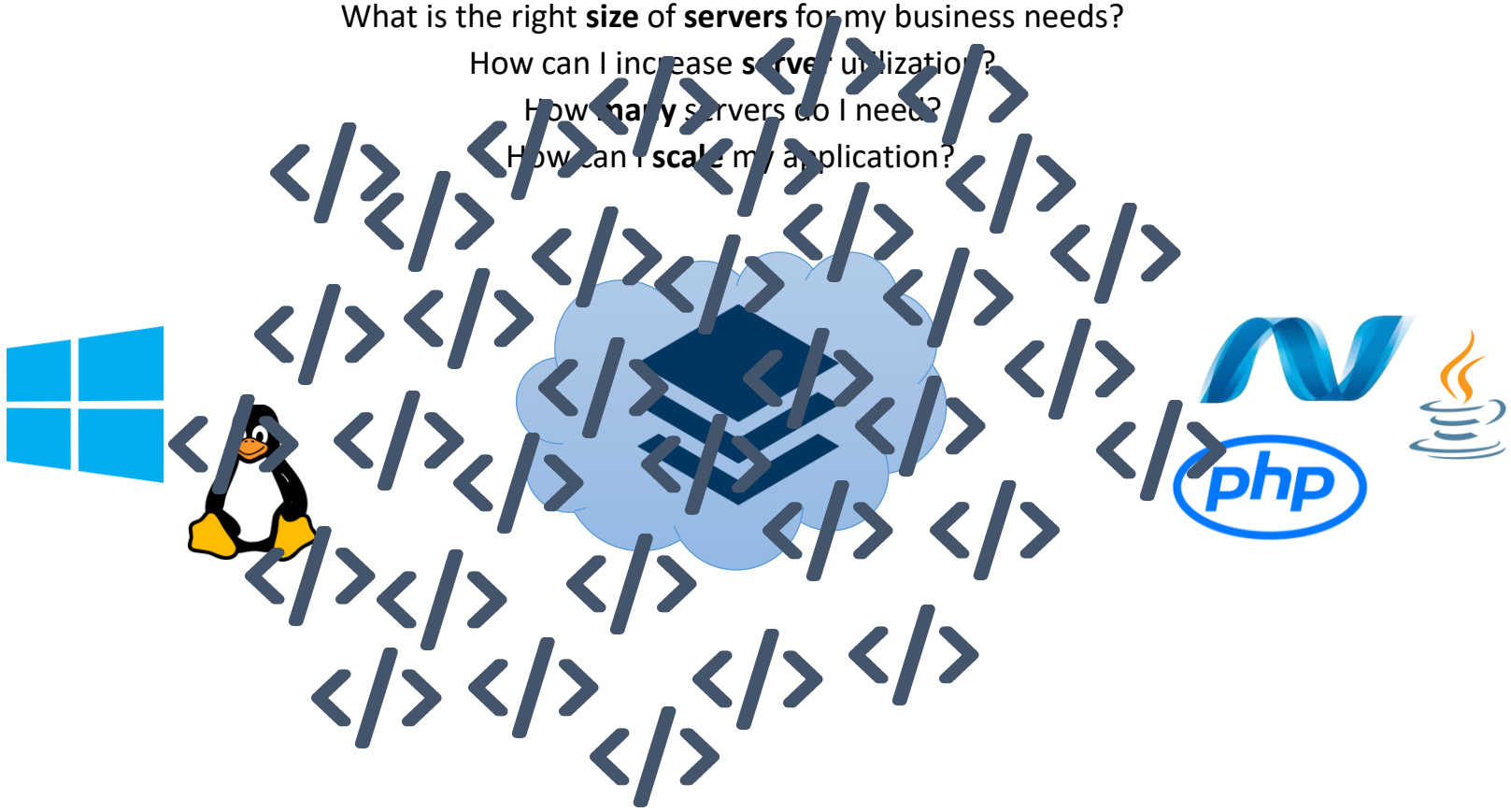


Not there isn't servers

Just, you can think about the servers less

~~Server Configuration~~

~~Server Scaling~~

Types of Serverless Architecture

Function as a Service (FaaS)

Backend as a Service (BaaS)

Function-as-a-Service

Event-Driven

Function-as-a-Service

Event-Driven

Short-Lived

Function-as-a-Service

Event-Driven

Short-Lived

Automatic Scaling

Function-as-a-Service

Event-Driven

Short-Lived

Automatic Scaling

Pay-Per-Execution

Function-as-a-Service

Event-Driven

Short-Lived

Automatic Scaling

Pay-Per-Execution

Abstraction of Infrastructure

Function-as-a-Service

Event-Driven

Short-Lived

Automatic Scaling

Pay-Per-Execution

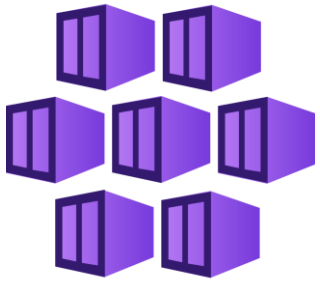
Abstraction of Infrastructure

Azure Serverless

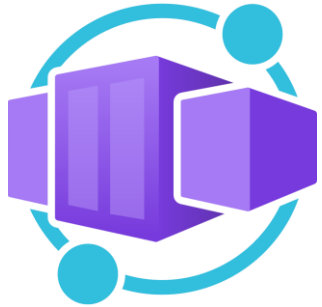
Azure Serverless

Azure Serverless

Compute



Azure Kubernetes Service



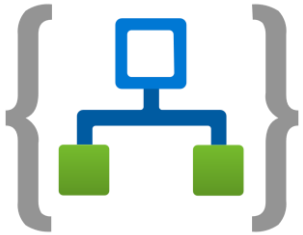
Azure Container Apps

Azure App Service

Azure Functions

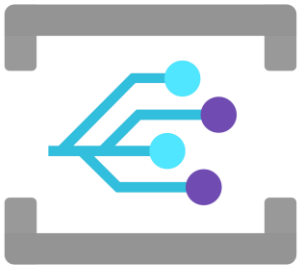
Azure Serverless

Workflow and Integration



Azure Logic Apps

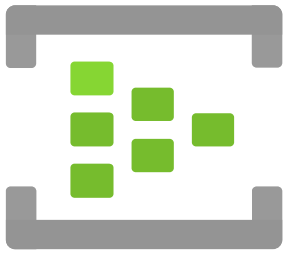
API Management



Azure Event Grid

Azure Serverless

Data Processing and Analytics



Azure Event Hubs

Azure Stream Analytics

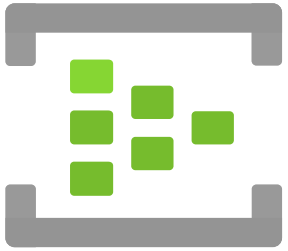
Azure Synapse Analytics

Azure Data Lake Analytics

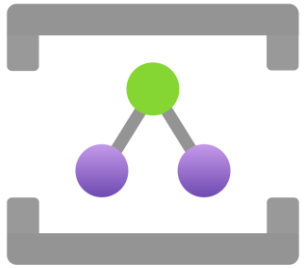
Azure Serverless

Messaging

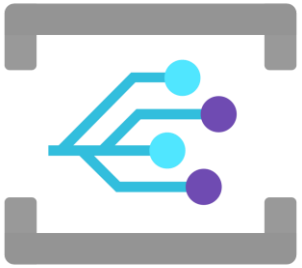
Azure Service Bus



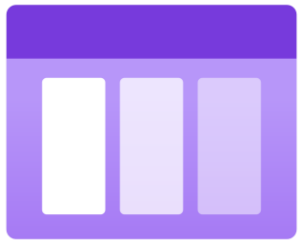
Azure Event Hubs



Azure Relays



Azure Event Grid



Azure Storage Queues

Azure Serverless

Data Storage

Azure SQL Database

Azure Cosmos DB

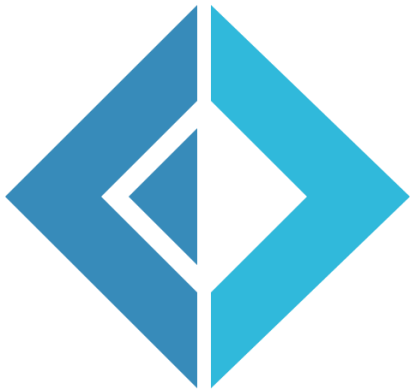
Azure Storage

Azure Functions

Code

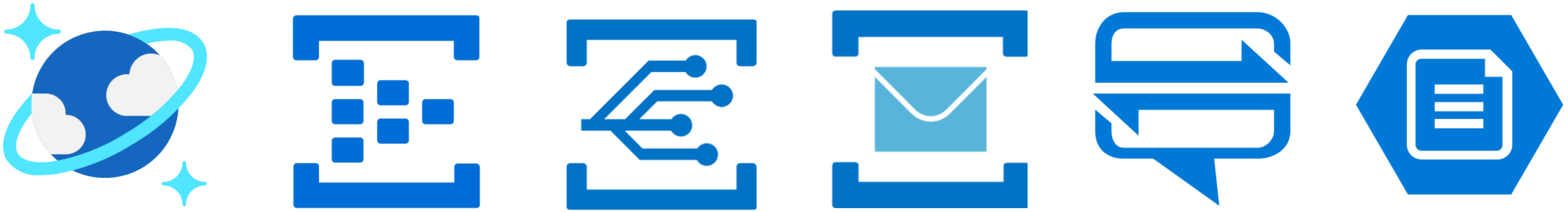
Events + data

Choice of Language



Bring your own dependencies

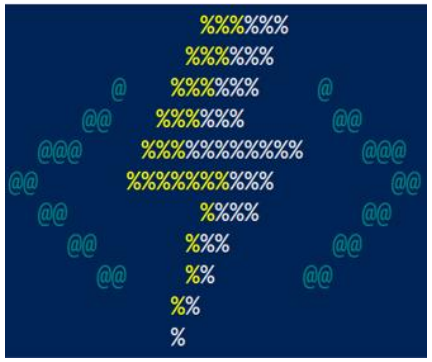
Simplified Integration



RabbitMQ

twilio

Flexible Development



Maven™

Many Hosting Options

Consumption

Serverless

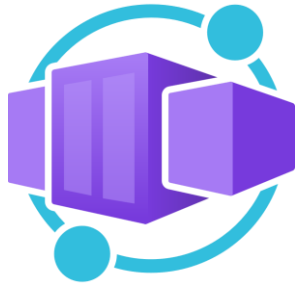
Premium

Sort of Serverless

Dedicated

App Service Plan

Container Apps



Consumption, Dedicated

App Service Environment

Network Isolation

Azure Stack

On Premises

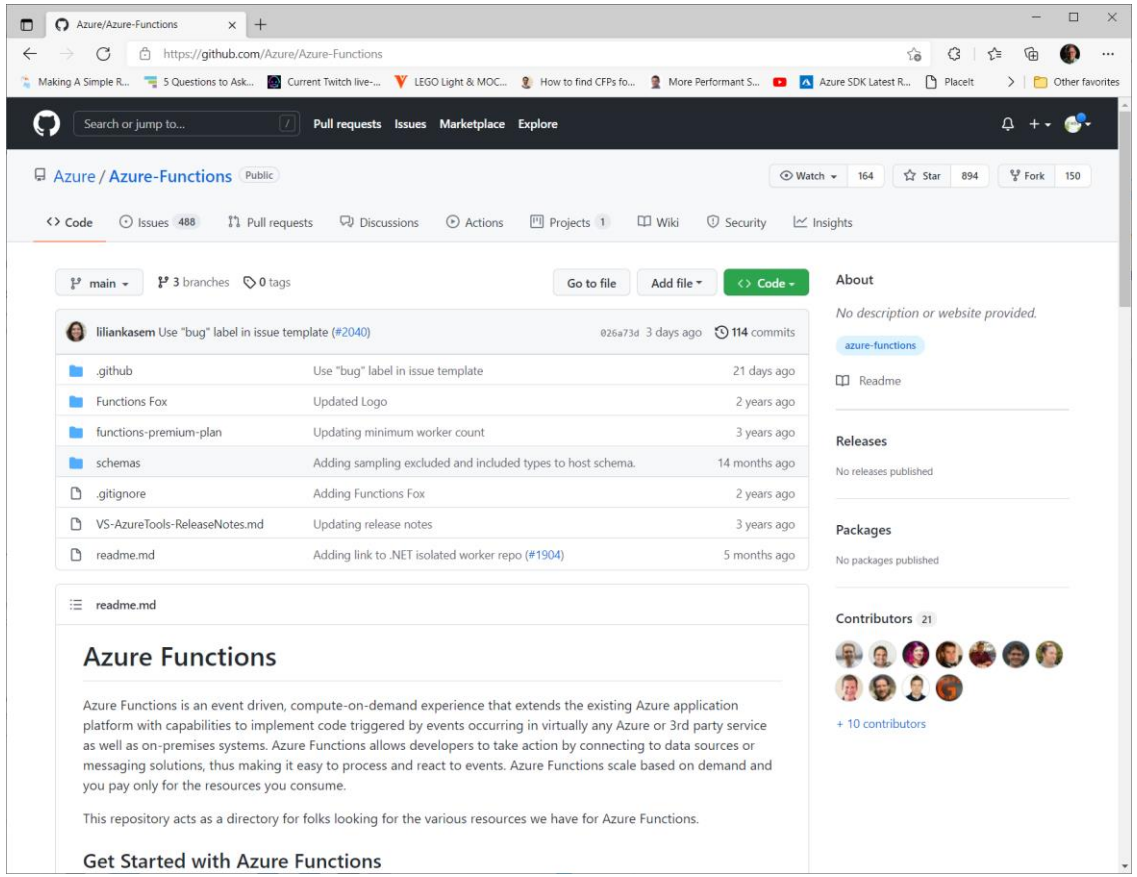
Functions Runtime

Your Server

Azure IoT Edge

On Devices

Open Source


Azure/Azure-Functions
https://github.com/Azure/Azure-Functions
Search or jump to...
Pull requests
Issues
Marketplace
Explore
Azure / Azure-Functions
Public
Watch 164
Star 894
Fork 150
Code
Issues 488
Pull requests
Discussions
Actions
Projects 1
Wiki
Security
Insights
main
3 branches
0 tags
Go to file
Add file
Code
liliankasem Use "bug" label in issue template (#2040)
026a73d 3 days ago
114 commits
.github Use "bug" label in issue template 21 days ago
Functions Fox Updated Logo 2 years ago
functions-premium-plan Updating minimum worker count 3 years ago
schemas Adding sampling excluded and included types to host schema. 14 months ago
.gitignore Adding Functions Fox 2 years ago
VS-AzureTools-ReleaseNotes.md Updating release notes 3 years ago
readme.md Adding link to .NET isolated worker repo (#1904) 5 months ago
readme.md
Azure Functions
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.
This repository acts as a directory for folks looking for the various resources we have for Azure Functions.
Get Started with Azure Functions
About
No description or website provided.
azure-functions
Readme
Releases
No releases published
Packages
No packages published
Contributors 21
+ 10 contributors

Azure Functions

- Choice of Language
- Bring Your Own Dependencies
- Simplified Integration
- Flexible Development
- Many Hosting Options
- Open Source

Many Hosting Options

Consumption

Serverless

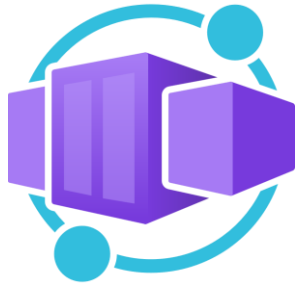
Premium

Sort of Serverless

Dedicated

App Service Plan

Container Apps



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Many Hosting Options

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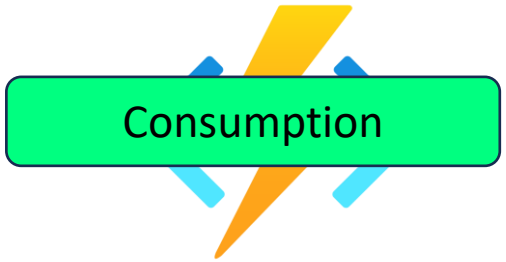

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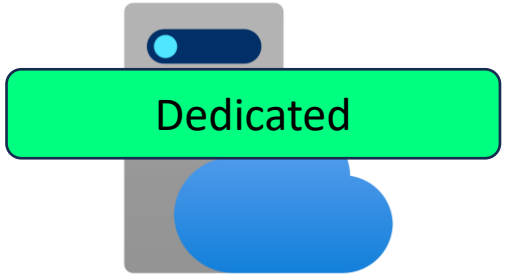
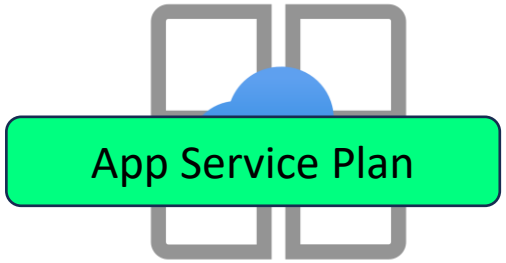


App Service Plan

Container Apps

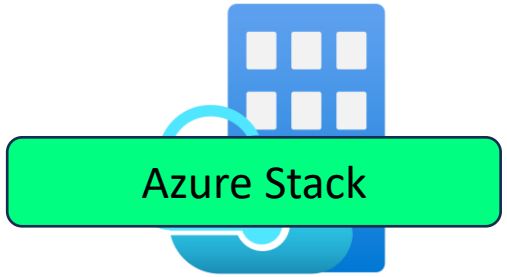
Consumption, Dedicated

App Service Environment



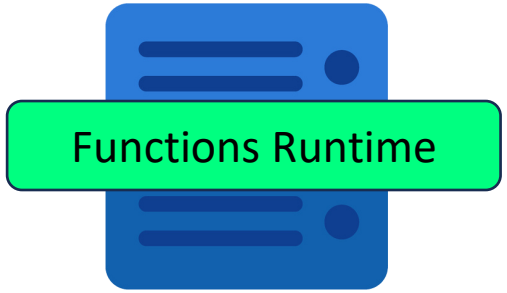
Network Isolation

Azure Stack



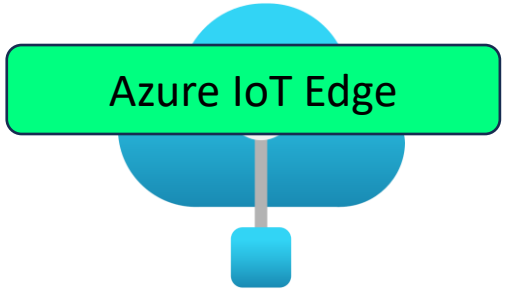
On Premises

Functions Runtime



Your Server

Azure IoT Edge



On Devices

Many Hosting Options

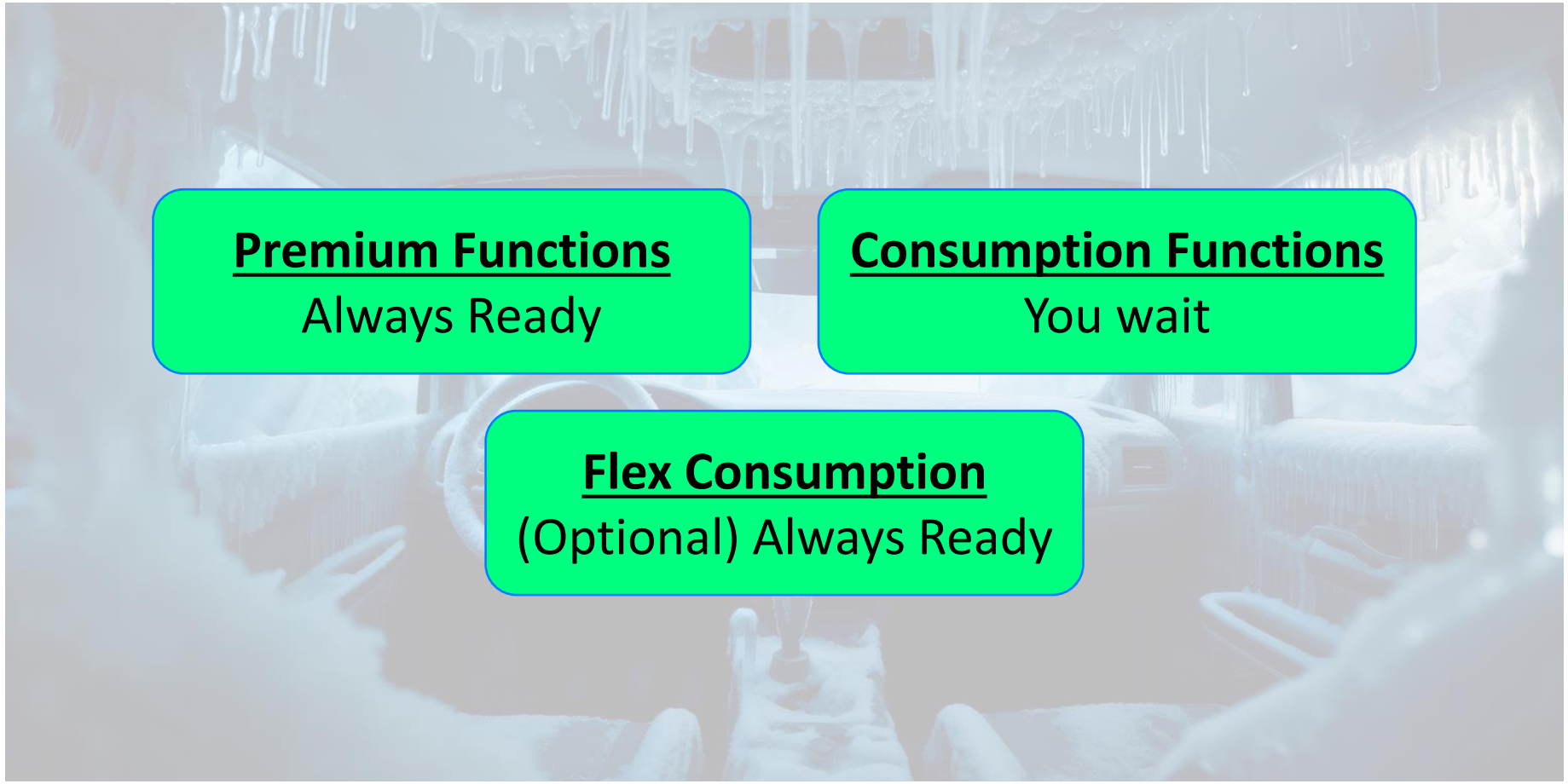
- Consumption
- Premium
- Dedicated
- Container Apps
- App Service Plan
- Azure Stack
- Functions Runtime
- Azure IoT Edge

Flex Consumption

Unleashing Extreme Scalability
with Azure Functions

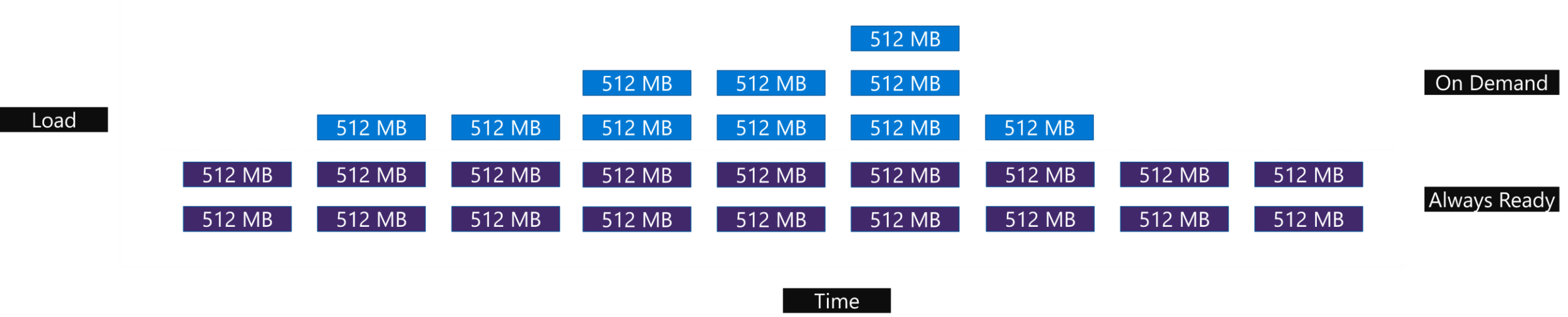
#1 Issue in Serverless: Cold Starts

Cold Start Solutions

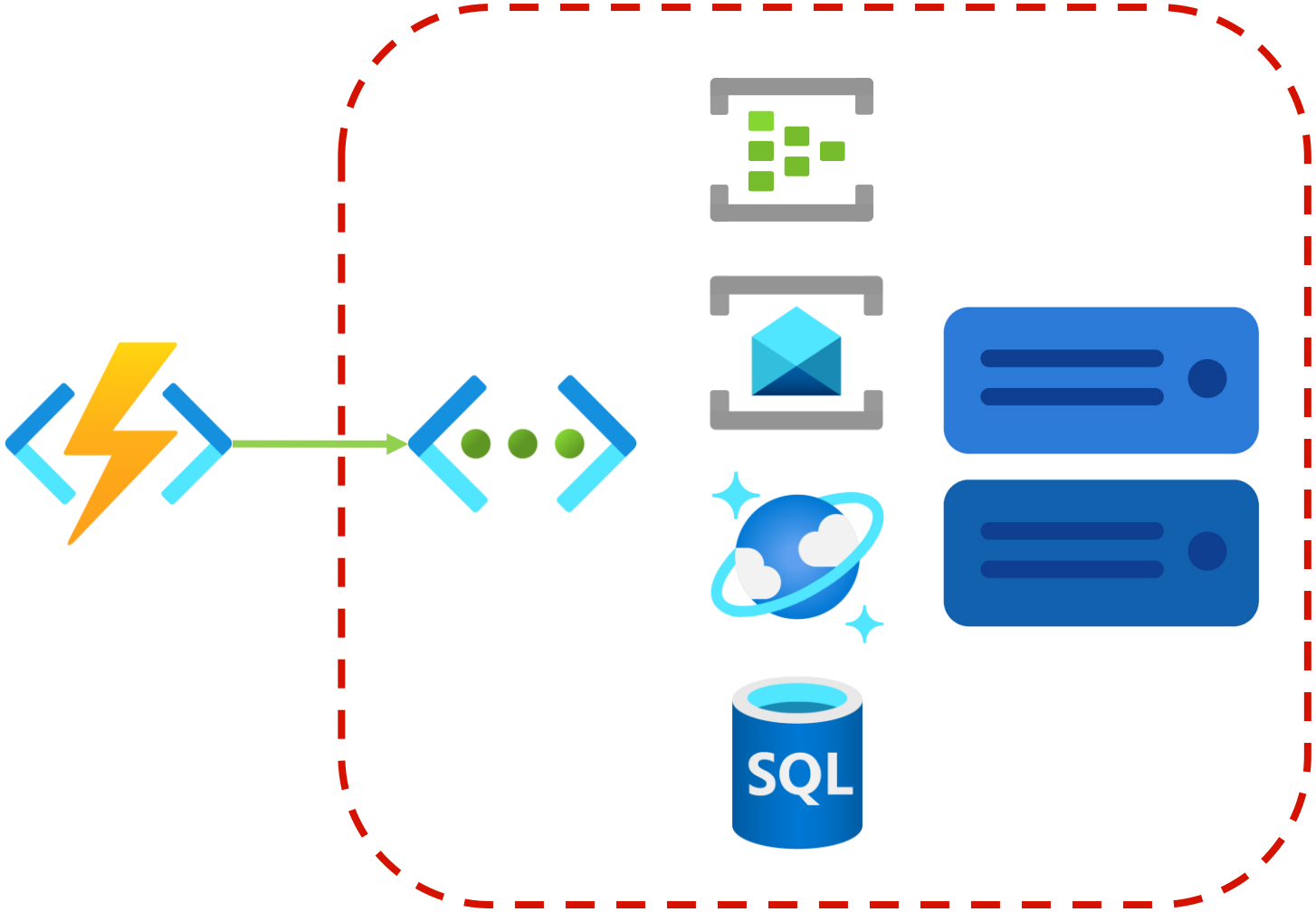


Always Ready Instances

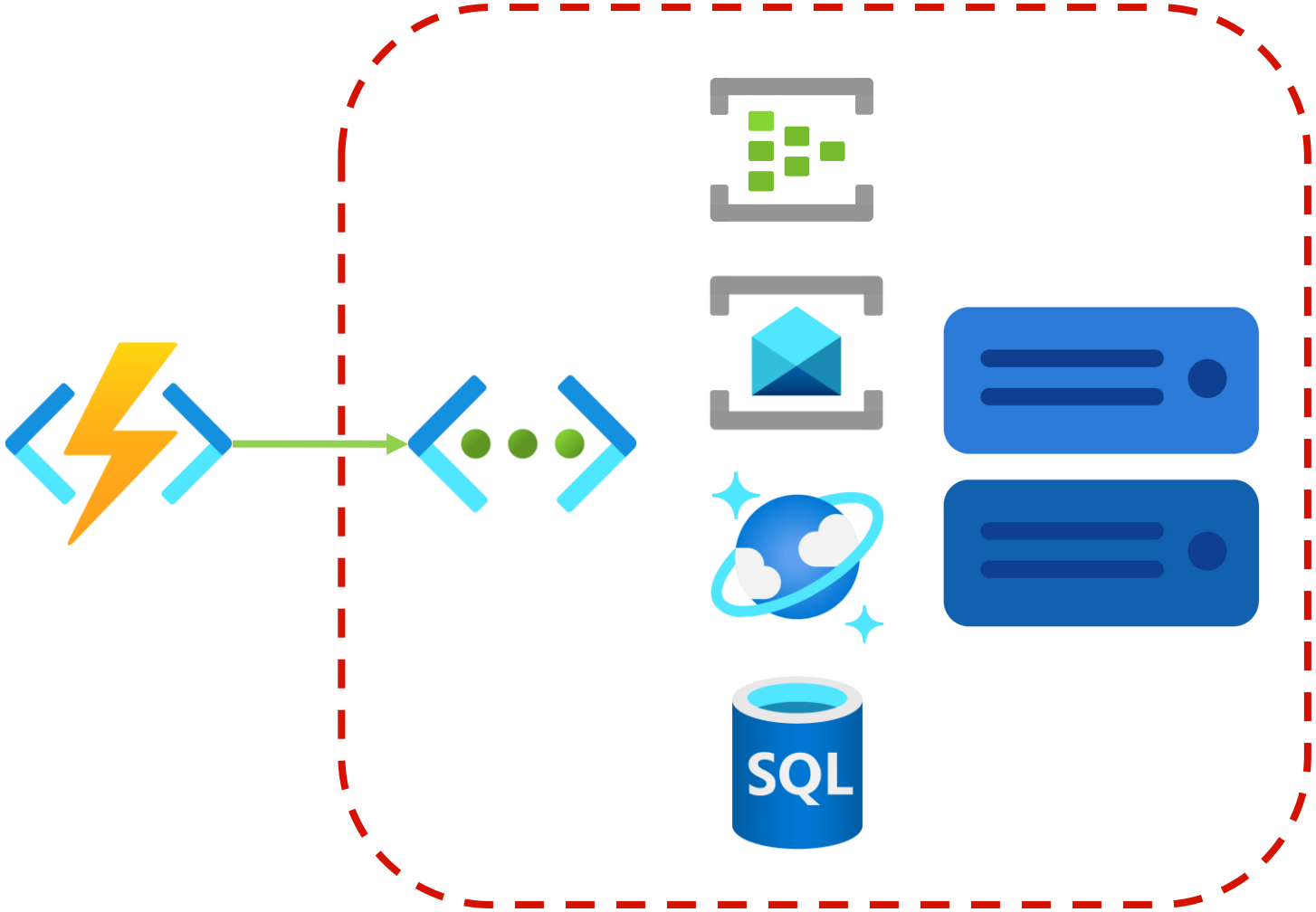
- Choose instances that are always running
- Set minimum number of instances always ready



Virtual Network Support



Virtual Network Support



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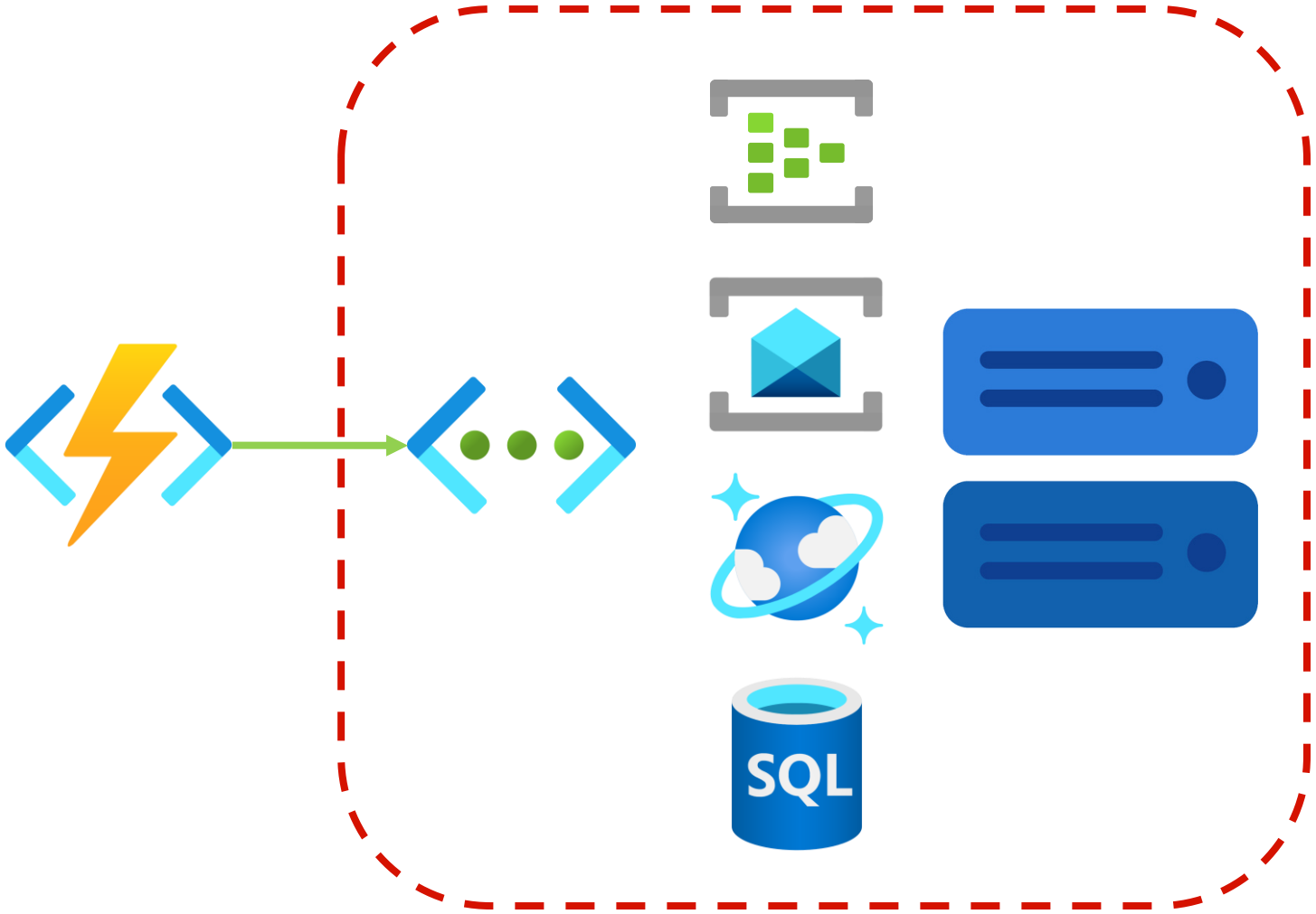


- Inbound Private Endpoints
- Virtual Network Integration
- Virtual Network Triggers (non-HTTP)
- Hybrid connections (Windows only)

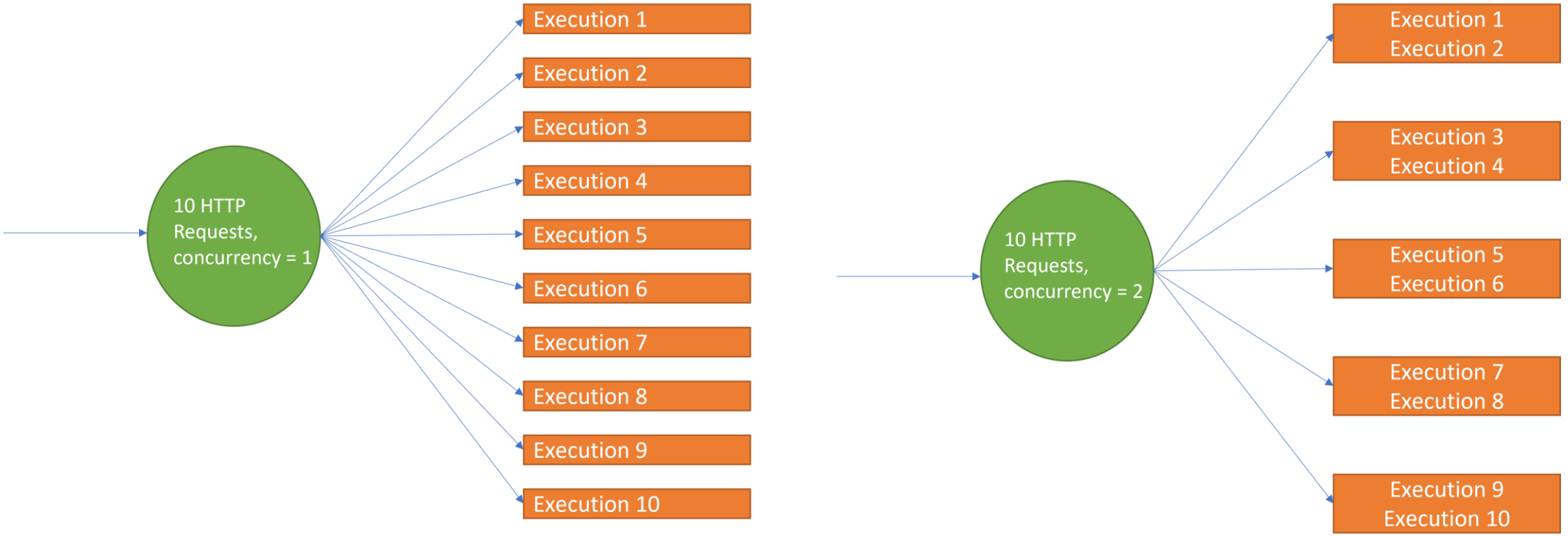
Instance Memory Choice

- 2048-Mb and 4096-Mb (more options coming)
- Default is 2048-Mb
- Change instance memory size at any time
- More memory means more can be done

Per-Instance Concurrency

- Number of parallel executions
- Can set concurrency level per instance
- Has a direct effect on how your app scales

Per-Instance Concurrency



Per-Instance Concurrency Defaults

- Python – 1
- Other languages
  - 512-Mb: 4
  - 2048-Mb: 16
  - 4096-Mb: 32

Per-Function Scaling

- Deterministic way of scaling your app on a per-function basis
- No code changes
- Special cases: HTTP, Blob (Event Grid), and Durable trigger

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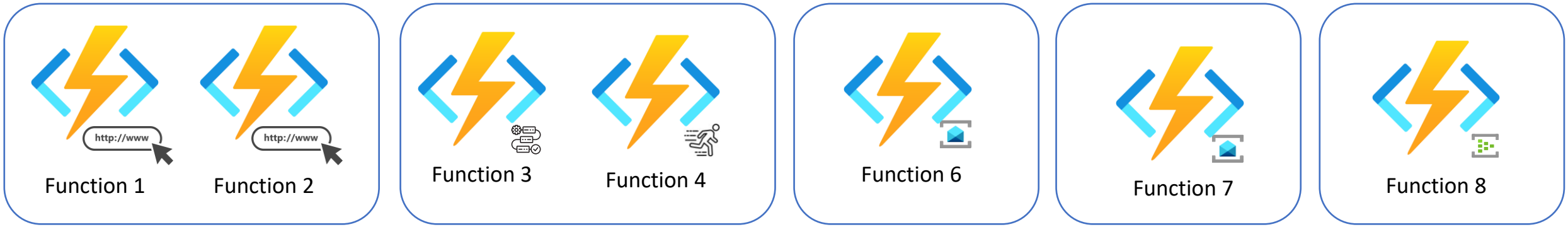
- No code changes
- Special cases: HTTP, Blob (Event Grid), and Durable trigger



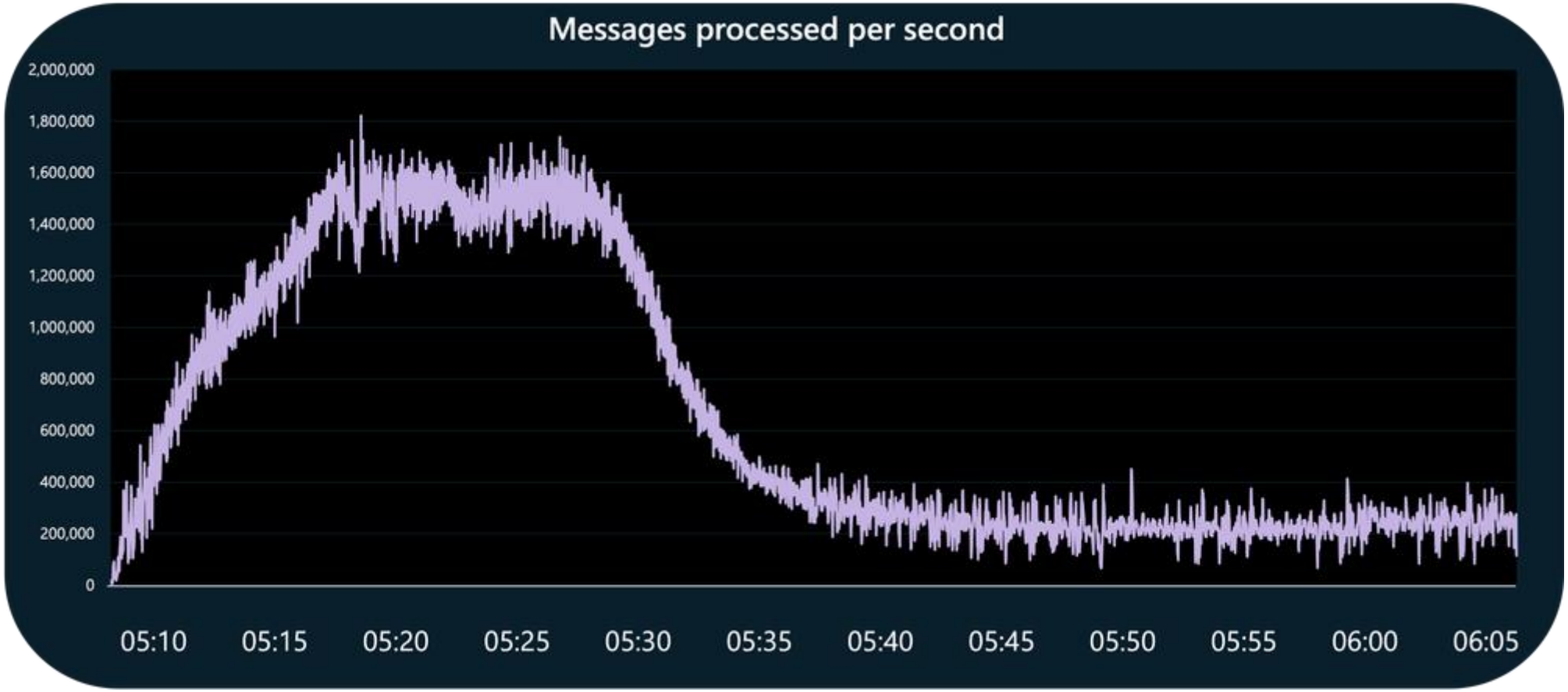
Scale Out Further

- Default is 100 instances
- Highest is 1000 instances
- Lowest is 40 instances

Region Subscription Memory Quota

512,000 MB per region per subscription

Extreme Scalability



Even More Benefits

- Azure Load Testing Integration
- Open Telemetry Opt-In
- Long Execution Times

Flex Consumption Features and Benefits

- Always Ready
- Virtual Network Support
- Instance Memory Choice
- Per-Instance Concurrency
- Per-Function Scaling
- Scale-Out Further
- Extreme Scalability
- Azure Load Testing Integration
- Open Telemetry Opt-In
- Long Execution Times

Pricing

Pricing

On-Demand

Always Ready

Meter	Free Grant (per month)	Pay as you go
On Demand Execution Time	100,000 GB-s	$0.000016/GB-s
On Demand Total Executions	250,000 executions	$0.20 per million executions
Always Ready Baseline		$0.000004/GB-s
Always Ready Execution Time		$0.000009/GB-s
Always Ready Total Executions		$0.20 per million executions

Billing

My Standard Scenario

3 million executions per month; each execution using 512 Mb and running for 1 second

Consumption: $18.00

Billing

Azure Function Scenario

3 million executions per month; each execution using 512 MB and running for 1 second

Consumption: $18.00

Premium: $155.27

Flex Consumption (w/o Always Ready): $20.60

Billing

Flex Consumption with Always Ready Scenario

3 million executions per month; each execution using 512 MB and running for 1 second; 1% of executions performed while idle

Consumption: $18.00

Premium: $155.27

Flex Consumption (w/o Always Ready): $20.60

Flex Consumption (with Always Ready): $33.70

Billing

Actual Scenario

434k executions per month; each execution using 2048 MB and running for 400 milliseconds; VNet connectivity needed no Always Ready (cold starts acceptable)

Consumption: N/A

Premium: $155.27

Flex Consumption: $4.16

Demonstrations

Unleashing Extreme Scalability
with Azure Functions

Demonstrations

- Deploying your first Flex Consumption Azure Function
- High-Scale HTTP Function App to Event Hubs via VNet

Considerations

Unleashing Extreme Scalability
with Azure Functions

Considerations

- Not all triggers fully supported (yet)

Unsupported Triggers
Kafka
Azure SQL
SignalR

Not-Fully Supported
Blob (only supports the Event Grid source)

Considerations

- Not all triggers fully supported (yet)
- Not all regions are supported (yet)

Flex Consumption Regions

- East US
- North Europe
- Southeast Asia
- East Asia
- East US 2
- South Central US
- Australia East
- North Central US
- West US 2
- UK South
- West US 3
- Sweden Central

Considerations

- Not all triggers fully supported (yet)
- Not all regions are supported (yet)
- Deployment options limited (currently)

Unsupported Deployment Methods

- Azure DevOps Task (AzureFunctionApp@2)
- GitHub Actions (function-action@v1)
- Deployment Slots

Considerations

- Not all triggers fully supported (yet)
- Not all regions are supported (yet)
- Deployment options limited (currently)
- Scaling limitations (currently)

Scaling Limitations

- Lowest maximum scale is 40
- Highest maximum scale is 1000

Considerations

- Not all triggers fully supported (yet)
- Not all regions are supported (yet)
- Deployment options limited (currently)
- Scaling limitations (currently)
- Limited Support – Preview Functionality

Decisions

Unleashing Extreme Scalability
with Azure Functions

Hosting Decisions

Consumption | Flex Consumption | Premium | Dedicated | Container Apps

Hosting Decisions

Consumption | Flex Consumption | Premium | Dedicated | Container Apps

Benefits

- Pay only when your functions are running (pay-as-you-go)
- True serverless hosting
- Automatic scaling during high load

Use case

Ideal for sporadic workloads with varying demand

Hosting Decisions

Consumption | **Flex Consumption** | Premium | Dedicated | Container Apps

Benefits

- High scalability with compute choices
- Support virtual networking for added security
- Specify pre-provisioned instances to reduce cold starts
- Connects to virtual networks

Use case

- When you need more control over concurrency and what to pay-as-you-go
- When you need VNet support for sporadic workloads

Hosting Decisions

Consumption | Flex Consumption | **Premium** | Dedicated | Container Apps

Benefits

- Automatically scales based on demand using prewarmed workers
- Suitable for continuous or nearly continuous workloads
- Connects to virtual networks

Use case

- Multiple functions apps on the same plan with event-driven scaling
- Need for more compute power
- When you need VNet support for high-use workloads

Hosting Decisions

Consumption | Flex Consumption | Premium | **Dedicated** | Container Apps

Benefits

- Dedicated compute resources for your app
- Ideal for complex applications with customization needs
- Fully utilize existing App Service Plans

Use case

- Get full utilization of an existing App Service Plan
- Long-running scenarios where Durable Functions cannot be used

Hosting Decisions

Consumption | Flex Consumption | Premium | Dedicated | **Container Apps**

Benefits

- Run your function app in a container
- Fully managed environment
- Dapr Support

Use case

- Mixing with other Container Apps and/or need Dapr support
- Migrating code execution form on-premises or legacy apps

Summary

Unleashing Extreme Scalability
with Azure Functions

Azure Functions Flex Consumption

- Instance Memory Choice
- Per-Instance Concurrency
- Per-Function Scaling
- Always Ready Instances
- Scale Out Further
- Virtual Network Support
- Azure Load Testing Integration
- Open Telemetry Opt-In
- Serverless Billing

Thank You

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