AZURE FUNCTIONS

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OVERVIEW

- Introduction to FaaS and Azure Functions
- History of the technology
- Architecture of Azure Functions
- Technical features of Azure Functions
- Use cases
- Advantages & Disadvantages of Azure Functions
- Azure Functions Pricing model
- Usability
- Demo

INTRODUCTION

- **FaaS (Function as a Service)** allows customers to develop, run and manage functionalities without having to maintain a server
- **Azure Functions**
  - Event driven, compute-on-demand experience
  - Implement code triggered by events occurring in azure or third party services or on-premises system
  - Solution to run small pieces of code in the cloud such as processing data, integrating systems, working with the internet-of-things (IoT), and building simple APIs and microservices

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HISTORY OF TECHNOLOGY

- **PaaS**
  - Designed for long running server applications
  - Lack the automatic scaling feature
  - User has to specify the amount of resources
  - Eg: Heroku or OpenShift
- **Serverless architecture**
  - Automatic scaling
  - Consumes resources only when there are incoming requests
- Introduced by **Microsoft** as part of Azure in the end of March 2016

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HISTORY OF AZURE FUNCTIONS

- Functions is a natural evolution of Azure WebJobs
- Azure WebJobs provide an easy way to run scripts or programs as background processes in the context of an App Service web app, API app or mobile app.
- WebJobs allows users to upload and run an executable
- Common features between WebJobs and Functions
  - Both are built on Azure App Service and enjoy features such as source control, authentication, and monitoring.
  - Both are developer-focused services.
  - Both support standard scripting and programming languages.
  - Both have NuGet and NPM support.

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HISTORY CONTINUED

- Microsoft took the positives of WebJobs and added the following improvements
  - Streamlined dev, test, and run of code, directly in the browser.
  - Built-in integration with more Azure services and 3rd-party services like GitHub WebHooks.
  - Pay-per-use, pay only for the resources consumed during the execution
  - Automatic, dynamic scaling.

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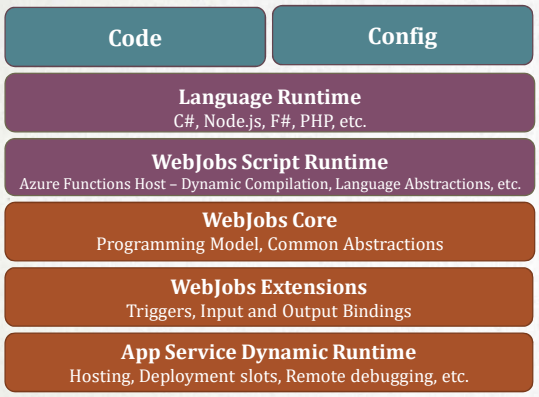
ARCHITECTURE



- Azure Functions is built on top of Azure App Service (fully managed PaaS dedicated VMs)
- WebJobs SDK (The WebJobs SDK has built-in features for working with Azure Storage and Service Bus, for scheduling tasks and handling errors, runtime binding. and for many other common scenarios.)
- WebJobs SDK can be used locally to create a local runtime environment
- The languages runtime run on top of WebJobs SDK

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FEATURES

- **Languages Supported**
  - C#, F#, Node.js, Python, PHP, batch, bash, or any executable
- **Pay-per-use pricing model**
  - Pay only for the time spent running your code
- **Bring your own dependencies**
  - Supports NuGet and NPM
- **Integrated security**
  - Protect HTTP-triggered functions with OAuth providers such as Azure Active Directory, Facebook, Google, Twitter, and Microsoft Account
- **Simplified integration**
  - Easily leverage Azure services and software-as-a-service (SaaS) offerings
- **Flexible development**
  - Code your functions right in the portal or set up continuous integration and deploy your code through GitHub, Visual Studio Team Services, and other supported development tools
- **Open-source runtime**
  - The Functions runtime is open-source and available on GitHub

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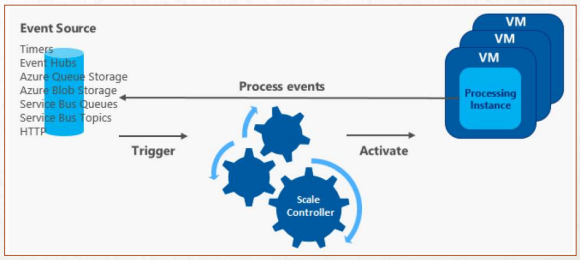
FEATURES CONTINUED

- **Triggers**
  - Function triggers and integrations are easier. Triggers are ways to start execution of the code. Eg: Blob trigger, EventHubTrigger, HTTPTrigger
- **Logging** – Tracewriter for logging
- **Runtime scaling**
  - Functions uses a scale controller to evaluate compute needs based on the configured triggers and to decide when to scale out or scale in
  - The scale controller continuously processes hints for memory requirements and trigger-specific data points



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USE CASES

- **Unikey,** a provider of digital key technologies for smart locks.
  - The company is taking advantage of Azure Service Fabric to create a microservices delivery model. As a result, it can customize its platform more easily for global markets with diverse regulations for data privacy and security.
- **CARMAX Inc.,** the largest used car retailer in the United States.
  - Moving toward a microservices architecture, which will allow it to scale and update parts of applications independently of the other parts-**rearchitecting carmax.com**
- **MedPoint Digital, Inc.,** a biopharmaceutical company.
  - Azure functions to run small pieces of code such as checking an inbox for new clinical documents to bring into the system
- **Arab Sea Information Systems,** one of the best-known independent software vendors (ISVs) in the Middle East and Africa (MEA) market
  - Azure functions has revolutionized a complex database backup process in a traditional enterprise Windows environment
  - 25 minute process came down to 4 minutes
- **Hitachi, Inspire the next,** developer of some of the world's largest enterprise systems, including mega-bank financial systems and train reservation systems
  - The company plans to adopt to the serverless architecture of Azure Functions

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ADVANTAGES

- **Reduced time to market**
  - Developers are free to focus on application code that implements business logic without worrying about the underlying infrastructure
- **Lower total cost of ownership**
  - No infrastructure or operating systems to maintain, developers can focus on providing value to the business.
- **Pay per execution**
  - A key cost savings as you only pay for the consumed cycles in conjunction with increasing the functional density of the compute resources used.
- **Logically grouped into applications**
  - It makes it easier to set environment variables
  - Memory allocated is per app service and not per function.

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ADVANTAGES CONTINUED

- **No limit**
  - No limit on Request Payload Size, Max duration, Deployment Package Size, Size of code/dependencies, Concurrent executions which improves performance.
- **Visual Studio Online**
  - Provides robust online editors

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DISADVANTAGES

- Versioning of code is not supported yet. However it can rely on Git or some other version control systems.
- Azure-functions CLI currently works on Windows, since the underlying Functions Host is not yet cross-platform
- Tracewriter logs are shortlived
  - They are available only for two days
  - It can store only 1000 messages

COST DISCUSSION

- Azure Functions has two kinds of pricing plans. User can choose the one that fits his needs.
  - Consumption Plan
  - App Service Plan
- **Consumption Plan:**
  - Azure provides all of the necessary computational resources
  - Resource management is automatically done
  - you only pay for the time that your code runs.
  - Cost is driven by memory size and total execution time for all functions in a function app
  - Use a consumption plan when your compute needs are intermittent or when your job execution times are short

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

PRICING EXAMPLE

- A function with observed memory consumption of 1,536MB, executes 2,000,000 times during the month and has an execution duration of 1 second; monthly billing would be calculated as follows:

Resource Consumption (Seconds)	
Executions	2 million seconds
Execution Duration (Seconds)	1 second
Resource Consumption Total	2 million seconds

Resource Consumption (GB-s)	
Resource Consumption converted to GB's	1,536 MB / 1,024 MB
Execution Time (Seconds)	2 million seconds
Total GB-s	3 million GB-s

Billable Resource Consumption	
Resource Consumption	3 million GB-s
Monthly Free Grant	400,000 GB-s
Total Billable Consumption	2,600,000 GB-s

Monthly Resource Consumption Cost	
Billable Resource Consumption	2,600,000 GB-s
Resource Consumption Price	$0.000016/GB-s
Total Cost	$41.60

Billable Executions	
Total Monthly Executions	2 million executions
Monthly Free Executions	1 million executions
Monthly Billable Executions	1 million executions

Monthly Executions Cost	
Monthly Billable Executions	1 million executions
Price per million Executions	$0.20
Monthly Execution Cost	$0.20

Total Monthly Cost	
Monthly Resource Consumption Cost	$41.60
Monthly Executions Cost	$0.20
Total Monthly Cost	$41.80

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COST DISCUSSION CONTINUED

- **App Service Plan:**
  - Run your functions just like your web, mobile, and API apps.
  - Your function apps run on dedicated VMs and are always available whether code is being actively executed or not.
  - When you are already using App Service for your other applications, you can run your functions on the same plan at no additional cost.
  - This is a good option if you have existing, underutilized VMs that are already running other code or if you expect to run functions continuously.
  - A VM decouples cost from both runtime and memory size. As a result, you can limit the cost of many long-running functions to the cost of the VMs that they run on.

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USABILITY

- Provides in-browser coding
- Configuring and managing events and bindings is simpler using triggers
- Azure's new dashboard is easier to use which is more streamlined and integrated with the rest of the Azure portal.
- It's now much easier to manage multiple function apps, and there are fewer clicks to get to Azure App Service platform features.
- Azure's Function usage charts are still in development phase
- Supports continuous deployment (supports dropbox, github, bitbucket etc)

TECHNOLOGICAL ALTERNATIVES

- AWS Lambda – Serverless platform provided by Amazon
- Google Cloud Functions - Run in a fully-managed, serverless environment where Google handles servers, operating systems, and runtime environments completely on your behalf
- IBM OpenWhisk - distributed compute service to execute application logic in response to events
- Auth0 WebTask - deploy functions via the Webtask CLI, and access your serverless backend over HTTP

CONCLUSION

- Azure functions is a micro-compute on demand
- It provides a new way to create cloud event handlers
- It enables elastic computing by having the functions run only when triggers are activated
- It provides two hosting methods – cloud and on premise

DEMO