SERVERLESS FP ON AZURE

WITH A LITTLE BIT OF HASKELL

Monadic Party 2018

NOTICE

Presented material (including this talk) is very much a *Work-in-Progress*.

There is little theory, fancy types, and (surprisingly) Haskell in this talk.

PLEASE ASK QUESTIONS DURING THE TALK

ABOUT ME

- Programming Languages Theory in Haskell/Pen-and-Paper
- ML/Signal Processing in Python/.NET

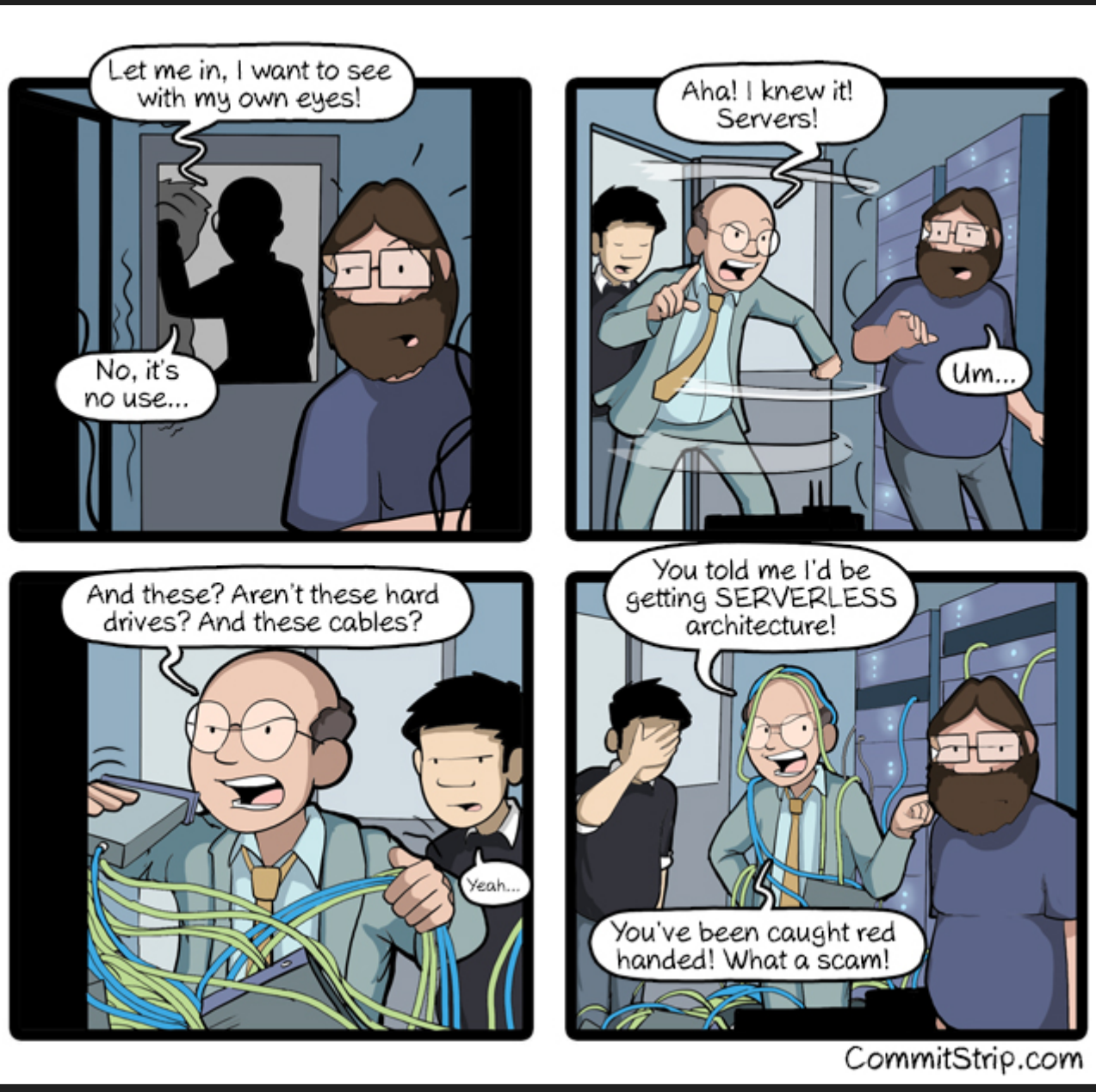
MOTIVATION

We wanted to see how difficult would it be to move to Haskell... -- Famous Last Words

IN MY CASE

I had some serverless workflows running on top of Microsoft Azure. I wanted to see if I could adopt any of them to running Haskell.

WTF IS SERVERLESS?


Let me in, I want to see with my own eyes!
No, it's no use...
Aha! I knew it! Servers!
Um...
And these? Aren't these hard drives? And these cables?
Yeah...
You told me I'd be getting SERVERLESS architecture!
You've been caught red handed! What a scam!
CommitStrip.com

ROUGH IDEA

Spinning-up a container per each request, or other event.

THE PROMISE OF SERVERLESS CLOUD

ABSTRACTING AWAY THE SERVERS

There is neither physical nor virtual machine to provision or maintain.

(ALMOST-)AUTOMATIC SCALABILITY

Scaling should be at least as easy as adjusting the number of instances. Ideally, you should be able to adjust automatically as the need arises.

PAY PER USE

Pay only for the resources used by your workload. Do not pay for idle time.

TWO FLAVOURS OF SERVERLESS

BRING YOUR OWN FILES (BYOF)

Here is my script, may you run it every 5 minutes, please?

- Provide your application as a set of files,
- Deploy either as a git repo, or as a zip file.

BRING YOUR OWN CONTAINER (BYOC)

Here is an image for my container, may you run it and keep it alive, please?

- Provide your application as a docker container,
- Deploy via some docker registry.

.NET CORE FRAMEWORK

Cross-platform .NET flavour.

https://www.microsoft.com/net/download

MICROSOFT AZURE

SERVERLESS ON AZURE

- Azure Functions
- Azure Container Instances
- Microsoft Flow
- Azure Logic Apps
- Azure WebJobs

Detailed Comparison: https://bit.ly/2u3LcZG

I will focus on:

- Azure Functions, and
- Azure Container Instances.

AZURE FUNCTIONS

Function as a Service (FaaS).

- Supports BYOF and BYOC
- Windows and Linux instances
- Supports:
  - .NET Languages (C#/**F#**)
  - JavaScript
  - Java
- Consumption Plan (Windows only)

AZURE FUNCTIONS V2

I will be focusing on Azure Functions V2, wich is cross-platform.

- In Preview,
- Stable probably in late 2018,
- Windows and Linux instances,
- BYOF and BYOC (Linux only),
- Dev tools for Windows, Linux, and macOS.

AZURE FUNCTIONS SCRIPT HOST

Runtime available on the instance

- Provides a set of bindings and triggers,
- Basic logging and monitoring,
- Automatic retry for some failing triggers,
- Automatic back-off for some failing triggers,

Github: Azure/azure-functions-host

AZURE FUNCTIONS CORE TOOLS

Run Azure Functions Runtime locally

```
npm i -g azure-functions-core-tools@core --unsafe-perm true
```

```
brew tap azure/functions
brew install azure-functions-core-tools
```

Github: Azure/azure-functions-core-tools

AZURE STORAGE

- Azure File Storage
- Azure Blob Storage
- Azure Queue Storage
- Azure Table Storage

AZURITE

Cross-platform Azure Storage Emulator

```
npm install -g azurite
```

Github: Azure/azurite

EXERCISE 1

- `dotnet-sdk` https://www.microsoft.com/net/download
- `azure-functions-core-tools` https://github.com/Azure/azure-functions-core-tools
- `azurite` https://github.com/Azure/Azurite
- `azure storage explorer` https://azure.microsoft.com/en-us/features/storage-explorer/

TRIGGERS AND BINDINGS

With some demos in F#.

TIMER TRIGGER

Execute a function every * * * * * * * (modified cron expression syntax)

HTTP TRIGGER

Execute a function on HTTP request

QUEUE TRIGGER

Execute a function whenever a message is available on a queue.

- Reply on error (by default 5 times),
- After that, move message to a poison queue.

QUEUE BINDING

Output the result of a function as a message to Azure Storage Queue.

BLOB STORAGE BINDING

Output the result of a function as a blob to Azure Blob Storage.

HASKELL ON AZURE FUNCTIONS

EXERCISE 2

Let's try to run a simple Haskell program for a HTTP request.

Code Samples: https://github.com/jakzale/monadic-party-2018-samples

.NET WRAPPER + UNIX DOMAIN SOCKETS

Demo

AZURE FUNCTIONS LANGUAGE WORKER

- Preview Support for Python
- Protobuf + gRPC

AZURE CONTAINER INSTANCES (ACI).

Container as a Service (CaaS).

- Windows and Linux Containers
- Azure Container Registry for hosting images
- Azure File Storage for persisting storage (Linux only)