
# The future of data centers

## Red Hat's Office of Technology's perspective

Stephen Watt
Red Hat Office of Technology
5/2/17

# The Red Hat Office of Technology

**Chris Wright**

Vice President and Chief Technologist

**Charter:**

To provide Red Hat with long-term technology perspectives around emerging technologies and products, as well as an internal hub to foster and evangelize forward-looking, pre-commercialized innovation

# Who are we?

**Dan Pratl:** Chief of Staff

**Sage Weil:** Storage

**Vincent Batts:** Containers

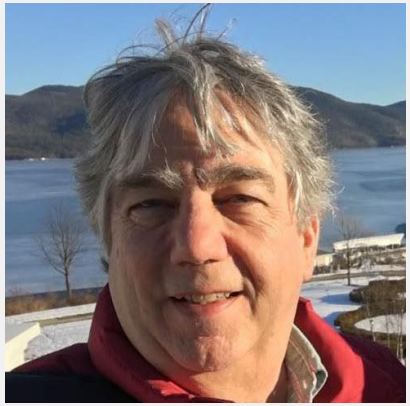
# Who are we?

**Mike Bursell:** Security

**Monty Taylor:** CI / CD

**Suneel Marthi:** ML & AI

# Who are we?



**Bill Burns:** NFV Partner Eng

**Andre Fredette:** ODL & NFV

**Russell Bryant:** OpenStack

# Who are we?

**Miki Kenneth:** Research

**Deb Bryant:** OSAS

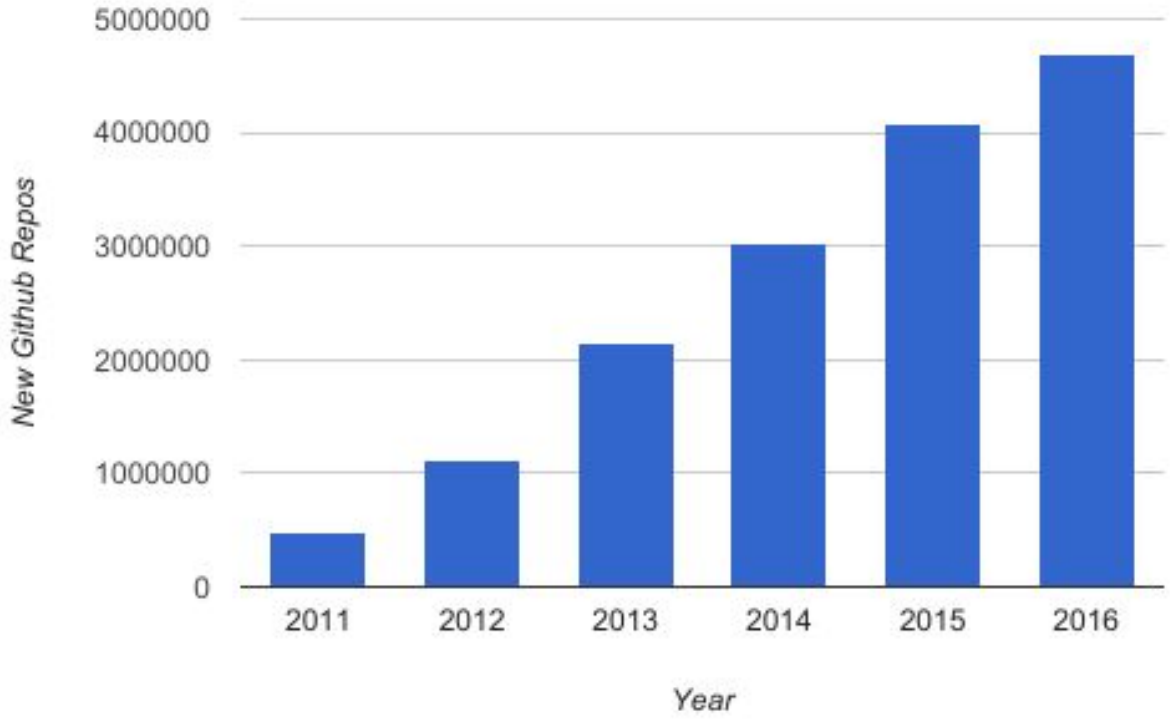
**Steve Watt:** Emerging Technologies

… and many others

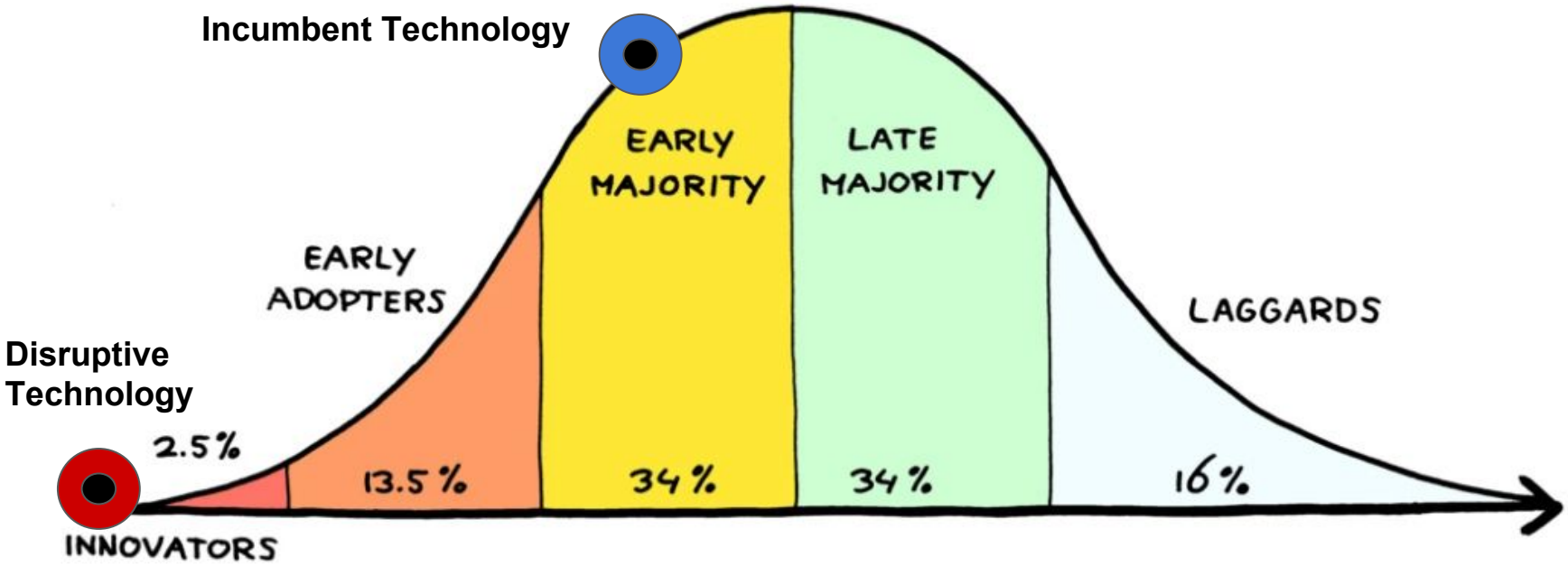
# Containers, Kubernetes

# & the Data Center

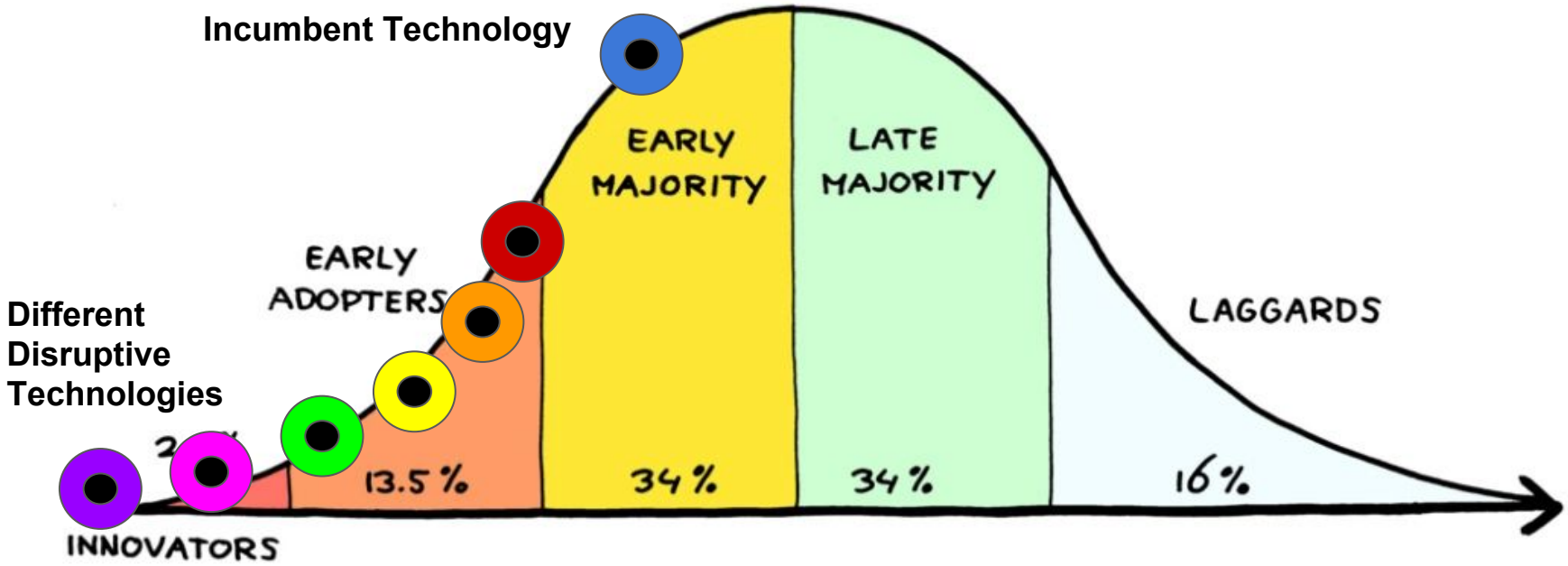
# S/W based innovation is increasing



# Historically, an enterprise responding to a threat or opportunity looked a little like this...

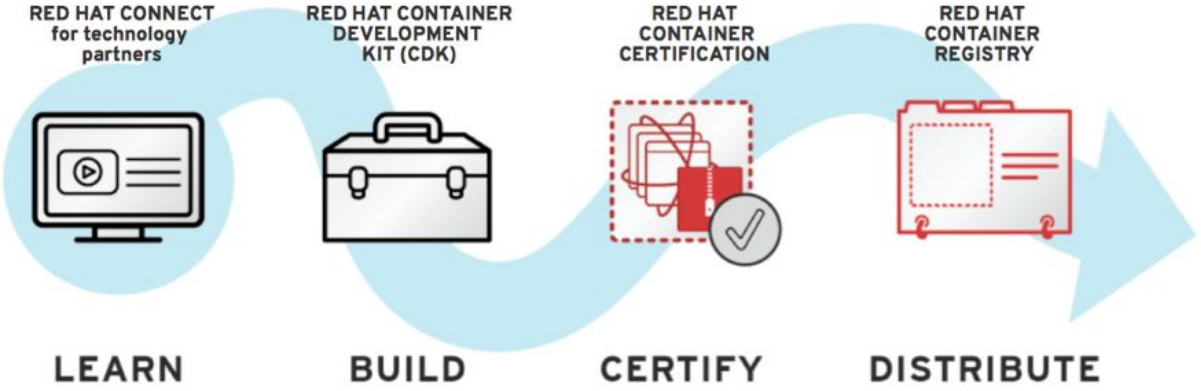


# But with an innovation deluge, it's starting to look a lot more like this...



# But applications are hard to deploy, which makes it costly to  experiment and innovate

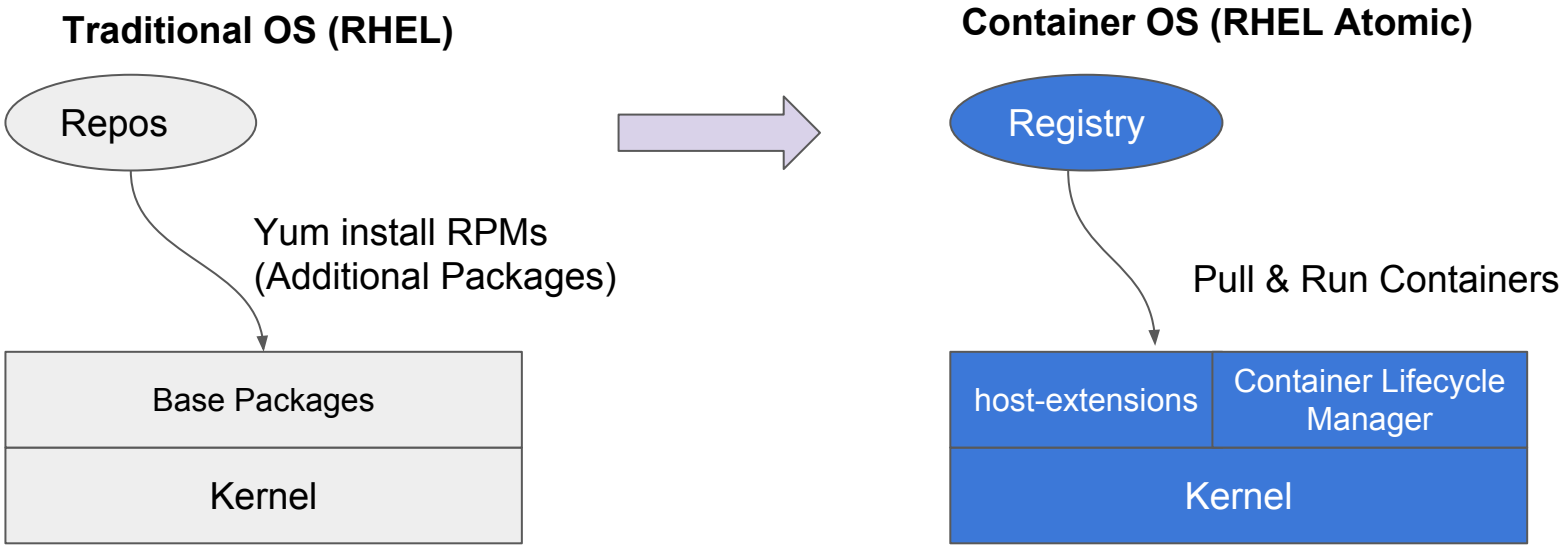
**Enter Containers**




A way to include environmental configuration and the runtime in a way that is easily packaged and can be rapidly deployed.

A huge step forward **for single server applications**.

# And is reshaping our expectations of what we call the OS



# But now we're seeing a proliferation of container runtimes


So we're continuing to strategically invest in OCI so that the industry can have a standard interchange format as an abstraction to build on for all of these runtimes

Containers by themselves are great, but most new open source innovation is designed as a distributed system with deployment documentation that is mediocre at best. We needed a solution for clusters.

Enter 

# With Kubernetes, **the Cluster is now the Computer**

Spark Cluster


Master ..... Worker(s)

Cassandra Cluster


Master ..... Worker(s)

MySQL

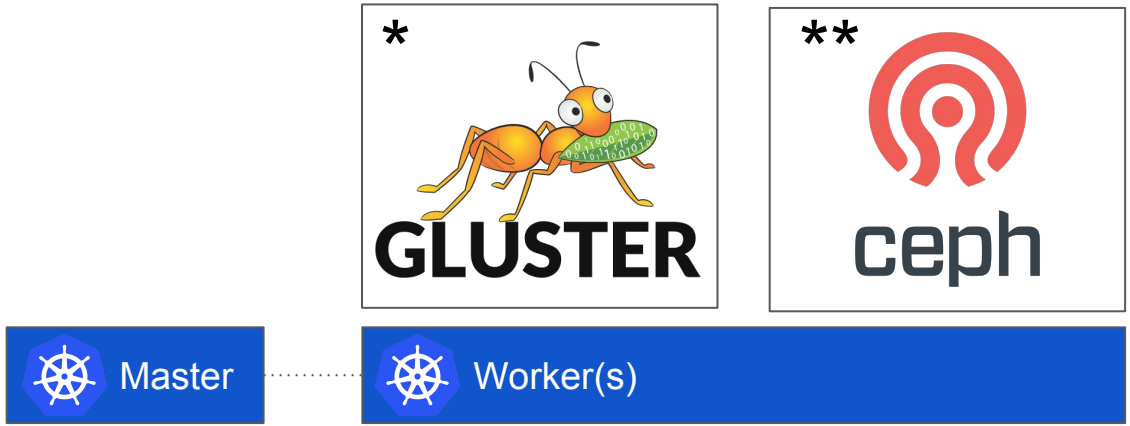

Single Instance

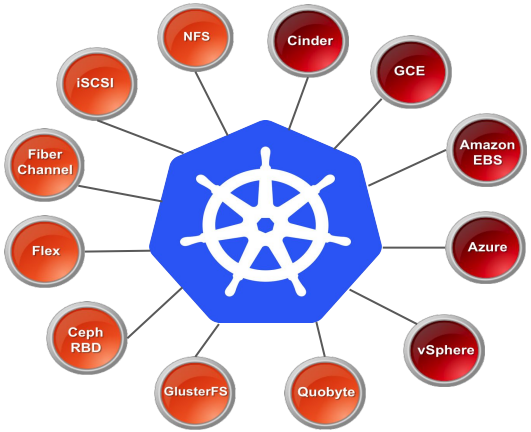
**From many large clusters to just one**

Registry


Master ..... Worker(s)

# This means one can run software defined storage platforms **IN** Kubernetes along with all your other containerized applications



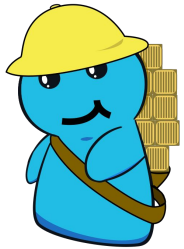




* https://github.com/gluster/gluster-kubernetes/

** https://github.com/ceph/ceph-docker/tree/master/examples/kubernetes/gce

# And all these containers need to communicate efficiently using standardized network interfaces

So we're investing in Kuryr to allow Kubernetes to use Neutron as a CNI plugin if you're running on OpenStack and also building CNI Plugins for OpenDaylight and OVN as well as contributing to those SDNs directly.

**Project Kuryr**

Which is great for on-premise, but Kubernetes still has a few challenges ahead to incentivize applications away from Cloud Provider lock-in

*“By 2025, 80% of all workloads will run on the public cloud”*

*Citigroup analyst report*



# Amazon's quick time-to-solution via their Service Catalog has wide appeal but creates a natural lock-in

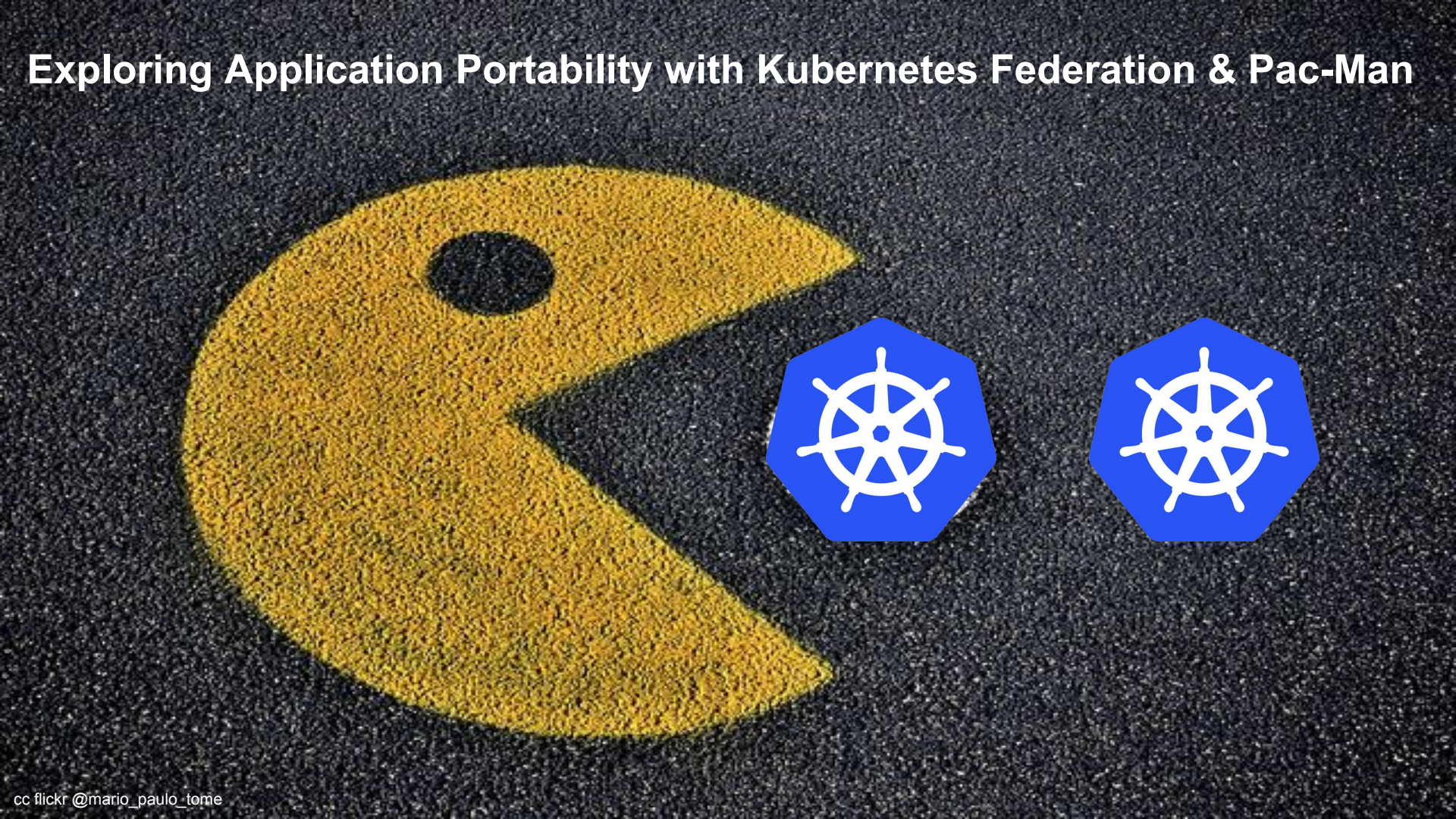
# There is an opportunity to create a compelling alternative by:

- Creating a great Application Portability experience across Cloud Providers (Investing in Kubernetes Federation)

- Exposing a rich ecosystem of services to Kubernetes Applications (Investing in Kubernetes Service Broker/Service Catalog)

    - S105156 - Open Service Broker API: Enabling microservices in the enterprise (Wednesday, May 3, 4:30 PM - 5:15 PM, Room 102A)

# Exploring Application Portability with Kubernetes Federation & Pac-Man

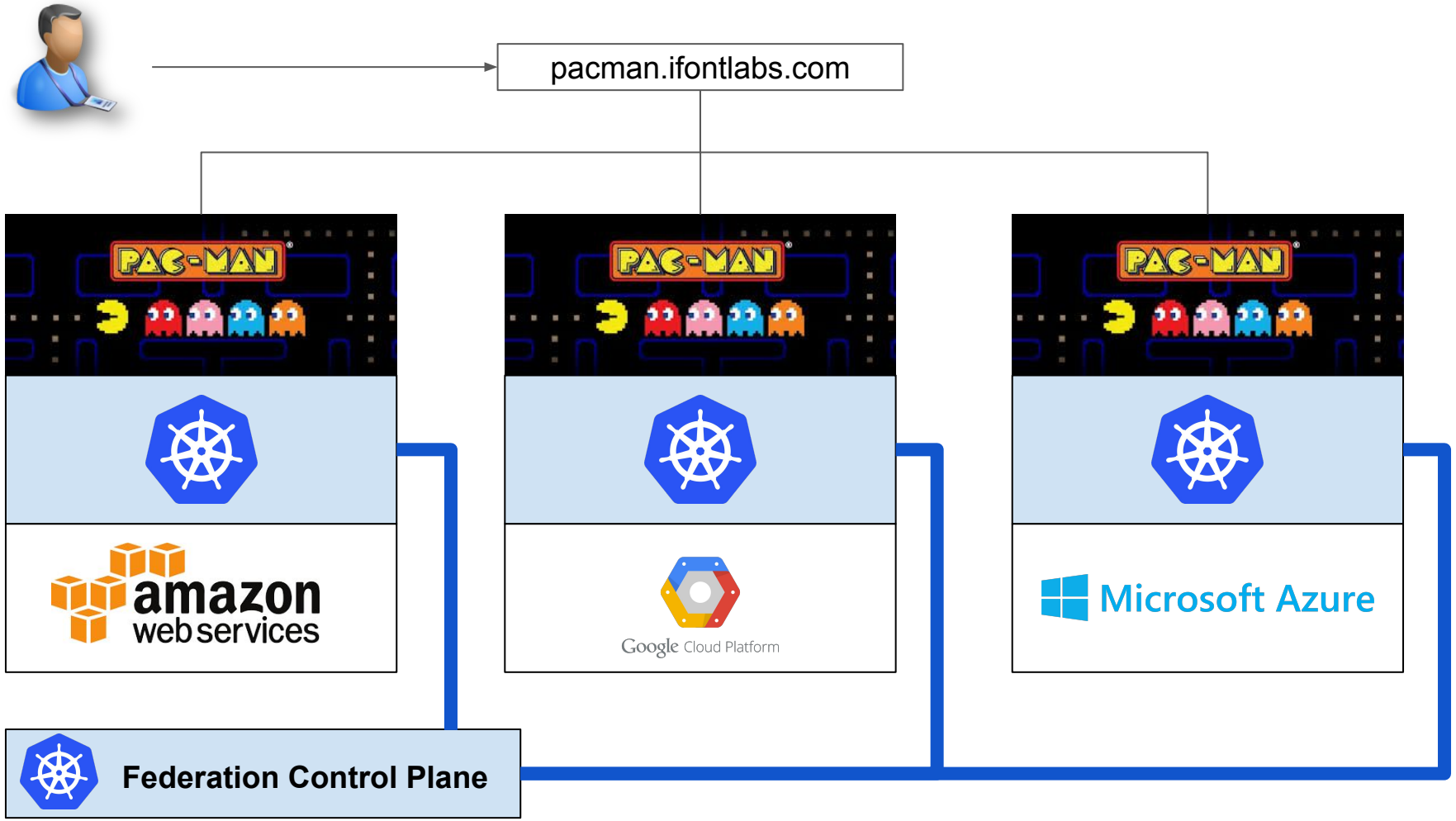


# In order to explore cross-cloud application portability we decided that we first need to build a reference stateful web application


It turns out that Jim and I love Pac-Man and that we could add state to the PacMan application by persisting the high scores in MongoDB

We then **modified the Pac-Man high scores to detect and reflect the cloud provider and zone the game was running in** and then containerized Pac-Man so we could deploy it along with containerized Mongo in Kubernetes.

We then built 3 separate Kubernetes Clusters in AWS, GCE and Azure respectively and plugged them into the Kubernetes Federation Control Plane and then used that to deploy the Application across all the cloud providers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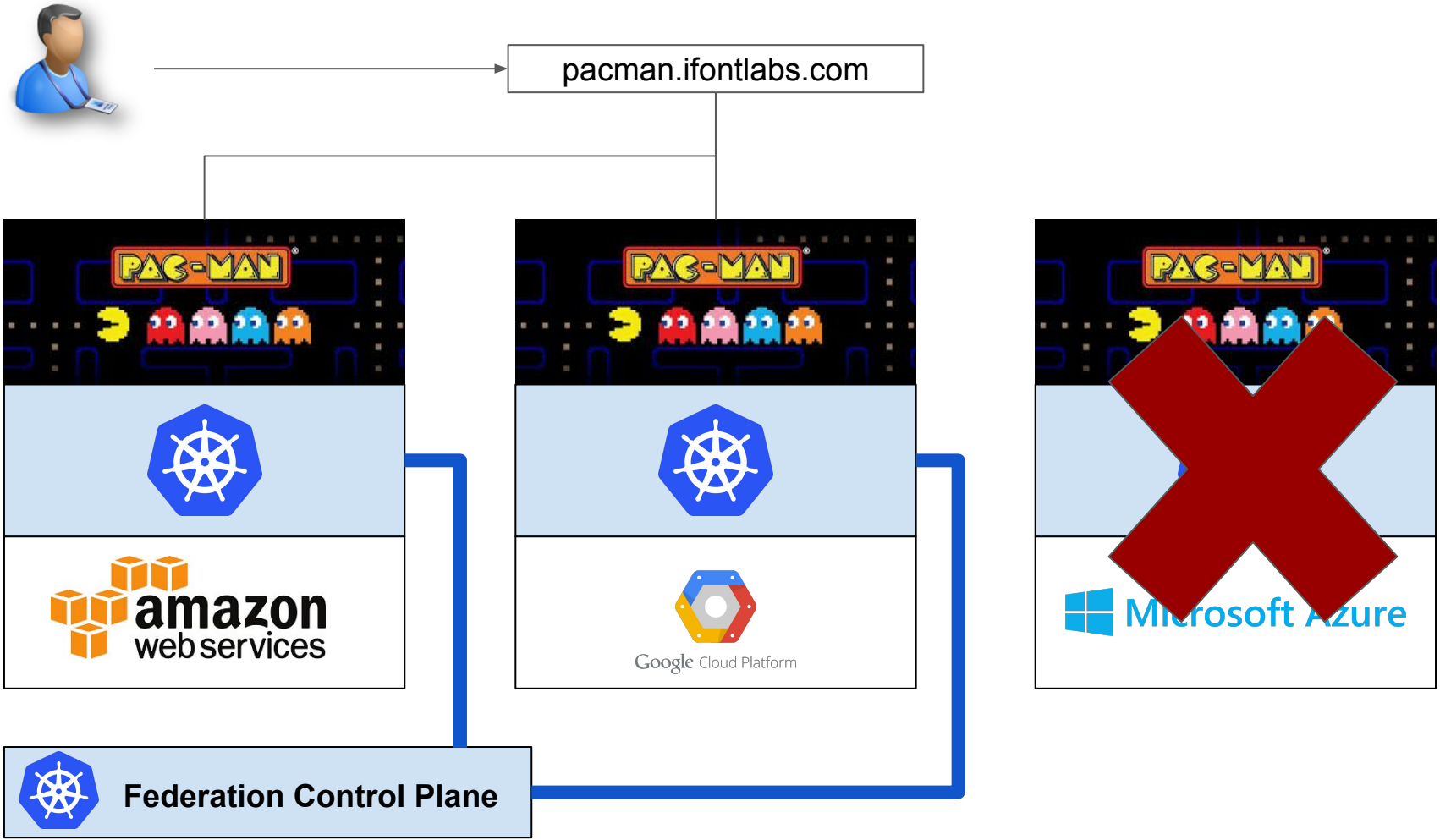
Google Cloud Platform
Microsoft Azure
Federation Control Plane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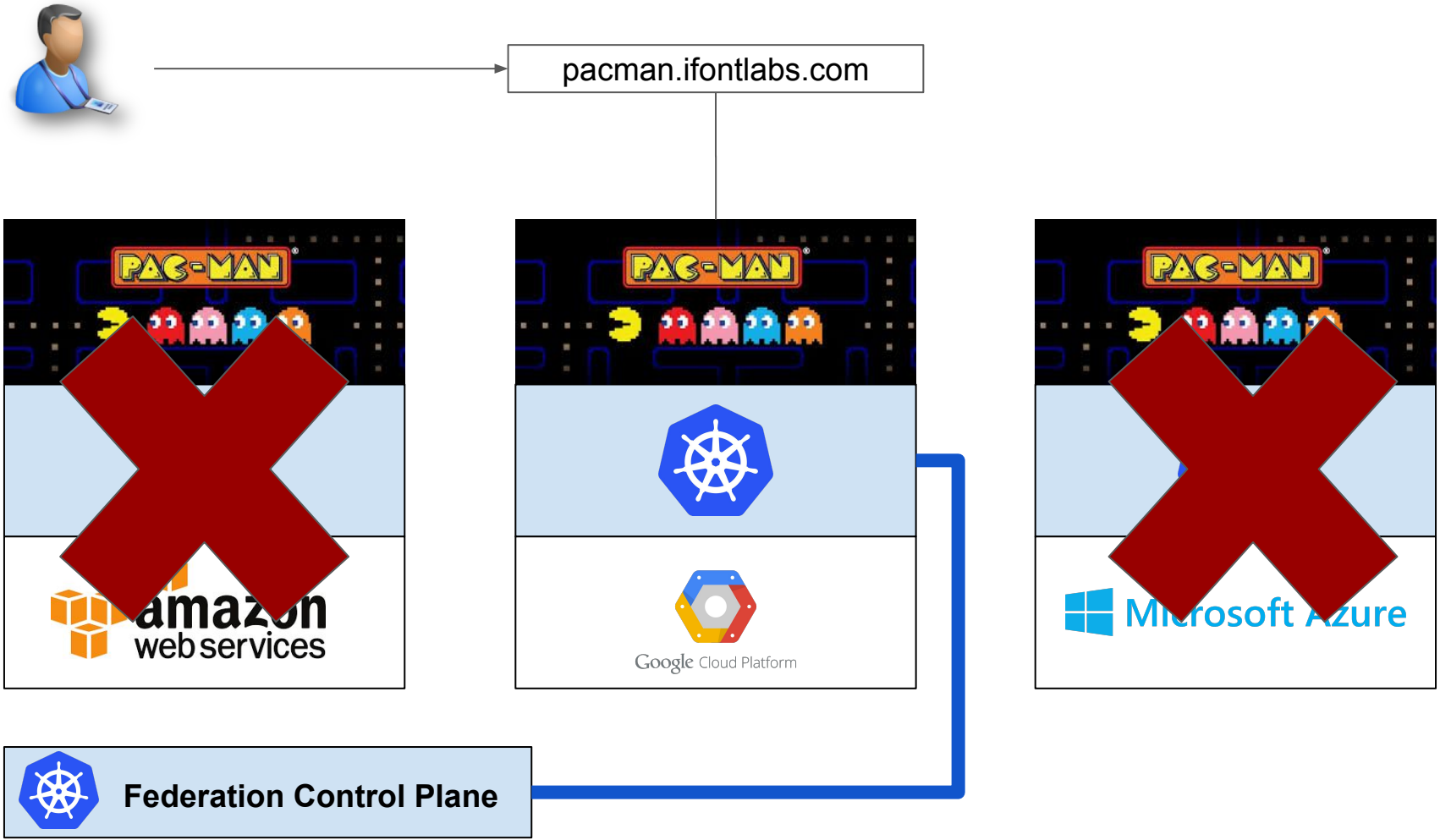
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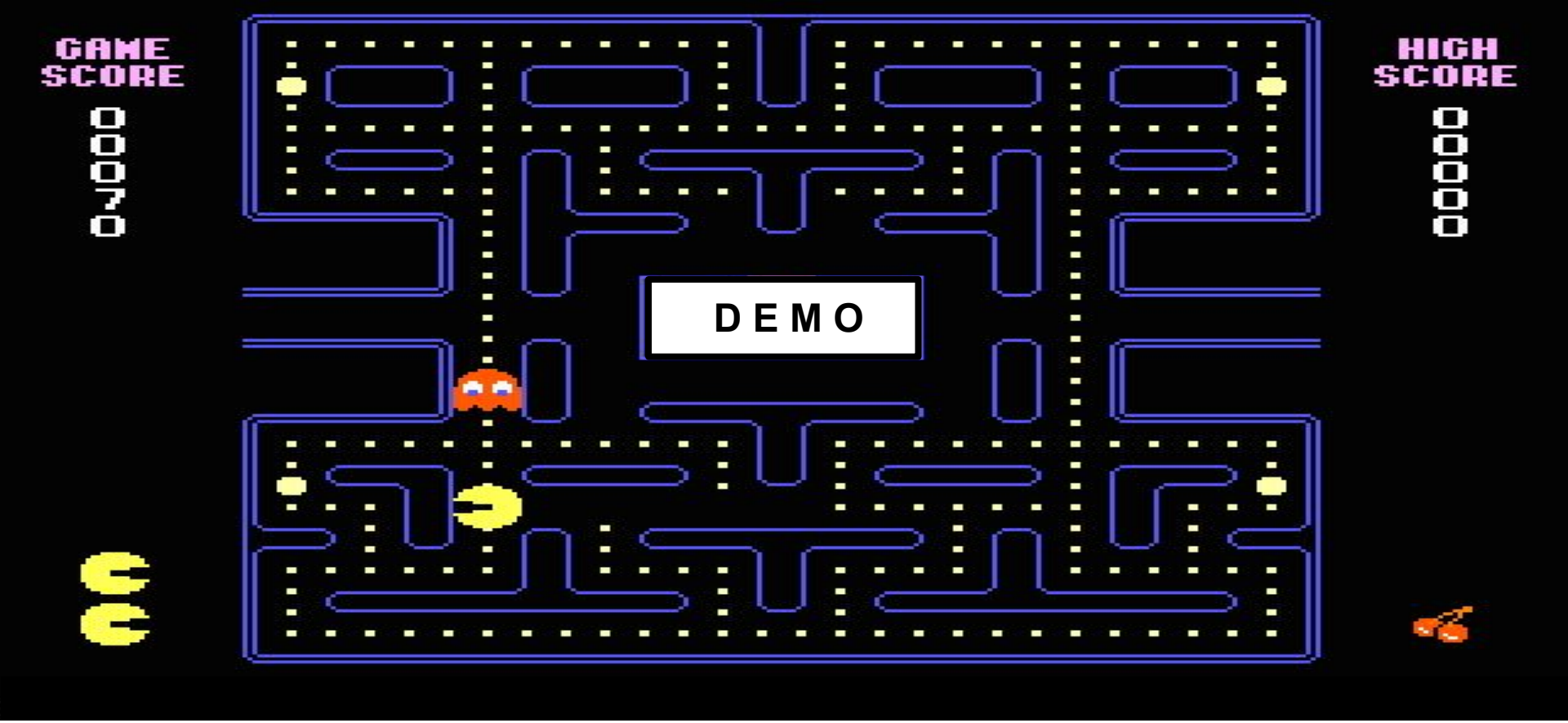


amazon web services

Google Cloud Platform

Microsoft Azure

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