Tackling complexity in giant systems

Approaches at Google, Microsoft, Amazon, Netflix & VMware

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French

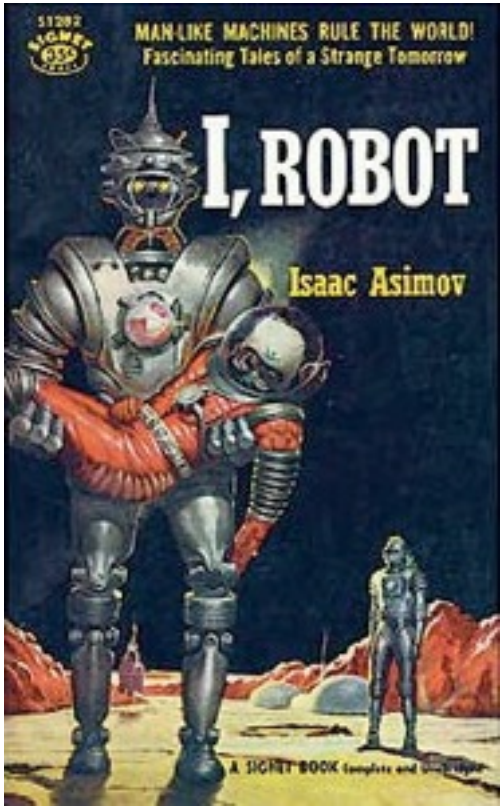
Polyglot

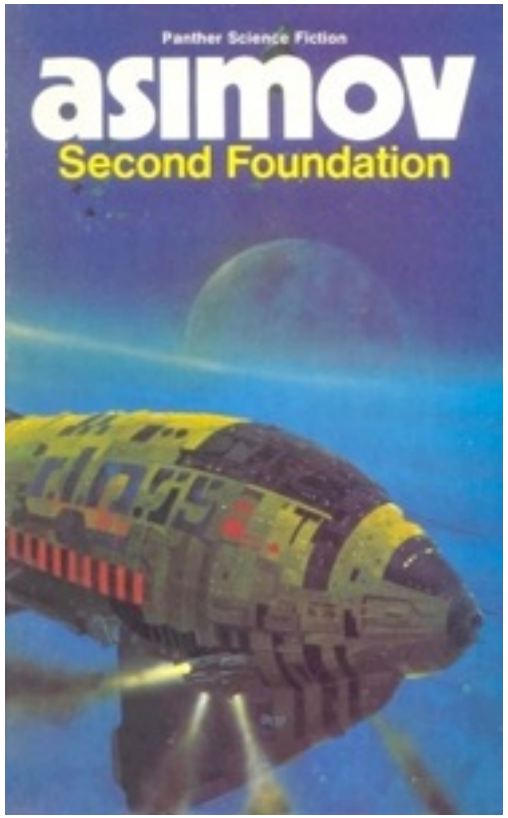
Server Side

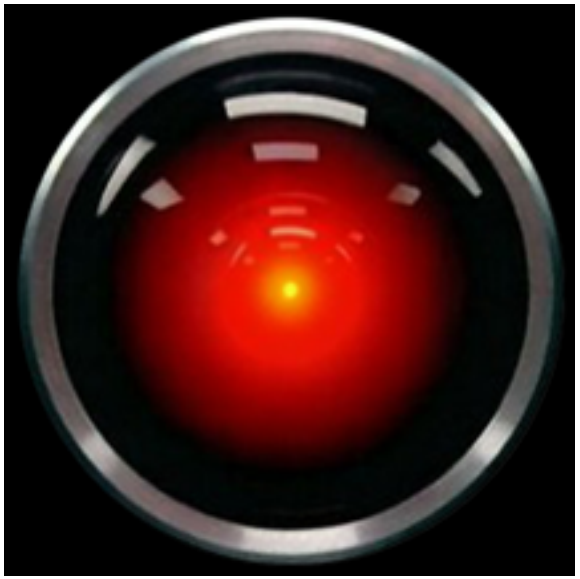
San Francisco

Developer Relations

Dreams Of my childhood

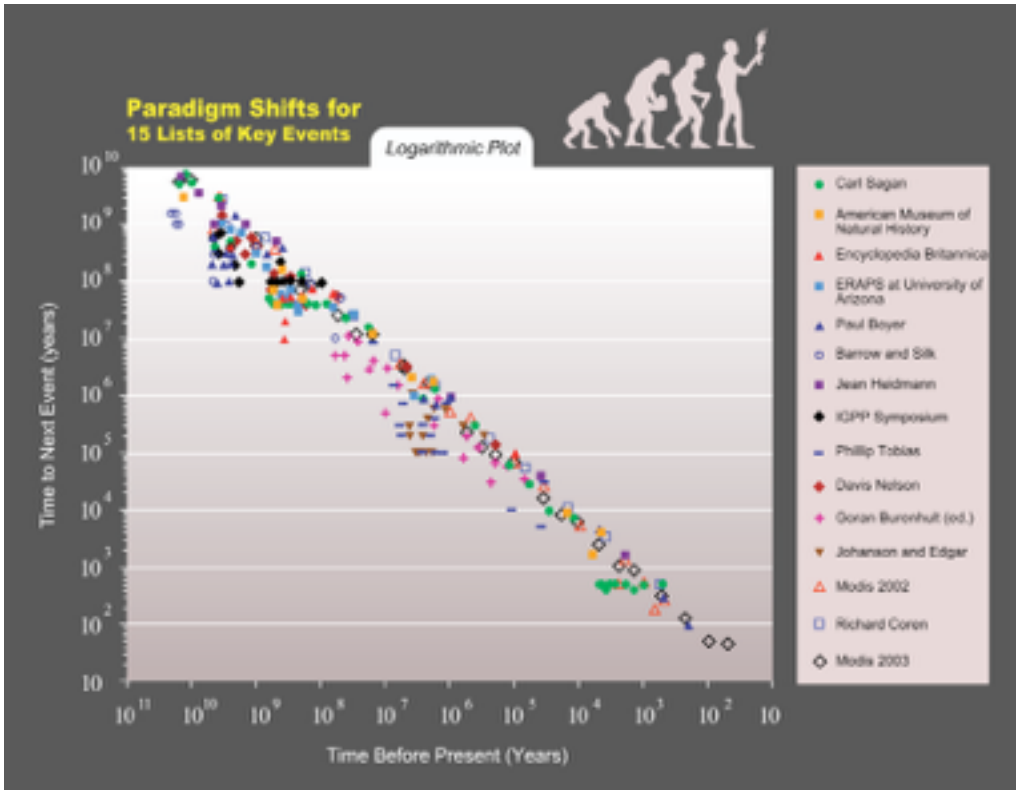






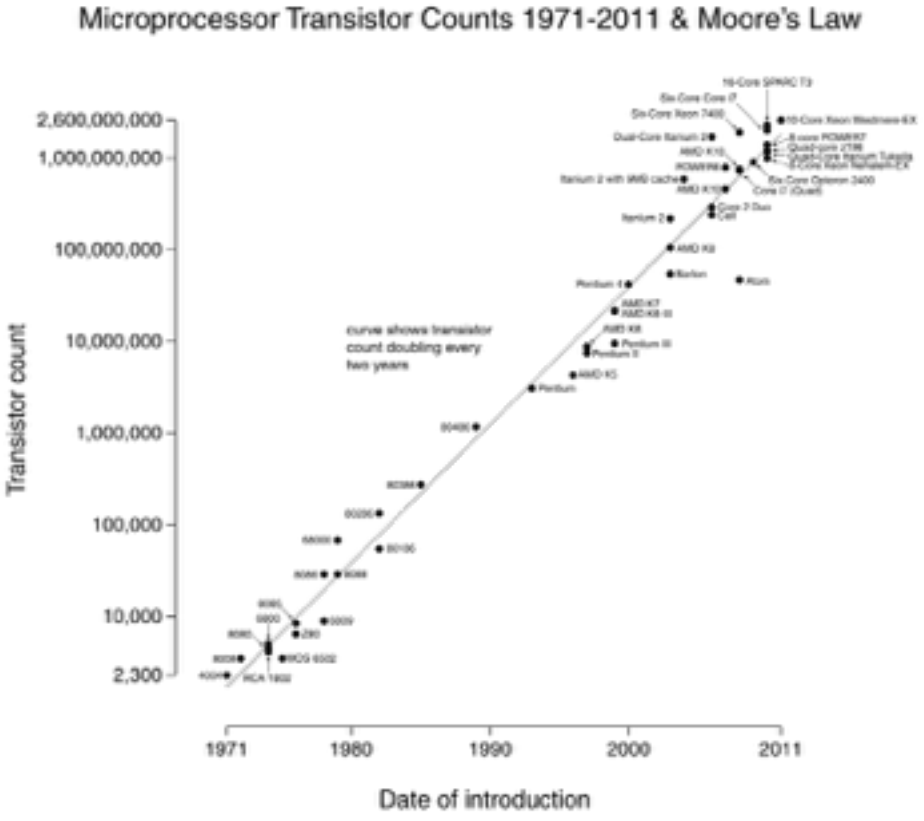
Accelerando / Singularity, in a Galaxy far far away

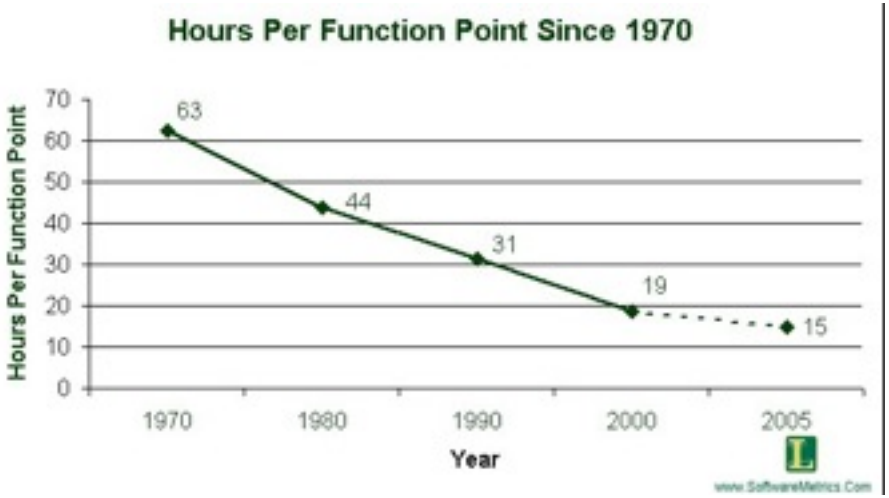
- Even if we automate ourselves out of a job every 10 years
- ...I don't think the singularity is near!



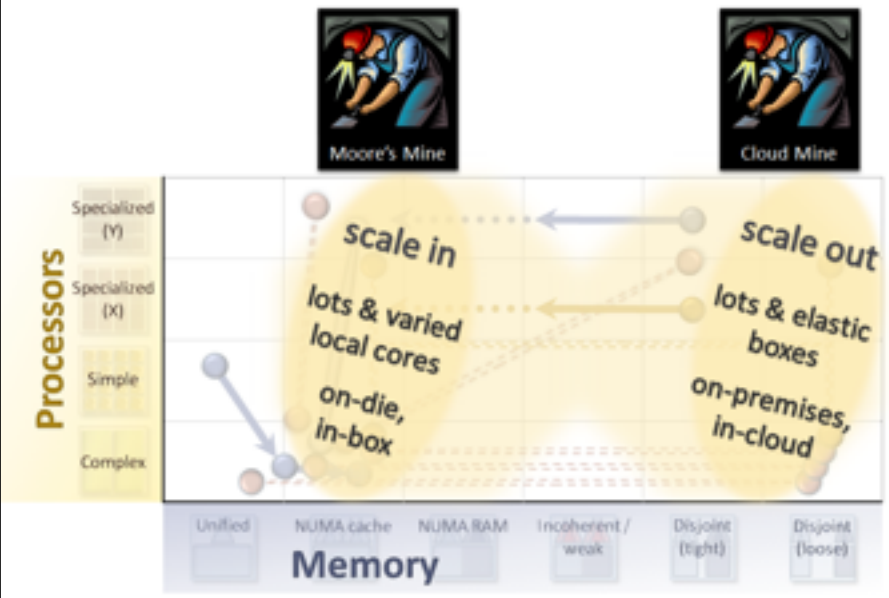
Moore's Law is for Hardware Only

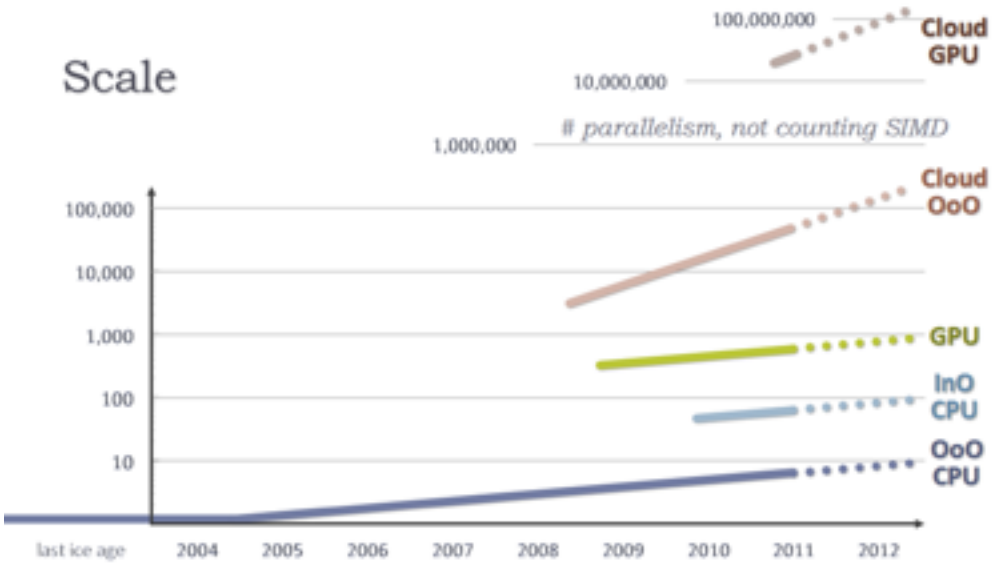
- Does not apply to software
- Productivity gains not keeping up with hardware and bandwidth
- Writing software is hard, painful, and still very much a craft





Moore's Law's free lunch is over

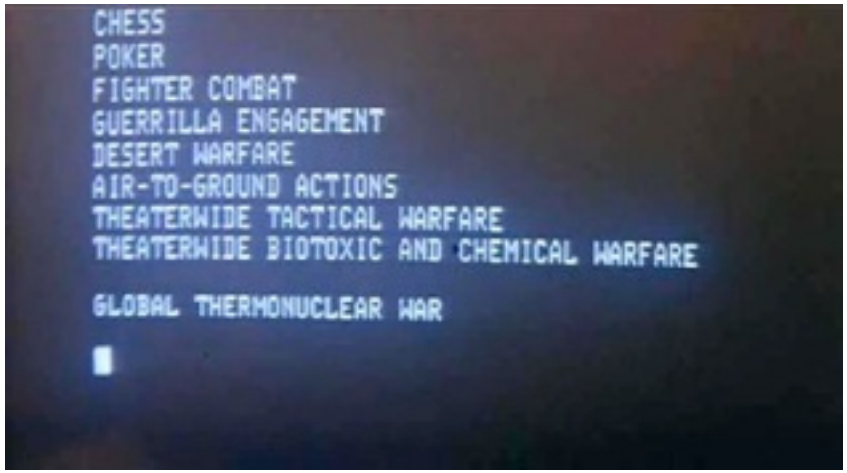




- Herb Sutter, Welcome to the Jungle
  http://herbsutter.com/welcome-to-the-jungle/

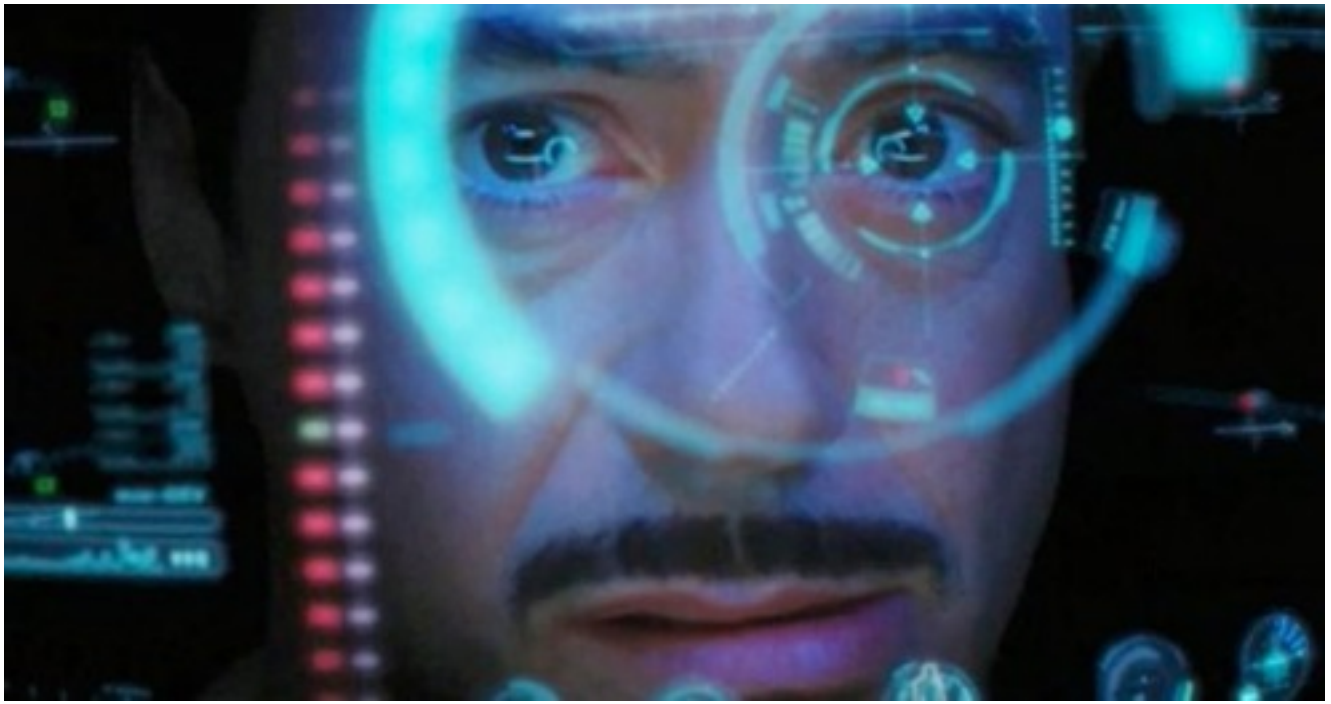
Architecture Changes: 60’s Mainframe

Architecture Changes: 80's Client-Server



Architecture Changes: 90’s Web

Architecture Changes: 2010's Cloud, HTML5, Mobile



Cloud started at Consumer websites solving their needs

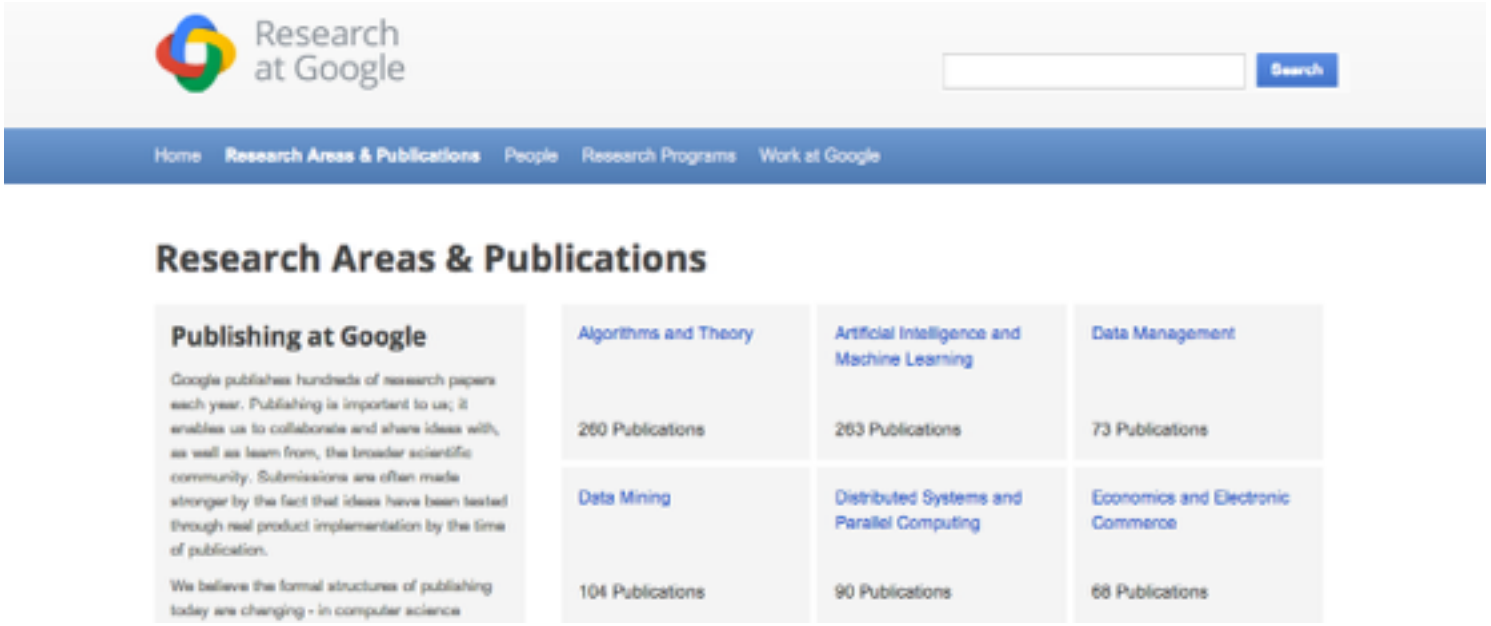
- Google, Amazon, Yahoo, Facebook, Twitter
- Large Data Sets
- Storage Capacity growing faster than Moore's Law
- Fast Networks
- Vertical -> Horizontal scalability
- Open Source Software
- Virtualization
- Cloud is a productization of these infrastructures
  - Public Clouds Services: Amazon, Microsoft, Google
  - Open Source Software: Hadoop, Open Stack, Eucalyptus, Cloud Foundry, OpenShift

“The future is already here — it's just not very evenly distributed”

William Gibson

Google

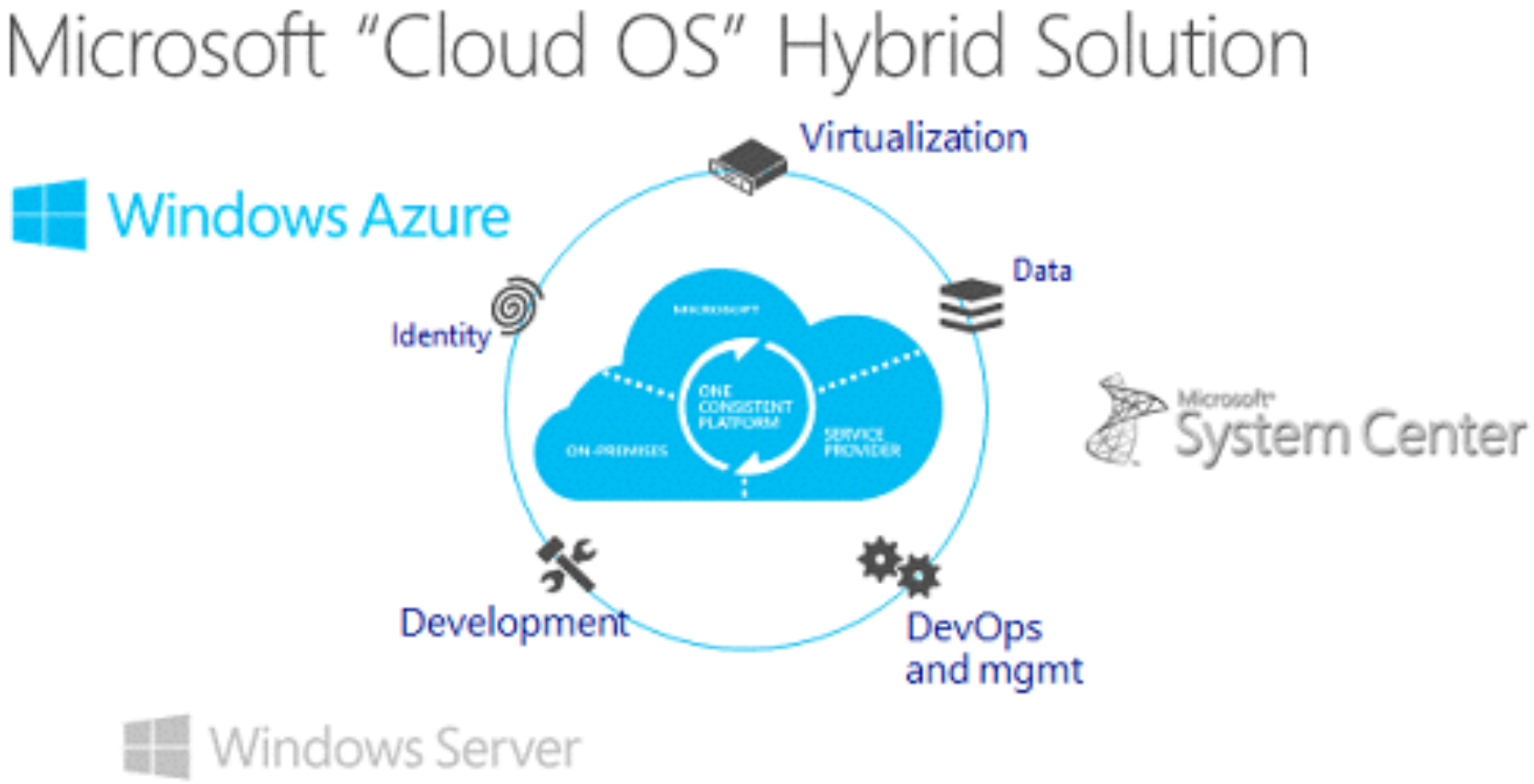
- Horizontal scalability 2004: Map/Reduce (Hadoop)
- NoSQL 2006: Bigtable (Mongo, Cassandra, HBase, Riak)
- Real Time analytics 2010: Dremel, BigQuery (Impala)
- Horizontally Scalable SQL 2012: Spanner, F1 / Amazon Redshift



Google

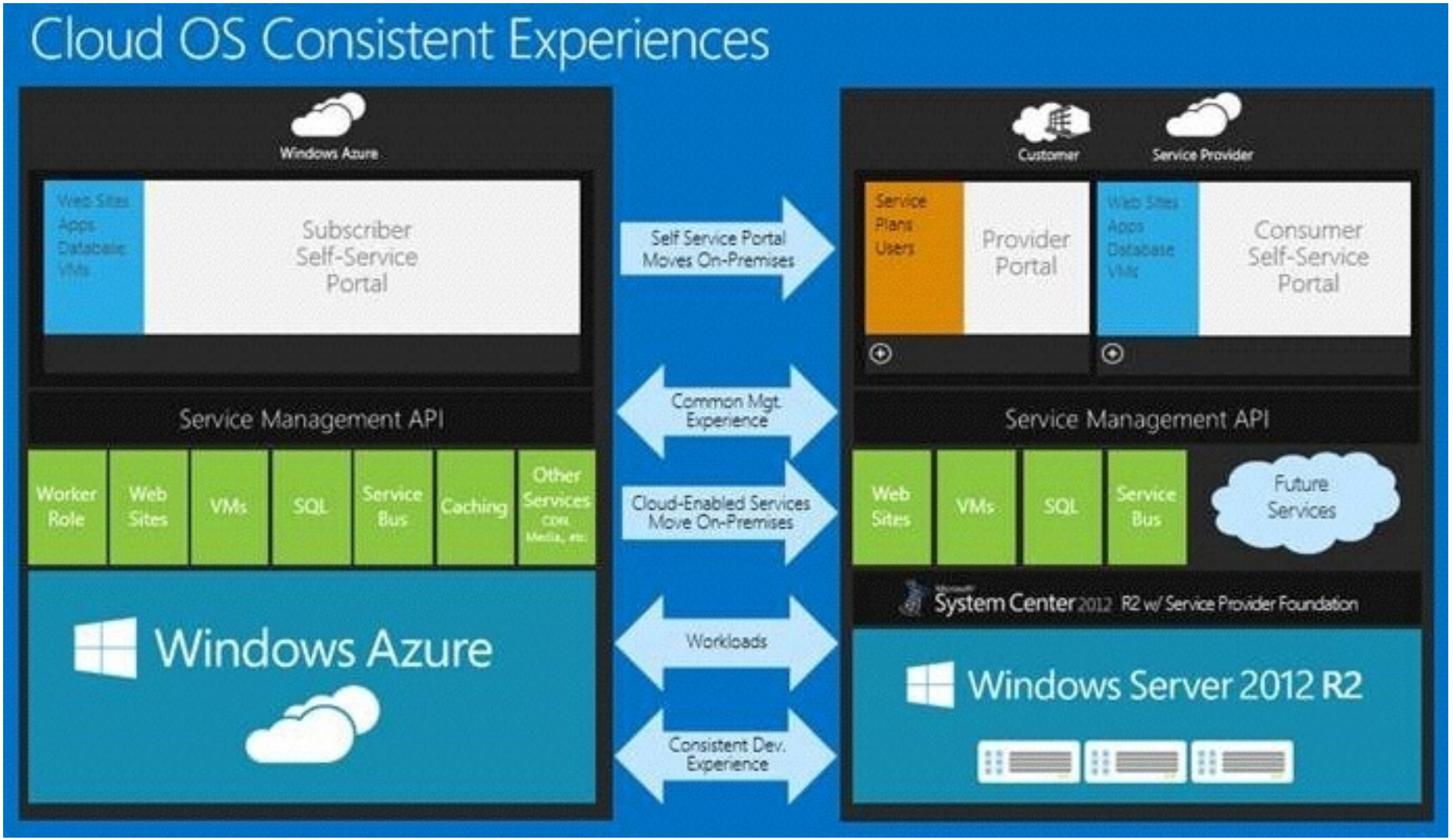

Google Cloud Platform
Compute
Storage
Big Data/Analysis
Services
SQL
App Engine
Compute Engine
Cloud Storage
Cloud Datastore
Cloud SQL
BigQuery
Cloud Endpoints

Microsoft - Cloud OS



Microsoft - We do Java!

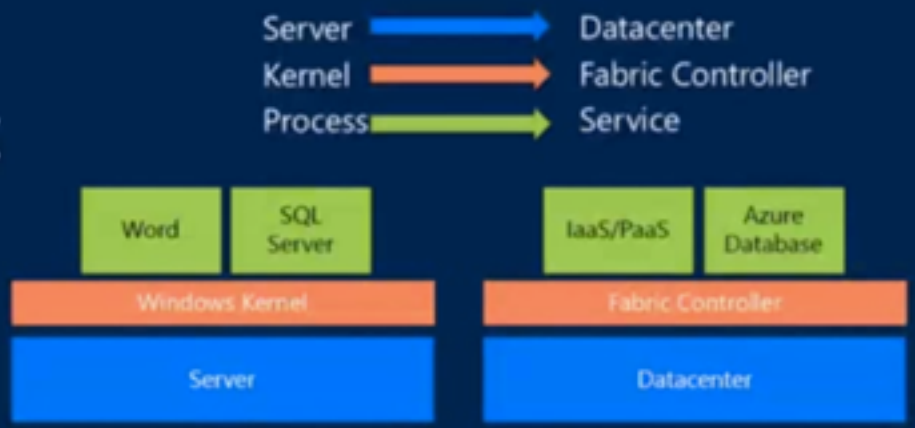
Microsoft - Hybrid



Microsoft - Multi Cloud

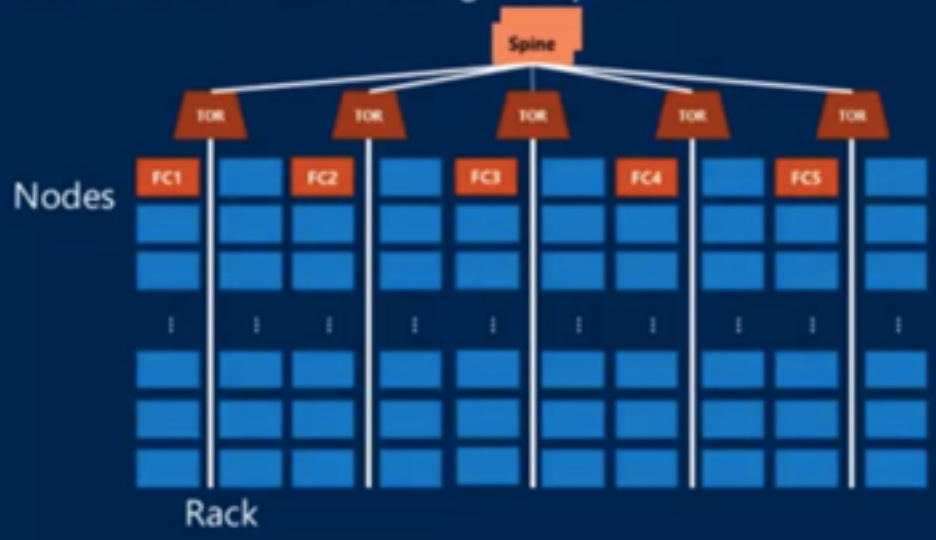
The Fabric Controller (FC)

- The "kernel" of the cloud operating system
  - Manages datacenter hardware
  - Manages Windows Azure services
- Four main responsibilities:
  - Datacenter resource allocation
  - Datacenter resource provisioning
  - Service lifecycle management
  - Service health management
- Inputs:
  - From hardware: description of the hardware and network resources it will control
  - From users: service model and binaries for cloud applications



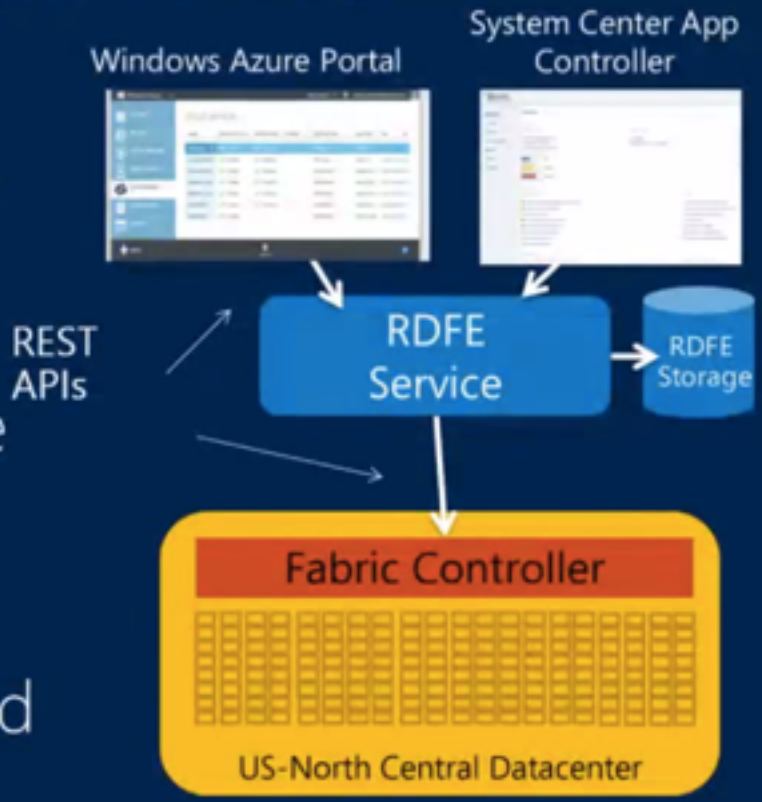
Inside a Cluster

- FC is a distributed, stateful application running on nodes
- Five instances for availability
  - One FC instance is the primary and all others keep view of world in sync
  - Supports rolling upgrade, and services continue to run even if FC fails entirely
  - Can tolerate one instance failure during an update



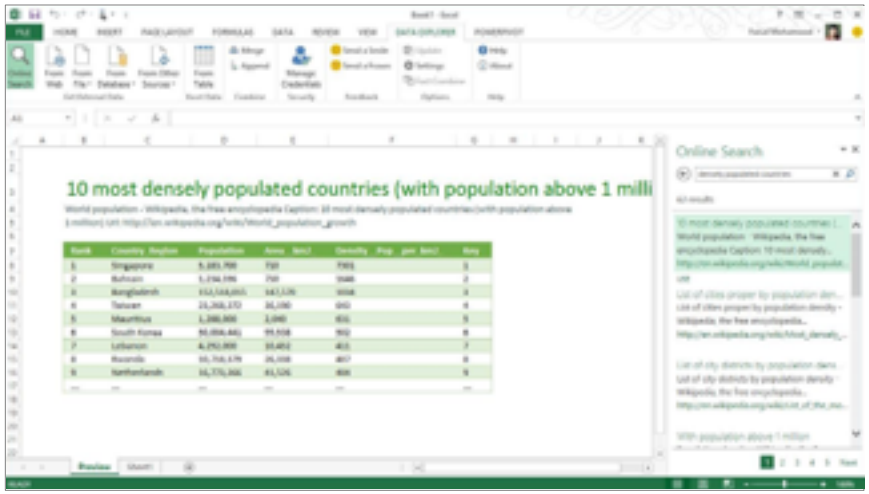
Deploying a Service to the Cloud:

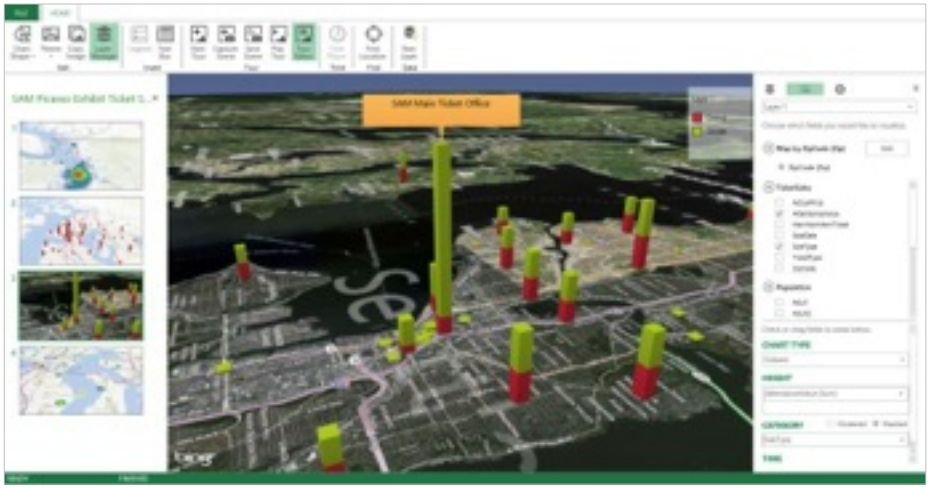
- Package deployed to RDFE
  - Windows Azure portal
  - System Center App Controller provides IT Pro upload experience
  - Powershell provides scripting interface
  - Visual Studio publish
- RDFE stores service in its storage account
  - Converts it to FC "instance model"
  - Sends service to a Fabric Controller (FC)
- FC stores image in repository and deploys service



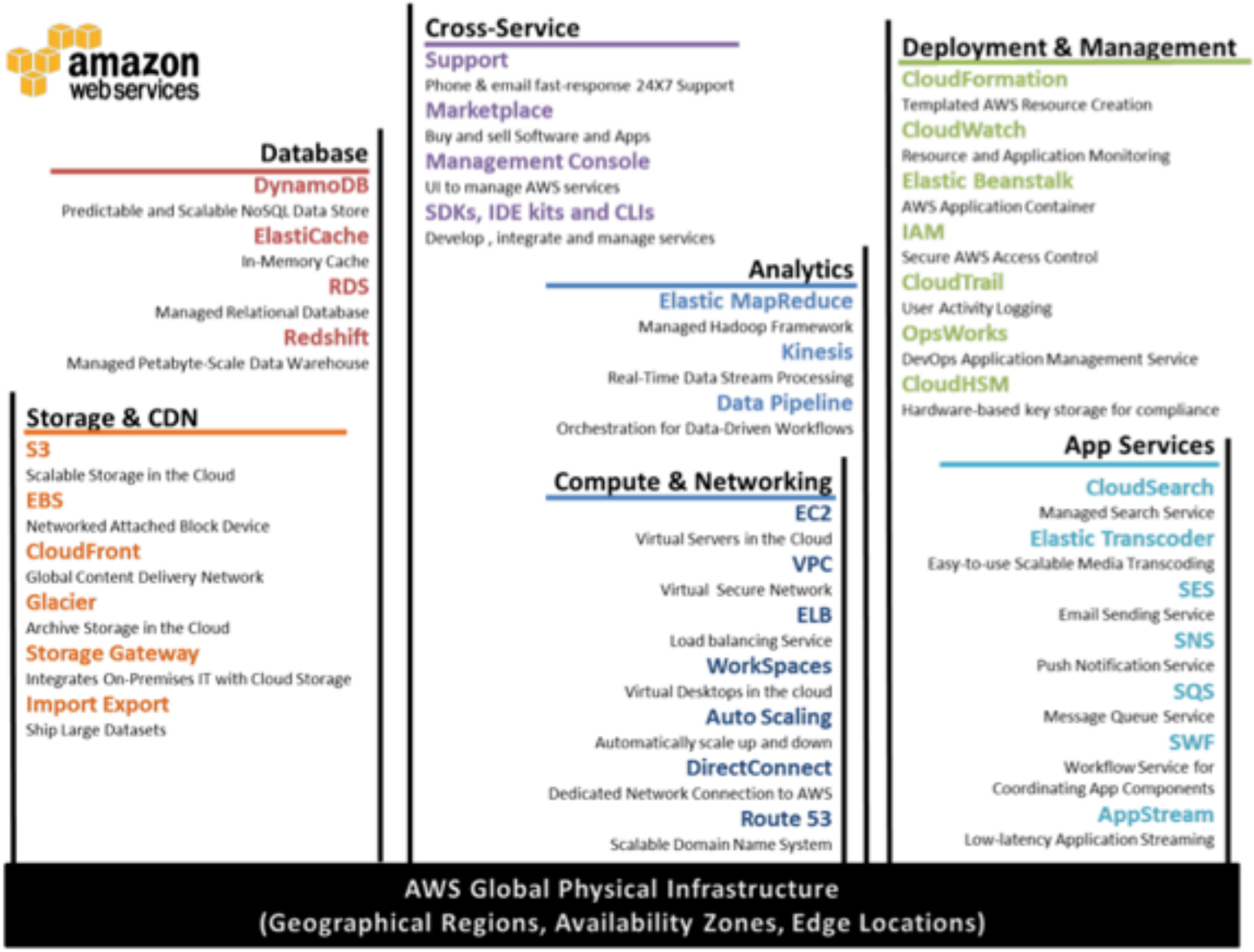
Microsoft Big Data Usability

- Agility in Data -> Insight
- Excel PowerBI + Azure HD Insight





Amazon

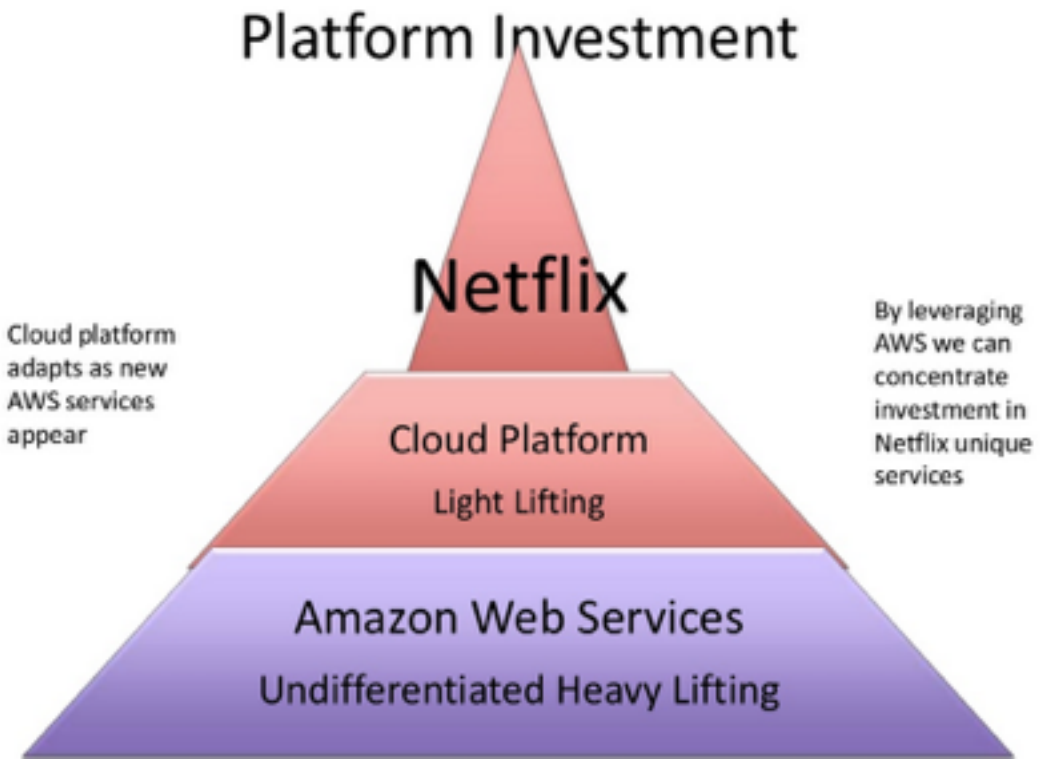


Source http://media.amazonwebservices.com/AWS_Overview.pdf

Amazon

- 2 pizza teams, focused on services
- Eventual consistency (Dynamo paper)
- Use OSS but don’t contribute much
- Elastic Beanstalk PaaS .NET, Java, Node.js, PHP, Python, Ruby
- PaaS partners: Heroku, Cloud Foundry
- VPC, but no complete hybrid story. Eucalyptus.

Netflix



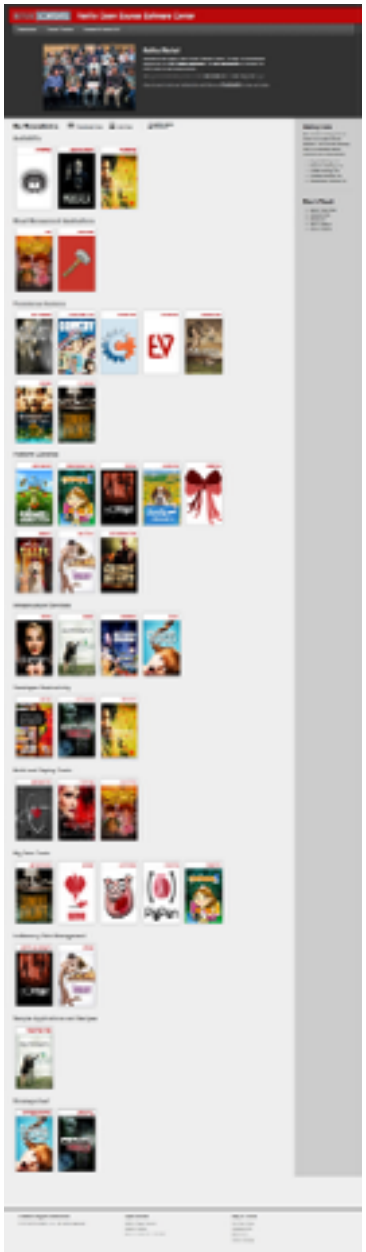
rapid evolution, low mtbiamsh

"mean time between idea and making stuff happen"

functionality and scale now, portability coming

source http://www.slideshare.net/adrianco/netflixoss-meetup

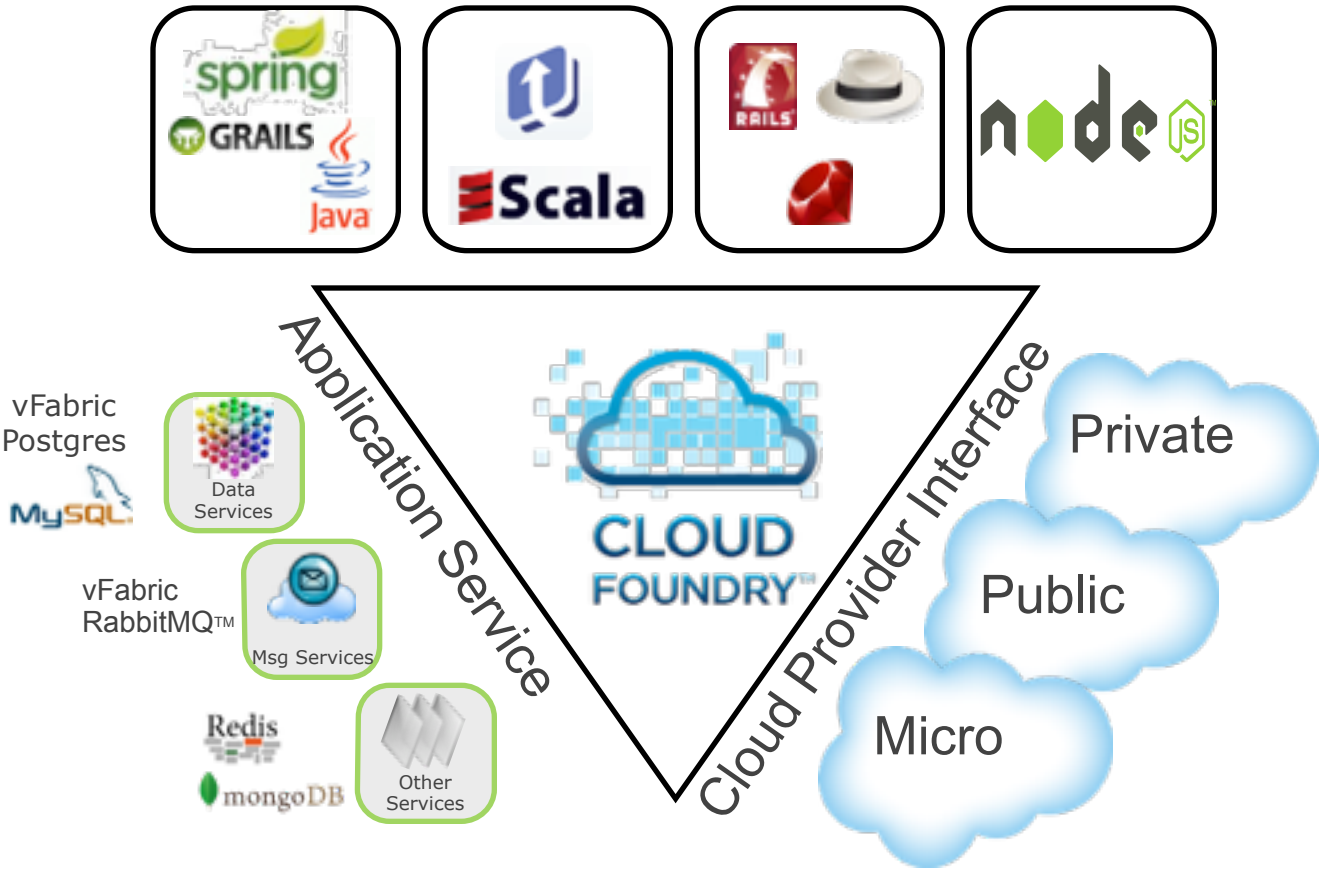
Netflix



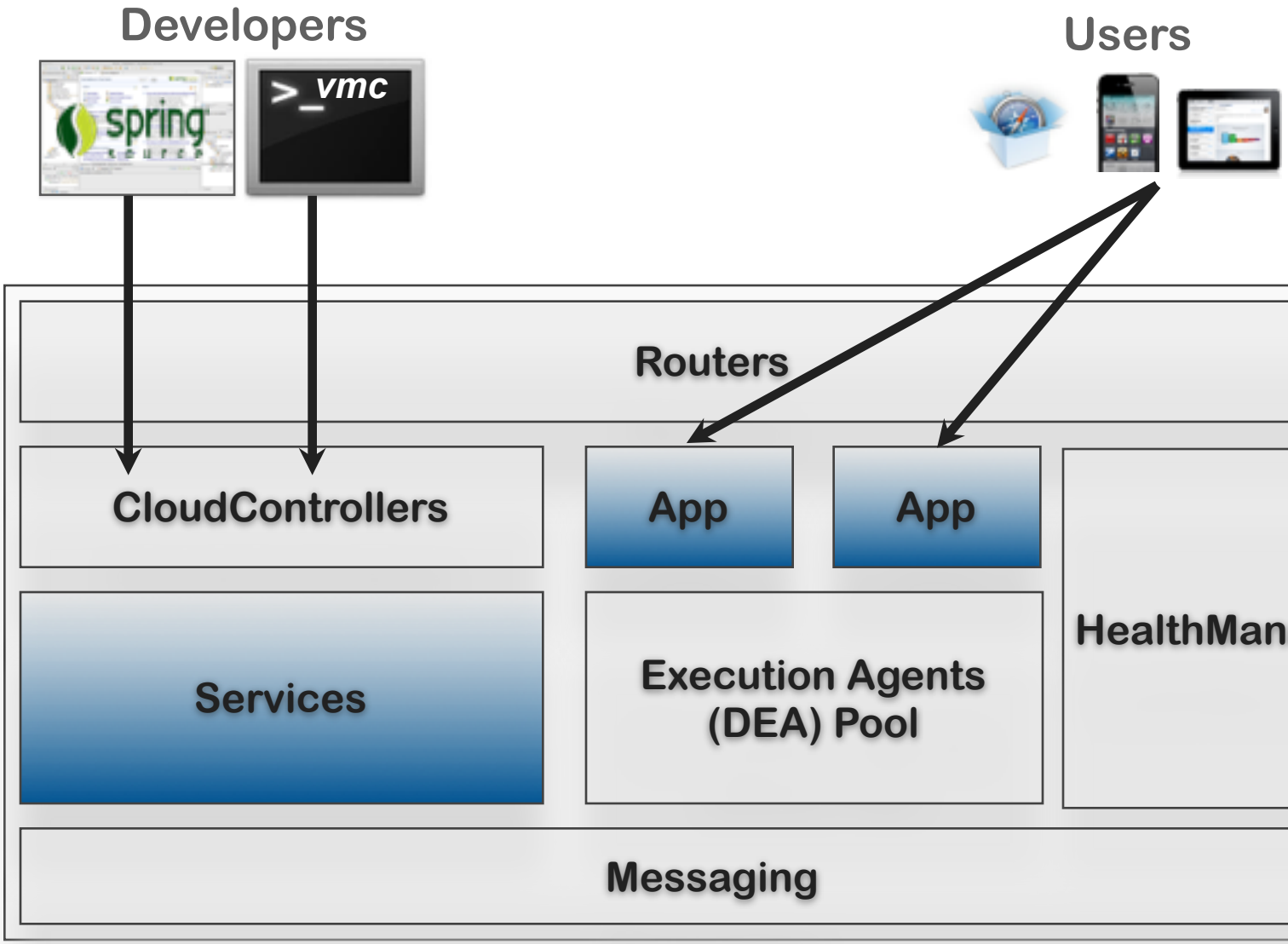
NETFLIX

VMWare / Pivotal CloudFoundry

- Open Source: Apache 2 Licensed
- multi language/frameworks
- multi services
- multi cloud

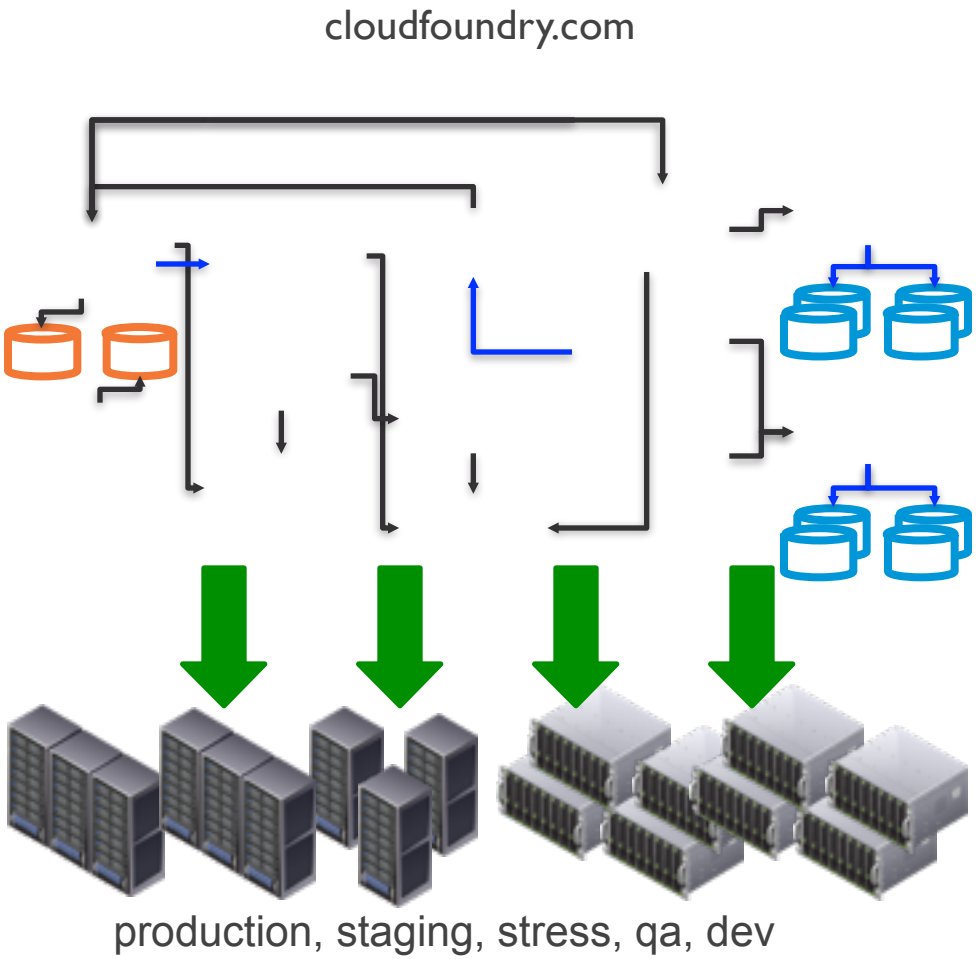


Cloud Foundry Logical View



Production Grade Cloud Foundry Clusters

- 500 – 5,000 VMs
- 40+ unique node types
- 75+ unique software packages
- 75+ unique environments
- 2x/week cf.com updates
- 24x7x365 non-stop operation
- No-downtime deployments
- Reliable, robust, repeatable deployments, updates, capacity adjustments
- Small teams manage many instances



Google style problem → Google style solution

BOSH: under the hood

BOSH User

"BOSH is deployed by BOSH"

bosh cli

director

healthmon

db

redis

nats

workers

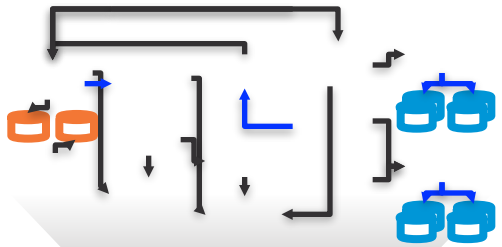
blobs

IaaS CPI

agent

stemcell

cloudfoundry.com



active jobs

disk

IaaS neutral by design

vmware

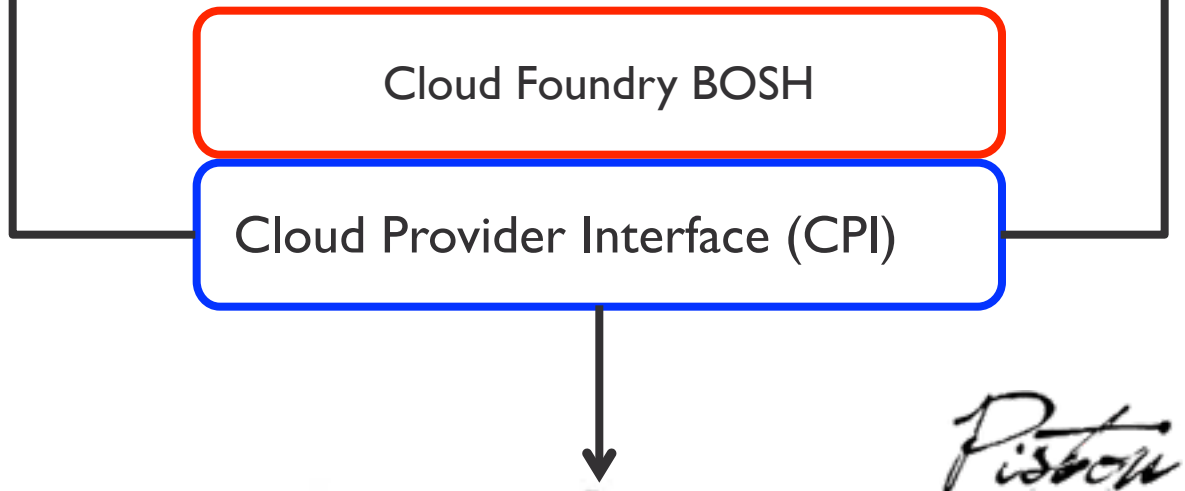
vSphere: battle tested implementation, *thousands of deployments*

vCloud Director: *"work in progress"*, 2H 2012

amazon web services

CPI: code complete

functional status: *"work in progress"*



cloudstack open source cloud computing

EUCALYPTUS

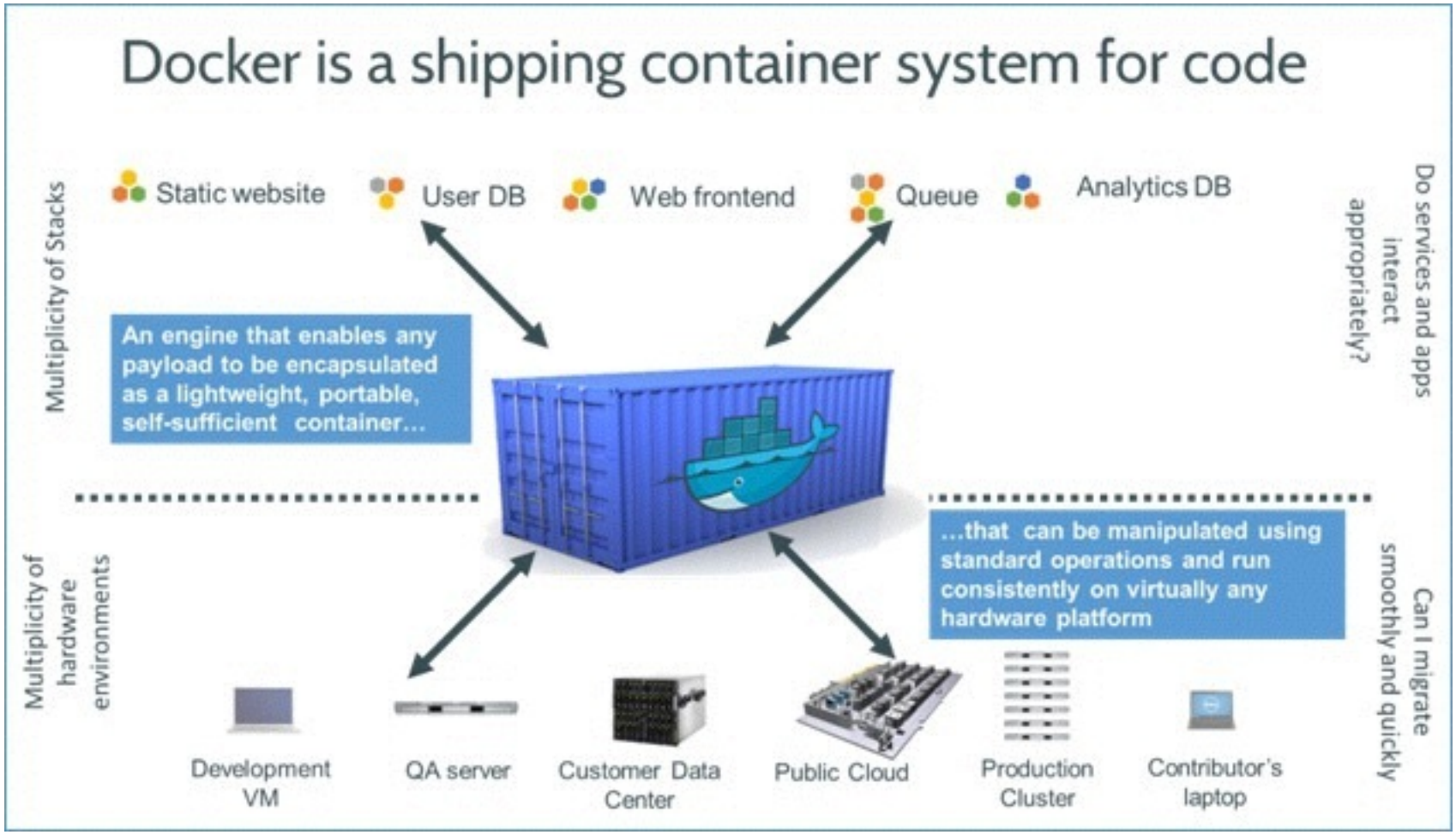
openstack

Piston Cloud Computing

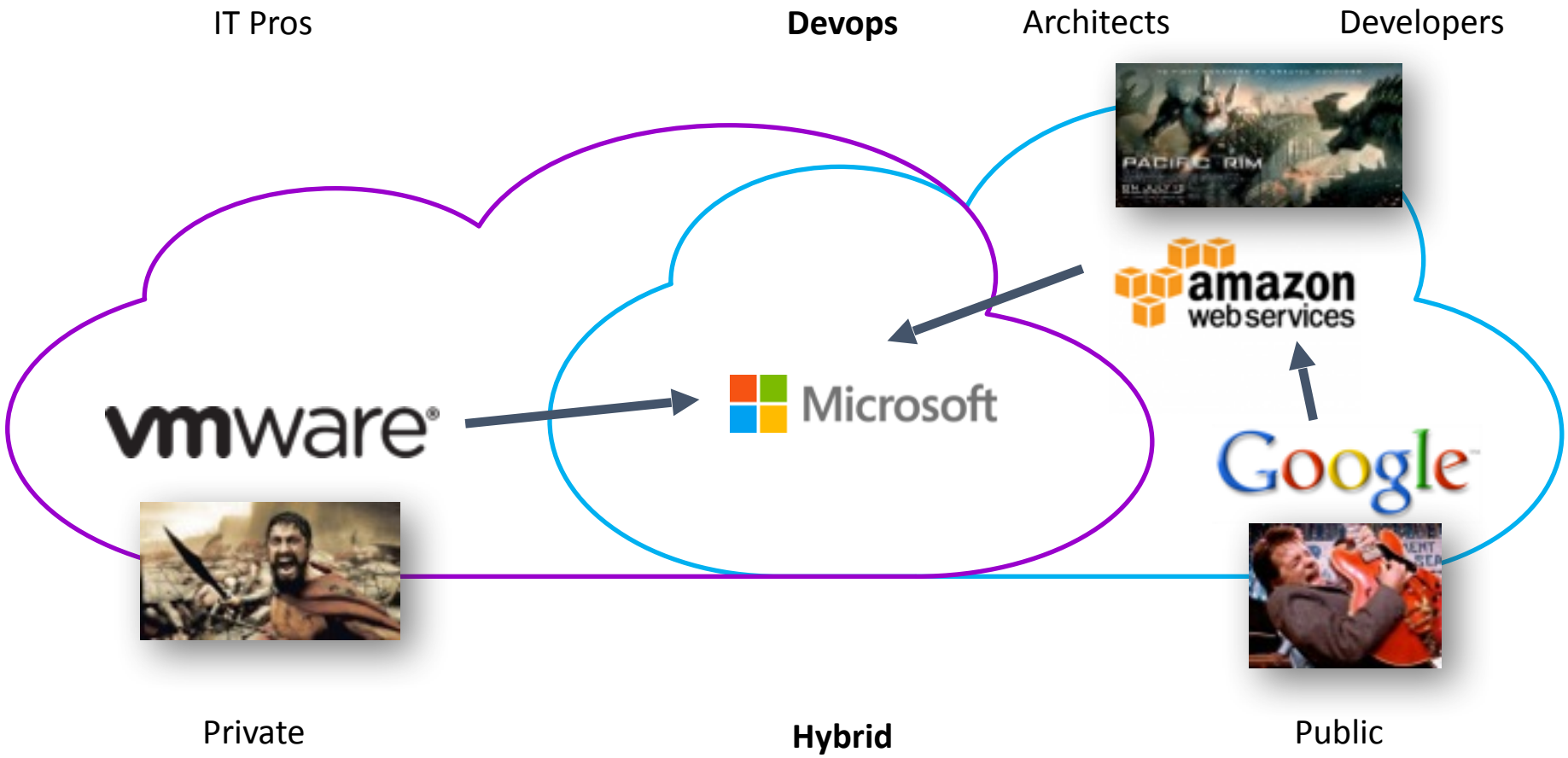
github.com/piston/openstack-bosh-cpi

contribute: github.com/cloudfoundry/bosh

Docker: IaaS -> PaaS continuum



Cloud Market



Building your Cloud

- Unit of scale: process -> service, kernel -> fabric, server -> datacenter
- Horizontally scalable uniform infrastructure for common workloads
- Set of managed Data services: SQL, Document, Graph
- Fabric to automate updates, monitoring
- Test and production lines blur: Monkeys, A/B Testing
- DevOps: Pizza box teams for each service, uniform tools
- Open Source: vendor independence, sharing the load, recruit
- IaaS/PaaS continuum, both useful, depends on needs
- Multi vendor, multi cloud, mix of proprietary and oss
- Hardware / Software interaction to innovate, eg F1, SSD instances
- Vertical / Sovereign / Geo clouds
- Among Big 3, Microsoft is best positioned or Hybrid

Thank You!

 @WindowsAzure

 @chanezon

Website : www.windowsazure.com/

Books / Articles

- Nick Carr, The Big Switch
- Eric Raymond, The Art of Unix Programming
- Weinberg, Psychology of Computer Programming
- Wes python book
- Mark html5 book
- Kent Beck XP
- Hunt, Thomas, The Pragmatic Programmer
- Ade Oshineye, Apprenticeship Patterns
- Matt Cutt's Ignite Talk IO 2011, Trying different things
- Josh Bloch talk about api design
- Larry and Sergey, Anatomy of a Search Engine
- Rob Pike, The Practice of Programming

References

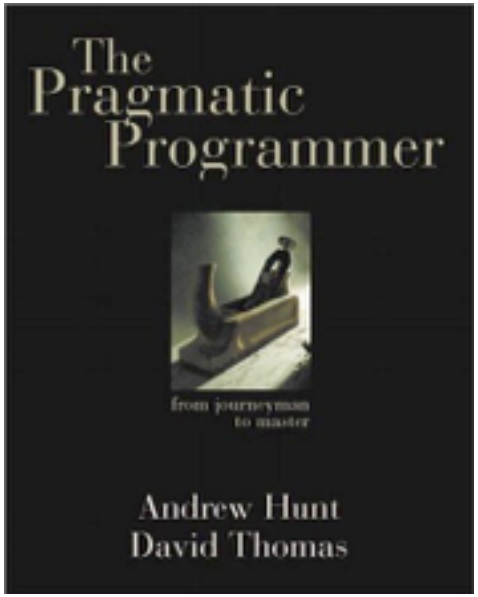
- Netflix OSS presentations source http://www.slideshare.net/adrianco/netflixoss-meetup
- Google Research papers
- Amazon architecture site
- Microsoft Azure center
- Mark Russinnovich Azure architecture talk http://channel9.msdn.com/Events/TechEd/NorthAmerica/2013/WAD-B402
- Scott Guthrie's blog

Papers / Talks

- Simon Wardley, Oscon 09 “Cloud - Why IT Matters”
- Tim O’Reilly article on internet os
- Peter Deutsch’s 8 Fallacies of Distributed Computing
- Brewer’s CAP Theorem
- Gregor Hohpe’s Starbucks Does Not Use Two-Phase Commit
- Herb Sutter, Welcome to the Jungle
  http://herbsutter.com/welcome-to-the-jungle/
- Stuff I tag http://www.delicious.com/chanezon/
- More specifically http://www.delicious.com/chanezon/cloudfoundry
- My previous Talks http://www.slideshare.net/chanezon
- My list of favorite books
  http://www.chanezon.com/pat/soft_books.html

Trends

Industry



Craft