Cloud

What is cloud

METAPHOR: FOR A USER, THE NETWORK ELEMENTS REPRESENTING THE PROVIDER-RENDERED SERVICES ARE INVISIBLE, AS IF OBSCURED BY A CLOUD.

Motivation

Traditionally:

- Purchasing racks of servers
- Deploying server side OS distribution
- Monitor and maintenance
- Deal with frequent failure

CAPEX model:

- buy the dedicated hardware as capital expense
- depreciate it over a period of time

Motivation

Company seek:

- sharing of resources to achieve coherence and economies of scale
- avoid upfront infrastructure costs
- improved manageability and less maintenance
- rapidly adjust resources to meet fluctuating business demand

OPEX model:

- use a shared cloud infrastructure
- pay operating expense as one uses it

“New Concept”

1970s

- “Extreme Uptime” (99.9999%)
- Expensive Custom Hardware
- Centralized
- Mainframe Time-sharing

2000s

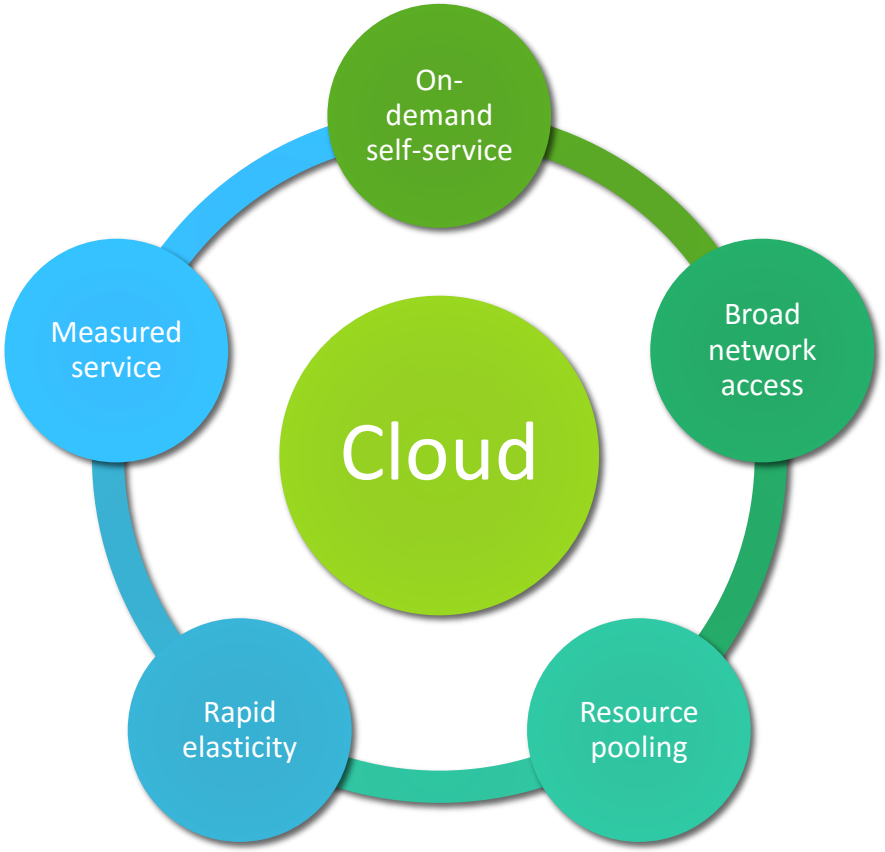
- “Design for failover”
- High-end “Commodity” Hardware
- Decentralized
- Service sharing

2010+

- “Design for failure” (Always up)
- Cheap “Commodity” Hardware
- Full Distributed
- Self-service

Characteristics

Source:
National Institute of Standards and Technology



Advantage

Agility

- Rapid adapting
- Easy scaling
- Peak-load ability

Cost Efficient

- Low entry barrier
- utilization efficiency

Reliability

- Fail safe mechanism
- Designed redundancy
- Maintenance

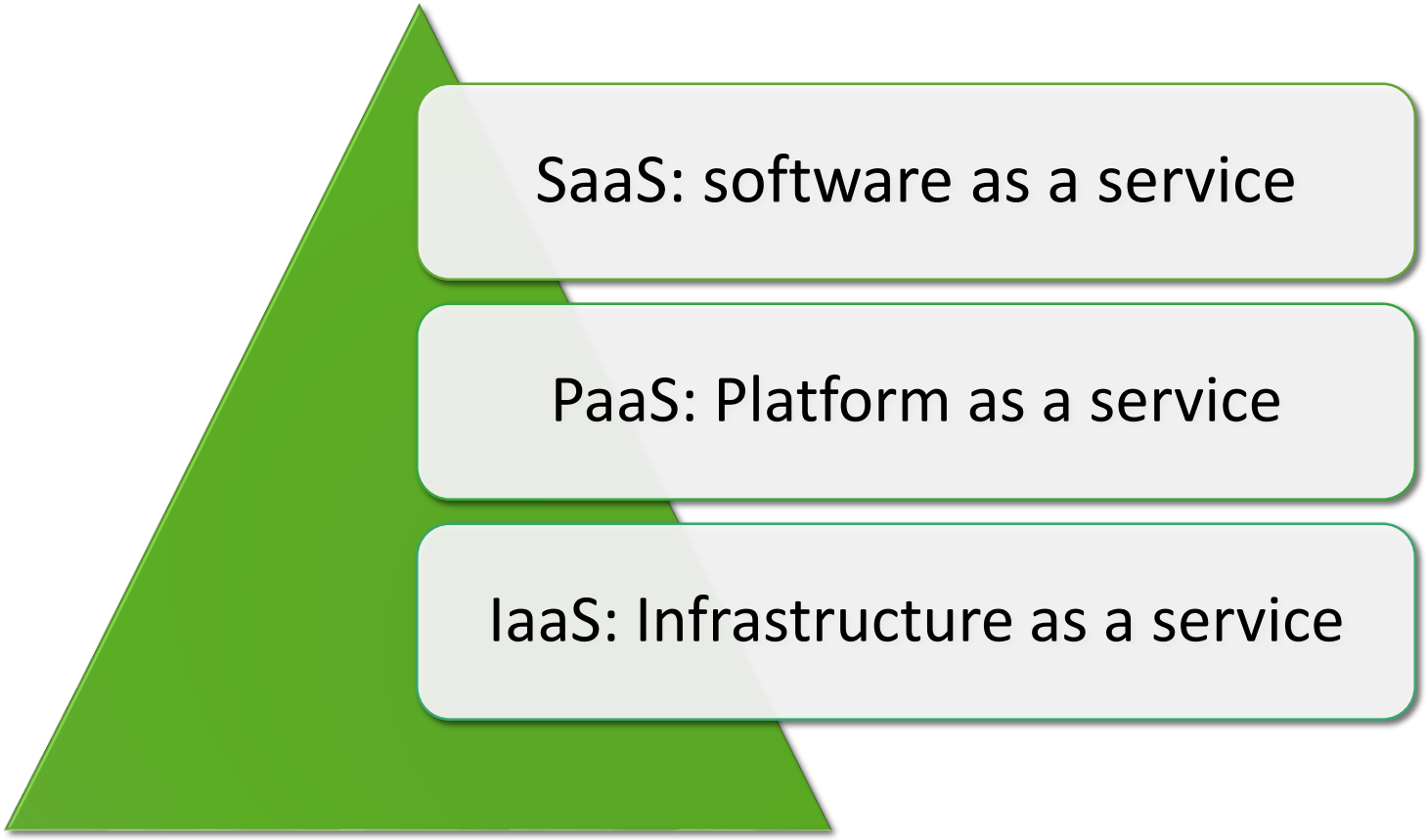
Security

- Devote resource for security
- Configurable control over content

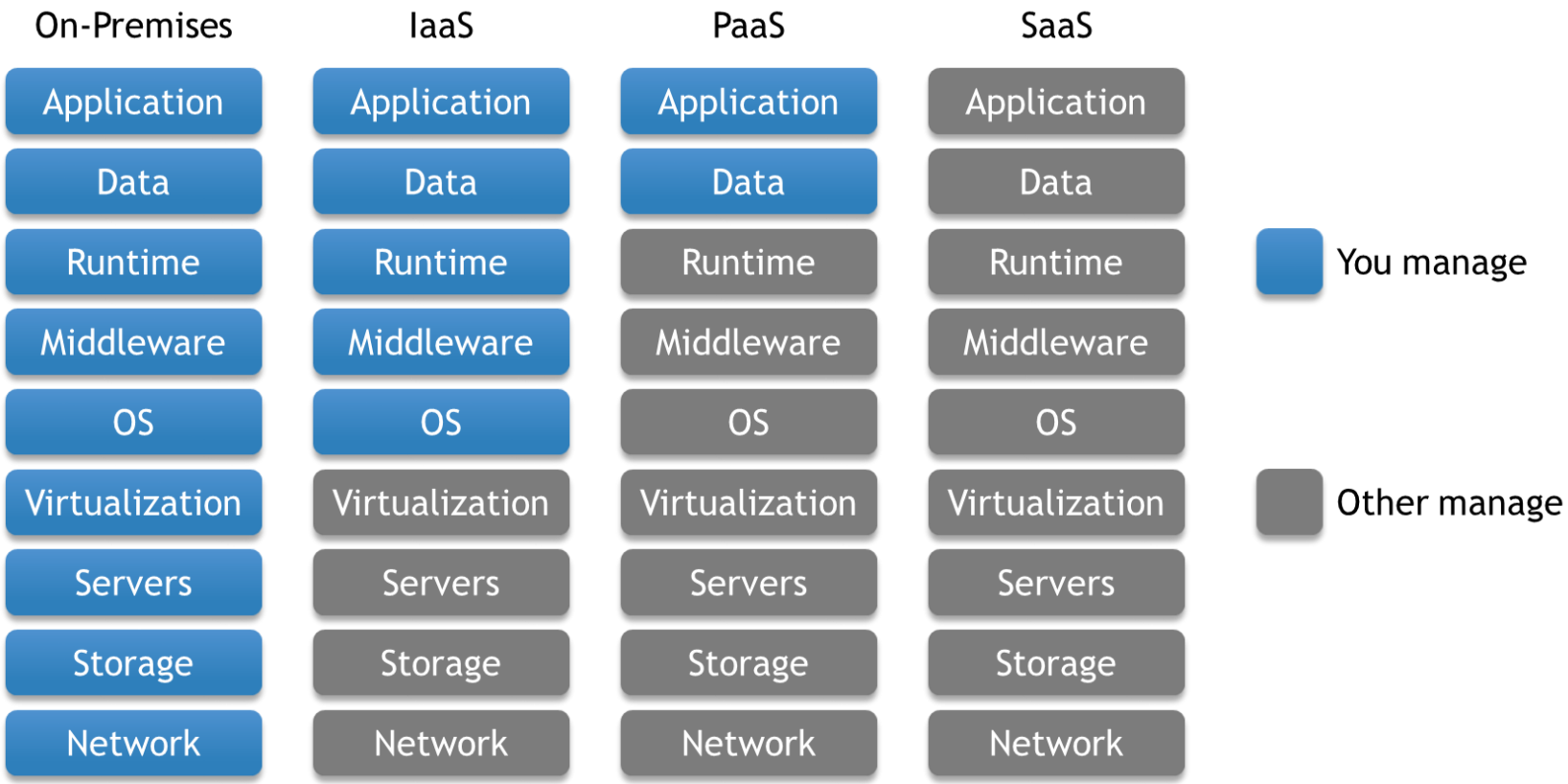
How can we use cloud

KNOW WHO AND HOW TO ORDER YOUR CLOUD

Service Model



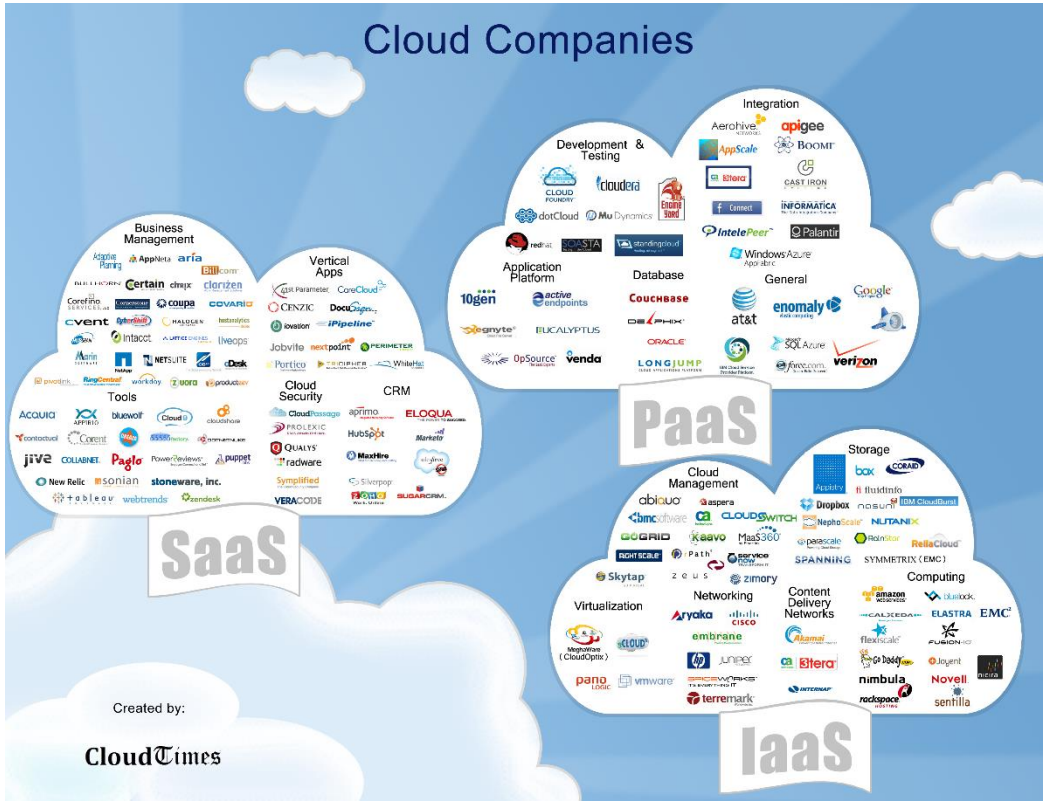
Service Model



Market Players

Market Leaders:

- AWS
- Azure
- Saleforce.com
- IBM
- Google AppEngine/ComputeEngine



Source: CloudTimes

Deployment Model

Public Cloud: services are rendered over a network that is open for public use

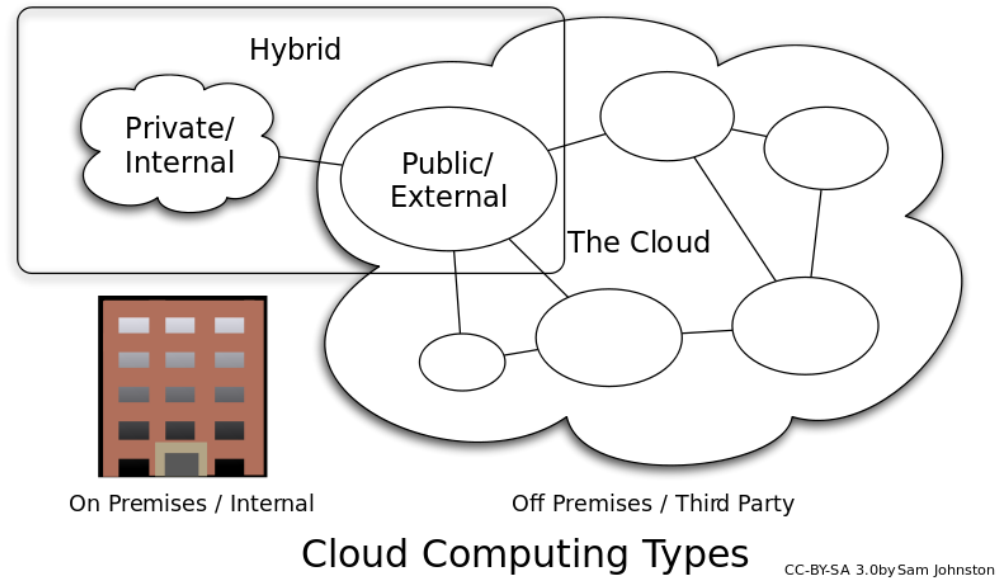
- E.g. AWS, Azure

Private Cloud: cloud infrastructure operated solely for a single organization

- E.g. Open Stack, Cisco

Hybrid Cloud: public cloud and private cloud build remain distinct entities but are bound together

- E.g. Eucalyptus



Source: Sam Johnston

Peek inside the cloud

A.K.A CLOUD PRODUCT/SERVICE HARD COMMERCIAL

AWS

IAAS

AWS (Amazon Web Services: What are they?)

Amazon Web Services is a bundled remote computing service that provides cloud computing infrastructure over the internet with storage, bandwidth and customized support for application programming interfaces (API).

Launched in 2006.

Database

DynamoDB
Predictable and Scalable NoSQL Data Store

ElastiCache
In-Memory Cache

RDS
Managed Relational Database

Redshift
Managed Petabyte-Scale Data Warehouse

Storage & CDN

S3
Scalable Storage in the Cloud

EBS
Networked Attached Block Device

CloudFront
Global Content Delivery Network

Glacier
Archive Storage in the Cloud

Storage Gateway
Integrates On-Premises IT with Cloud Storage

Import Export
Ship Large Datasets

Cross-Service

Support
Phone & email fast-response 24X7 Support

Marketplace
Buy and sell Software and Apps

Management Console
UI to manage AWS services

SDKs, IDE kits and CLIs
Develop , integrate and manage services

Analytics

Elastic MapReduce
Managed Hadoop Framework

Kinesis
Real-Time Data Stream Processing

Data Pipeline
Orchestration for Data-Driven Workflows

Compute & Networking

EC2
Virtual Servers in the Cloud

VPC
Virtual Secure Network

ELB
Load balancing Service

WorkSpaces
Virtual Desktops in the cloud

Auto Scaling
Automatically scale up and down

DirectConnect
Dedicated Network Connection to AWS

Route 53
Scalable Domain Name System

Deployment & Management

CloudFormation
Templated AWS Resource Creation

CloudWatch
Resource and Application Monitoring

Elastic Beanstalk
AWS Application Container

IAM
Secure AWS Access Control

CloudTrail
User Activity Logging

OpsWorks
DevOps Application Management Service

CloudHSM
Hardware-based key storage for compliance

App Services

CloudSearch
Managed Search Service

Elastic Transcoder
Easy-to-use Scalable Media Transcoding

SES
Email Sending Service

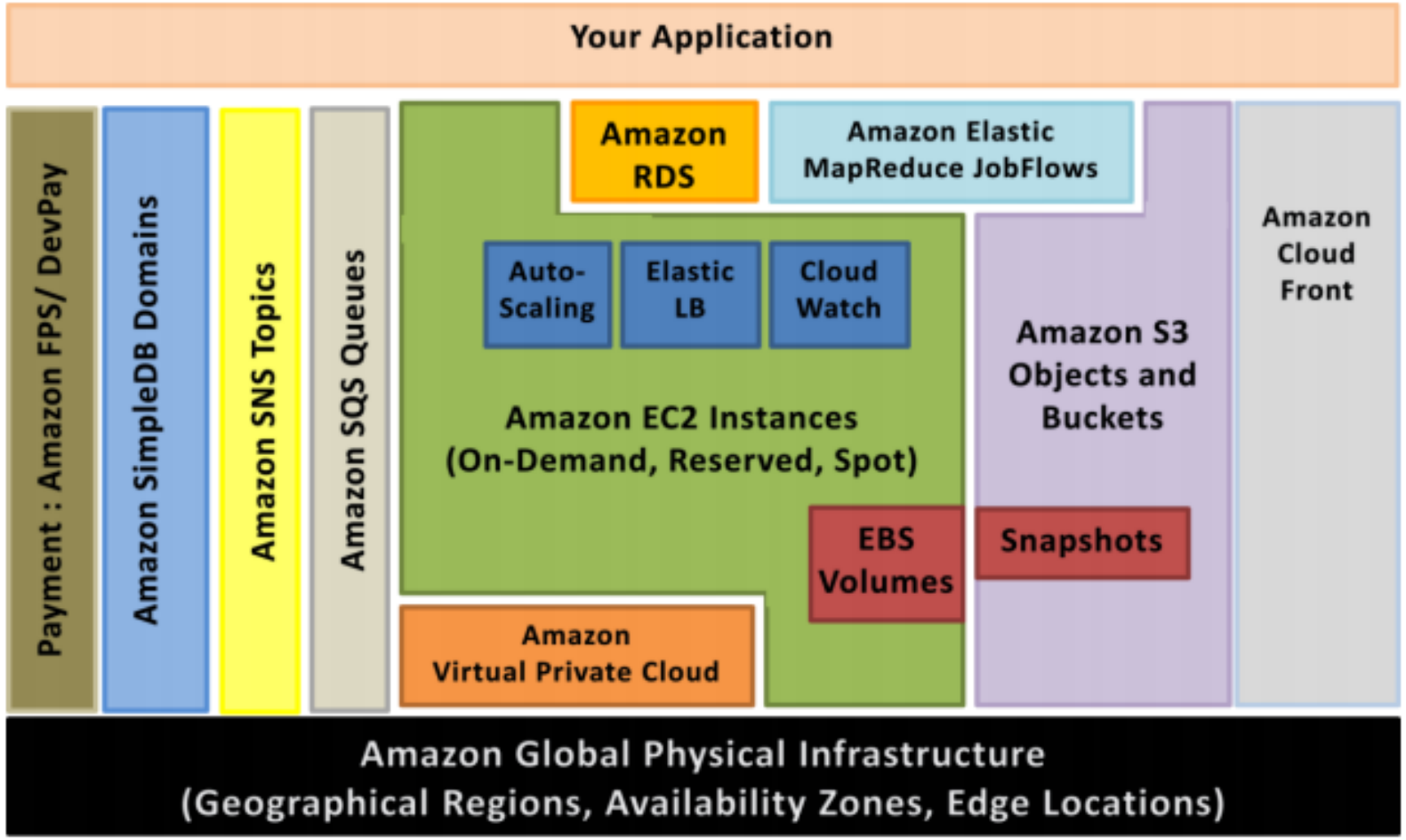
SNS
Push Notification Service

SQS
Message Queue Service

SWF
Workflow Service for
Coordinating App Components

AppStream
Low-latency Application Streaming

AWS


Your Application
Payment : Amazon FPS/ DevPay
Amazon SimpleDB Domains
Amazon SNS Topics
Amazon SQS Queues
Amazon RDS
Amazon Elastic MapReduce JobFlows
Auto-Scaling
Elastic LB
Cloud Watch
Amazon EC2 Instances (On-Demand, Reserved, Spot)
EBS Volumes
Amazon Virtual Private Cloud
Amazon S3 Objects and Buckets
Snapshots
Amazon Cloud Front
Amazon Global Physical Infrastructure
(Geographical Regions, Availability Zones, Edge Locations)

Compute & Networking

Amazon Elastic Computing Cloud (AWS EC2)

Central part of AWS cloud computing platform.

Users rent virtual computers on which to run their own computer applications.

Scalable deployment of application by providing “instance” (AMI).

Elastic --- on-demand use and payment.

Storage & Content Delivery Network

Amazon Elastic Block Storage (Amazon EBS)

Block storage attached to EC2 instance

Attach multiple volumes to one instance

Durable, point-in-time snapshots

Easily detach from one instance and attach to another

Provision a specific level of I/O performance if desired

Storage & Content Delivery Network

Amazon Simple Storage Service (Amazon S3)

Object storage for the Internet

An object an be up to 5TB

Each object is stored in a bucket and retrieved via a unique, developer-assigned key

Unlimited storage, unlimited objects

Natively online, HTTP/S access

99.999999% durability via replication across multiple Availability Zones in a region.

AWS S3 Use Case

Backup

Content Storage and Distribution

Big Data Analytics

Static Website Hosting

Cloud-native Application Data

Disaster Recovery

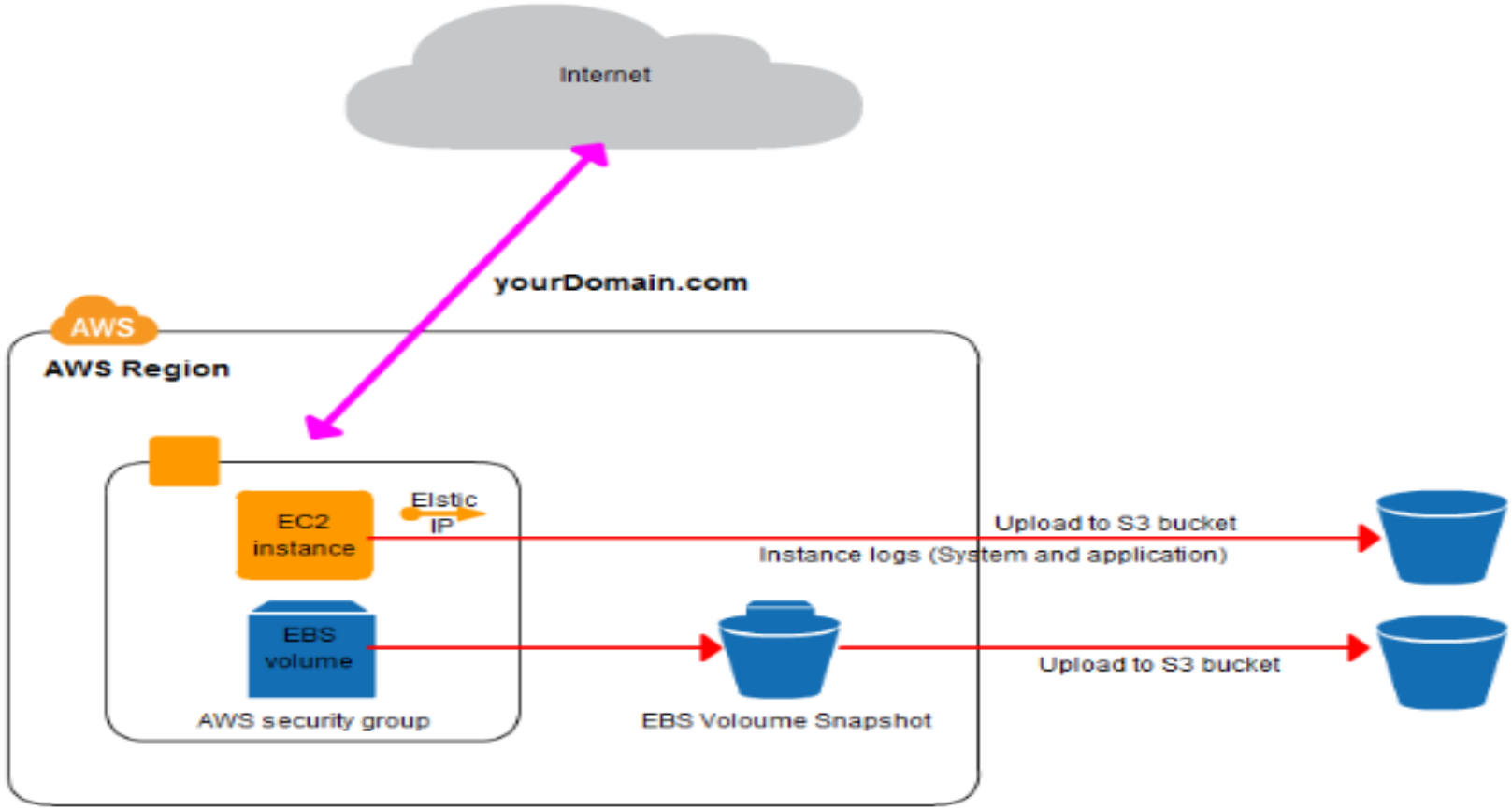
Basic structure of a AWS EC2

Instances

Xen virtualization

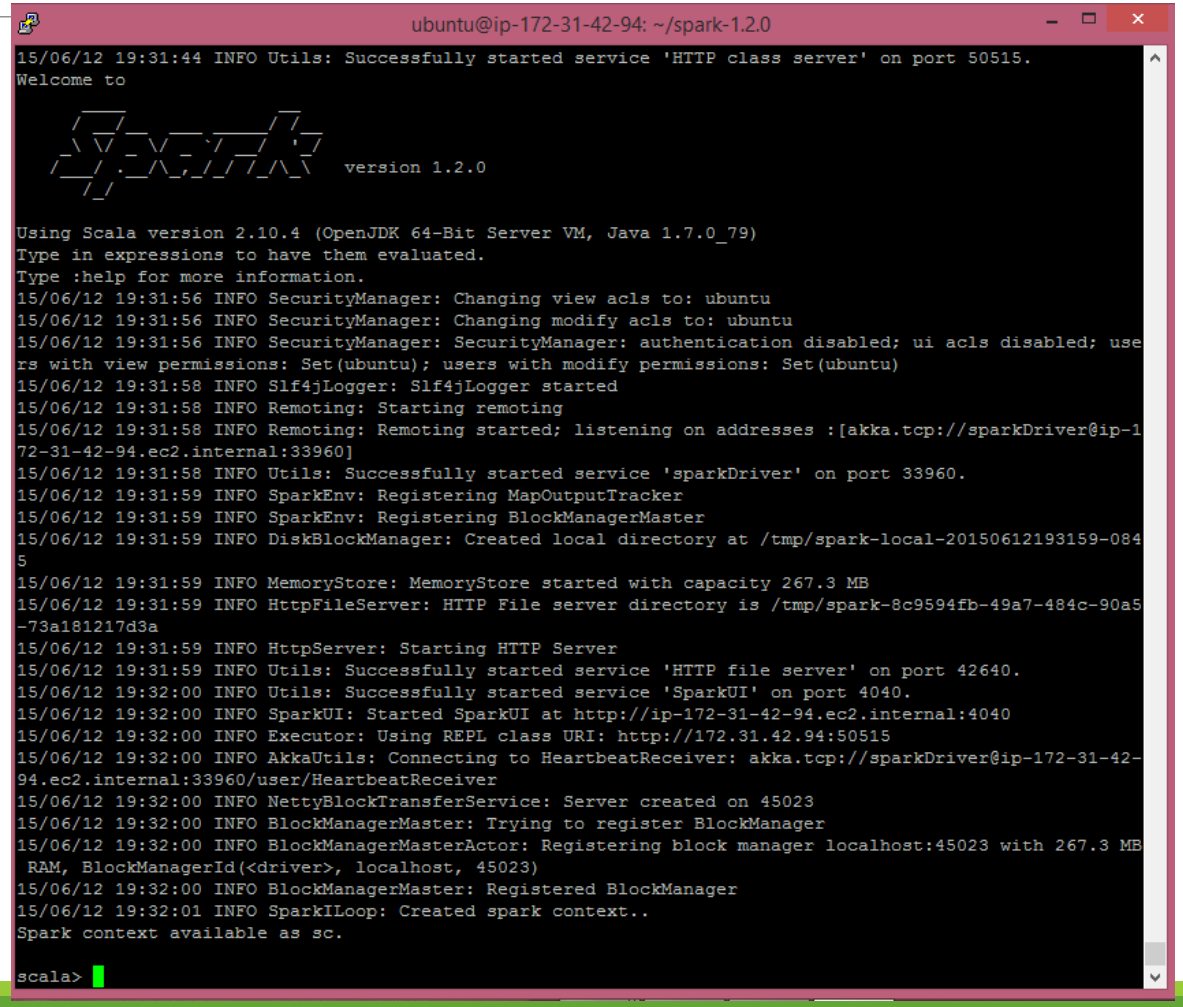
Each virtual machine -> “Instance”

3 tpyes
- -On-demand
- -Reserved
- -Spot



Running Spark on EC2

http://spark.apache.org/docs/1.2.0/ec2-scripts.html



Running Spark on EC2

spark-ec2 script

- Located in Spark's ec2 directory
- Allow to launch, manage and shut down Spark clusters on EC2

Each cluster is identified by placing its machines into EC2 security groups whose names are derived from the name of the cluster.

Running Spark on EC2

AWS Setup

cd 600 <keypair_file>
export AWS_ACCESS_KEY_ID=<>
export WS_SECRET_ACCESS_KEY=<>

Launching a luster

cd spark/ec2
./spark-ec2 -i <keypair_file> -k<keypair_name> launch <cluster_name>

Accessing Data in S3

Spark's file interface allows it to process data in Amazon S3 using the same URI formats that are supported for Hadoop.

URI: s3n://<bucket>/path

Launch the Spark cluster with the option-copy-aws-credentials

Advantage	Disadvantage
Flexible	Complicated
Cost-effective	Maintenance
Scalable and elastic	
Secure	
Experienced	

Azure

PAAS

Azure

What is Azure?

A Microsoft’s cloud computing platform,a growing collection of integrated services—analytics, computing, database, mobile, networking, storage, and web.

Azure

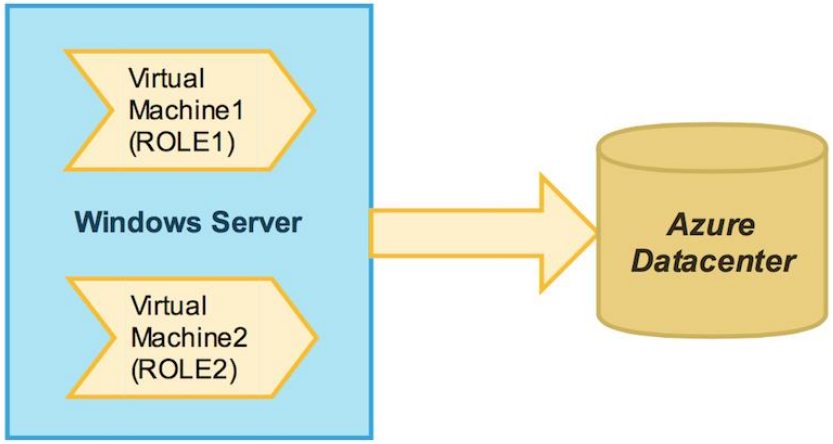
Azure Cloud Applications provide two different types of roles as below:

- **Worker Role** is a piece of code that can run in the background

  and code will communicate with the Windows Azure using either .NET libraries or a REST interface.

- **Web Role** provides a single HTTP and HTTPS endpoint

  to your code (Similar to an ASP.NET application)



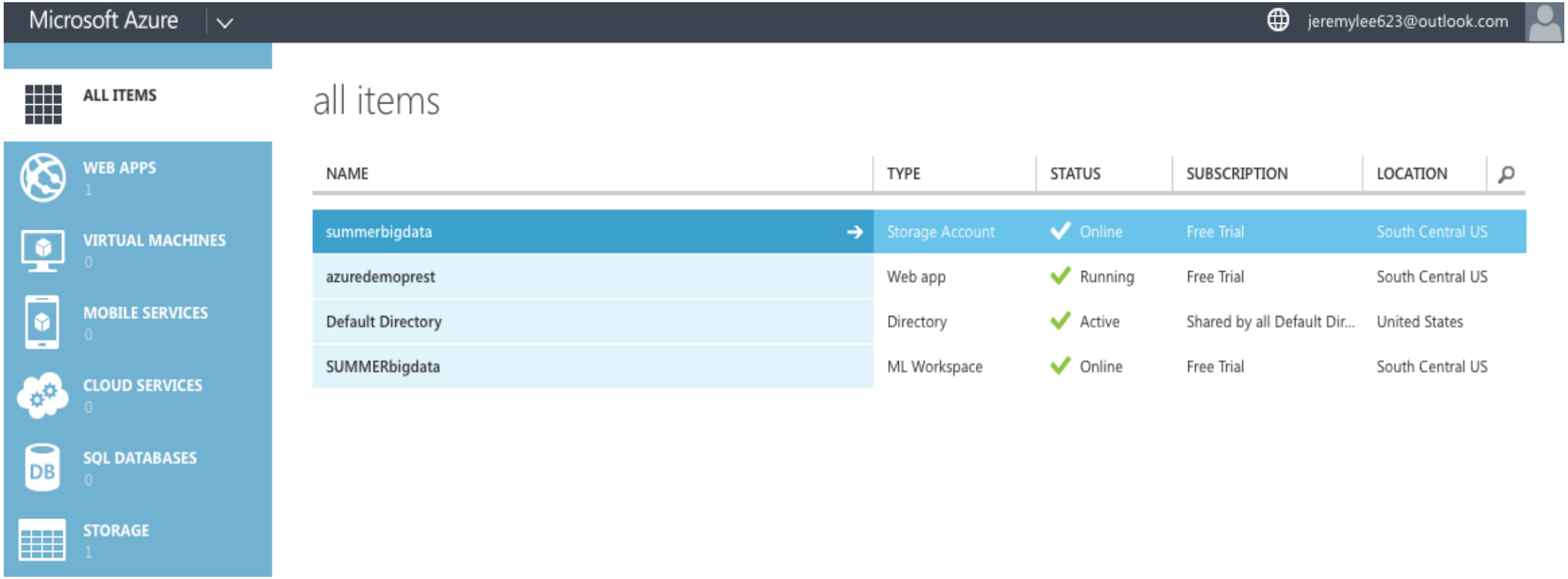
Azure

Use cases：

- Build a web application that runs and stores its data in Microsoft datacenters
- Help on-premises applications connect with each other
- Map between different sets identity information due to wide range of Azure services.

Azure

Launch a web application with WordPress installed

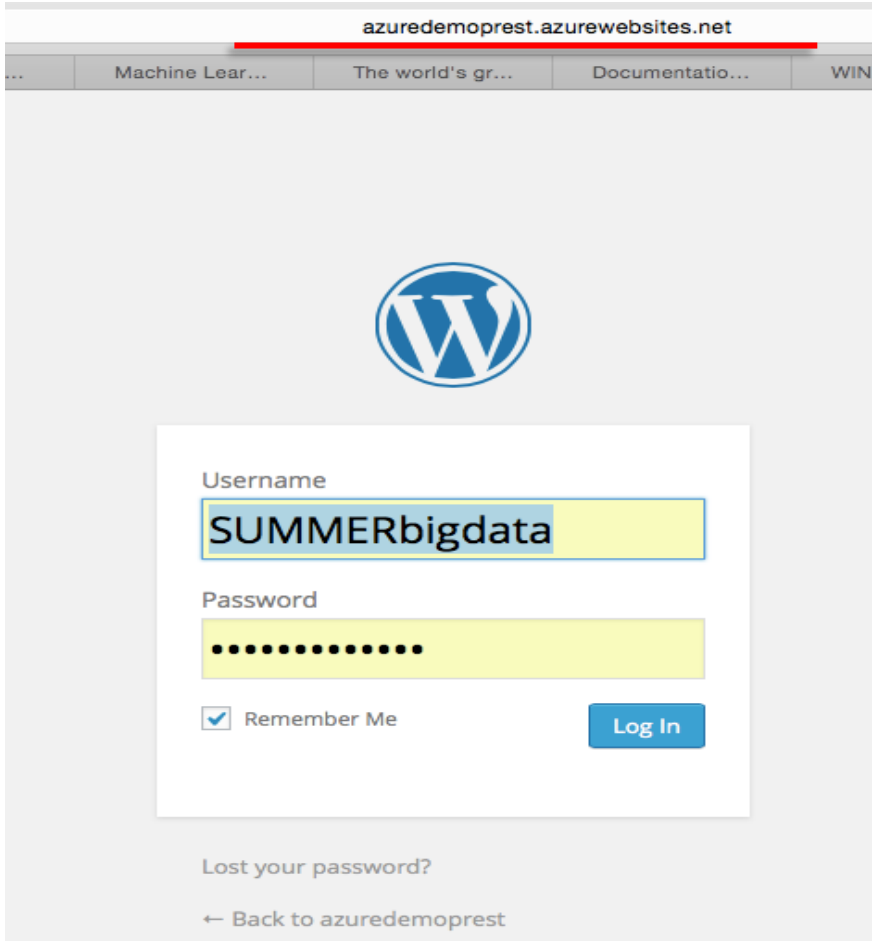


Azure

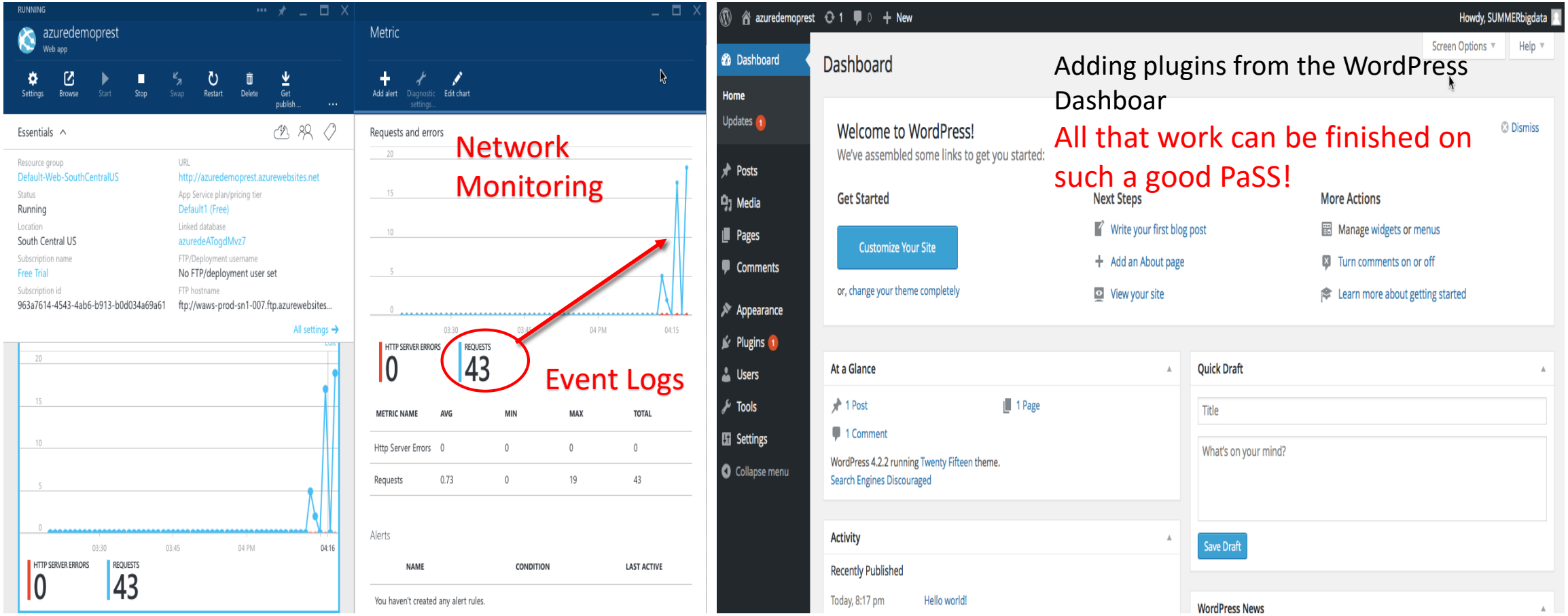
Deployed Web Application on Azure

http://azuredemoprest.azurewebsites.net/wp-login.php

- Variety of open source sites and applications
- Deploy rapidly with just a few clicks
- Connect with MySQL database



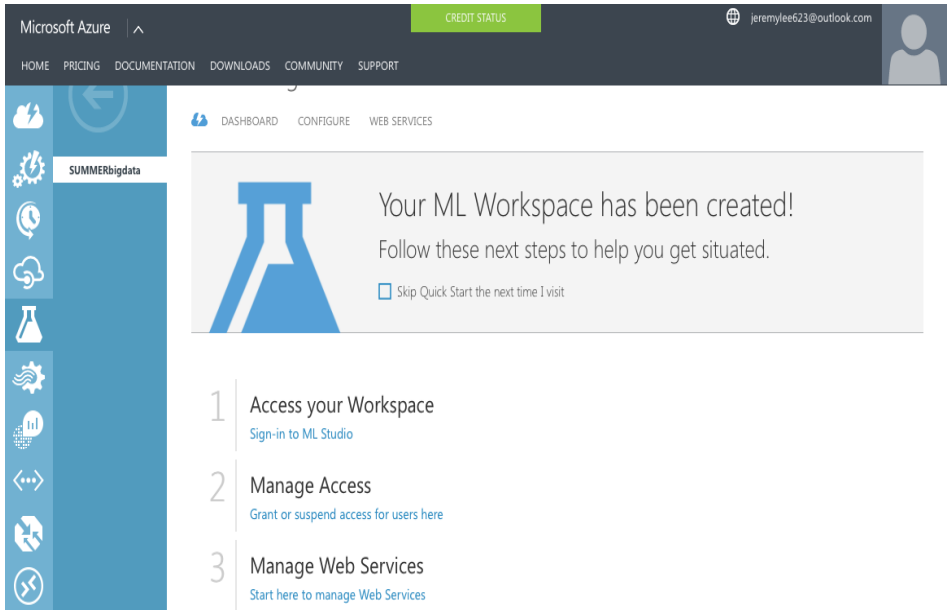
Azure

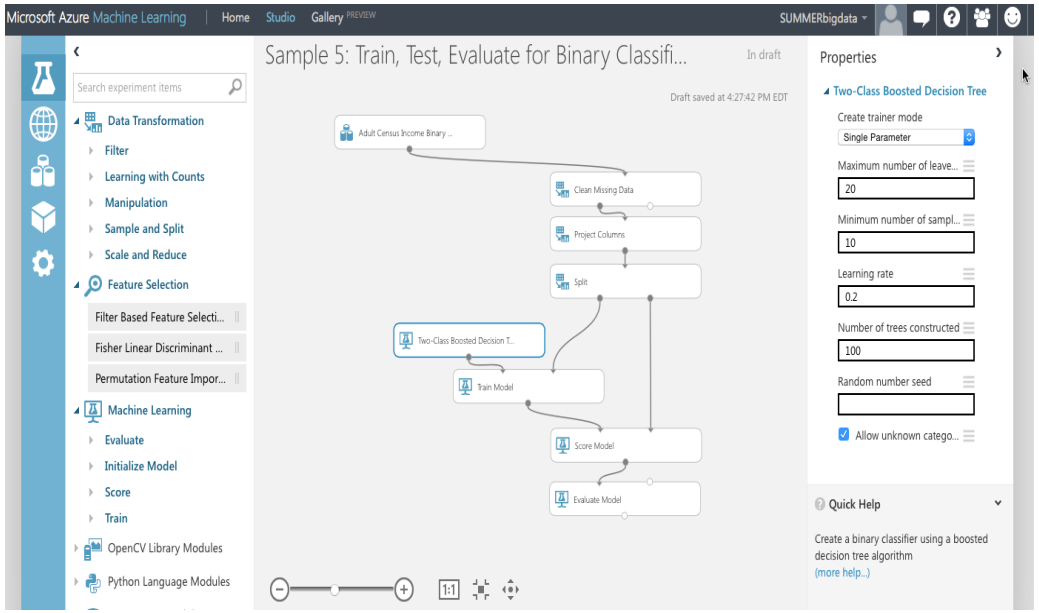

RUNNING
azuredemoprest
Web app
Settings
Browse
Start
Stop
Swap
Restart
Delete
Get publish ...
Essentials
Resource group
Default-Web-SouthCentralUS
URL
http://azuredemoprest.azurewebsites.net
Status
Running
App Service plan/pricing tier
Default1 (Free)
Location
South Central US
Linked database
azuredeATogdMvz7
Subscription name
Free Trial
FTP/Deployment username
No FTP/deployment user set
Subscription id
963a7614-4543-4ab6-b913-b0d034a69a61
FTP hostname
ftp://waws-prod-sn1-007.ftp.azurewebsites...
All settings
HTTP SERVER ERRORS
0
REQUESTS
43
Metric
Add alert
Diagnostic settings...
Edit chart
Requests and errors
Network Monitoring
Event Logs
METRIC NAME
AVG
MIN
MAX
TOTAL
Http Server Errors
Requests
0.73
19
Alerts
NAME
CONDITION
LAST ACTIVE
You haven't created any alert rules.
azuredemoprest
New
Howdy, SUMMERbigdata
Dashboard
Home
Updates
Posts
Media
Pages
Comments
Appearance
Plugins
Users
Tools
Settings
Collapse menu
Screen Options
Help
Welcome to WordPress!
We've assembled some links to get you started:
Dismiss
Get Started
Customize Your Site
or, change your theme completely
Next Steps
Write your first blog post
Add an About page
View your site
More Actions
Manage widgets or menus
Turn comments on or off
Learn more about getting started
At a Glance
1 Post
1 Page
1 Comment
WordPress 4.2.2 running Twenty Fifteen theme.
Search Engines Discouraged
Quick Draft
Title
What's on your mind?
Save Draft
Activity
Recently Published
Today, 8:17 pm
Hello world!
WordPress News
Adding plugins from the WordPress Dashboar
All that work can be finished on such a good PaSS!

Azure ML

Azure Machine Learning

We created the ML workspace studio, then chose the datasets from sample and execute every step in chart flow.





Azure

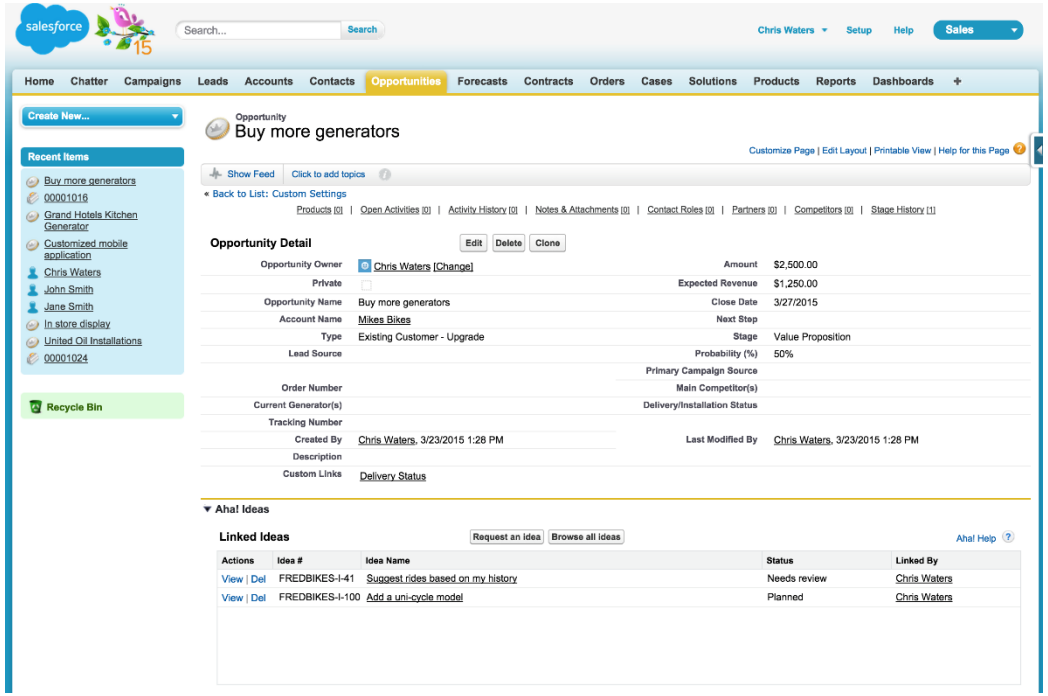
Azure’s Performance

Strengthens	Weakness
Lower application lifecycle costs	Loss of account control to Microsoft
Greater pool of development resources	Increased competition for development resources
Faster deployment times and client adoption	Increased self-hosting and integration costs

Salesforce CRM

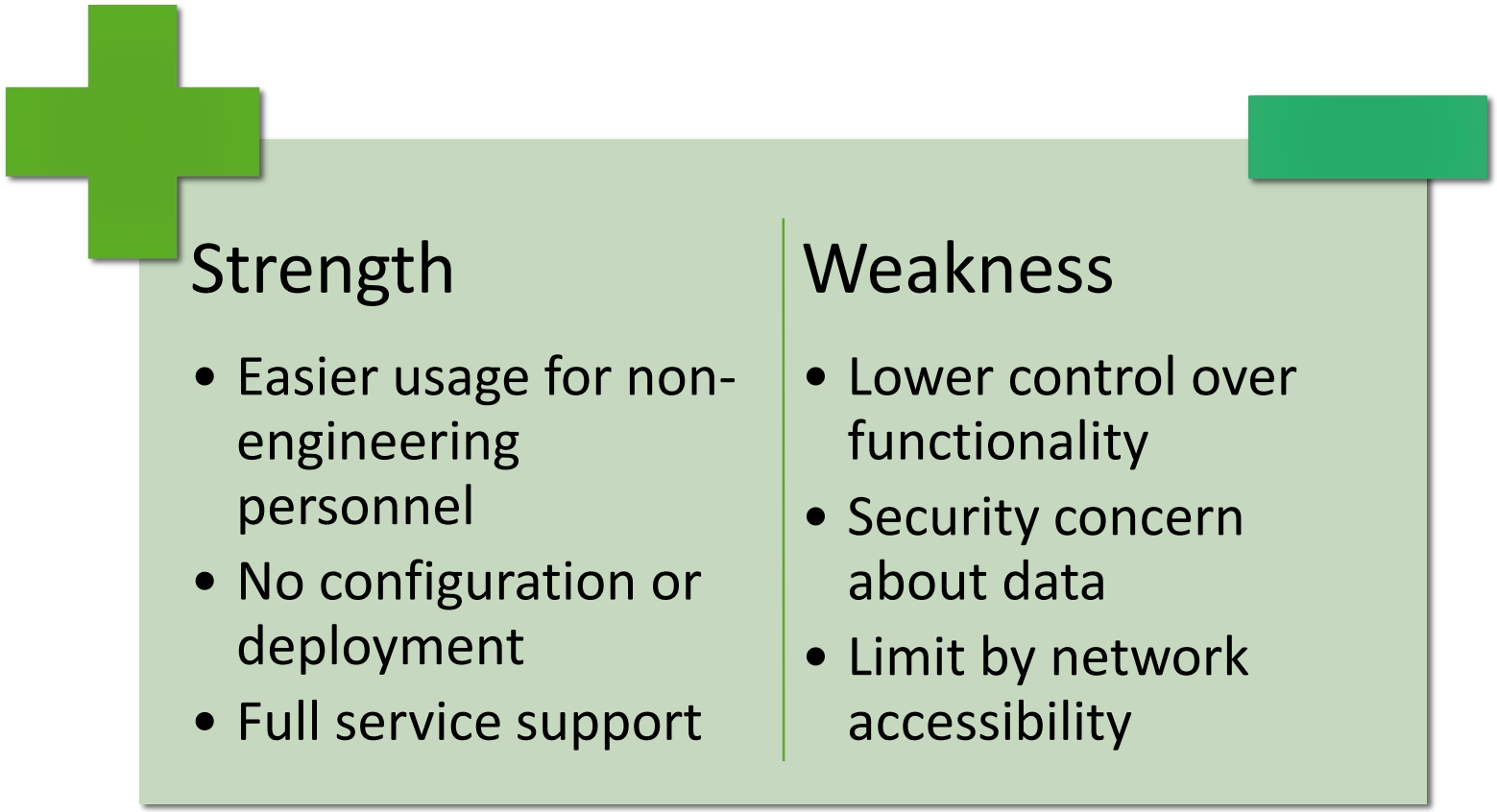
SAAS

Component



Source: support.aha.io

Strength/Weakness



Eucalyptus

HYBRID CLOUD

Simple Facts

Open source software for building AWS-compatible private clouds

- github.com/eucalyptus

Acronym: “Elastic Utility Computing Architecture, Linking Your Programs To Useful Systems”

Brought by HP, part of HP Helion

Partner with Amazon, maintain compatibility with AWS:

- Interface: EC2, IAM, S3, Auto Scaling, Elastic Load Balancing
- Tool: s3cmd, AWS Ruby SDK, Eclipse Toolkit

Architecture

Cloud level:

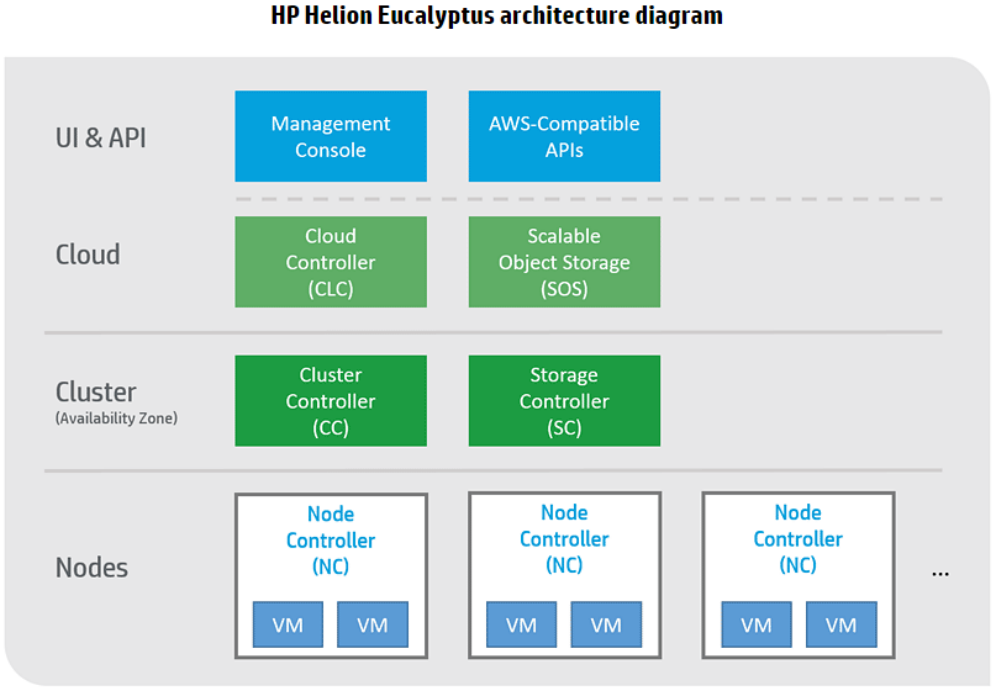
- CLC: EC2 SOAP and Query interface
- SOS (Walrus): S3 REST API

Cluster level:

- CC: AWS Availability Zone
- SC: AWS Elastic Block Store (EBS)

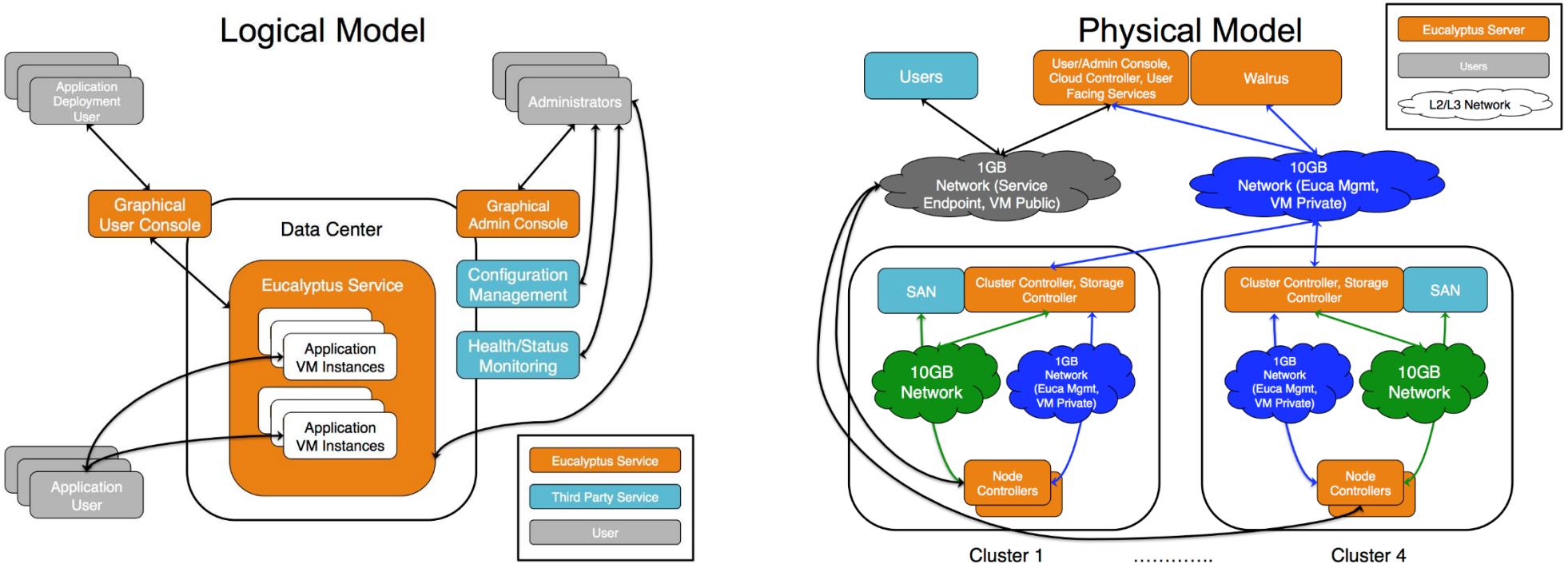
Node level:

- NC: hosts the VM instances and manages the virtual network endpoints



Source: eucalyptus.com

Reference Architecture



Source: eucalyptus.atlassian.net/wiki

Hybrid mode

Eucalyptus:

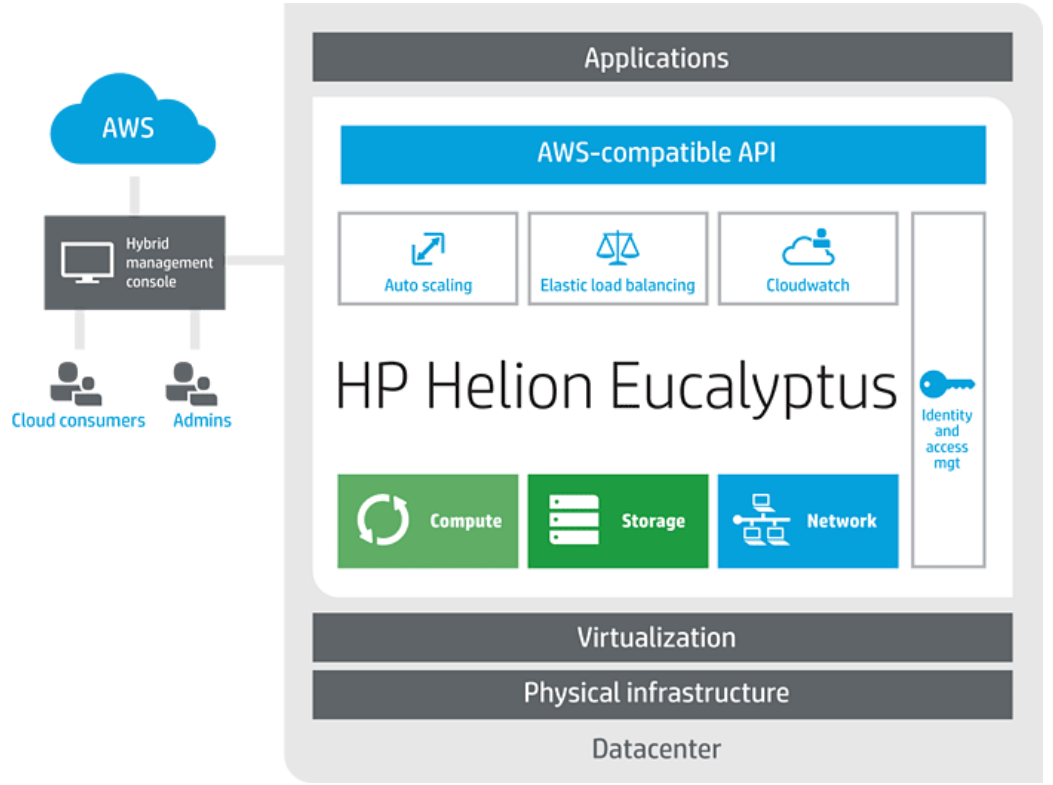
- Cloud on your hardware
- More control and protection

AWS:

- Cloud on other hardware
- More capacity and availability

Hybrid:

- Cloud busting ability
- Data gravity
- Information and resource sharing



Source: eucalyptus.com

Deployment – euca2tool

Config options:

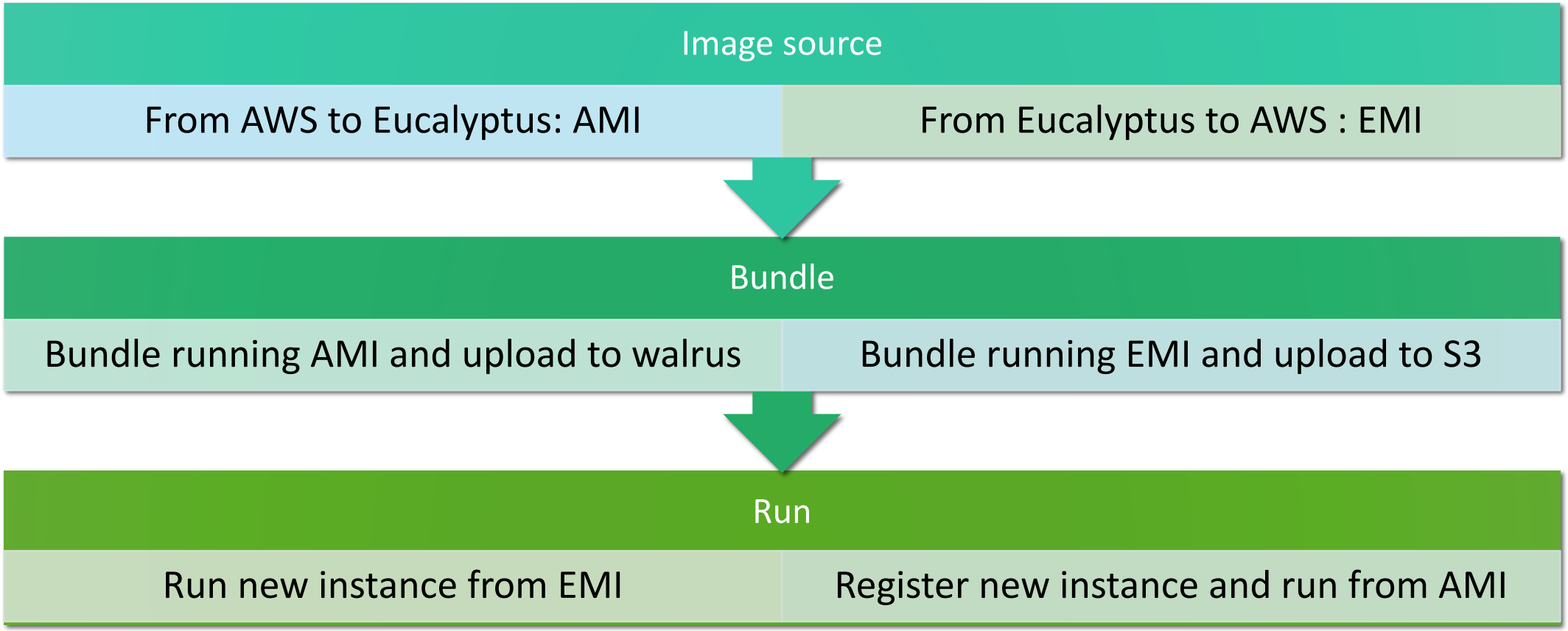
- User
- Region

For easy switch between clouds

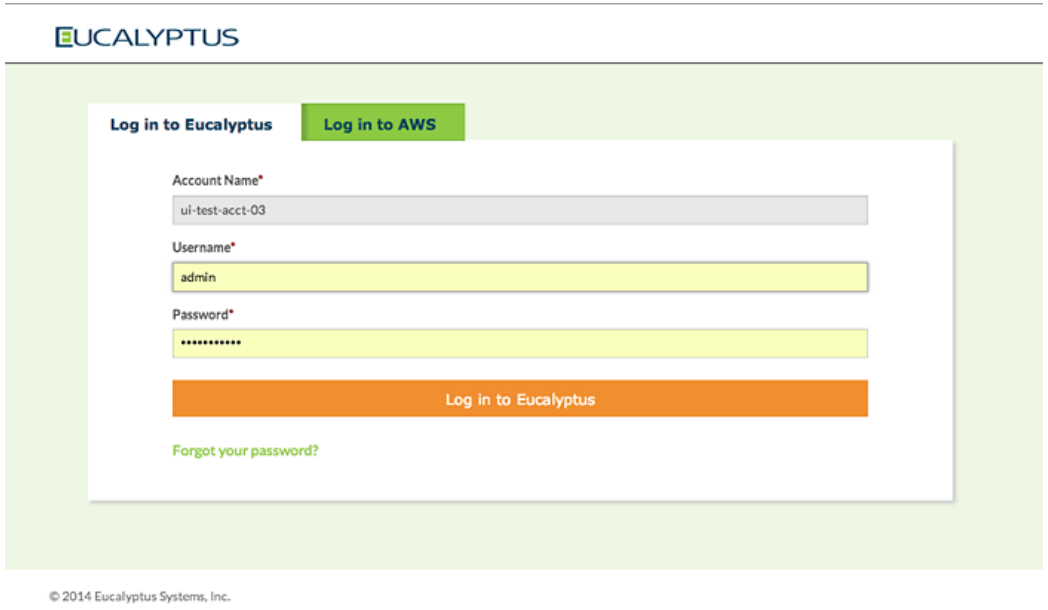
- E.g. euca-describe-instances --region aws

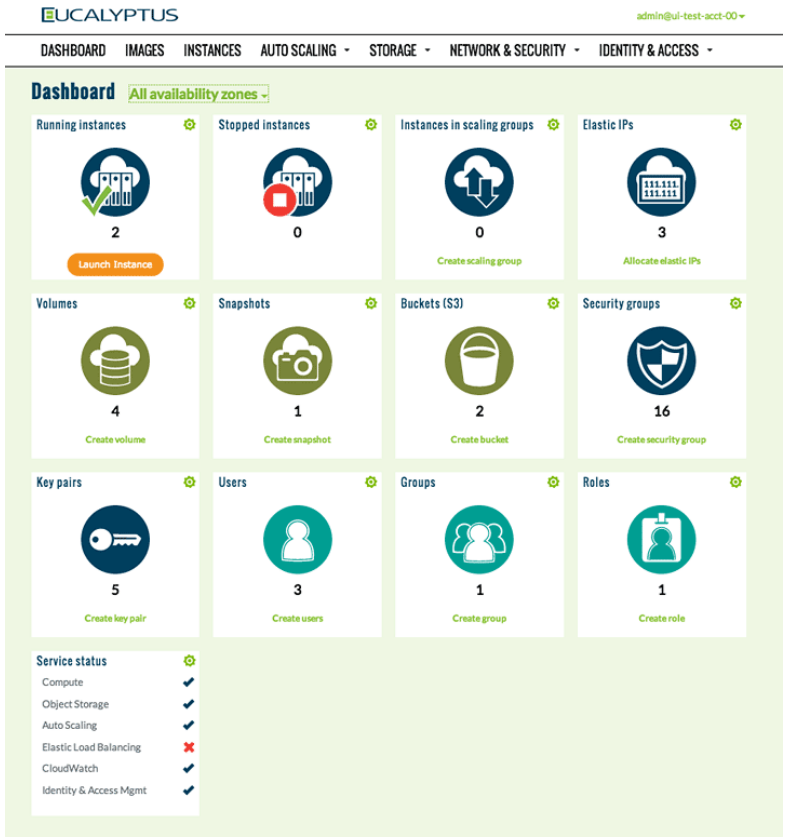
```
[user example]
key-id = AKIAIOSF0DNN7EXAMPLE
secret-key = vrwAGfda90v/FDASFEO4/498qADFAeefEXAMPLE
;
; After doing so, you can add a "user" option to a "region" section, which
; causes the region to connect as a specific user by default:
;
[region localhost]
user = example


[global]
default-region = aws:us-east-1


[region localhost]
; Eucalyptus (all services on localhost)
autoscaling-url = http://127.0.0.1:8773/services/AutoScaling/
ec2-url = http://127.0.0.1:8773/services/Eucalyptus/
elasticloadbalancing-url = http://127.0.0.1:8773/services/LoadBalancing/
iam-url = http://127.0.0.1:8773/services/Euare/
monitoring-url = http://127.0.0.1:8773/services/CloudWatch/
s3-url = http://127.0.0.1:8773/services/Walrus/
sts-url = http://127.0.0.1:8773/services/Tokens/

; Eucalyptus-specific services, most of which are cloud admin-only
configuration-url = http://127.0.0.1:8773/services/Configuration/
empyrean-url = http://127.0.0.1:8773/services/Empyrean/
properties-url = http://127.0.0.1:8773/services/Properties/
reporting-url = http://127.0.0.1:8773/services/Reporting/

certificate = /var/lib/eucalyptus/keys/cloud-cert.pem
```

Migration – euca2tool



Manage - Eucalyptus Console





Source: eucalyptus.com

Hybrid cloud use cases

E.g. small e-commerce website

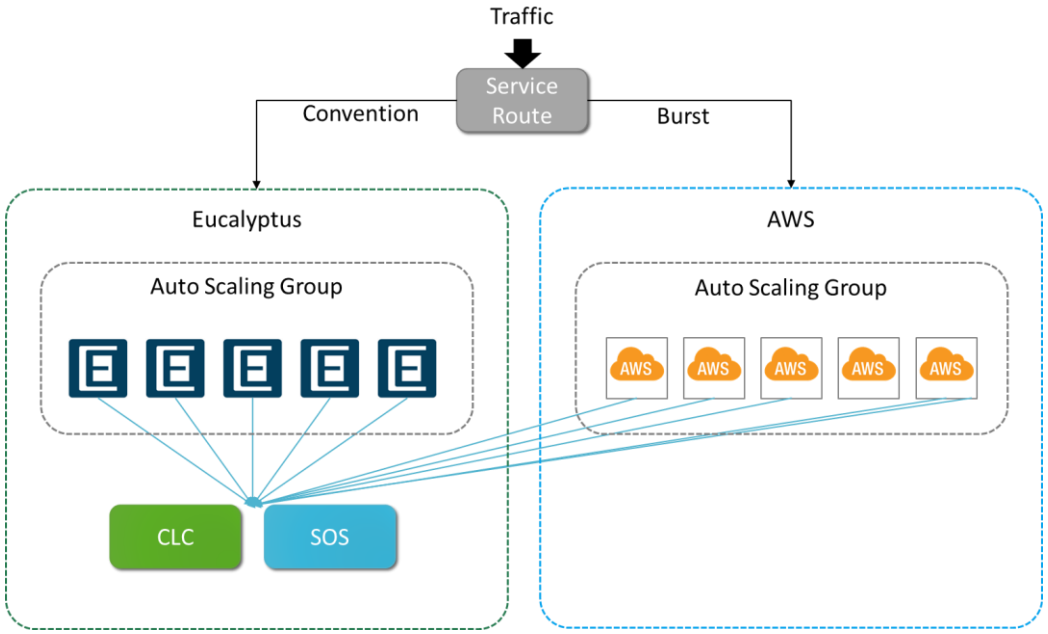
- Limited scale private servers @ US east coast

Cloud Bursting ability:

- Utilize exist cloud for daily low-volume traffic
- Need private storage to protect sensitive information like Credit cards (PCI compliance)
- Need extra resource from public cloud for peak requirement (Black Friday, Christmas)

Geolocation Optimization:

- Lower latency for customer in Australia
- No physical data nodes in Australia



Hybrid cloud use cases

E.g. Non-profit Global Ocean research organization

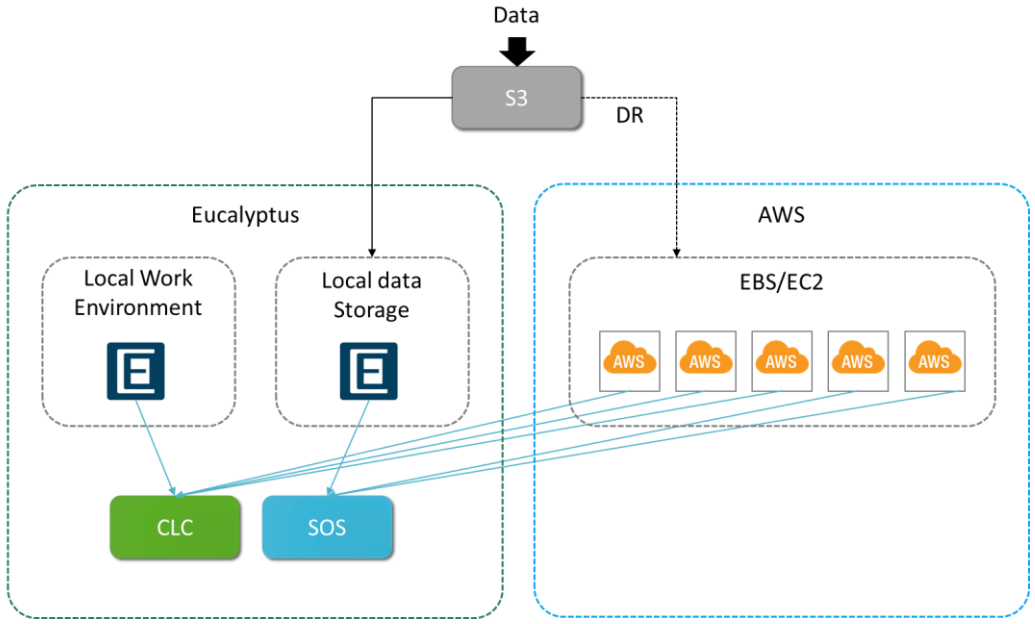
- Mainly long term research
- Intense computation for urgent project

Migration:

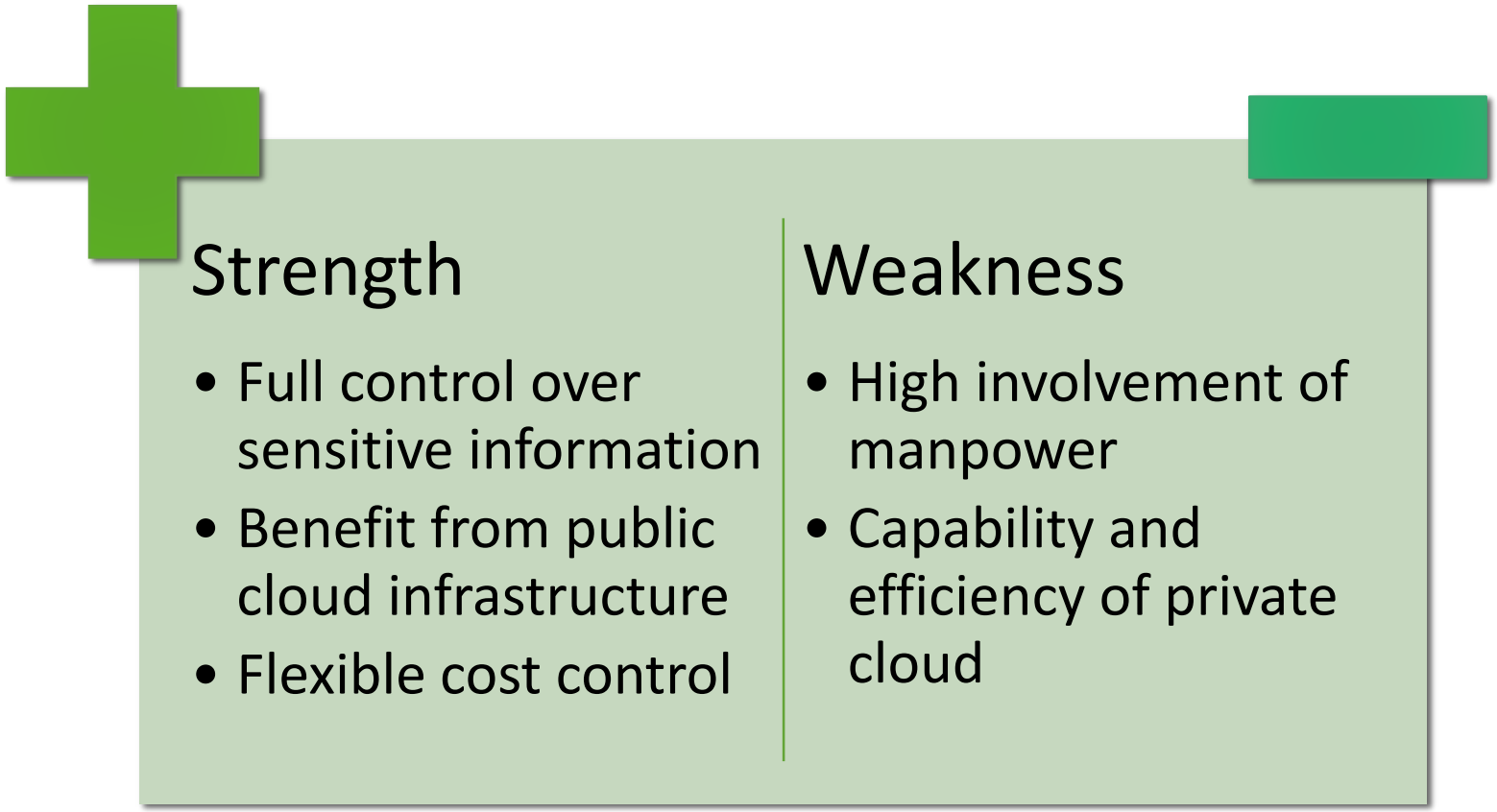
- Export research environment from local storage to cloud for high computation need
- Ease migration process to save manpower and cost

Disaster recovery:

- Instable connection with remote expedition team
- Rapid transfer connection endpoint to avoid loss data



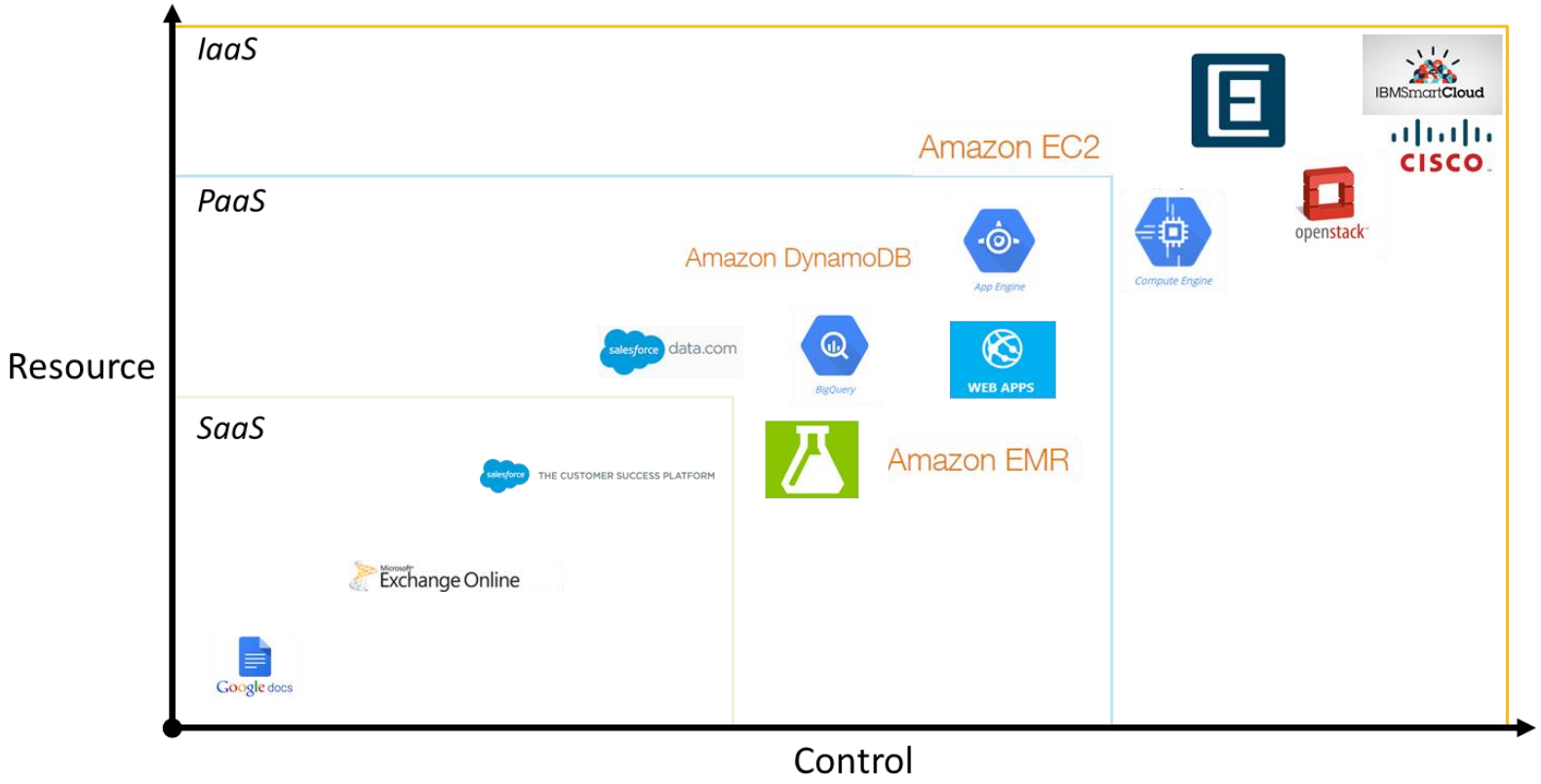
Strength/Weakness



Compare cloud products

ANOTHER COMMERCIAL TIME!

Comparison matrix



Q & A

Thank you!