

Cloud & Virtualization Technologies

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Where to begin?

- Technology at the heart of every company
- Most companies will need some type of cloud-based solution
- The Cloud presents an opportunity & a threat
- Still a nascent technology
- Most people use the Cloud without knowing it
 - Gmail, iCloud, Google Drive, etc.

What is the “Cloud”?

- Access to hardware, platforms, software without purchasing or configuring them locally
 - Contractually available as needed
 - Can cancel at any time, no penalty
 - No continued cost
- All items available via Internet connection
- Platform independent
 - PC, laptop, Chromebook, phone, tablet

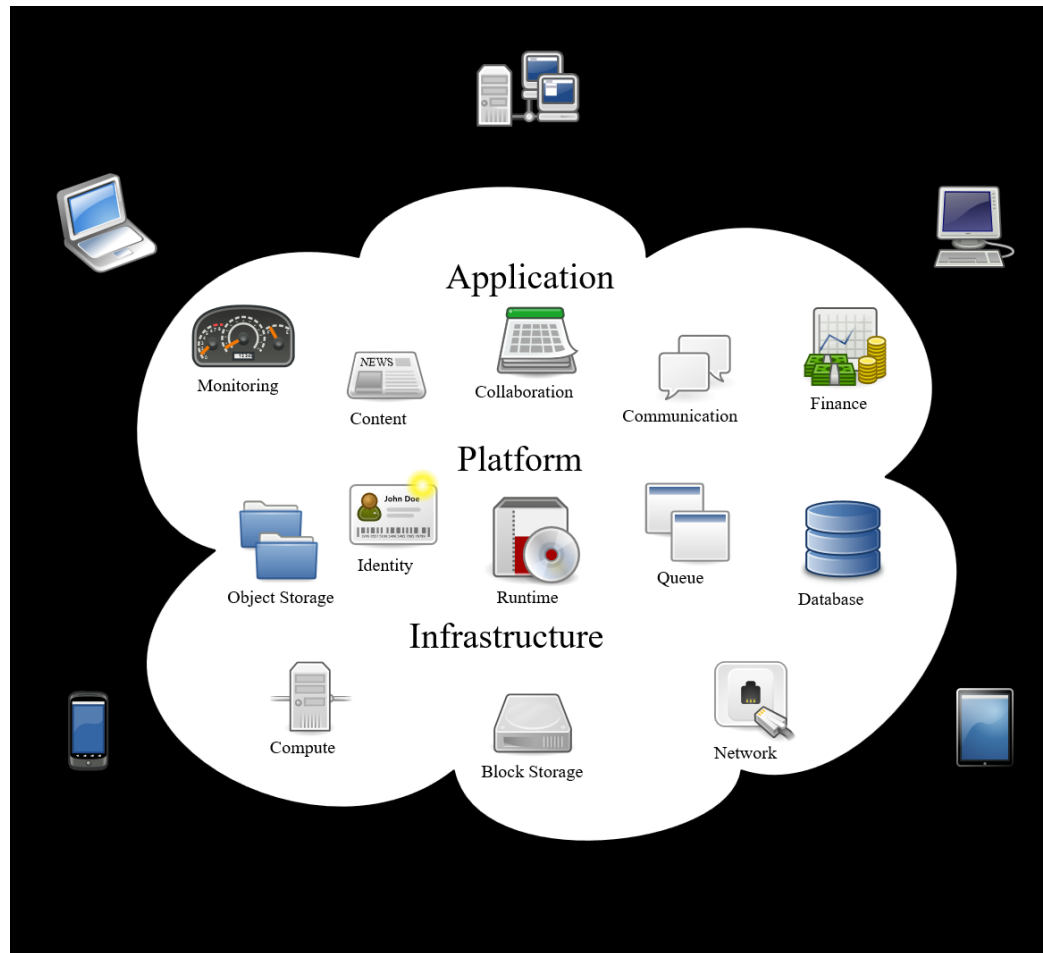
Cloud types

- Public
 - So-called 'multi-tenant' architecture
 - All cloud customers in one large bucket
- Private
 - Costs more than public cloud
 - Some isolation from other cloud customers
- Hybrid
 - Use of physical infrastructure, public, & private cloud technologies

Cloud models per type

- Infrastructure as a service (IaaS)
 - Hardware
- Platform as a service (PaaS)
 - Operating systems (OS) to run on hardware
- Software as a service (SaaS)
 - Software that runs in the OS
- Anything as a service (XaaS)
 - Literally anything and everything

Graphical Cloud example...



A simple Cloud example...

- Gmail
 - Previously required email client on device to send/receive email
 - Now able to log in via portal, access all email & functions
- Google Drive
 - Previously required to store files on a local device
 - Now able to store data on Internet server
 - Simplifies storage and backup of data

Why move to the Cloud?

- Always on, everywhere in the world
- Decreased cost
 - Less hardware
 - Pay for what you use
- Products faster to market
 - Create virtual infrastructure in a few minutes
 - Virtualized hardware, OS, and software
- Increased security (with caveat!)
- Disaster recovery

Why NOT move to the Cloud?

- Up front cost
- Regulatory requirements (HIPPA, SOX, etc.)
- Data isolation (security)
 - My data usually stored with competitor's data
- Use same XaaS as competitors, which may decrease competitive edge
- Might not work for my company
 - May require 'always on' hardware
 - This cost model may not 'pencil out'

What is virtualization?

- Example
 - Need 3-Windows servers
 - Need 10-Windows 10 desktops
 - Need productivity software & calendar
- Old solution
 - Purchase 3 physical servers & OS licenses
 - Purchase 10 desktops & OS licenses
 - Purchase MS Office for each user

What is virtualization (cont'd)?

- Major Cloud providers offer virtualization
- Today's solution
 - Perhaps purchase 1-Windows server to house virtual machines (VMs)
 - Create 2-cloud (virtual) Windows servers
 - Virtualized using VMware or other software
 - Contract for MS Office 365 in Cloud
- Much less costly
- More flexibility to cancel Cloud contract

What is happening?

- Companies moving to cloud
- Three main players dominate
 - AWS, Google, Microsoft
- Others are niche market players (IBM)
- Unable to hire staff to manage cloud
- Cloud management harder than it looks
- Companies relying more on Cloud Access Security Brokers (CASBs)

Major Cloud players

- Amazon Web Services – AWS
- Google Cloud & G Suite
- Microsoft Azure
- Many, many others:
 - IBM
 - Alibaba, Cisco, Oracle, Salesforce, Rackspace, etc.

AWS

- Elephant in the room...

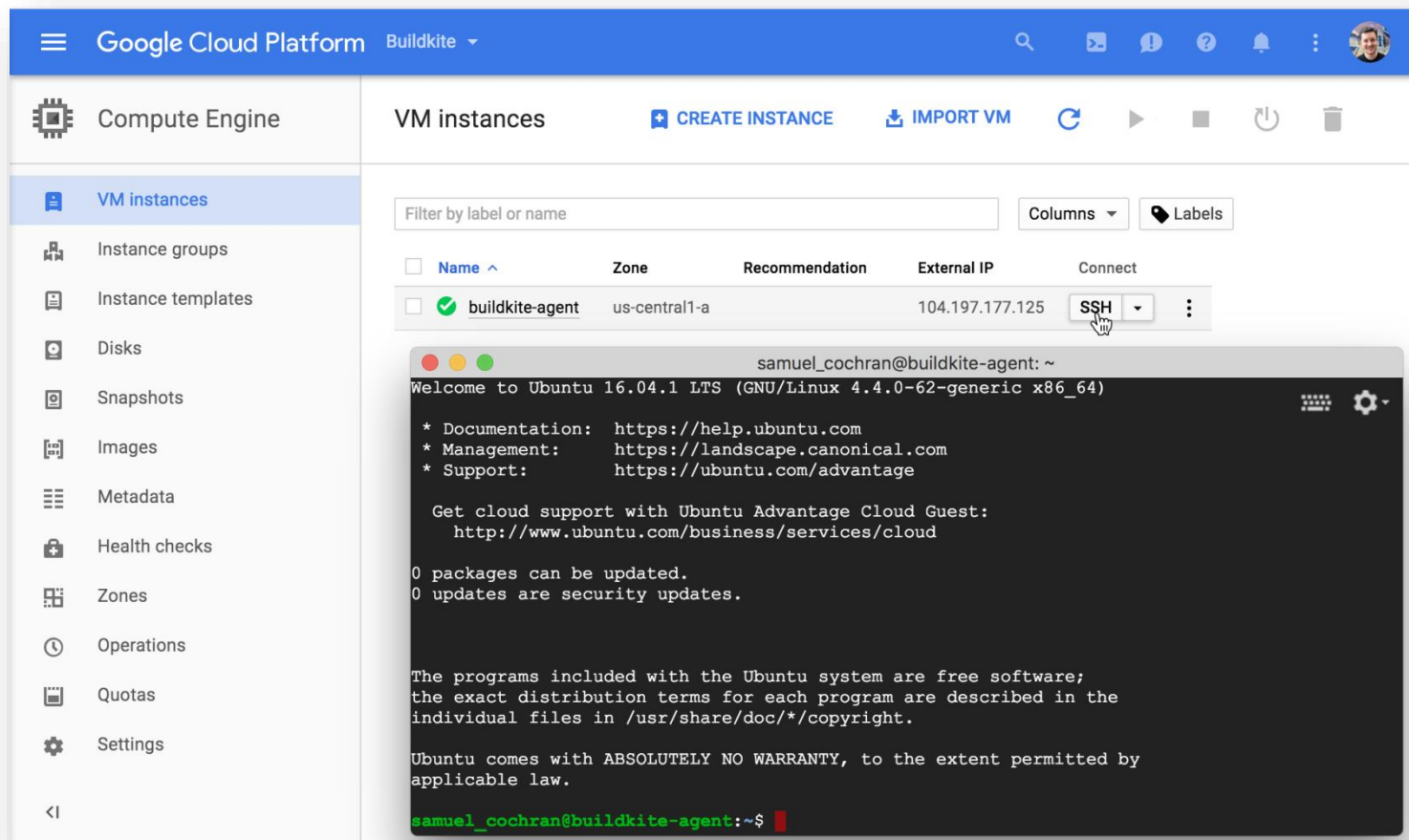
The screenshot shows the AWS Management Console interface. At the top, the browser address bar displays the URL <https://console.aws.amazon.com/console/home?#>. The page header includes the 'Services' menu and the user name 'Michael L. Foster'. The main content area is titled 'Amazon Web Services' and is organized into several columns of service categories:

- Compute & Networking:** Direct Connect, EC2, Route 53, VPC.
- Storage & Content Delivery:** CloudFront, Glacier, S3, Storage Gateway.
- Database:** DynamoDB, ElastiCache, RDS, Redshift.
- Deployment & Management:** CloudFormation, CloudTrail, CloudWatch, Elastic Beanstalk, IAM, OpsWorks.
- Analytics:** Data Pipeline, Elastic MapReduce, Kinesis.
- App Services:** CloudSearch, Elastic Transcoder, SES, SNS, SQS, SWF.

On the right side, there are sections for 'Additional Resources' (Getting Started, Trusted Advisor), 'Service Health' (All services operating normally), and 'Set Start Page' (Console Home). At the bottom, there is a footer with copyright information and a 'Feedback' button.

Google Cloud (GC)

- Expanding rapidly...



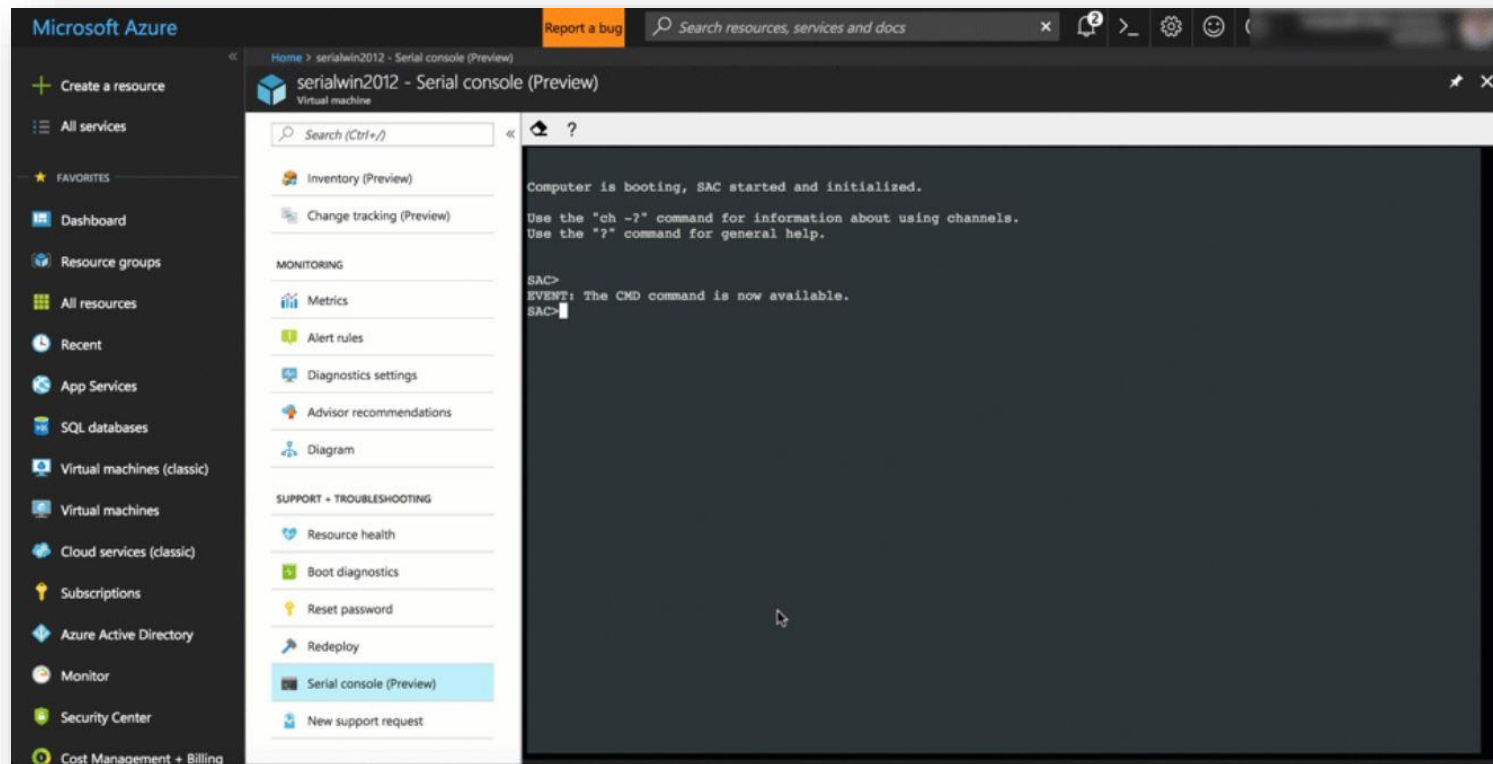
The screenshot displays the Google Cloud Platform (GCP) console interface. The top navigation bar shows "Google Cloud Platform" and "Buildkite". The left sidebar lists various services, with "Compute Engine" selected. Under "Compute Engine", "VM instances" is highlighted. The main content area shows a list of VM instances. A table with columns "Name", "Zone", "Recommendation", "External IP", and "Connect" is visible. The instance "buildkite-agent" is listed with zone "us-central1-a" and external IP "104.197.177.125". An "SSH" button is visible next to the instance. Below the table, an SSH terminal window is open, showing the Ubuntu 16.04.1 LTS login screen. The terminal output includes the Ubuntu logo, version information, and links for documentation, management, and support. It also displays the Ubuntu Advantage Cloud Guest support link and package update information.

Name	Zone	Recommendation	External IP	Connect
<input checked="" type="checkbox"/> buildkite-agent	us-central1-a		104.197.177.125	SSH

```
samuel_cochran@buildkite-agent: ~  
Welcome to Ubuntu 16.04.1 LTS (GNU/Linux 4.4.0-62-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:       https://ubuntu.com/advantage  
  
Get cloud support with Ubuntu Advantage Cloud Guest:  
http://www.ubuntu.com/business/services/cloud  
  
0 packages can be updated.  
0 updates are security updates.  
  
The programs included with the Ubuntu system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*/copyright.  
  
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by  
applicable law.  
  
samuel_cochran@buildkite-agent:~$
```

Microsoft Azure

- Currently between AWS & GC in market share



Company challenges

- Companies losing money due to slow cloud migration
- Clouds are rapidly changing
 - AWS adding 1K features/year
- Lack of skilled staff
 - This was the most mentioned challenge companies face

Impact on UCC CIS programs

- Must train all students in basic programming and Cloud/virtualization technologies
- CIS core degree offerings may be moved to Cloud
 - Reduced cost for students
 - Reduced cost for UCC
 - Will require planning & change management
 - Rapid cloud innovations make transition difficult

Impact on UCC CIS programs (cont'd)

- Courses to move to Cloud:
 - Server, SQL Server, & OS
 - Programming & Web design
 - MS Office
- May offer generic Cloud Technologies course for all students
- CIS Cybersecurity degree may embed Cloud & virtualization in coursework

Impact on UCC CIS programs (cont'd)

- May apply to writing, business, pieces/all of other programs
- Adoption of Cloud and virtualization technologies will require staff training
 - All UCC employees affected by transition

