

Deep Azure

Lecture 01

Introduction to Cloud Computing & Azure

Topics

- What is Azure
- What is Cloud
- Key Driver
- Usage Patterns
- Benefits
- Market Size
- Main Providers
- Azure Portal
- Main Azure Services
- Creating an Account
- Creating first Resources, Linux and Windows VMs

What is Azure

az·ure /'aZHər/ 

adjective

1. bright blue in color, like a cloudless sky.
"white beaches surrounded by azure seas"
synonyms: sky-blue, bright blue, **blue**; *literary* **cerulean**
"she wears contacts that make her eyes azure"

noun

1. a bright blue color.
2. a small butterfly that is typically blue or purplish, with color differences between the sexes.



More of Côte d'Azur



What is Cloud

- noun: **cloud computing**; plural noun: ~~cloud computings~~
 - the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.

Warning: “Everyone is going to the Cloud.

Do not be left on the ground” (Konica-Minolta site).

- Who invented Cloud:
 - Amazon Web Services (AWS)?
 - Google?
 - Salesforce.com?
 - Oracle? (you are right!!)

Oracle Cloud

The screenshot shows the Oracle Cloud website homepage. The browser's address bar displays www.oracle.com/us/solutions/cloud/overview/index.html. The Oracle logo is in the top left, followed by navigation links: Welcome Zoran, Account, Sign Out, Help, Select Country/Region, Communities, I am a..., and I want to... A search bar is on the right. Below the navigation bar is a menu with links: Products and Services, Solutions, Downloads, Store, Support, Training, Partners, About, and Oracle Technology Network. The main content area features a large banner for 'Oracle Cloud' with the text 'Larry Ellison tells why Oracle Cloud is the enterprise choice.' and links to 'Watch here' and 'Read the news'. To the right of the banner is a section titled 'ORACLE EXECUTIVE STRATEGY' featuring a portrait of Larry Ellison, Chief Executive Officer of Oracle. Below the banner is a grid of four categories: Application Services, Platform Services, Social Services, and Other Cloud Solutions. Each category has a featured tile: 'ORACLE EXALOGIC' for Application Services, 'What's New Cloud Standards Announcement' for Platform Services, 'ORACLE RIGHTNOW CX CLOUD SERVICE' for Social Services, and 'Learn More RightNow CX Cloud Service' for Other Cloud Solutions. A 'Resources' section on the right offers a 'White paper: Oracle Fusion HCM Cloud Applications (PDF)'. At the bottom, there is an 'Overview' section describing Oracle Cloud's services, a 'Stay Connected' section with social media links, and a sidebar with the Oracle phone number (1-800-633-0738) and links for 'Have Oracle call you', 'Global contacts', and 'Sales Chat Live'.

Oracle Secure Enterprise Search | Cloud Computing | Oracle | Oracle Cloud

www.oracle.com/us/solutions/cloud/overview/index.html

ORACLE

Welcome Zoran Account Sign Out Help Select Country/Region Communities I am a... I want to... Search

Products and Services Solutions Downloads Store Support Training Partners About Oracle Technology Network

Solutions > Cloud > Overview

Oracle Cloud

Larry Ellison tells why Oracle Cloud is the enterprise choice.

Watch here > Read the news >

ORACLE EXECUTIVE STRATEGY

Larry Ellison
Chief Executive Officer, Oracle

Application Services Platform Services Social Services Other Cloud Solutions

ORACLE EXALOGIC > What's New
Cloud Standards Announcement

ORACLE RIGHTNOW CX CLOUD SERVICE > Learn More
RightNow CX Cloud Service

> Resources
White paper: Oracle Fusion HCM Cloud Applications (PDF)

More More More

Overview

Oracle Cloud offers a broad portfolio of software as a service [applications](#), platform as a service, and social capabilities, all on a subscription basis. Oracle Cloud delivers instant value and productivity for end users, administrators, and developers alike through functionally rich, integrated, secure, enterprise cloud services.

Stay Connected: [f](#) [in](#) [t](#) [M](#)

Oracle 1-800-633-0738

Have Oracle call you
Global contacts
Sales Chat Live

- Larry Ellison was a true visionary and tried hard to promote so called Network Computer and Utility Computing as early as early 1990's. The names are different but those concepts were full equivalent to today's Cloud Computing.

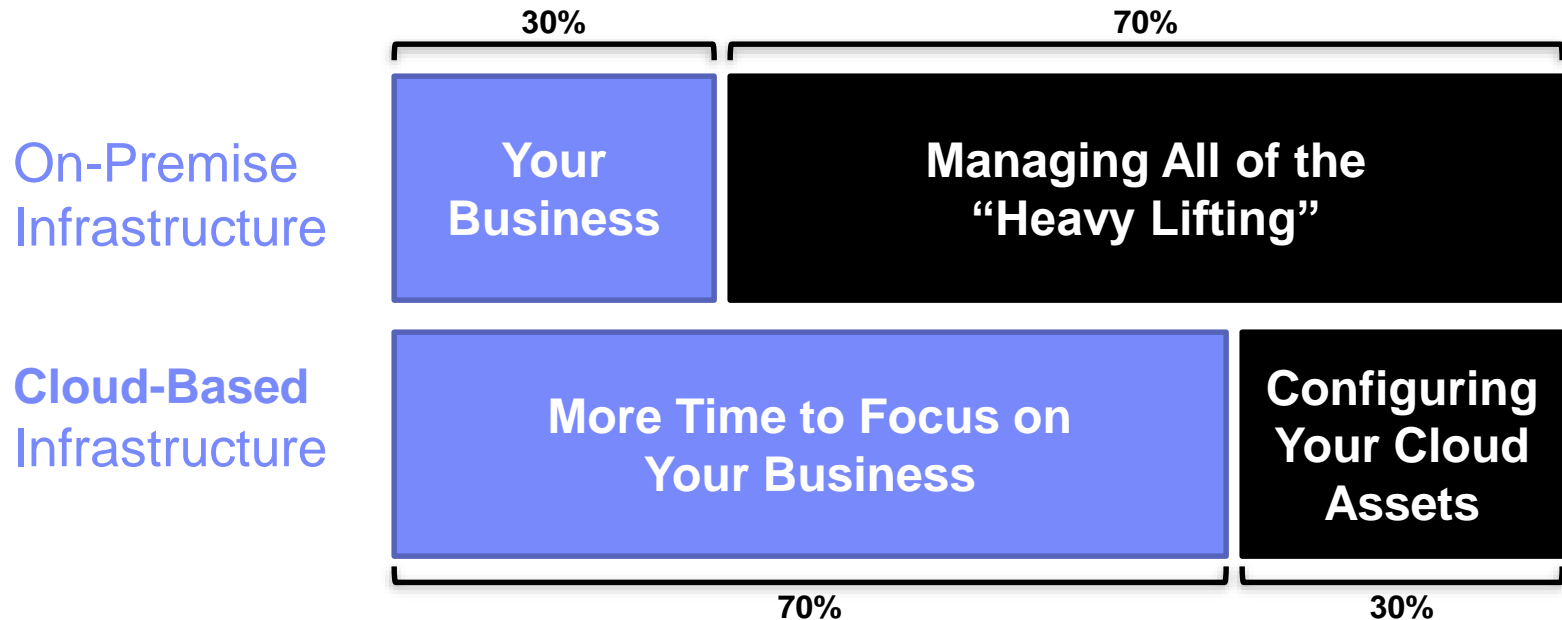
Cloud Computing is a Mature Industry, Existing Facilities



Another Mature Industry, Ford MC Assembly Plant



Some of the Drivers for The Cloud

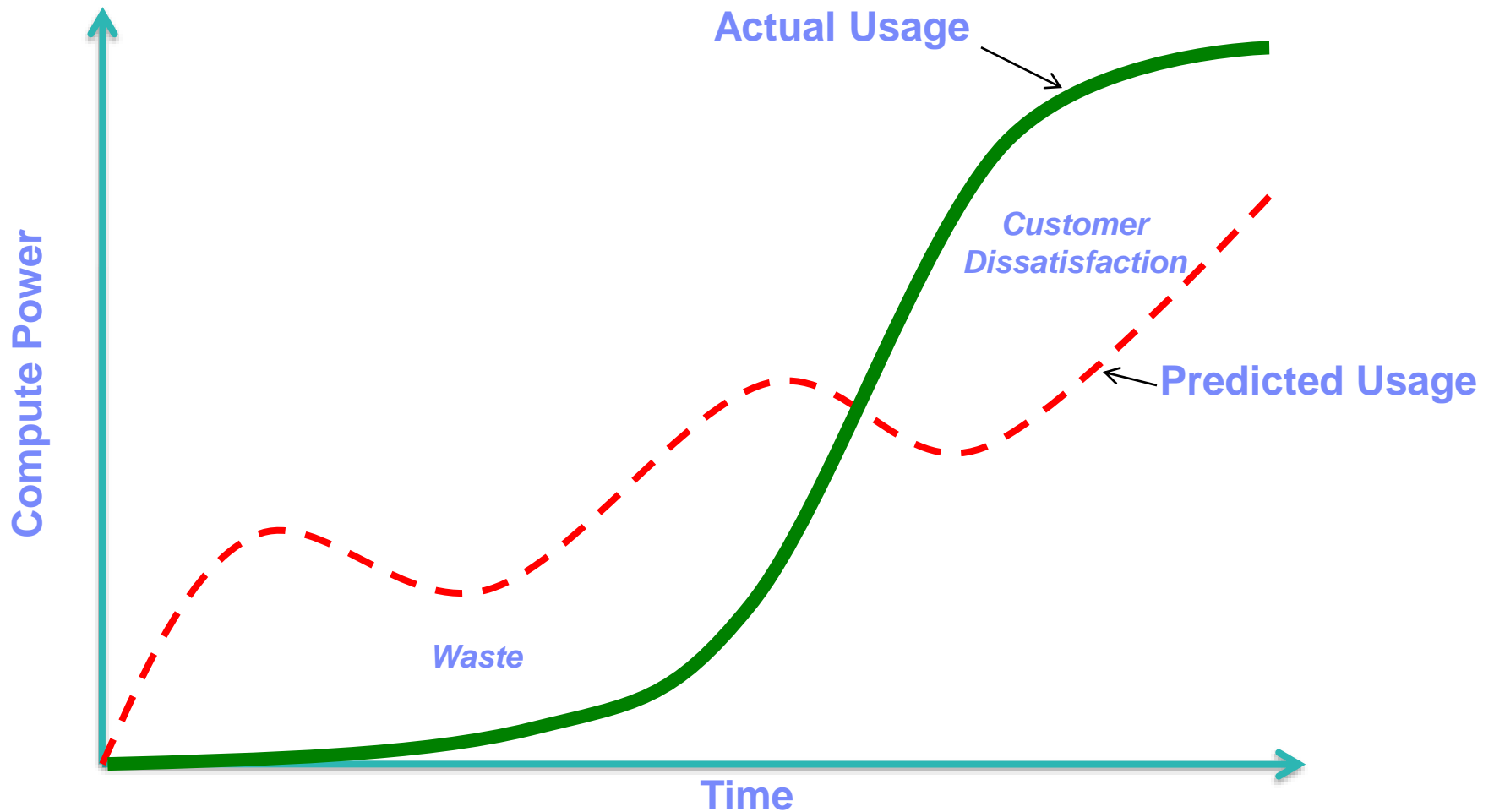


- Cloud provides reliable and dependable on-demand infrastructure that frees time and expense for you to focus on innovating for your business.

Key Business Benefits of the Cloud

- **Almost zero upfront infrastructure investment:** If you have to build a large-scale system it may cost a fortune to invest in real estate, physical security, hardware (racks, servers, routers, backup power supplies), hardware management (power management, cooling), and operation personnel. Because of the high upfront costs, the project would typically require several rounds of management approvals before the project could even get started. Now, with utility-style cloud computing, there is little fixed cost or startup cost.
- **Just-in-time Infrastructure:** In the past, if your application became popular and your systems or your infrastructure did not scale you became a victim of your own success. Conversely, if you invested heavily and did not get popular, you became a victim of your failure. By deploying applications in-the-cloud with just-in-time self-provisioning, you do not have to worry about pre-procuring capacity for large-scale systems. This increases agility, lowers risk and lowers operational cost because you scale only as you grow and only pay for what you use.
- **More efficient resource utilization:** System administrators usually worry about procuring hardware (when they run out of capacity) and higher infrastructure utilization (when they have excess and idle capacity). With the cloud, they can manage resources more effectively and efficiently by having the applications request and relinquish resources on demand.

Cloud Rational, **Elasticity** of Infrastructure



Key Benefits of Cloud

- **Usage-based costing:** With utility-style pricing, you are billed only for the infrastructure that has been used. You are not paying for allocated but unused infrastructure. This adds a new dimension to cost savings. You can see immediate cost savings (sometimes as early as your next month's bill) when you deploy an optimization patch to update your cloud application. For example, if a caching layer can reduce your data requests by 70%, the savings begin to accrue immediately and you see the reward right in the next bill. Moreover, if you are building platforms on the top of the cloud, you can pass on the same flexible, variable usage-based cost structure to your own customers.
- **Reduced time to market:** Parallelization is the one of the great ways to speed up processing. If one compute-intensive or data-intensive job that can be run in parallel takes 500 hours to process on a single machine, with cloud architectures, it would be possible to spawn and launch 500 instances and process the same job in 1 hour. Having available an elastic infrastructure provides the application with the ability to exploit parallelization in a cost-effective manner reducing time to market

Key Technical Benefits of the Cloud

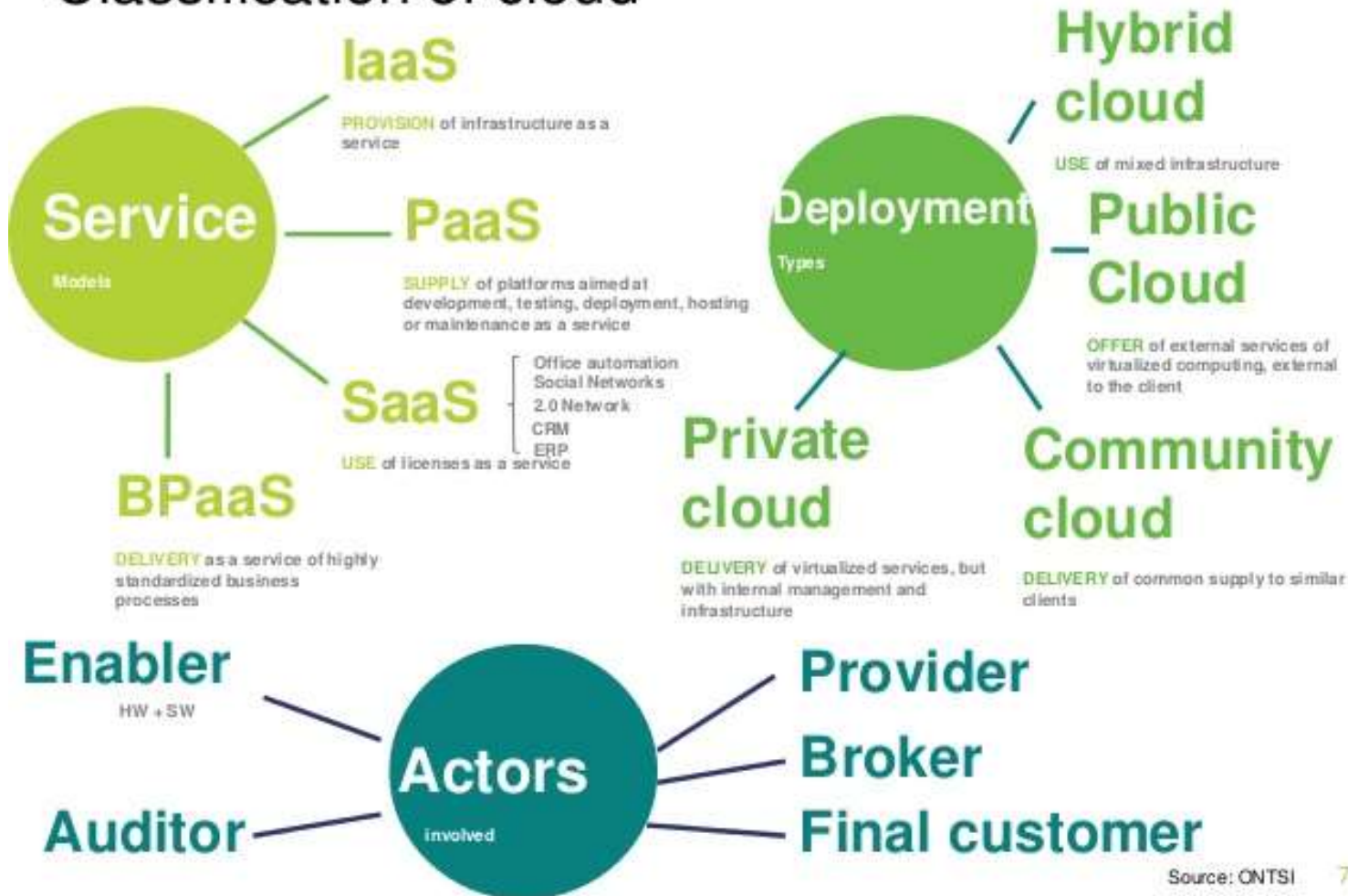
- **Automation** – “Scriptable infrastructure”: You can create repeatable build and deployment systems by leveraging programmable (API-driven) infrastructure.
- **Auto-scaling**: You can scale your applications up and down to match your unexpected demand without any human intervention. Auto-scaling encourages automation and drives more efficiency.
- **Proactive Scaling**: Scale your application up and down to meet your anticipated demand with proper planning understanding of your traffic patterns so that you keep your costs low while scaling.
- **More Efficient Development lifecycle**: Production systems may be easily cloned for use as development and test environments. Staging environments may be easily promoted to production.
- **Improved Testability**: Never run out of hardware for testing. Inject and automate testing at every stage during the development process. You can spawn up an “instant test lab” with pre-configured environments only for the duration of the testing phase.
- **Disaster Recovery and Business Continuity**: The cloud provides a lower cost option for maintaining a fleet of DR servers and data storage. With the cloud, you can take advantage of geo-distribution and replicate the environment in other location within minutes.
- **“Overflow”** the traffic to the cloud: With a few clicks and effective load balancing tactics, you can create a complete overflow-proof application by routing excess traffic to the cloud.

Many Uses of the Cloud

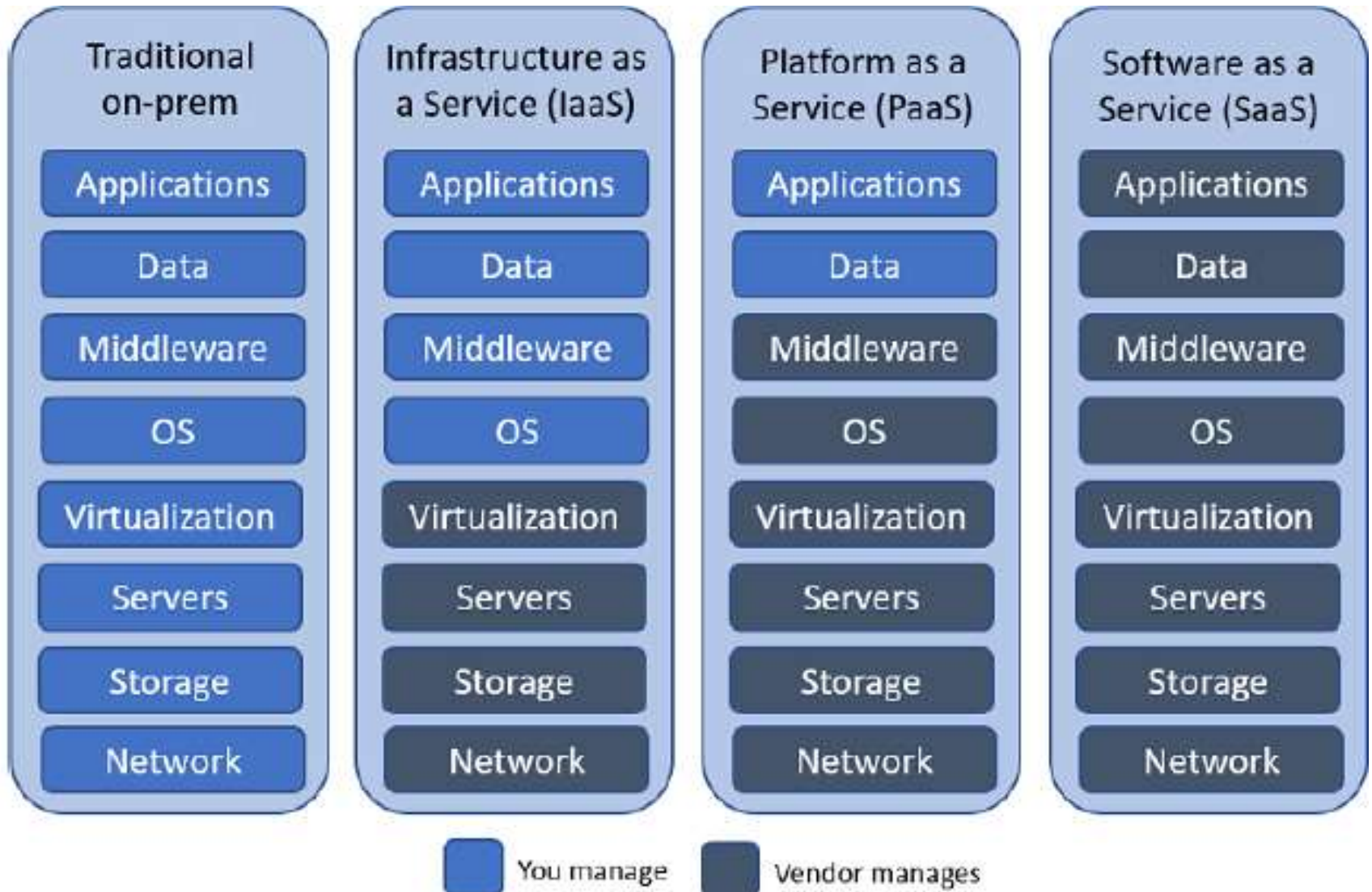
- Software as a Service Platform
- Portal Applications – Consumer and Business
- Elastic Computing
- Media Distribution
- Scalable Web Sites
- Business Continuity (Backup/Recovery)
- Financial Applications
- High-Performance Computing
- Software Development/Testing
- Back Office Applications
- Regular IT Plants

Classifications of Clouds and Services

Classification of cloud



Classification of Cloud Services



Classification of Services

- **On-premises** – you configure and manage the whole datacenter, from the network cables, storage, and servers, up to the data and applications.
- **Infrastructure as a Service (IaaS)** – you purchase the base compute resources from a vendor that manages the core infrastructure. You create and manage the VMs, data, and applications.
- **Platform as a Service (PaaS)** – you purchase the underlying platform stack from vendor that manages up to the OS and patches, and bring your applications and data.
- **Software as a Service (SaaS)** – you just need access to software, with a vendor providing everything else.
- Most of what we use in Azure falls into the IaaS and PaaS area. The main use cases include VMs and virtual networking (IaaS), or Web Apps, Functions, and Cosmos DB (PaaS).

Trends Driving Cloud Growth

- **Huge volumes of data** generated in:
 - **Commercial Application** (Amazon, eBay, e-commerce of all kinds) ,
 - **Social Media** (Facebook, Twitter, Netflix ...),
 - **Scientific Applications** (Genomic, Astronomy, Nuclear Physics,...)
 - **Light weight clients**: smart phones, tablets, home use and industrial sensors are producing massive volumes of data and are requiring massive processing support (Number of smart devices is already beyond 20 billion and growing fast.)
- **Advances in Machine Intelligence, Big Data Analytics**
- **Advances in Parallel Computing**
- **Continuous Drop in Hardware and Storage Costs**
- **Growing Complexity of Software Application and IT Systems**

Illustrative Data Sizes, Facebook

September, 2017 (<https://zephoria.com/top-15-valuable-facebook-statistics/>)

- Worldwide, there are over 2.01 billion monthly active Facebook users for June 2017 (Facebook MAUs) which is a 17 percent increase year over year.
- There are 1.15 billion mobile daily active users (Mobile DAU) for December 2016, an increase of 23 percent year-over-year. Mobile advertising revenue represented approximately 87 percent of advertising revenue for Q2.
- 1.32 billion people on average who log onto Facebook daily active users (Facebook DAU) for June 2017, which represents a 17 percent increase year over year
- There are 1.74 billion mobile active users (Mobile Facebook MAU) for December 2016 which is an increase of 21% year-over-year (Source: Facebook as of 02/01/17).
- On average, the Like and Share Buttons are viewed across almost 10 million websites daily. (Source: Facebook as of 10/2/2014)
- In Europe, over 307 million people are on Facebook. (Source: Search Engine Journal)
- Age 25 to 34, at 29.7% of users, is the most common age demographic.

Illustrative Data Sizes, Facebook

- Facebook users are: 76% of all females and 66% of all males.
- Highest traffic occurs mid-week between 1 to 3 pm.
- On Thursdays and Fridays, engagement is 18% higher.
- There are 83 million fake profiles.
- Photo uploads total 300 million per day.
- Average time spent per Facebook visit is 20 minutes. .
- Every 60 seconds on Facebook: 510,000 comments are posted, 293,000 statuses are updated, and 136,000 photos are uploaded.
- 4.75 billion pieces of content shared daily as of May 2013 which is a 94 percent increase from August 2012. (Source: Facebook)
- 50% of 18-24 year-olds go on Facebook when they wake up.
- One in five page views in the United States occurs on Facebook.
- 42% of marketers report that Facebook is critical or important to their business.
- 16 Million local business pages have been created as of May 2013 which is a 100 percent increase from 8 million in June 2012.

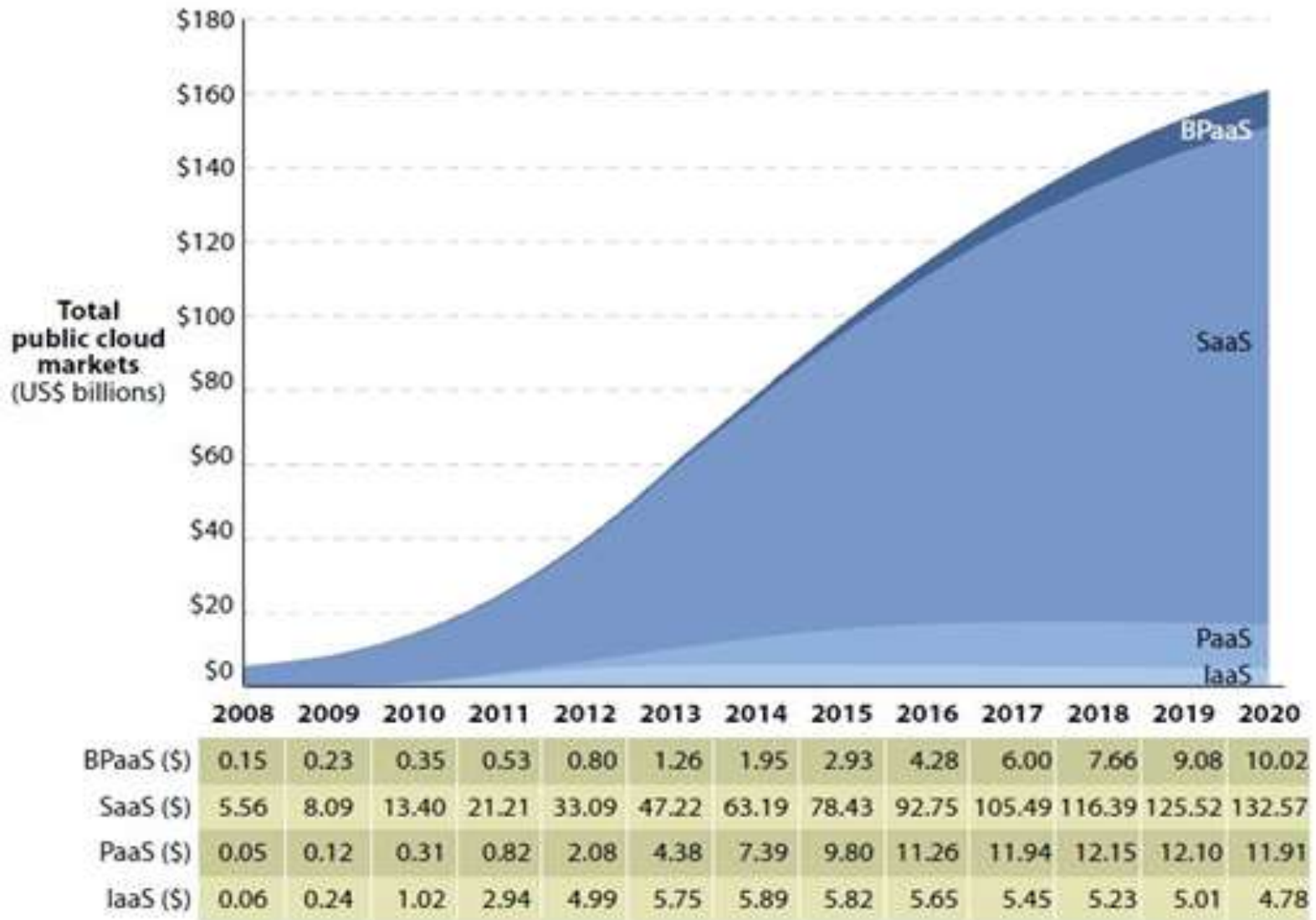
Some Twitter Statistics (zephoria.com)

- Twitter Monthly Active Users (MAU) Worldwide: 328 million Q2 2017 an increase of over 9 million quarter-over-quarter.
- Twitter has increased their year over year Daily Active Users (DAU) by 14 percent year-over-year marking the fourth consecutive quarter of accelerating growth (source: Twitter)
- Twitter Monthly Active Users (MAU) United States 68 million Q1 2017 (source: Twitter)
- Twitter Monthly Active Users (MAU) International is 260 million Q2 2017 which is a five percent increase over the previous year. (source: Twitter)
- Advertising cost-per-engagement for Twitter has decreased by 21 percent for Q4 2016 (source: Twitter – <http://bit.ly/2oirtys>)
- Twitter ad engagements for 2016 was 151 percent higher than it was for the previous year (source: Twitter – <http://bit.ly/2oirtys>)
- According to eMarketer nearly 66 percent of the businesses who have 100 or more employees have a Twitter account and expect it to rise in 2017.

Illustrative Data Sizes, Beyond Facebook

- **LHC** (Large Hadron Collider) 15 petabytes per year
- **Radiology** 69 petabytes per year
- **Square Kilometer Array Telescope** will acquire 100 terabits/second
- **Earth Observation** acquiring ~4 petabytes per year
- **Earthquake Science** – few terabytes **total** today
- **PolarGrid** – 100's terabytes/year ice-sheet radar
- **Exascale simulation** data dumps – terabytes/second (30 exabytes per year)
- We need tools to process those data volumes.
- Processing needs and desired features are beyond capacity of most IT organizations.
- Cloud is the only place where practical processing could be done

Global Public Cloud Market, Forecast



Cloud Providers and Vendors

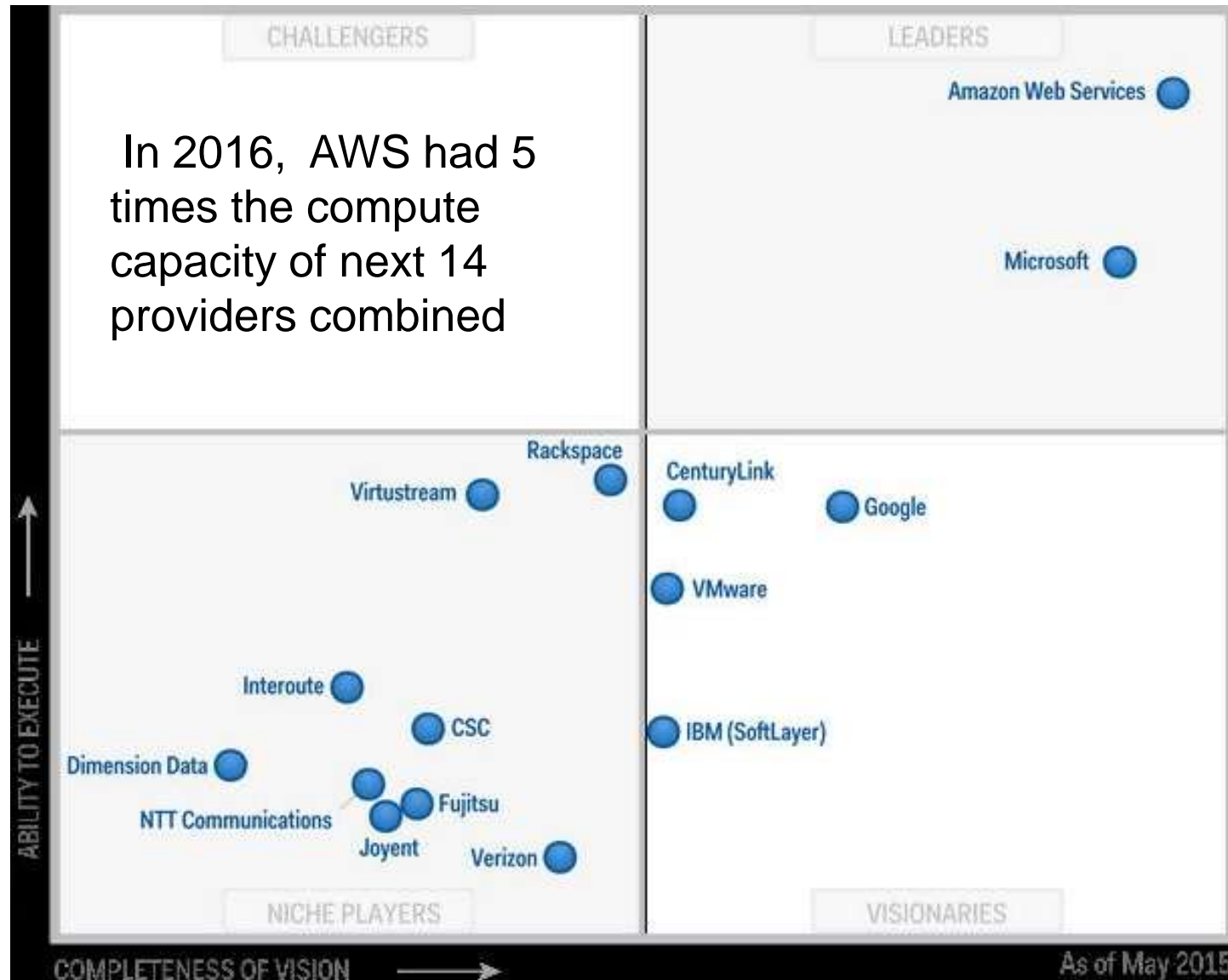
- Amazon Web Services (AWS). AWS started in 2006 as the first major Cloud Provider. There are many more major providers:
- Microsoft with Azure
- Google with Gmail and Google App Engine and Google Cloud Platform
- IBM
- Verizon
- Oracle
- Salesforce
- HP
- EMC
- Dell

Every major firm in the IT world claims to be a Cloud Provider

Gartner Magic Quadrants, the Race, 2013



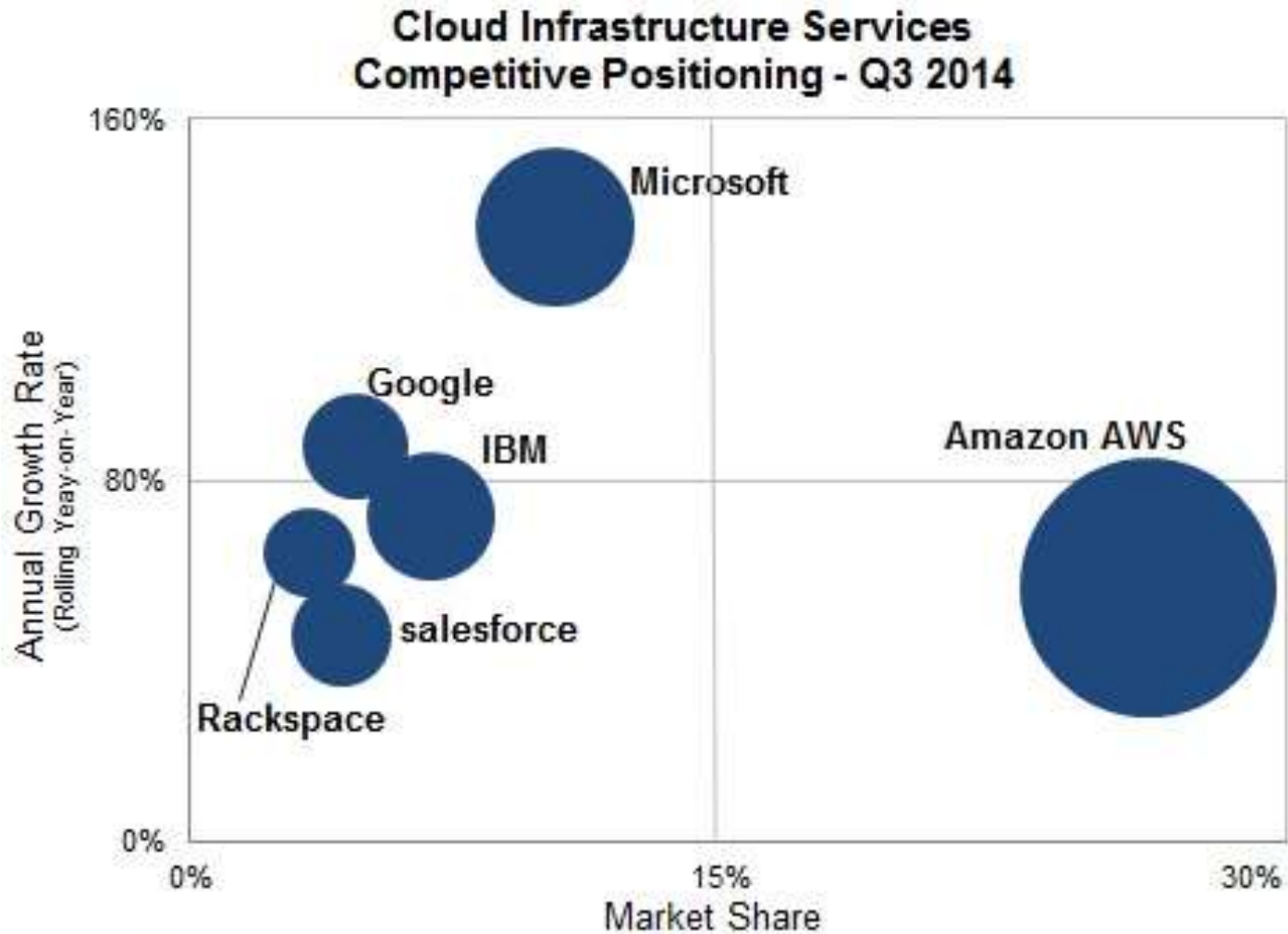
Gartner Magic Quadrants, Catching Up, 2015



Gartner Magic Quadrant, Still Catching Up, 2017



Another View, Another Leader

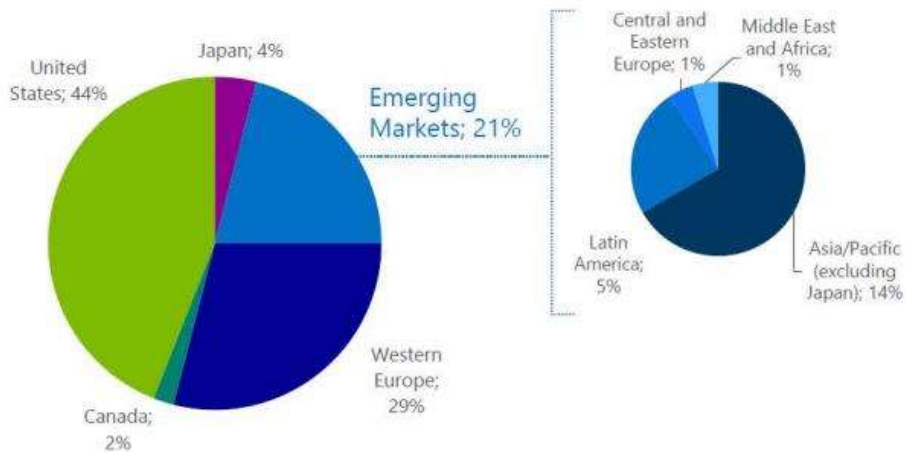


Source: Synergy Research Group

Distribution by Markets

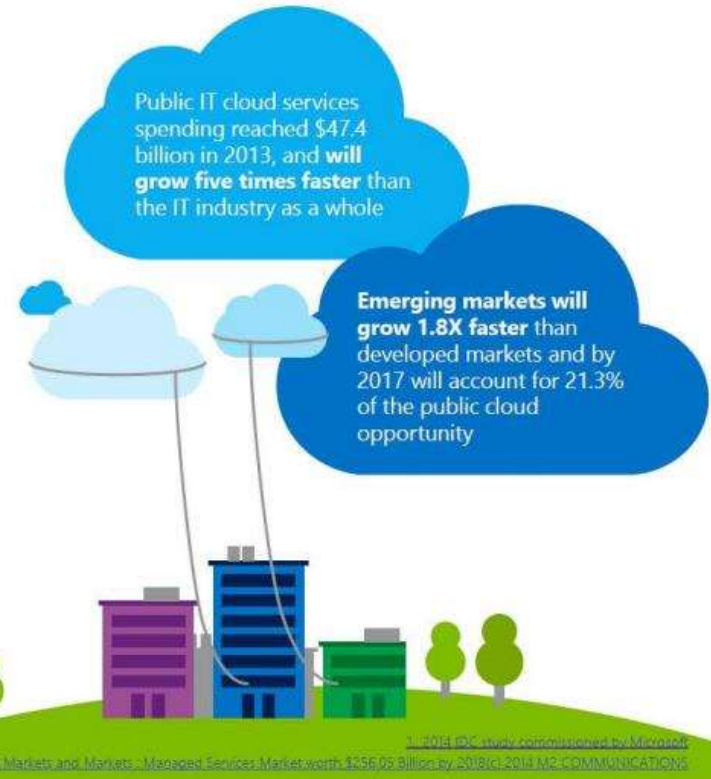
\$127B

Worldwide Public IT Cloud Services Revenue in 2018¹



\$256 B

The managed services opportunity by 2018²



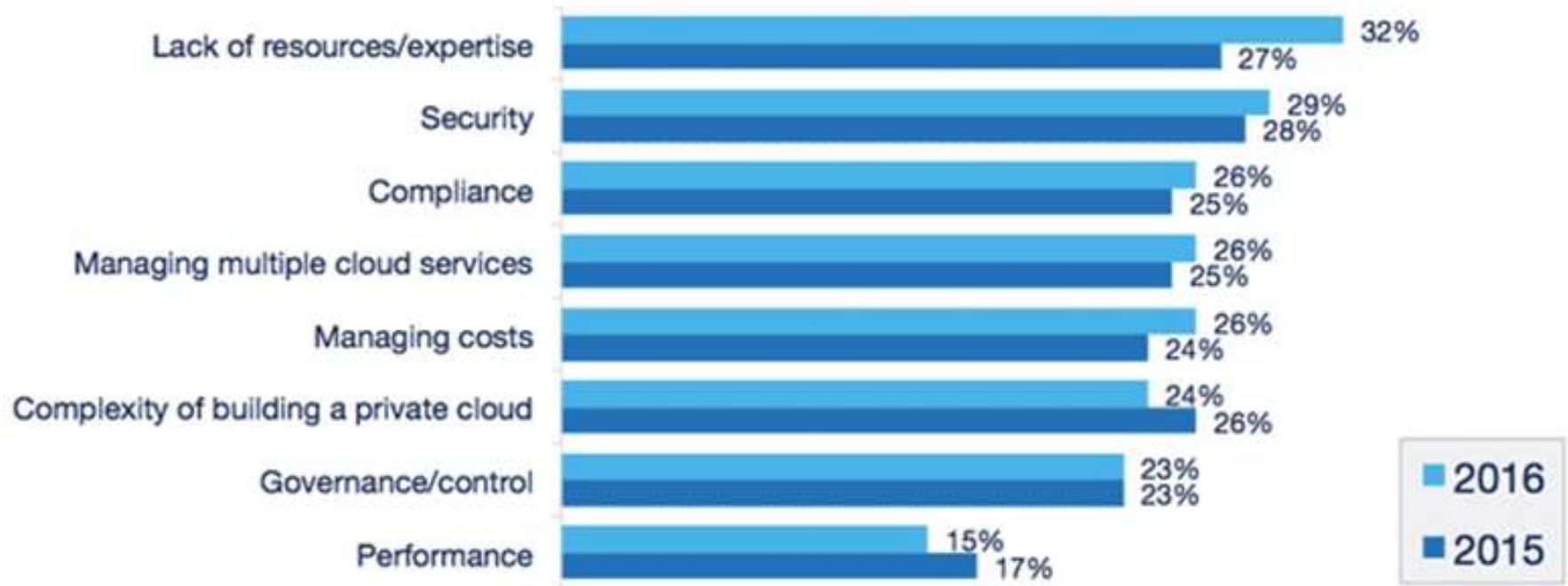
Cloud is Green, Some Additional Qualities

- Cloud wins by efficient resource use and efficient data centers
- GMAIL Example, <http://www.google.com/green/pdfs/google-green-computing.pdf>

Business Type	Number of users	# servers	IT Power per user	PUE (Power Usage effectiveness)	Total Power per User	Annual Energy per user
Small	50	2	8W	2.5	20W	175 kWh
Medium	500	2	1.8W	1.8	3.2W	28.4 kWh
Large	10000	12	0.54W	1.6	0.9W	7.6 kWh
Gmail (Cloud)	∞	∞	< 0.22W	1.16	< 0.25W	< 2.2 kWh

Data Center Part	Cost in small-sized Data Center	Cost in Large Data Center	Ratio
Network	\$95 per Mbps/month	\$13 per Mbps/month	7.1
Storage	\$2.20 per GB/month	\$0.40 per GB/month	5.7
Administration	~140 servers/Administrator	>1000 Servers/Administrator	7.1

Real or Perceived Challenges 2016 vs 2015



Source: RightScale 2016 State of the Cloud Report

Fear Mongering

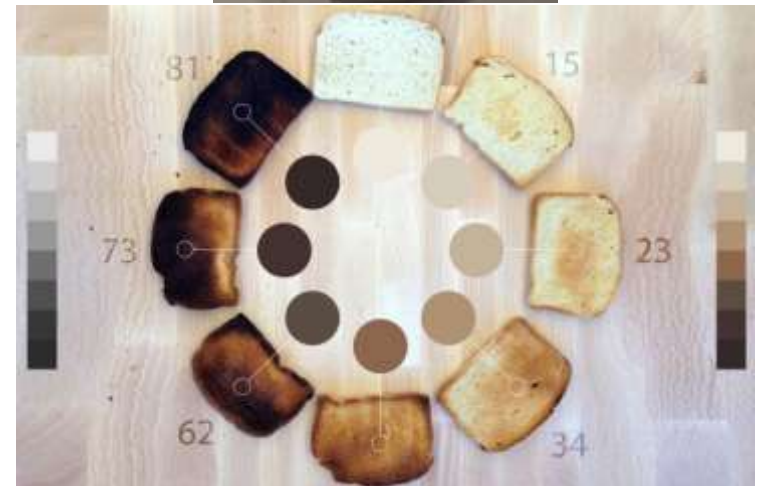
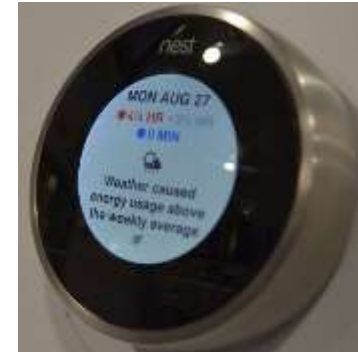
- Uncertainty related to novelty of Cloud Computing should be gone by now. Cloud is not a novelty any more.
 - Security problems are similar or identical to the ones on premise.
 - There are few new rules of regulatory compliance
- General fear of loss of control in the Cloud is not justified
 - Auditability is not an issue.
 - Regulatory compliance requires transparency into Cloud
- CREDIBILITY and TRUST of Cloud Provider are still critical issues
- Large enterprises are not testing the waters any more.
- GE will be completely in the Cloud.
- One has impression that only losers stay back.
- All US software based startups are in the Cloud.

Another Big Driver, Internet of Things

- The **internet of things (IoT)** is the network of physical devices, vehicles, buildings and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. (Wikipedia.org).
- 2013 Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society."
- The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems.
- When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of computer-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities.
- Each THING is uniquely identifiable through its IP address and embedded computing system but is able to interoperate within the existing Internet infrastructure.
- Experts estimate that the IoT will consist of 50 billion objects by 2020

IoToasters, Nests and other Things

- When asked for an example of those Internet connected Things, most experts point to Toasters.



- By some sources, by 2025 there will be 5(0) billion Internet Enabled Toasters?
- As you are waking-up the toasters are toasting your bread to the color you prefer. Nests will raise the temperature of your home to your favorite temperature.

Things

- "Things," in the IoT sense, refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters,¹ automobiles with built-in sensors, DNA analysis devices for environmental/food/pathogen monitoring or field operation devices, machine sensors and similar.
- These things (devices) collect useful data with the help of various existing technologies and then autonomously flow the data to and from other devices.
- Current market examples include smart thermostat (Nest) systems and washer/dryers that use Wi-Fi for remote monitoring.
- IoT is also expected to generate large amounts of data from diverse locations, with the consequent necessity for quick aggregation of the data, and an increase in the need to index, store, and process such data more effectively.
- IoT is one of the platforms of today's Smart City, and Smart Energy Management Systems.

More Forecasts, Revenue Opportunity

2018



2014

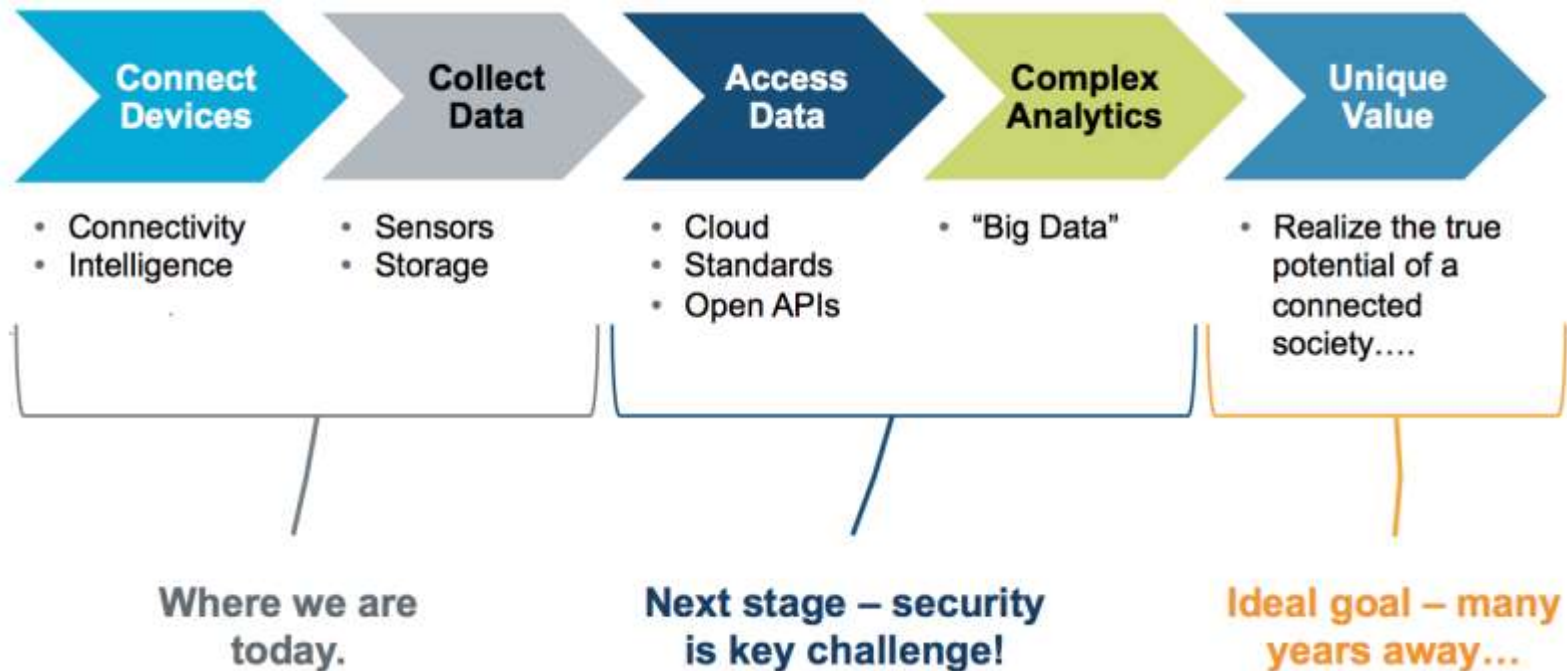


IDC, Internet of Things Spending Guide by Vertical Market, 2014

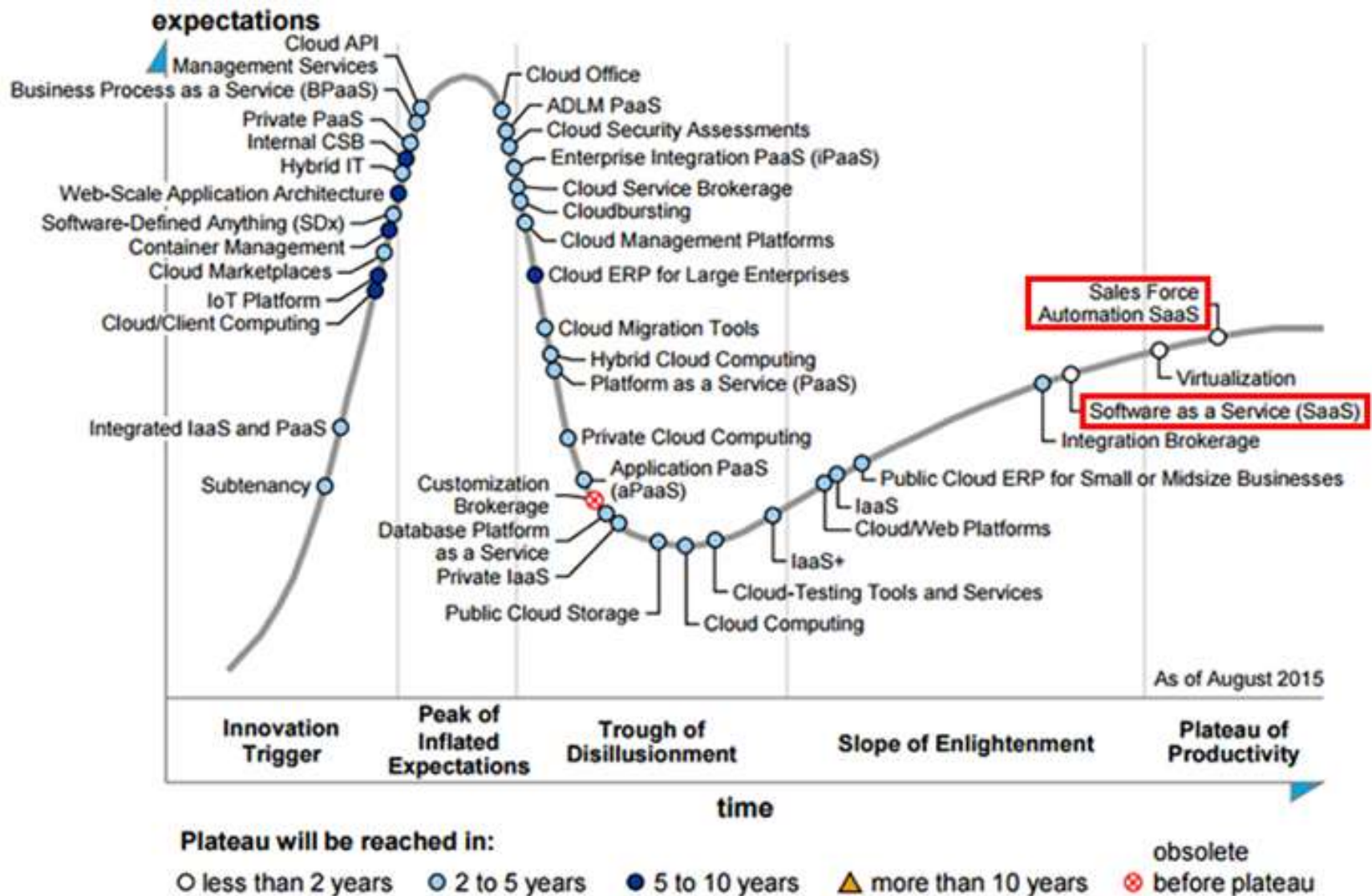
- These forecasts probably include everything that has I, O, or T in its name.

Evolution Stages, Io(Every)Thing

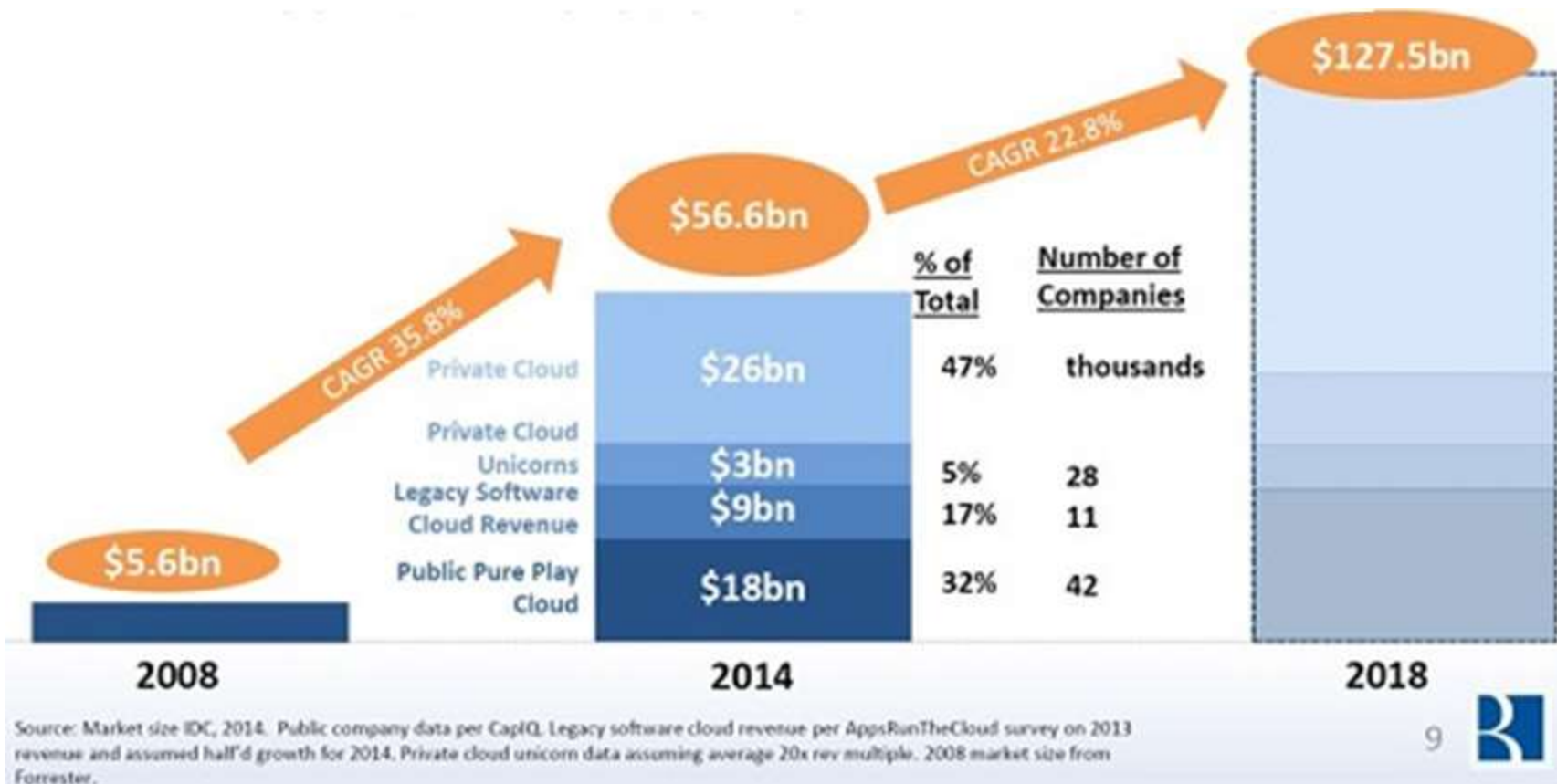
- Eventually we will all have chips embedded in most parts of our body and Insurance-Medical-Education Complex will be able to extract the Unique Value from all of us.



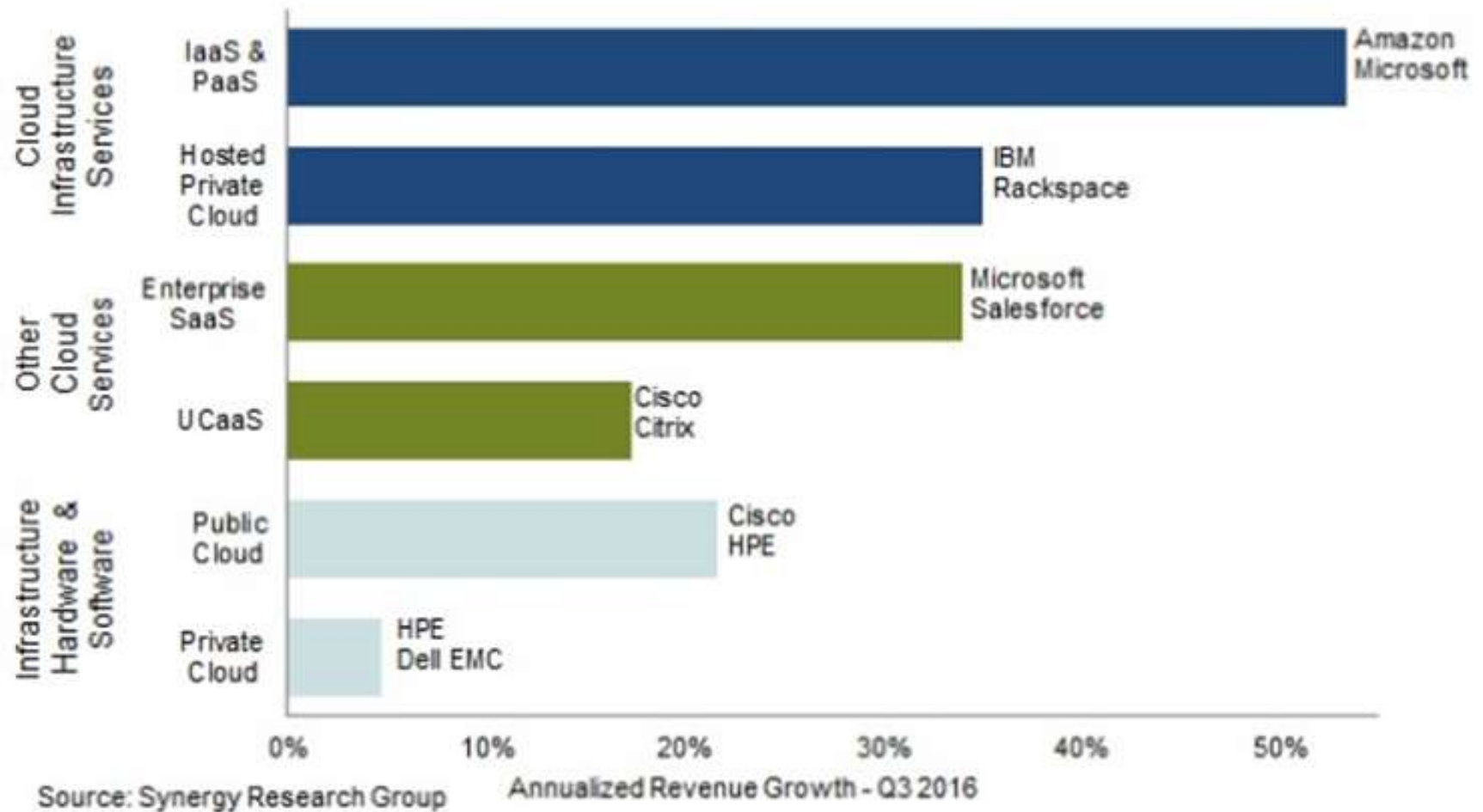
Gartner Hype Cycle for Cloud Computing 2015



Cloud Revenue, Up 10X in 6 years, 2X in next 4



Cloud Growth by Segments, Market Leaders



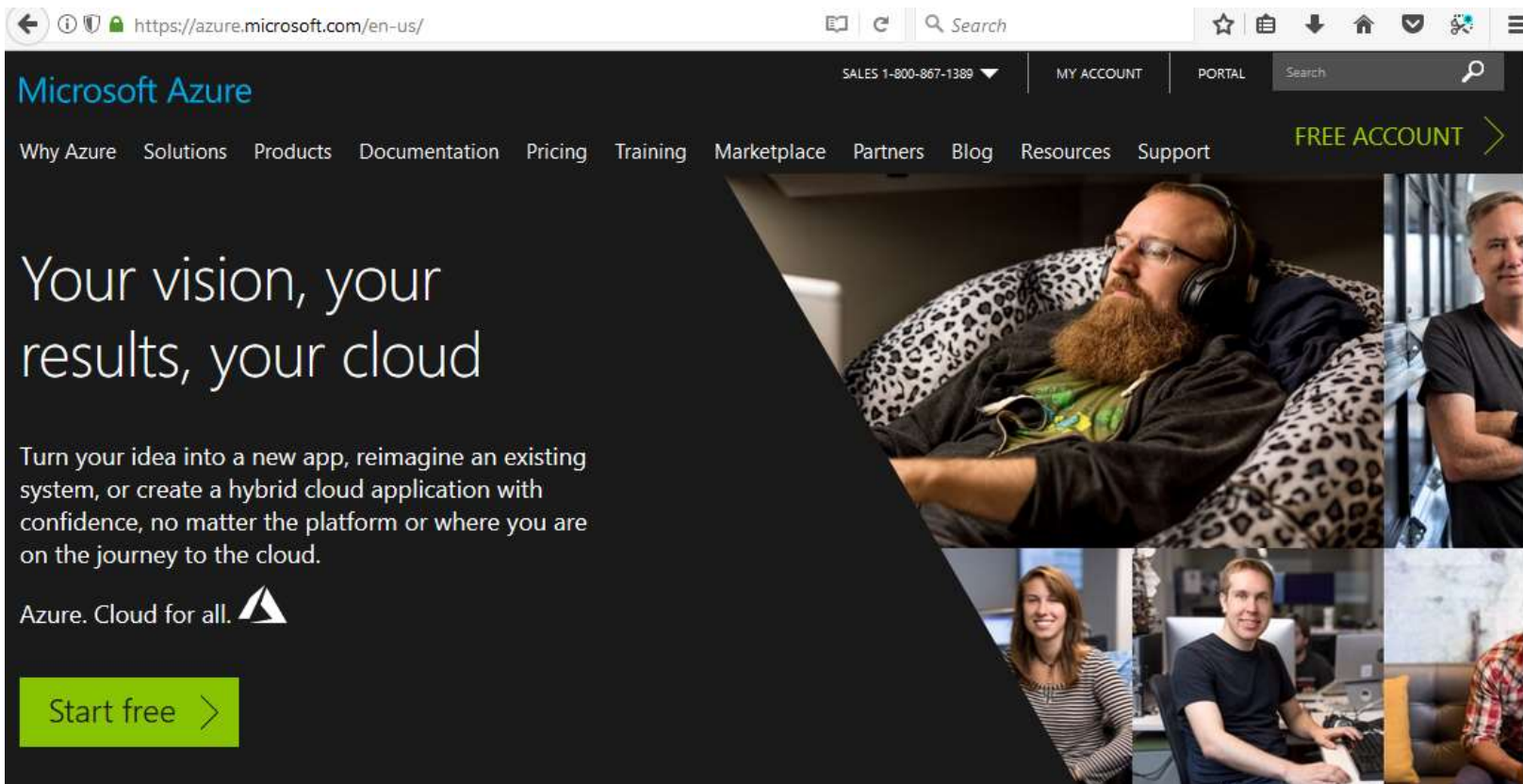
Microsoft Azure Itself

What is Microsoft Azure, wikipedia.org

- **Microsoft Azure** (formerly **Windows Azure**) [/ˈæʒər/](#) is a [cloud computing](#) service created by [Microsoft](#) for building, testing, deploying, and managing applications and services through a global network of Microsoft-managed [data centers](#). It provides [software as a service \(SaaS\)](#), [platform as a service](#) and [infrastructure as a service](#) and supports many different [programming languages](#), tools and frameworks, including both Microsoft-specific and third-party software and systems.
- Azure was announced in October 2008 and released on February 1, 2010 as "Windows Azure" before being renamed "Microsoft Azure" on March 25, 2014.

Azure Home Page

- To learn to use Azure, just go to `azure.com`, or `azure.microsoft.com`
- If you have doubts, select **FREE ACCOUNT>**






Azure free account

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-  **\$200 in credit** for 30 days to explore any combination of Azure services.
-  **12 months free access** to compute, storage, database and networking services.
-  **More than 25 always-free** services.

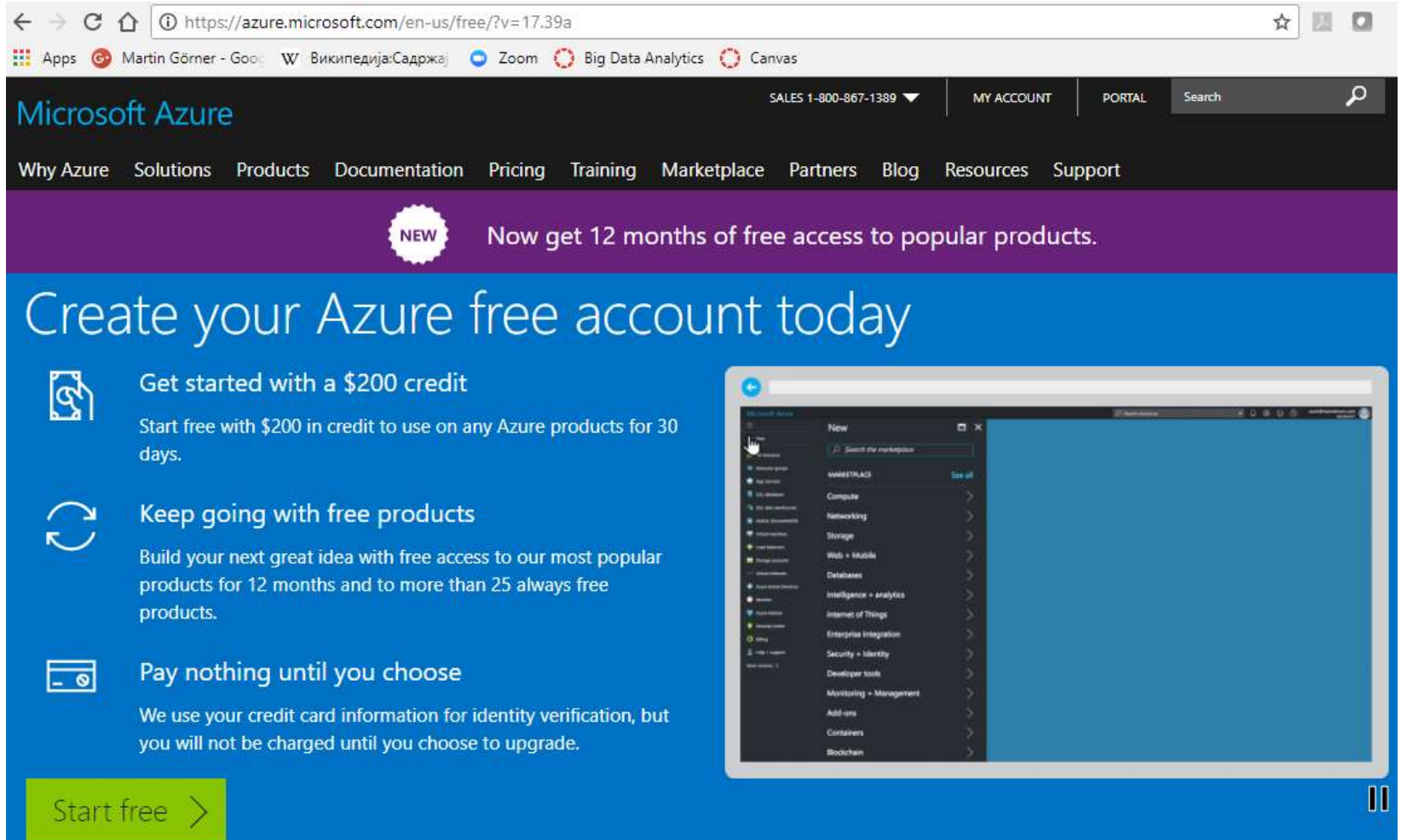
Your credit card will only be used for identity verification. You won't be charged until you subscribe.

Start free >

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More questions? Call us: 1-800-867-1389

Free Account



The screenshot shows the Microsoft Azure website's 'Free Account' page. The browser's address bar displays the URL <https://azure.microsoft.com/en-us/free/?v=17.39a>. The page features a dark blue header with the 'Microsoft Azure' logo and navigation links for 'Why Azure', 'Solutions', 'Products', 'Documentation', 'Pricing', 'Training', 'Marketplace', 'Partners', 'Blog', 'Resources', and 'Support'. A purple banner highlights a 'NEW' offer: 'Now get 12 months of free access to popular products.' The main section, titled 'Create your Azure free account today', lists three benefits: 1) 'Get started with a \$200 credit' (Start free with \$200 in credit to use on any Azure products for 30 days), 2) 'Keep going with free products' (Build your next great idea with free access to our most popular products for 12 months and to more than 25 always free products), and 3) 'Pay nothing until you choose' (We use your credit card information for identity verification, but you will not be charged until you choose to upgrade). A green 'Start free >' button is at the bottom left. On the right, a preview of the Azure portal shows the 'New' page with a sidebar menu and a list of services including Compute, Networking, Storage, Web + Mobile, Databases, Intelligence + analytics, Internet of Things, Enterprise Integration, Security + Identity, Developer tools, Monitoring + Management, Add-ons, Containers, and Blockchain.


Microsoft Azure


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Why Azure Solutions Products Documentation Pricing Training Marketplace Partners Blog Resources Support

NEW Now get 12 months of free access to popular products.

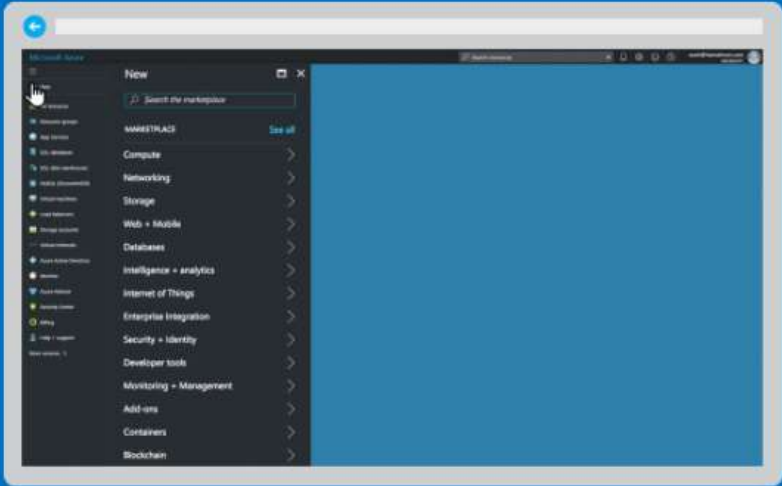
Create your Azure free account today

 **Get started with a \$200 credit**
Start free with \$200 in credit to use on any Azure products for 30 days.

 **Keep going with free products**
Build your next great idea with free access to our most popular products for 12 months and to more than 25 always free products.

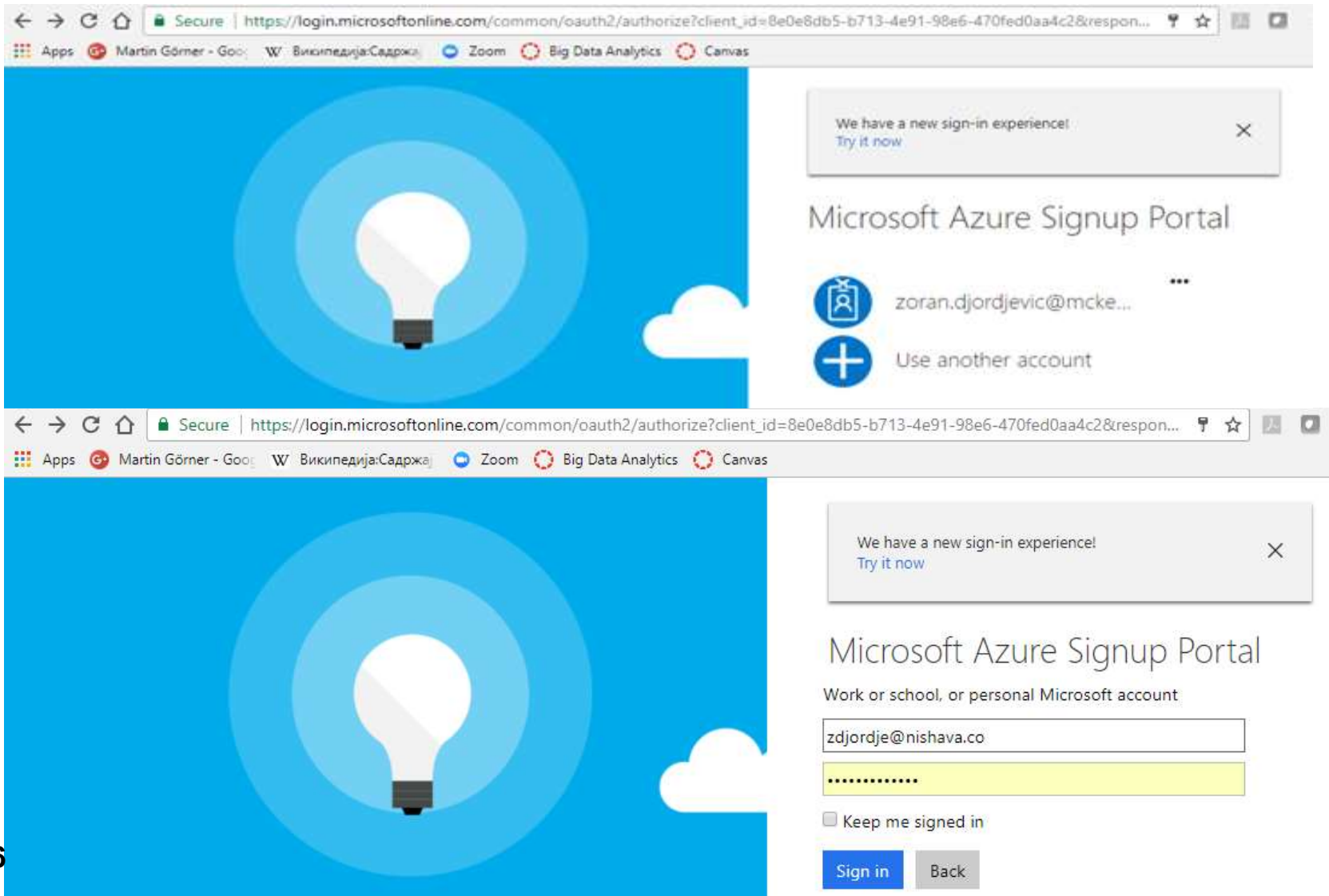
 **Pay nothing until you choose**
We use your credit card information for identity verification, but you will not be charged until you choose to upgrade.

[Start free >](#)



Use another account

- To get to the account you want, you might have to use another account



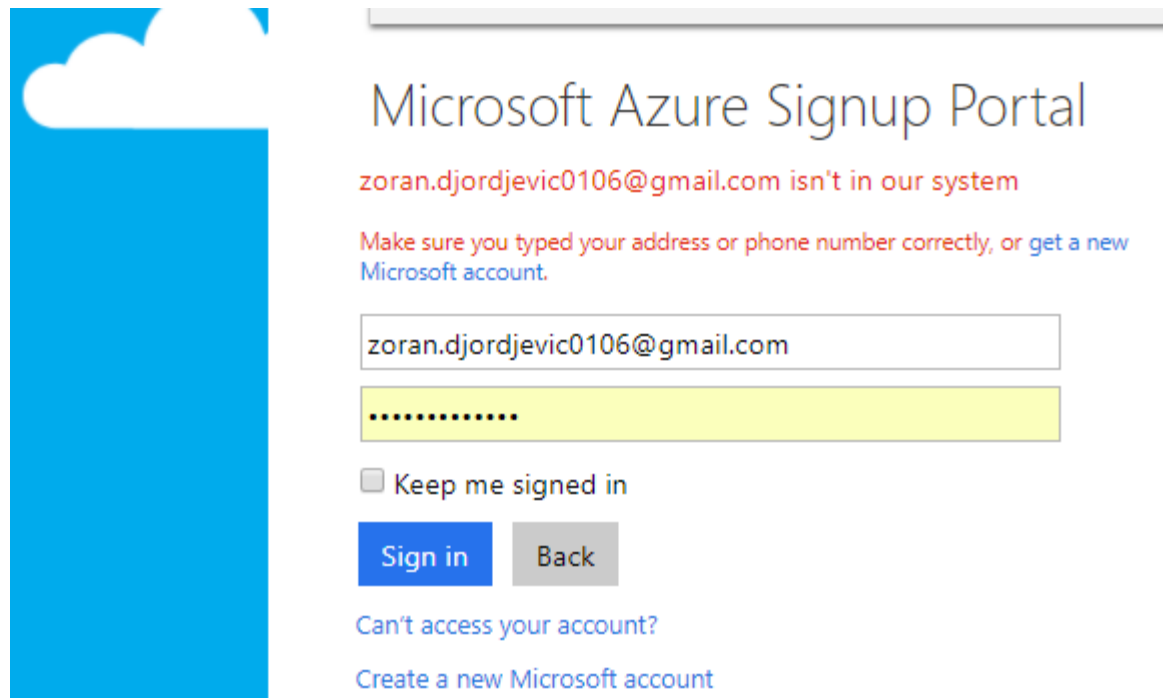
The image displays two screenshots of the Microsoft Azure Signup Portal, illustrating the process of logging in with an existing account.

Top Screenshot: The page shows the Microsoft Azure Signup Portal. A notification banner at the top right states: "We have a new sign-in experience! Try it now". Below the banner, the text "Microsoft Azure Signup Portal" is visible. Underneath, there is a user profile section showing a profile icon and the email address "zoran.djordjevic@mcke...". Below this, there is a button labeled "Use another account" with a plus sign icon.

Bottom Screenshot: This screenshot shows the login form. The notification banner is still present. Below the "Microsoft Azure Signup Portal" heading, the text "Work or school, or personal Microsoft account" is displayed. There are two input fields: one for the email address, which contains "zdjordje@nishava.co", and another for the password, which is masked with dots. Below the password field, there is a checkbox labeled "Keep me signed in". At the bottom, there are two buttons: "Sign in" (in blue) and "Back" (in grey).

If you want to use free Azure offering

- If you are attempting to get into Azure Free Account, you might have to create a new Microsoft account.
- None of this is particularly painful. You just need a bit of patience.



The screenshot shows the Microsoft Azure Signup Portal. On the left is a blue vertical bar with a white cloud icon at the top. The main content area has a light blue background. At the top, the text "Microsoft Azure Signup Portal" is displayed. Below it, a red error message states: "zoran.djordjevic0106@gmail.com isn't in our system". A red instruction follows: "Make sure you typed your address or phone number correctly, or [get a new Microsoft account](#)." Below this is a login form with two input fields. The first field contains the email address "zoran.djordjevic0106@gmail.com". The second field is a password field with a yellow background and masked characters ".....". Below the password field is a checkbox labeled "Keep me signed in". At the bottom of the form are two buttons: a blue "Sign in" button and a grey "Back" button. Below the buttons are two links: "Can't access your account?" and "Create a new Microsoft account".

Microsoft Azure Signup Portal

zoran.djordjevic0106@gmail.com isn't in our system

Make sure you typed your address or phone number correctly, or [get a new Microsoft account](#).

zoran.djordjevic0106@gmail.com

.....

☐ Keep me signed in

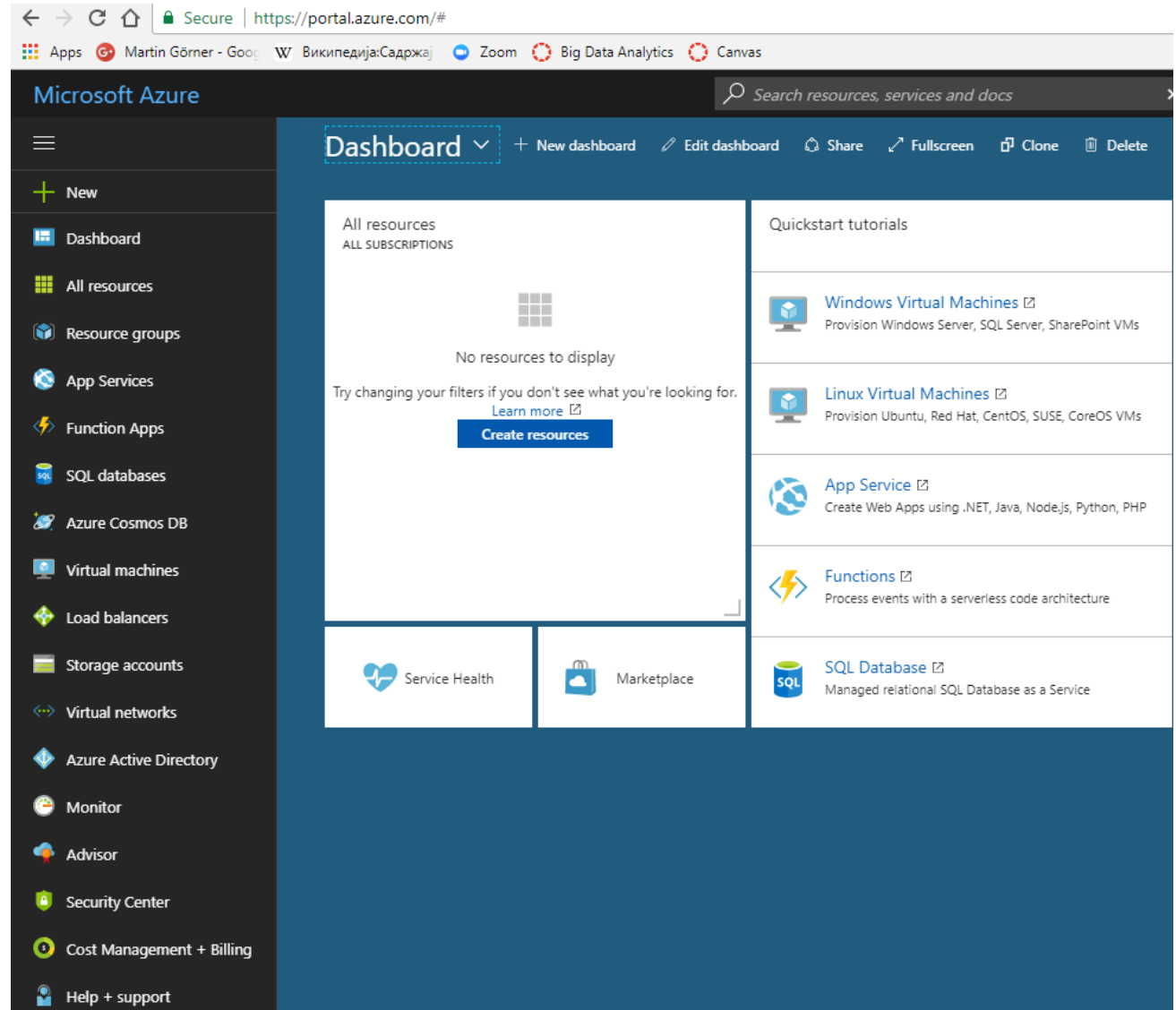
[Sign in](#) [Back](#)

[Can't access your account?](#)

[Create a new Microsoft account](#)

Once you have an account, go to Portal

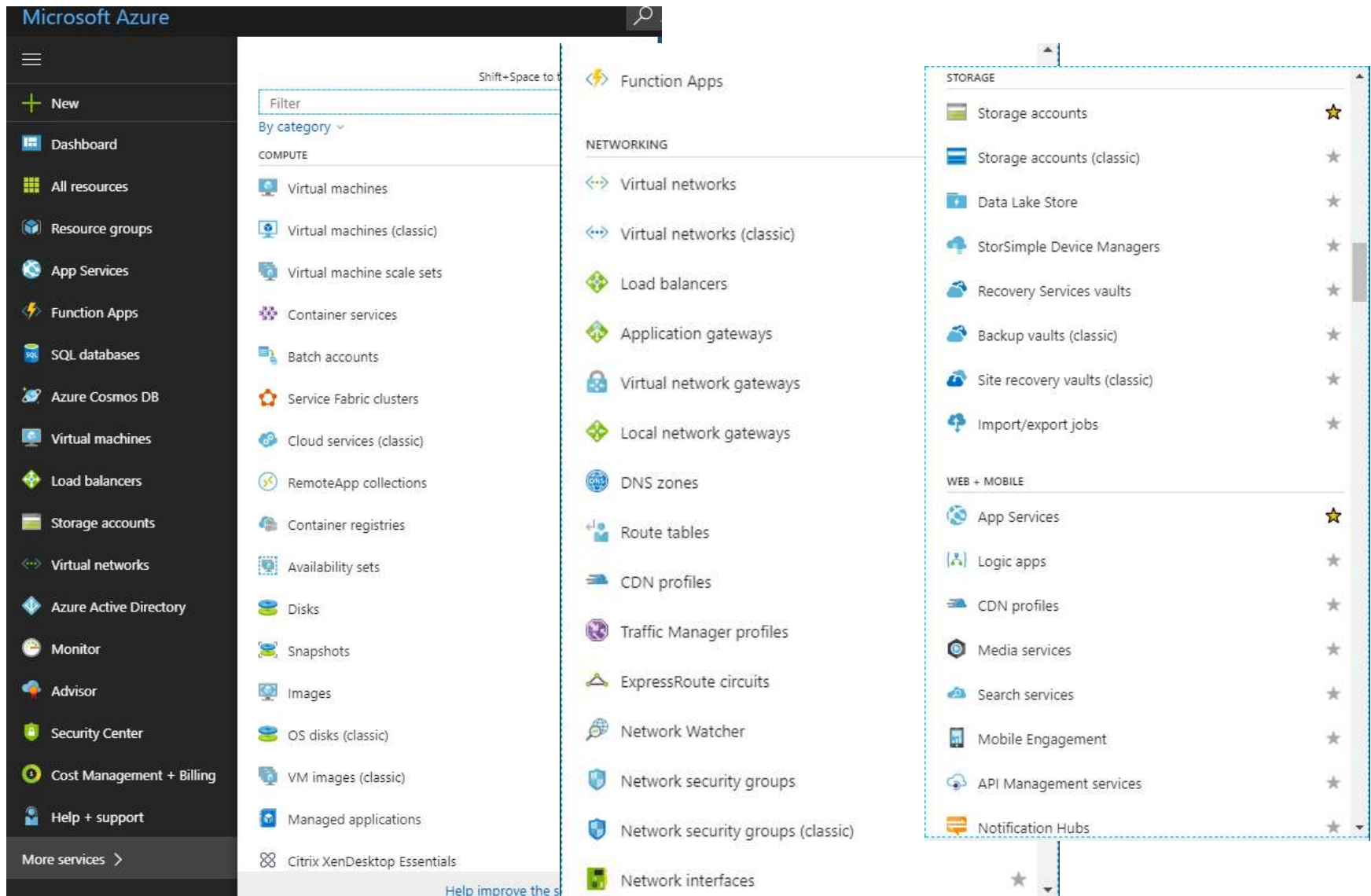
- Once you create an account, go to Portal directly.
- *(Management) Portal* is a Web interface that allows administrators to access and manage most, but not all Azure features.
- Microsoft typically releases the newer UI portal in beta before retiring an older one.



What is MS Azure Portal

- The Microsoft Azure portal is a central place where you can provision and manage your Azure resources.
- Azure Portal is:
 - A **comprehensive marketplace** that lets you browse through thousands of items from Microsoft and other vendors that can be purchased and/or provisioned.
 - A **unified and scalable browse experience** that makes it easy to find the resources you care about and perform various management operations.
 - **Consistent management pages** (or blades) that let you manage Azure's wide variety of services through a consistent way of exposing settings, actions, billing information, health monitoring and usage data, and much more.
 - A **personal experience** that lets you create a customized start screen that shows the information that you want to see whenever you log in. You can also customize any of the management blades that contain tiles.

Many, Many Services



Why So Many Azure Services

- You might need them.
- Also, AWS might have more:

AWS services

Find a service by name or feature (for example, EC2, S3 or VM, storage).



> Recently visited services

✓ All services



Compute

EC2
EC2 Container Service
Lightsail
Elastic Beanstalk
Lambda
Batch



Storage

S3
EFS
Glacier
Storage Gateway



Database

RDS
DynamoDB
ElastiCache
Amazon Redshift



Developer Tools

CodeStar
CodeCommit
CodeBuild
CodeDeploy
CodePipeline
X-Ray



Management Tools

CloudWatch
CloudFormation
CloudTrail
Config
OpsWorks
Service Catalog
Trusted Advisor
Managed Services



Security, Identity & Compliance



Internet of Things

AWS IoT
AWS Greengrass



Contact Center

Amazon Connect



Game Development

Amazon GameLift



Mobile Services

Mobile Hub
Cognito
Device Farm
Mobile Analytics
Pinpoint



Application Services

Step Functions

AWS Service, . . .



Networking & Content Delivery

VPC
CloudFront
Direct Connect
Route 53



Migration

AWS Migration Hub
Application Discovery Service
Database Migration Service
Server Migration Service
Snowball



Analytics

Athena
EMR
CloudSearch
Elasticsearch Service
Kinesis
Data Pipeline
QuickSight [↗](#)
AWS Glue



Artificial Intelligence

Lex
Amazon Polly
Rekognition
Machine Learning

IAM
Inspector
Certificate Manager
Directory Service
WAF & Shield
Artifact
Amazon Macie [↗](#)
CloudHSM

SWF
API Gateway
Elastic Transcoder



Messaging

Simple Queue Service
Simple Notification Service
Simple Email Service



Business Productivity

WorkDocs
WorkMail
Amazon Chime [↗](#)



Desktop & App Streaming

WorkSpaces
AppStream 2.0

Components of Azure

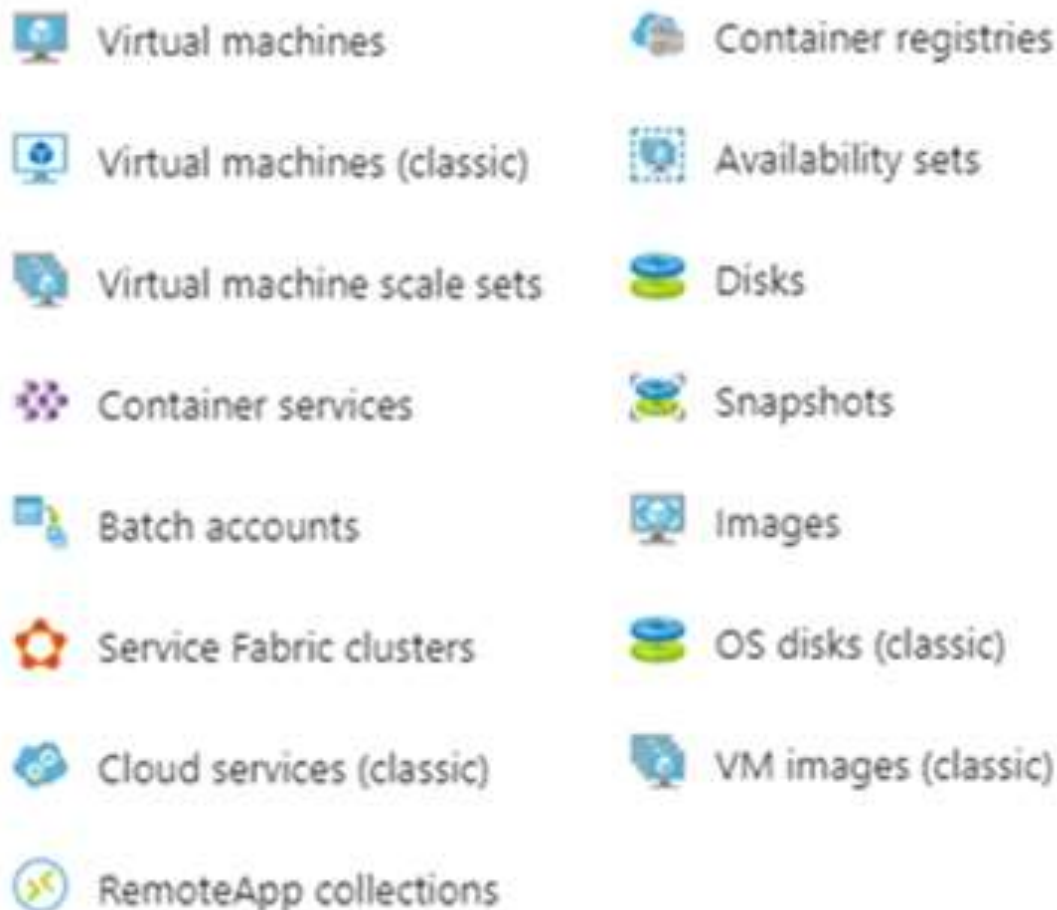
- Azure groups services into categories in the Management Portal and on various visual aids.
- These are many main groups of services.
- We cannot review them all.
- We will become familiar with some of those categories and services as we practice with them.
- Many more services you will discover only when a specific problem forces you to use them.
- In what follow we will give a brief description of a few “main” categories of services



Compute Services

- The most basic function of a Cloud platform is to executes applications.
- Cloud computes. Azure has many compute models and each has its own role.

COMPUTE

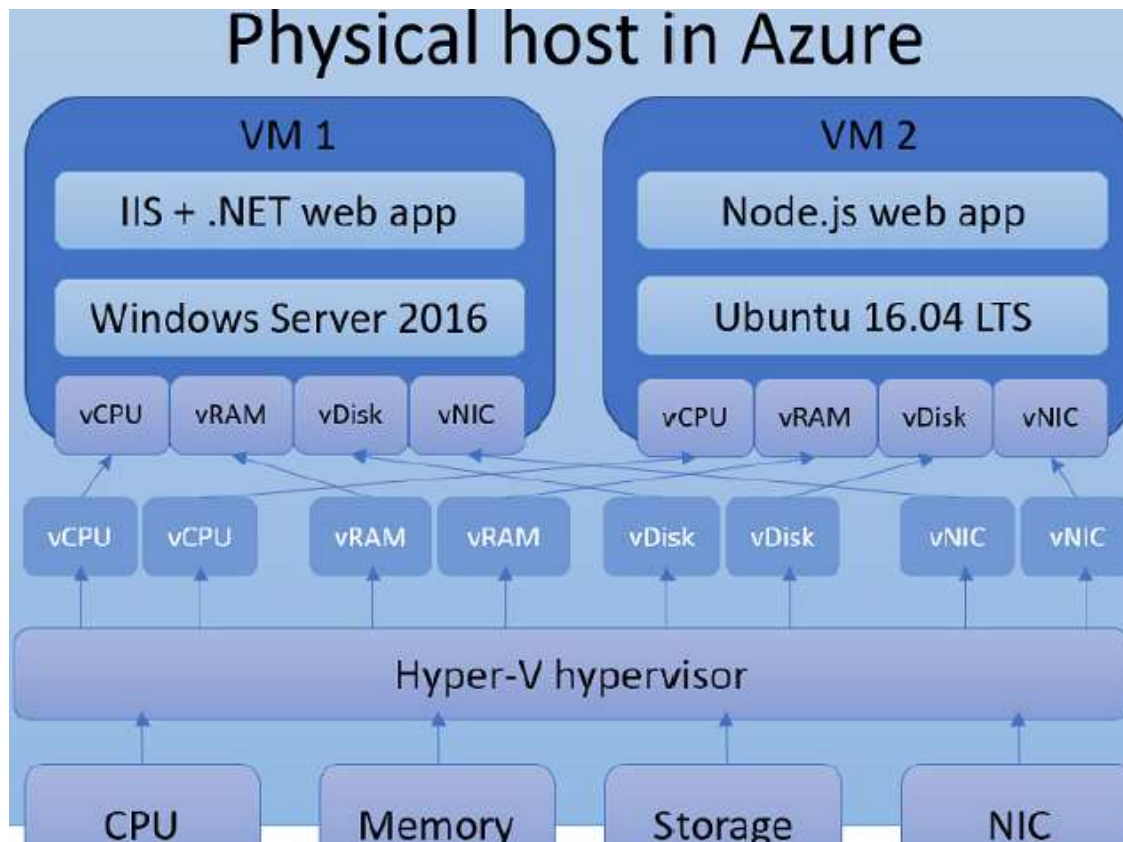


Azure Virtual Machines

- The ability to create a virtual machine on demand, whether from a standard image or from one you supply, is perhaps the most essential function of a Cloud service.
- Images of VMs are called VHDs (Virtual Hard Drives) . To create a VM, you specify which VHD to use and the VM's size and other properties and Cloud provider instantiates the Virtual Machine on your behalf.
- You pay for the time that the VM is running. With Azure you pay by the minute and only while VM is running, though there is a minimal storage charge for keeping the VHD available. Some other providers will charge you for hour of usage even if you used the VM only a few minutes.
- Azure offers a gallery of stock VHDs (called "images") that contain a bootable operating system to start from. These include Microsoft and partner VMs, such as Windows Server and Linux, SQL Server, Oracle and many others.
- We can create VHDs and images, and then upload them to the Cloud ourselves. We can even upload VHDs that contain only data and then access data from other running VMs.

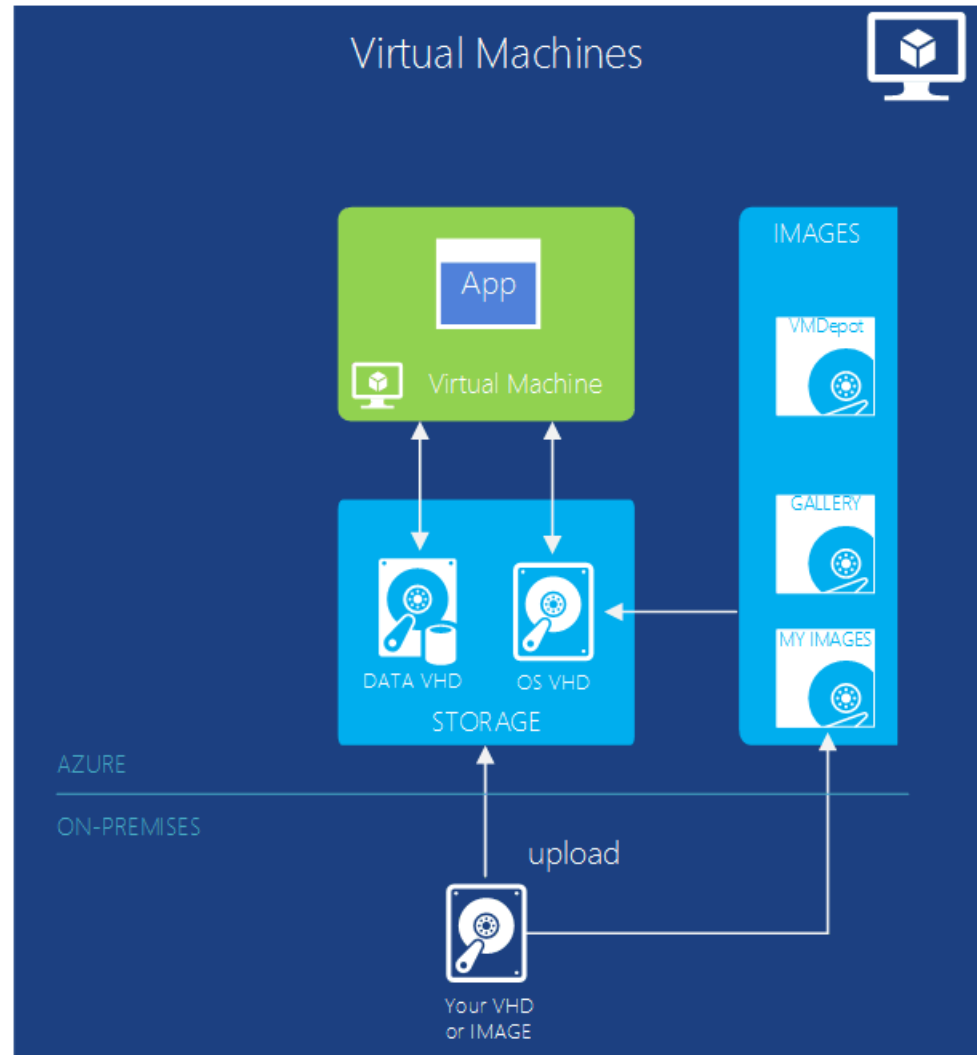
Virtualization in Azure

- Virtualization is the real magic behind Azure and the Cloud technology.
- Virtualization logically divides physical resources of a server into virtual resources that can be securely accessed by individual workloads.
- A virtual machine (VM) contains a virtual CPU (vCPU), memory (vRAM), storage (vDisk), and network connectivity (vNIC) as show in figure bellow



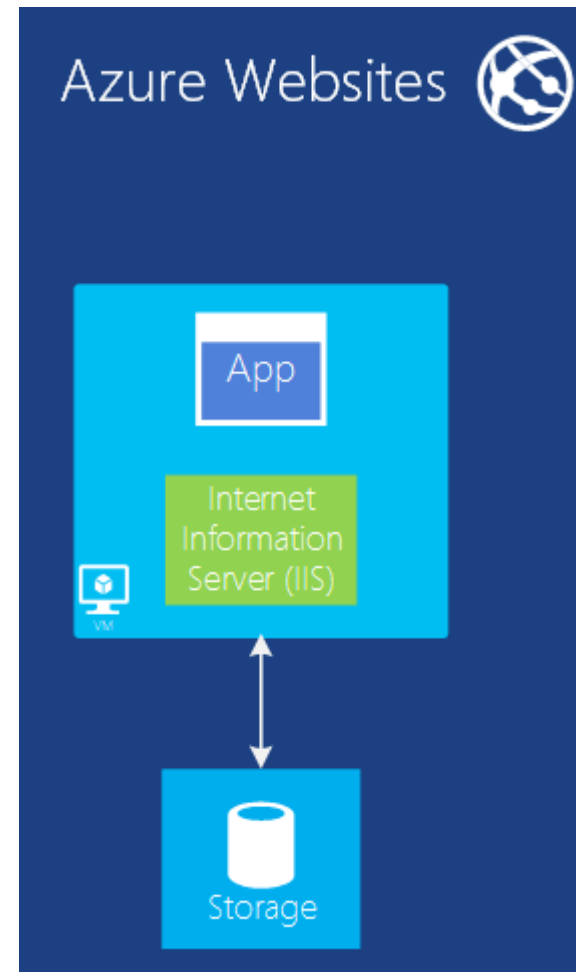
Azure Virtual Machines

- The figure shows how a Virtual Machine (VM) is created from a Virtual Hard Drive (VHD).
- Wherever the VHD comes from, you can persistently store any changes made while a VM is running.
- The next time you create a VM from that VHD, things pick up where you left off. The VHDs that back the Virtual Machines are stored in Azure Storage blobs.



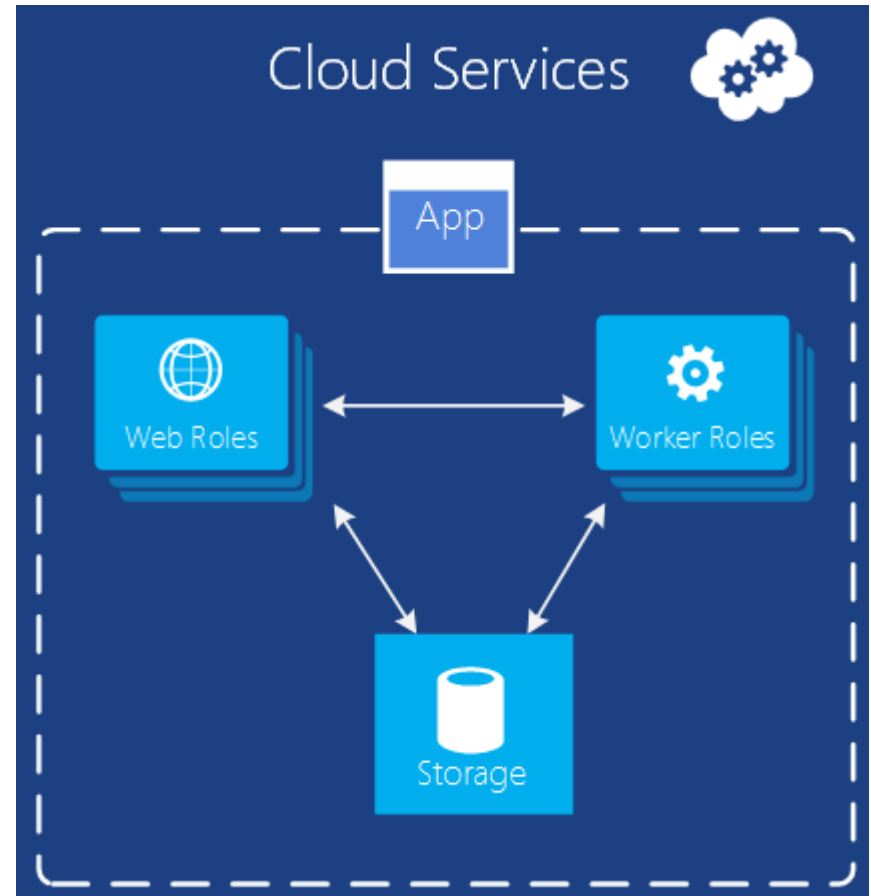
App Services

- App Services allow you to create, build, deploy, and manage powerful web, mobile, and API apps using a single back-end.
- In Azure we build standards-based web apps and APIs using .NET, Java, Node.js, PHP, and Python.
- This compute model offers a managed web environment using the Azure Management portal as well as APIs.
- We can move an existing website application into Web Apps unchanged, or you can create a new one directly in the cloud.
- Once a website is running, you can add or remove instances dynamically, relying on Azure Web Apps to load balance requests across them.



Cloud Services

- Azure Cloud Services provides a place to run highly scalable custom code on a **Platform as a Service (PaaS) environment**.
- If you want to build a cloud application that can support lots of simultaneous users, doesn't require much administration, and never goes down use Azure Cloud Services.
- To use it, you create an application using the technology you choose, such as C#, Java, PHP, Python, Node.js, or something else. Your code then executes in virtual machines (referred to as instances) running a version of Windows Server.
- These VMs are distinct from the ones you create with Azure Virtual Machines. For one thing, Azure itself manages them, doing things like installing operating system patches and automatically rolling out new patched images. This implies that your application shouldn't maintain state in web or worker role instances.
- Worker role does not run an IIS.



Storage Management

- Applications need data, and different kinds of applications need different kinds of data. Because of this, Azure provides several different ways to store and manage data.
- Azure provides many storage options.
- All are designed for very durable storage.
- With any of these options, there are always 3 copies of your data kept in sync across an Azure datacenter -- 6 if you allow Azure to use geo-redundancy to back up to another datacenter at least 300 miles away.

STORAGE



Storage accounts



Storage accounts (classic)



Data Lake Store



StorSimple Device Managers



Recovery Services vaults



Backup vaults (classic)



Site recovery vaults (classic)



Import/export jobs

Storage Accounts

- A storage account can store up to 500TB of data in the cloud.
- Use a general-purpose storage account to store object data, use a NoSQL data store, define and use queues for message processing, and set up file shares in the cloud.
- Use the Blob storage account and the hot or cool access tiers to optimize your costs based on how frequently your object data is accessed.

Storage Types

File

- Simple, distributed, cross-platform file system
- Lift and shift migration
- Simple and inexpensive
- Move data to cloud with no coding

Disk

- Premium storage for I/O-intensive applications
- Low latency, high throughput
- Automatic triple replication
- Enterprise-grade durability

Blob

- Massively-scalable object storage for unstructured data
- Cost-effective for massive volume
- Tiered storage options
- Single infrastructure with global reach

Queue

- Durable queues for large-volume cloud services
- Simple, cost-effective messaging
- Decoupled component flexibility
- Resilient scaling and buffering

Table

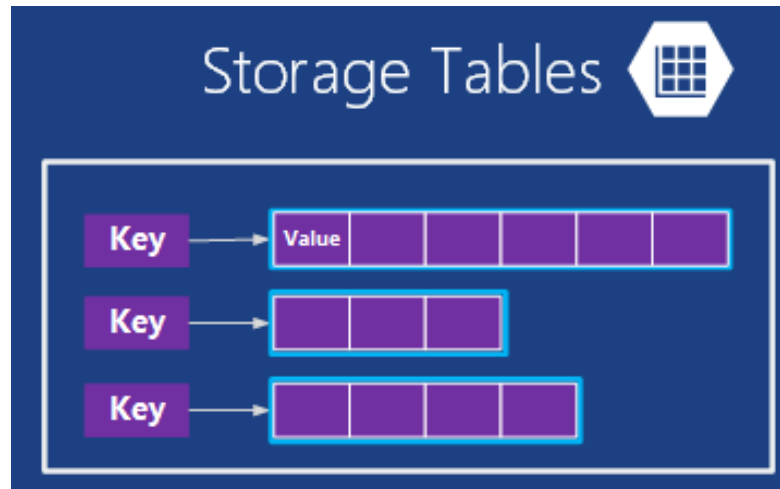
- Flexible NoSQL database
- Key-value table storage
- Structured or unstructured data
- Low latency at Internet scale

Blobs

- Azure Blobs (again "Blob Storage" and just "Storage Blobs" are the same thing) is designed to store unstructured binary data. Like Tables, Blobs provides inexpensive storage, and a single blob can be as large as 1TB (one terabyte). Azure applications can also use Azure drives, which let blobs provide persistent storage for a Windows file system mounted in an Azure instance. The application sees ordinary Windows files, but the contents are actually stored in a blob.+
- Blob storage is used by many other Azure features (including Virtual Machines), so it can certainly handle your workloads too.
- **Scenarios for Blobs**
- An application that stores video, massive files, or other binary information can use blobs for simple, cheap storage. Blobs are also commonly used in conjunction with other services like Content Delivery Network, which we will talk about later.

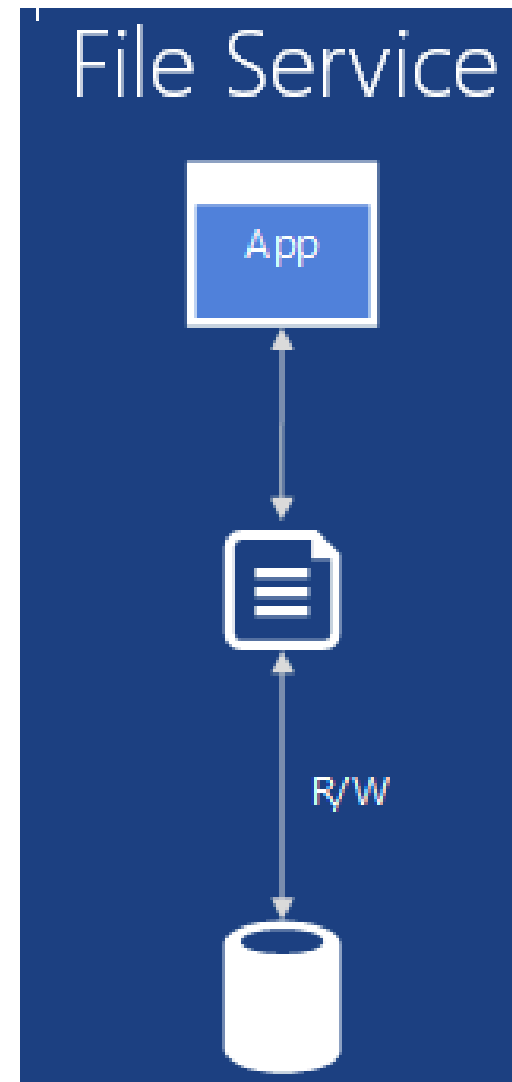
Tables

- *Figure: Azure Tables provides a flat NoSQL way to store data.*
- Azure Tables do not provide relational storage. In fact, it's an example of a NoSQL approach called a key/value store. Azure Tables let an application store properties of various types, such as strings, integers, and dates. An application can then retrieve a group of properties by providing a unique key for that group. While complex operations like joins aren't supported, tables offer fast access to typed data. They're also very scalable, with a single table able to hold as much as a terabyte of data. And matching their simplicity, tables are usually less expensive to use than SQL Database's relational storage.+



File Service

- On-premise, it's common to have large amounts of file storage accessible through the Server Message Block (SMB) protocol using a \\Server\share format.
- Azure now has a service that allows you to use this protocol in the cloud. Applications running in Azure can use it to share files between VMs using familiar file system APIs like ReadFile and WriteFile and a REST interface.
- Azure Files is built on top of the blob service, so it inherits the same availability, durability, scalability, and geo-redundancy built into Azure Storage.



Database Management

- If you're creating an Azure application (using any of the compute models) that needs relational storage, SQL Database can be a good option. Applications running outside the cloud can also use this service, though, so there are plenty of other scenarios. For instance, data stored in SQL Database can be accessed from different client systems, including desktops, laptops, tablets, and phones. And because it provides built-in high availability through replication, using SQL Database can help minimize downtime.

DATABASES



SQL databases



SQL data warehouses



SQL Server stretch databases



Azure Cosmos DB



Redis Caches



Data factories



Azure Database for MySQL servers



Azure Database for PostgreSQL servers



SQL elastic pools

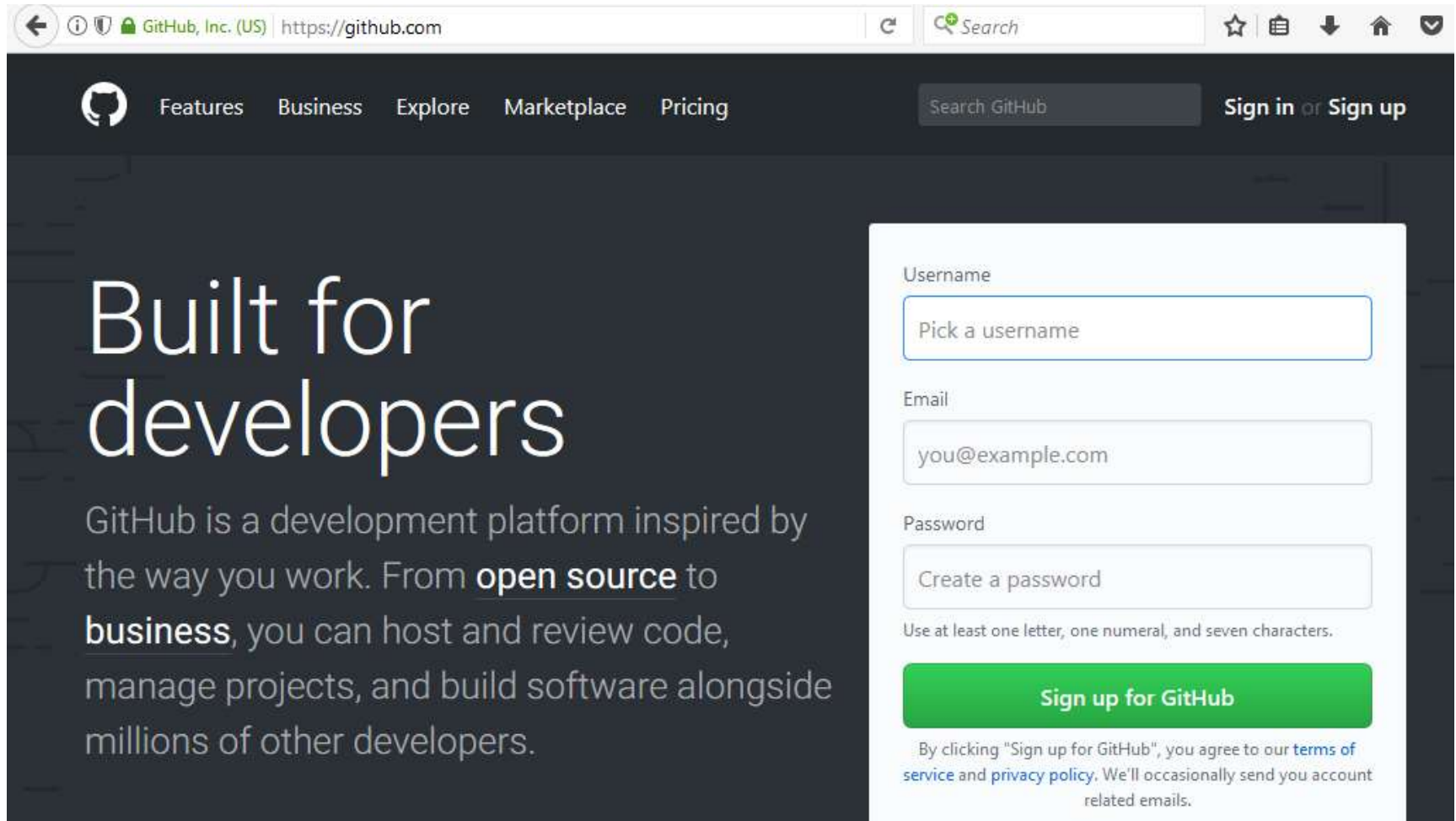


SQL servers

Azure Resources, GitHub Account

- GitHub is a free web service that many organizations and individuals use to manage projects, code, templates, and documentation.
- Azure has hundreds of free templates and script examples that you can use, and contribute to.
- Creating a GitHub account is optional, but a highly recommended part of building your lab environment:
 1. Open your web browser to <https://www.github.com> and provide a username, e-mail address, and password to create a free GitHub account.
 2. After you receive a validation e-mail from GitHub, select the link in the e-mail to activate your account.
 3. Check out some of the Azure repositories that provide sample resources such as:
 - a) Azure Resource Manager templates - <https://github.com/Azure/azure-quickstarttemplates>
 - b) Azure CLI 2.0 - <https://github.com/Azure/azure-cli>
 - c) Azure DevOps Utilities - <https://github.com/Azure/azure-devops-utils>

GitHub Sign up Page



The image is a screenshot of the GitHub sign-up page. At the top, the browser's address bar shows the URL 'https://github.com' and the page title 'GitHub, Inc. (US)'. The GitHub logo is on the left, and navigation links for 'Features', 'Business', 'Explore', 'Marketplace', and 'Pricing' are in the center. On the right, there is a search bar and links for 'Sign in' or 'Sign up'. The main content area has a dark background with the text 'Built for developers' in large white font. Below this, a paragraph describes GitHub as a development platform. On the right side, there is a white sign-up form with fields for 'Username', 'Email', and 'Password'. The 'Username' field contains the placeholder 'Pick a username'. The 'Email' field contains 'you@example.com'. The 'Password' field contains the placeholder 'Create a password'. Below the password field, there is a note: 'Use at least one letter, one numeral, and seven characters.' A green button labeled 'Sign up for GitHub' is at the bottom of the form. Below the button, there is a disclaimer: 'By clicking "Sign up for GitHub", you agree to our [terms of service](#) and [privacy policy](#). We'll occasionally send you account related emails.'

Username

Pick a username

Email

you@example.com

Password

Create a password

Use at least one letter, one numeral, and seven characters.

[Sign up for GitHub](#)

By clicking "Sign up for GitHub", you agree to our [terms of service](#) and [privacy policy](#). We'll occasionally send you account related emails.

Extra Help

- Cloud Computing and Azure moves quickly, and new services and features are always being released.
- As you start to explore Azure and want to learn about additional services, the most excellent site is:

<https://docs.microsoft.com/azure>

- Every Azure service is documented with quick start examples, tutorials, code samples, developer reference, and architecture guides.
- You can also access both free and paid support options if you really need some help along the way.

Creating Azure Linux Virtual Machine

As the simplest illustration of the Power of Azure, let us create a Linux VM.



Before You Begin, Cygwin or Mac OS or Linux

- To connect to Linux boxes (VMs) in Azure from your local Windows machine, you need to install Cygwin, first. Cygwin is a Linux emulator. You get it from:
<https://cygwin.com/install.html>
- During the installation, make sure you select `Net` group of packages and then check box `OpenSSH` package. That will install `OpenSSH` Linux package with Cygwin. There are many Linux packages and Cygwin would get bloated (many GBs) if you would install all of them.
- `OpenSSH` lets you run commands like `ssh` (secure shell) or `scp` (secure copy).
- Your Mac OS or Linux box have those (Unix) packages already installed.
- To update all of your Linux (Ubuntu) packages to the latest version, you might type on the command prompt:

```
$ sudo apt-get -y update
```
- There are many Linux. On a Red Hat (CentOS), a similar command reads

```
$ sudo yum -y update.
```
- We will learn about both `apt-get` and `yum` utilities in due course.

SSH Key Pair

- One can login into a Linux machine using username and password. Passwords are not particularly secure and we need a stronger protection.
- A much better protection is provided by SSH key pairs. An SSH key pair is made of a public key which in our case will be transferred to the remote Linux VM and a private key which will be kept as a secret on our local machine.
- If you have an existing SSH key pair, you may use it. You do not have to create a new pair.
- We will see later that SSH key pairs also protect our data in transit and are used to encrypt our communication with remote machines.

- From the Cygwin prompt, i.e. Bash shell, run

```
$ ssh-keygen -t rsa -b 2048
```

- The command output includes the file name of the public key file.
- On the following screen is the output of this command. Notice that we accepted that the system (Cygwin) sends generated key pair (2 files) to a default location: `/home/073621/.ssh`. Your directory will have a different name. `.ssh` starting with a dot (.) is name of a standard directory

Generation of SSH Key Pair

```
$ ssh-keygen -t rsa -b 2048
```

```
Generating public/private rsa key pair.
```

```
Enter file in which to save the key (/home/073621/.ssh/id_rsa):
```

```
/home/073621/.ssh/id_rsa already exists.
```

```
Overwrite (y/n)? y
```

```
Enter passphrase (empty for no passphrase):
```

```
Enter same passphrase again:
```

```
Your identification has been saved in /home/073621/.ssh/id_rsa.
```

```
Your public key has been saved in /home/073621/.ssh/id_rsa.pub.
```

```
The key fingerprint is:
```

```
SHA256:AEsQOkcQKMmFFzlc5Rkh0jThp1U+NtiBG6QyOH8Ph5A
```

```
073621@USMASCSQ607244
```

```
The key's randomart image is:
```

```
+---[RSA 2048]-----+
```

```
|  **0*+=oo          |
| o*o*++=oB .        |
| O+oEoo.*o*         |
| ooo + =o. o         |
| . = .S             |
| . +                |
| .                  |
```

```
+----[SHA256]-----+
```

- We generated 2 files: the private key file named: `id_rsa` and the public key file named: `id_rsa.pub`

Content of the private key file `id_rsa`

- The private key file `id_rsa` reads like:

```
-----BEGIN RSA PRIVATE KEY-----
```

MIIEpAIBAAKCAQEAXWtdo1l80xFYMoKOqE3k9SQBdEMxa//EvE08eveipldNKqJe
jbUzMZPMc17znQmKCGfAV8/VILGfS2+44GgC+POT8+Kmp5OQ0Tfd9gcm5qZNfRoQ
0UQG5pFkx4phdl3yfAa/BfFKqvB6mNlCn2qlJ2cmCHPXc5F/hdbDgq59vdu4KYdp
6Htukv784vC/SensucZ3DJQVHu4gEtdJYXOE mwXVnlBZY o75RWnxQbv35mh02d3r
duYikcjEKBppifBFzuyUb nNXEfHAHJIKU8C4sUM5qUmsxA6ZJ7XSaaMkr g7Dk4Ov
EHnvG3PM6fi3nCCEAT9KaMJ0oCt/Ddq/5VE4YQIDAQABAoIBAEnSwlpCrFnVQ5Dn
4h2htuffNwoycreZiqOMA8DLcGZG0R1bingkaQUCgYAuhYrpZhu4kLJaSMWaGK/0
.

Vkpp8PfI2ks0t9tRdIpA+tWW0P8n+wThuoPfaiTi5uN0oiy7UnAX9qMcZa/0kZoC
LcQv3FyMnFJTcmEqVi4CrHZyyUcaMG1gXnB1lCSOPEgRrlavmp+jd8MyeObS/q4M
9udRlNJHLgT6A0BIqRHq+QKBgQCliqAcf0s0IRdbqAjW8o925faki1Bq7/JueMWD
NLFxnHFSxfDoyeAW17rFXxobt7Kb+ZnzDqIb9/paARZOKDyUWxy5D8BjfiwduTaW
U+AYUb6kWYMonuaABetYTuicvHIga7cb6tzf4SxHSeipG9A9l9ZkdUl3yytazDSN
+ngf0QKBgQCm+fpbYqFucLIVYfg+2FbYJT6iFuQpChoTqedwJvMPTaWjFfPLh7w4
8tUAVQz4ZXmhbTbUMjZcXTYIwW+5QU+oHWv3zqSUPFRslgm3GFWQeHOlg03MX5cU
PCYP0dR4GpOEWSwPNB/4ueoTkKJDnyrx/QPGVK05CVRHIkJ52g6OXw==

-----END RSA PRIVATE KEY-----

Content of the public key file `id_rsa.pub`

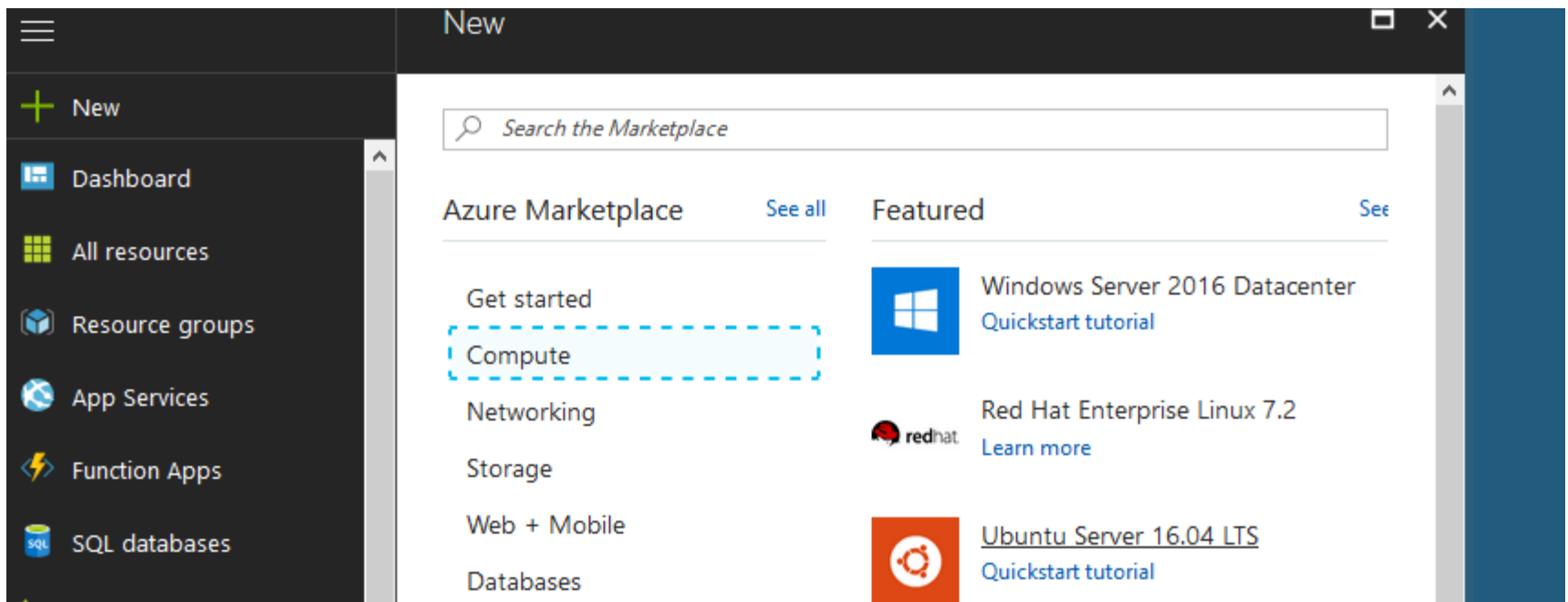
- Just generated public key file `id_rsa.pub` reads exactly like this:

```
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAQDAFa12jXXzTEVgygo6oTeT1JAF0QzFr/8
S8TTx696KmV00qol6NtTMxk8xzXvOdCYoIZ8BXz9UgsZ9Lb7jgaAL485Pz4qan
k5DRN932Bybmpk19GhDRRAbmkWTHimF3XfJ8Br8F8Uqq8HqY2UKfaqUnZyYIc9
dzkX+F1sOCrn2927gph2noe26S/vzi8L9J6ey5xncMlBUe7iAS10lhc4SbBdWe
UFlijvlFafFBtXfmaHTZ3et25iKRyMQoGmmJ8EX07JRuc1cR8cAckgpTwLixQz
mpSazEDpkntdJpoySuDsOTg68Qee8bc8zp8jecIIQBP0pownSgK38N2r/lUThh
073621@USMASCSQ607244
```

- We will need to copy that content, i.e. the public key, and transfer it to Azure or remote Linux machine. In doing that we must carefully copy the initial `ssh-rsa` string and stop at the very end, in our case `...244`. No extra white spaces are allowed.

Create Linux Machine on Portal

- In the top right corner of azure.microsoft.com page, hit Portal.
- Once in Azure Portal, Hit + New
- On the panel that appears select Compute and then on the right side: Ubuntu Server 16.04 LTS



- Create Virtual Machine panel will pop up. Several choices must be made.

Populate Basic Parameters

- Insert VM Name
- VM disk type
- User name
- Authentication type. Select SSH public key.
- Copy and past the content of file id_rsa.pub from your local machine into provided space. No spaces after the end of the text, please.
- Name resourceGroup
- Select Location near you

78 Hit OK

Microsoft Azure New > Create virtual machine > Basics

Create virtual machine

Basics

1 Basics
Configure basic settings

2 Size
Choose virtual machine size

3 Settings
Configure optional feature

4 Purchase
Ubuntu Server 16.04 LTS

* Name
MyBuntu

VM disk type
HDD

* User name
tourist

* Authentication type
SSH public key Password

* SSH public key
ssh-rsa
AAAAAB3NzaC1yc2EAAAADAQABAAQBAQ
QDJoBXpD8svXxOVv7TrMgWIKvB5aFyX

Subscription
Free Trial

* Resource group
☒ Create new ☐ Use existing
myResourceGroup

* Location
East US

OK

Choose VM Size

- Next select the size of VM appropriate for your task. We will choose the cheapest machine.
- Your tasks might require one of very powerful machines. Choose wisely.

Create virtual machine

1 Basics
Done

2 Size
Choose virtual machine size

3 Settings
Configure optional features

4 Purchase
Ubuntu Server 16.04 LTS

Choose a size

Browse the available sizes and their features

Prices presented are estimates in your local currency that include only Azure infrastructure costs and any discounts for the subscription and location. The prices don't include any applicable software costs. Recommended sizes are determined by the publisher of the selected image based on hardware and software requirements.

Supported disk type: HDD

Minimum vCPUs: 1

Minimum memory (GiB): 0

★ Recommended | [View all](#)

D1_V2 Standard ★	D1 Standard ★	A1 Standard ★
1 vCPU	1 vCPU	1 vCPU
3.5 GB	3.5 GB	1.75 GB
2 Data disks	2 Data disks	2 Data disks
2x500 Max IOPS	2x500 Max IOPS	2x500 Max IOPS
50 GB Local SSD	50 GB Local SSD	
Load balancing	Load balancing	Load balancing
54.31 USD/MONTH (ESTIMATED)	57.29 USD/MONTH (ESTIMATED)	44.64 USD/MONTH (ESTIMATED)

- Type of disk: HDD or SSD is important in real deployments.

Satisfy Curiosity, Select [View all](#)

- You will have a clear view of a great variety of machines

2

Size
Choose virtual machine size

>

3

Settings
Configure optional features

>

4

Purchase
Ubuntu Server 16.04 LTS

>

- Click on your choice
- Click “Select”
- You have populated the 2nd panel called `Size`.

★ Recommended | [View all](#)

D2S_V3 Standard	D4S_V3 Standard	D8S_V3 Standard
2 vCPUs	4 vCPUs	8 vCPUs
8 GB	16 GB	32 GB
4 Data disks	8 Data disks	16 Data disks
4000 Max IOPS	8000 Max IOPS	16000 Max IOPS
16 GB Local SSD	32 GB Local SSD	64 GB Local SSD
Premium disk support	Premium disk support	Premium disk support
Load balancing	Load balancing	Load balancing
74.40 USD/MONTH (ESTIMATED)	148.80 USD/MONTH (ESTIMATED)	297.60 USD/MONTH (ESTIMATED)
D16S_V3 Standard	D32S_V3 Standard	D64S_V3 Standard
16 vCPUs	32 vCPUs	64 vCPUs
64 GB	128 GB	256 GB
32 Data disks	32 Data disks	32 Data disks
32000 Max IOPS	64000 Max IOPS	128000 Max IOPS
128 GB Local SSD	256 GB Local SSD	512 GB Local SSD
Premium disk support	Premium disk support	Premium disk support
Load balancing	Load balancing	Load balancing
595.20	1,190.40	2,380.80

Settings, Optional Features

- Under **Settings**, keep the defaults or make specific selections and click **OK**.
- On the summary page, click **Ok** to start the virtual machine deployment.
- The VM will be pinned to the Azure portal dashboard. Once the deployment has completed, the VM summary automatically opens.

Create virtual machine ✕

1 Basics Done ✓

2 Size Done ✓

3 Settings Configure optional features >

4 Purchase Ubuntu Server 16.04 LTS >

Settings □ ✕

High availability

* Availability set ⓘ
None >

Storage

Use managed disks ⓘ
No Yes

Network

* Virtual network ⓘ
(new) myResourceGroup-vnet >

* Subnet ⓘ
default (10.0.0.0/24) >

* Public IP address ⓘ
(new) MyBuntu-ip >

* Network security group (firewall) ⓘ
(new) MyBuntu-nsg >

Extensions

Extensions ⓘ
No extensions >

Auto-shutdown

Enable auto-shutdown ⓘ
Off On

Monitoring

Boot diagnostics ⓘ

OK

Purchase

- Click “Purchase”
- After you hit Purchase, Azure starts the process of creation of the machine you requested.
- Deployment sometimes takes several minutes.

Create virtual machine

1 Basics Done ✓

2 Size Done ✓

3 Settings Done ✓

4 Purchase Ubuntu Server 16.04 LTS >

Purchase

Validation passed

Offer details

Prices presented are estimates in your local currency that include only Azure infrastructure costs and any discounts for the subscription and location. The prices don't include any applicable software costs.

Ubuntu Server 16.04 LTS
by Canonical
[Terms of use](#) | [privacy policy](#)

Standard A1
by Microsoft
[Terms of use](#) | [privacy policy](#)

Pricing details

0.0600 USD/hr
[Pricing for other VM sizes](#)

Azure resource

You may use your Azure monetary commitment funds or subscription credits for these purchases. Prices presented are retail prices and may not reflect discounts associated with your subscription.

Summary

Basics

Subscription

Free Trial

Resource group

(new) myResourceGroup

Location

East US

Settings

Computer name

MvBuntu

Terms of use

By clicking "Purchase", I (a) agree to the legal terms and privacy statement(s) associated with each Marketplace offering above, (b) authorize Microsoft to charge or bill my current payment method for the fees associated with my use of the offering(s), including applicable taxes, with the same billing frequency as my Azure subscription, until I discontinue use of the offering(s), (c)

Purchase

Download template and parameters

82

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VM is Provisioned and Deployed

MyBuntu
Virtual machine

Search (Ctrl+)

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

SETTINGS

Networking

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Size

Extensions

Availability set

Configuration

Properties

Locks

Automation script

OPERATIONS

Auto-shutdown

Backup

Disaster recovery (Preview)

Connect

Start

Restart

Stop

Capture

Move

Delete

Refresh

Resource group [\(change\)](#)
[myResourceGroup](#)

Status
Running

Location
East US

Subscription [\(change\)](#)
[Free Trial](#)

Subscription ID
ab293589-2b01-4b26-97a4-24f36b894fd2

Computer name
MyBuntu

Operating system
Linux

Size
Standard A1 (1 vcpu, 1.75 GB memory)

Public IP address
[52.170.46.105](#)

Virtual network/subnet
[myResourceGroup-vnet/default](#)

DNS name
[Configure](#)

Show data for last:

1 hour

 6 hours 12 hours 1 day 7 days 30 days

CPU (average)

100%

50%

0%

8:30 PM

8:45 PM

9 PM

9:15 PM

Percentage

Network (total)

100B

50B

0B

8:30 PM

8:45 PM

9 PM

9:15 PM

In Out

Disk bytes (total)

100B

50B

Disk operations/sec

100

50

@Nishava, Inc.

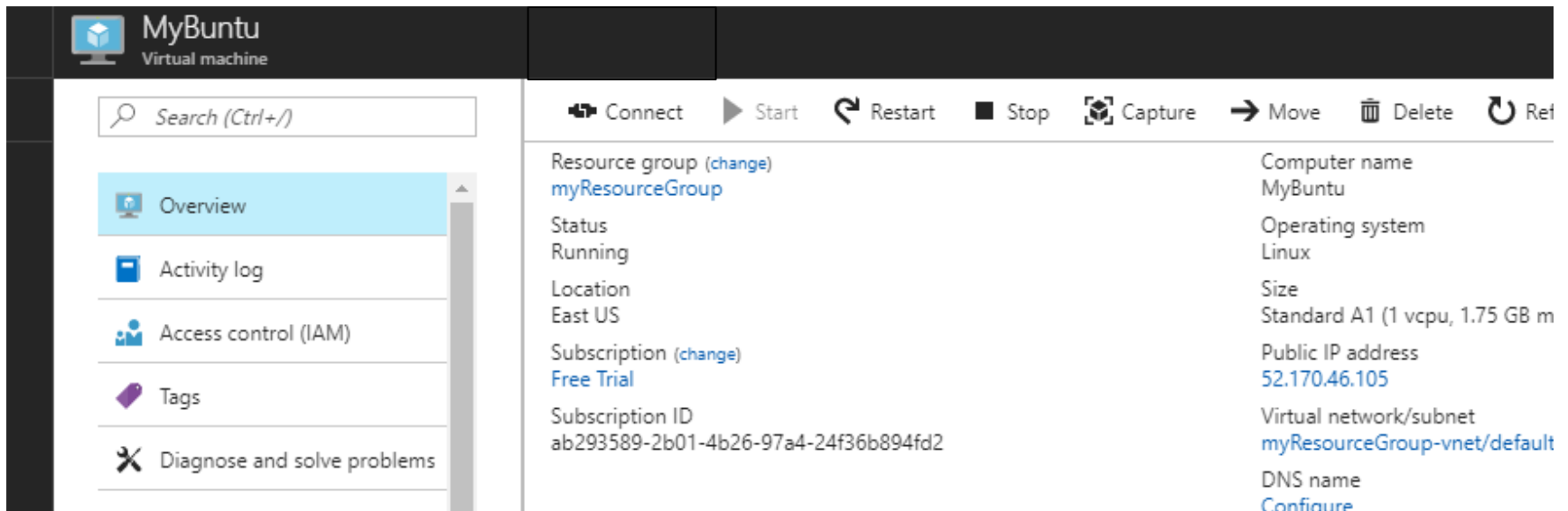
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Connect

- Click the **Connect** button on the virtual machine properties. The connect button displays an SSH connection string that can be used to connect to the virtual machine.

```
ssh tourist@52.170.46.105
```

- Copy the command to your Cygwin or Mac OS prompt



- 52.170.46.105 is the public IP address of your machine

You are in

```
$ ssh tourist@52.170.46.105
```

```
The authenticity of host '52.170.46.105 (52.170.46.105)' can't be established.
```

```
ECDSA key fingerprint is SHA256:OojIGVyXwspB/OezZIGnlpbfDgynJaEDUvBd309tqOc.
```

```
Are you sure you want to continue connecting (yes/no)? yes
```

```
Warning: Permanently added '52.170.46.105' (ECDSA) to the list of known hosts.
```

```
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.11.0-1011-azure 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 updates are security updates.
```

```
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by  
applicable law.
```

```
To run a command as administrator (user "root"), use "sudo <command>".
```

```
See "man sudo_root" for details.
```

```
tourist@MyBuntu:~$ pwd
```

```
/home/tourist
```

```
tourist@MyBuntu:~$
```

Install Apache

- If we want to see something colorful, we could install Apache on our Linux VM in Azure.
- On remote prompt of your Ubuntu Linux machine, just type:

```
$ sudo apt-get -y --fix-missing install apache2
```


Start Apache, Open Port 80

- On the command prompt type:

```
$ sudo /etc/init.d/apache2 start
```

- A Network security group (NSG) secures inbound and outbound traffic. When a VM is created from the Azure portal, an inbound rule is created on port 22 for SSH connections. Because this VM hosts a webserver, an NSG rule needs to be created for port 80.
- On the virtual machine, click the name of the **Resource group**.
- Select the **network security group**. The NSG can be identified using the **Type** column.
- On the left-hand menu, under settings, click **Inbound security rules**.
- Click on **Add**.
- In **Name**, type **http**. Make sure **Port range** is set to 80 and **Action** is set to **Allow**.
- Click **OK**.

Network Security Group

[+ Add](#) [Assign Tags](#) [Columns](#) [Delete resource group](#) [Refresh](#) [Move](#)

Essentials ^

Subscription name ([change](#))
[Free Trial](#)

Subscription ID
ab293589-2b01-4b26-97a4-24f36b894fd2

Deployments
1 Succeeded

All types








▼

All locations


▼

No grouping

1 of 7 items selected

<input type="checkbox"/>	NAME ↑↓	TYPE ↑↓	LOCATION ↑↓
<input type="checkbox"/>	 MyBuntu	Virtual machine	East US
<input type="checkbox"/>	 MyBuntu_OsDisk_1_e4e790cec0ef41ef9e3a946fe66bdf8f	Disk	East US
<input type="checkbox"/>	 mybuntu936	Network interface	East US
<input type="checkbox"/>	 MyBuntu-ip	Public IP address	East US
<input checked="" type="checkbox"/>	 MyBuntu-nsg	Network security group	East US
<input type="checkbox"/>	 myresourcegroupdiag162	Storage account	East US
<input type="checkbox"/>	 myResourceGroup-vnet	Virtual network	East US

Inbound Security Rules

 MyBuntu-nsg
Network security group

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

SETTINGS

Inbound security rules

Outbound security rules

Network interfaces

Subnets

Properties

→ Move

🗑 Delete

Resource group [\(change\)](#)
myResourceGroup

Location
East US

Subscription [\(change\)](#)
[Free Trial](#)

Subscription ID
ab293589-2b01-4b26-97a4-24f36b894fd2

Security rules
1 inbound, 0 outbound

Associated with
0 subnets, 1 network interfaces

Inbound security rules

PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACT
1000	default-allow-ssh	22	TCP	Any	Any	✔

Outbound security rules


PRIORITY	NAME	PORT	PROTOCOL	SOURCE	DESTINATION	ACT
No results.						

Set Port 80 for Inbound Traffic

- Change
 - Port name,
 - Destination port
 - Action to Allow
- Hit OK

Add inbound security rule

MyBuntu-nsg

 Basic

* Source ⓘ

* Source port ranges ⓘ

* Destination ⓘ

* Destination port ranges ⓘ

* Protocol

☒ Any

☐ TCP

☐ UDP

* Action

☒ Allow

☐ Deny

* Priority ⓘ

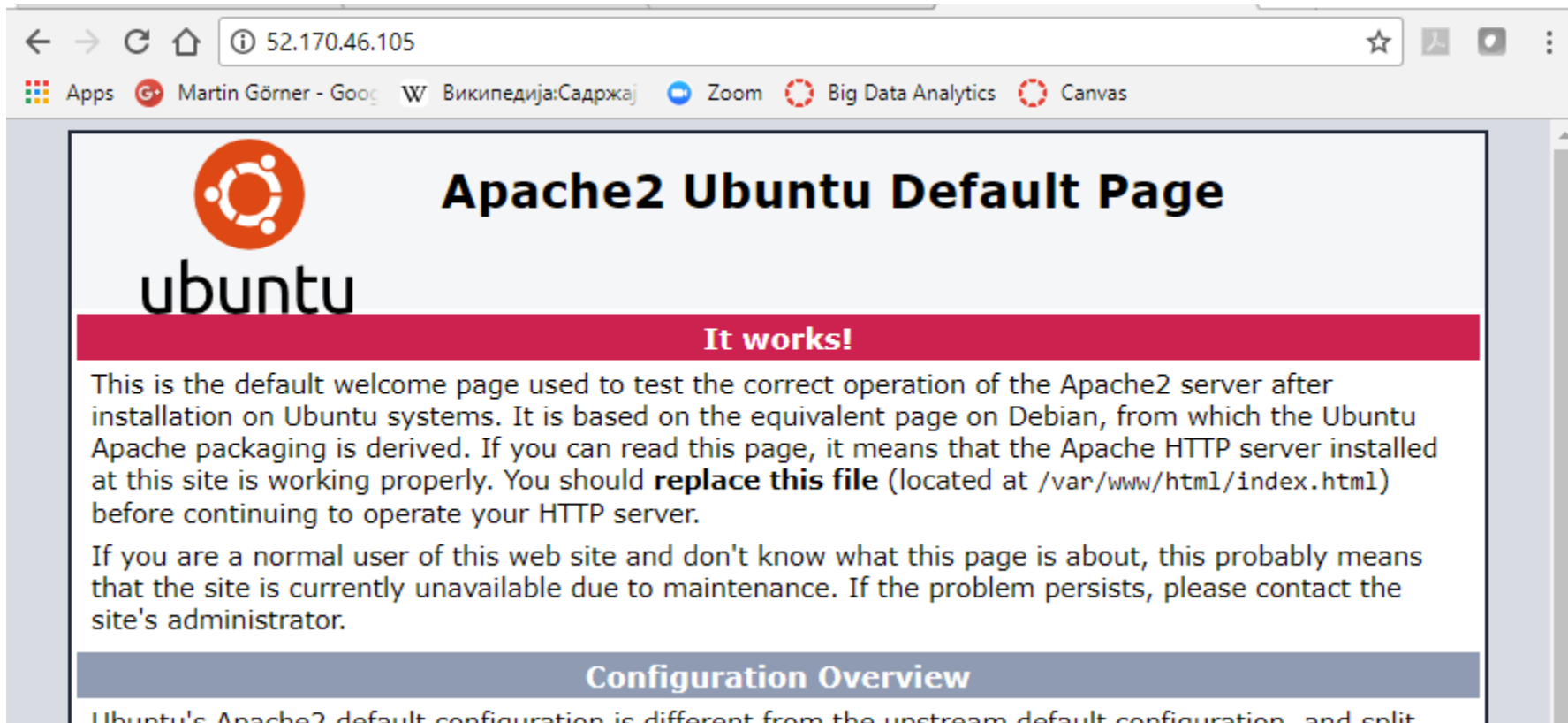
* Name

Description

OK

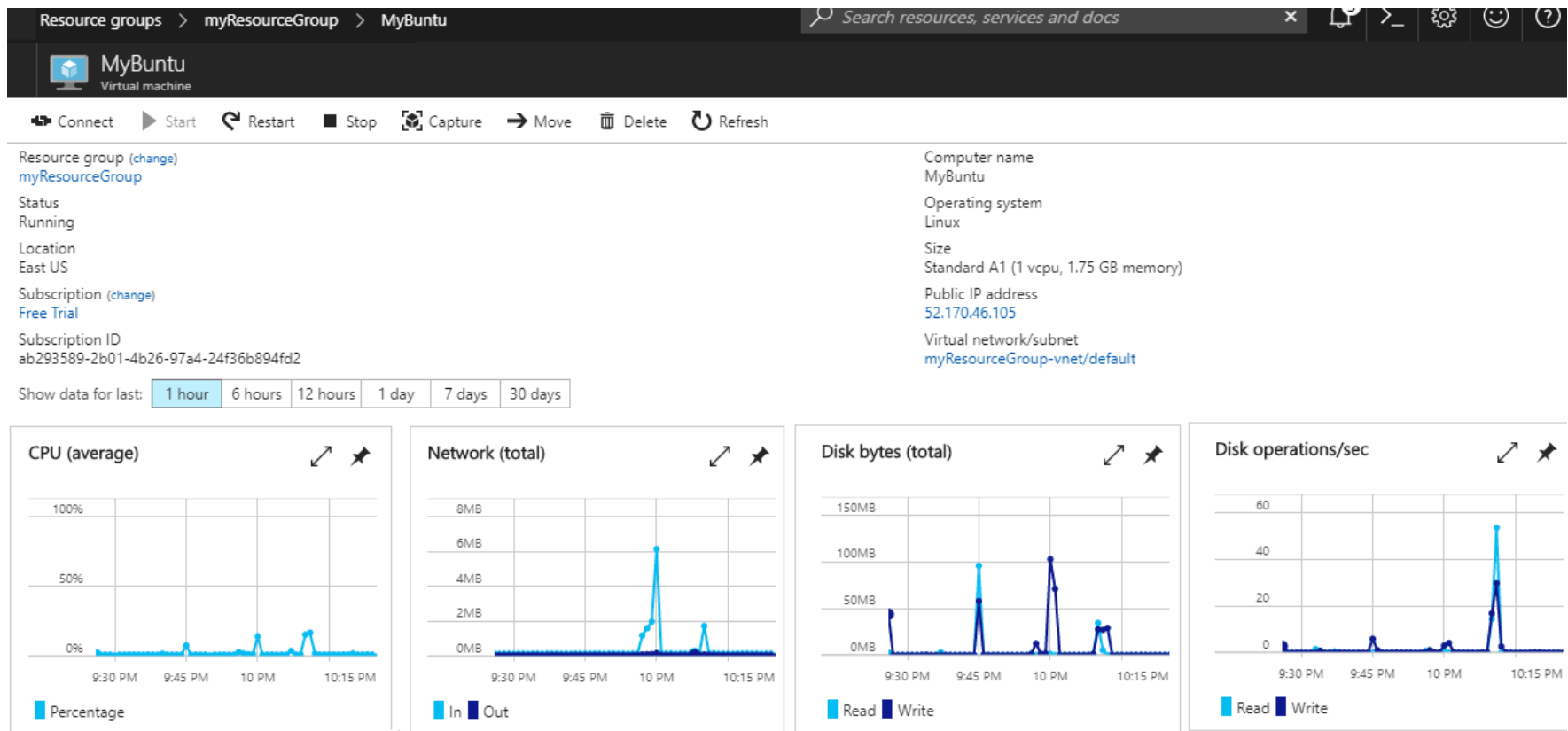
Visit your Machine on the Web

- With Apache installed, and port 80 open to your VM, the webserver can now be accessed from the internet.
- Open a web browser, and enter the public IP address of the VM. The public IP address can be found on the VM properties in the Azure portal.



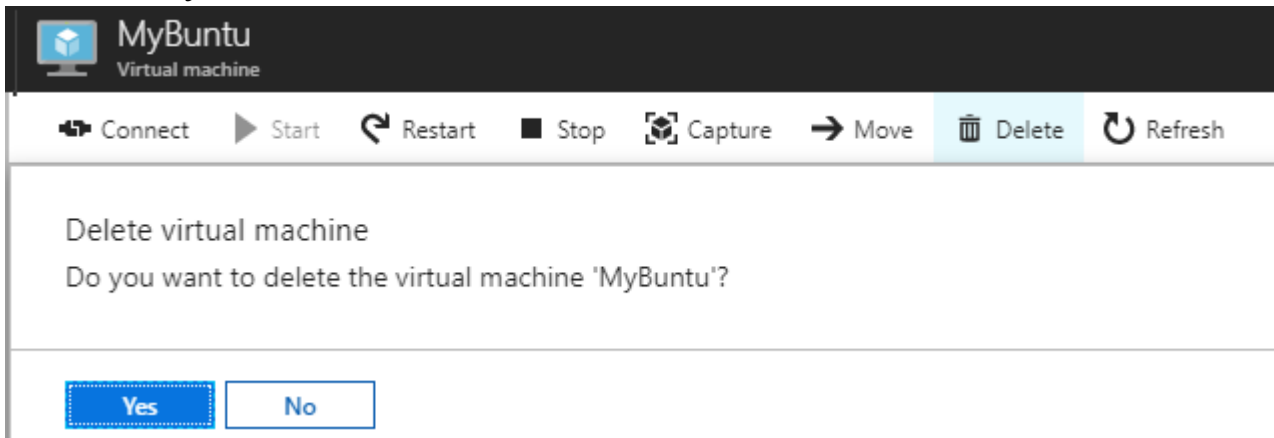
Go back to Portal

- Select Resource groups > myResourceGroup > MyBuntu
- And you will see information on recent behavior of your machine and all of its parameters:



Delete resources

- Resource that are not needed should be removed.
- Select your VM and then Delete:



- Select your Resource group and Delete

