How to Cloud: Cloud Concepts, Virtualization, and Creating a Virtual Machine using the Azure Portal

for the MSU Cloud Fellowship

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Introduction

This is an abbreviate introduction to cloud, virtualization concepts, and the azure portal

The goal is to have enough conceptual background for a workshop session creating a Virtual Machine in Azure

You may have to install remote desktop software: which you do now or as we start the workshop

MacOS : install the Microsoft Remote Desktop Client, only available on the App Store:
https://apps.apple.com/app/microsoft-remote-desktop/id1295203466?mt=12

Linux users install http://xrdp.org/

Windows Users ensure you have the client : In the search box on the taskbar, type Remote Desktop Connection, and then select Remote Desktop Connection.

Review: what is cloud computing?

NIST Definition https://csrc.nist.gov/publications/detail/sp/800-145/final

On-demand self-service : *computing resources can be created from software*

Broad network access

Resource pooling

Rapid elasticity

Measured service : *fee-for-service model, because it is metered*

Important Terms for Today

Resource = "entity you can interact with" = something you can order, and change. For example, at a restaurant you can't order a new table, that's part of the environment and can't be changed, but you could ask for a new fork if yours is dirty.

Interface = the means by which interact with resources There are multiple ways to put in your cloud order, and we'll use the Web Interface today

Virtualization = described below

Background: how does this all actually work?

The fact that " resources" can be created automatically with software is the key:

- phone systems used to be manually switched but change to electronic and now digital switching
- in 90s computer networks used to be all wires. *creating a secure route -> new router and wires.*
- Now we use software defined networks *programmable network-> "virtual" routes on-demand*

This all can work because 'virtualized' hardware can be created and controlled with software

Add user accounts, metering, and a billing system and you can start charging for usage

Metered, Pay-per-use computing system

What is a Virtual Machine? (VM)

Like a network can be made "virtual" an entire computer hardware system can be created with software, so that when you install an operating system (windows, Linux), the operating system thinks it's inside an actual computer.

You can do this on your own laptop with software from https://www.virtualbox.org/

The implementation is not important. (Hypervisor, etc)

The importance is that you can create new virtual "computers" at any time using software

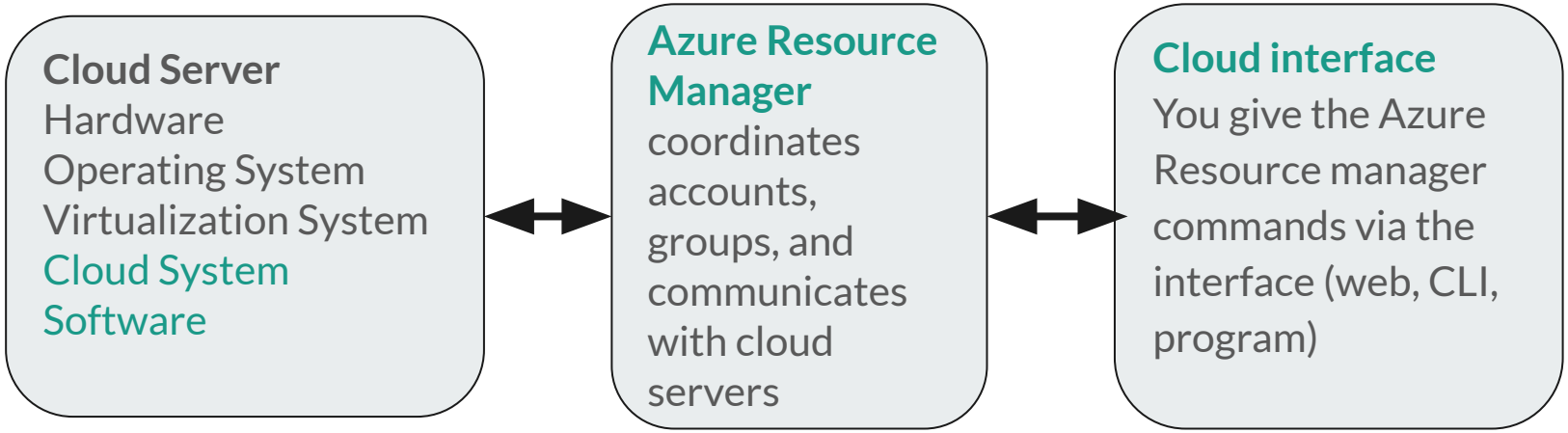
The "disk" of the virtual machine is just another (very large) file so when the virtual computer saves data, it's saved inside the virtual disk, and you can re-use the disk and restart the "virtual computer"

windows 10 VM guest on a MacOS host: computer in a box

Components of a VM

- **VM Management Software**
- **CPU** = the virtual computer itself
- **Memory** = a portion of the host computer's memory.
- **Disk** The operating system and software installed on this disk (the "OS Disk")
- **Network Interface** a virtual network card,e.g. a wifi on your laptop,
- **Virtual Network** to connect it to the rest of the world and to secure it
- **Operating System and Software** pre-installed and/or after creation

Diagram of a Cloud System



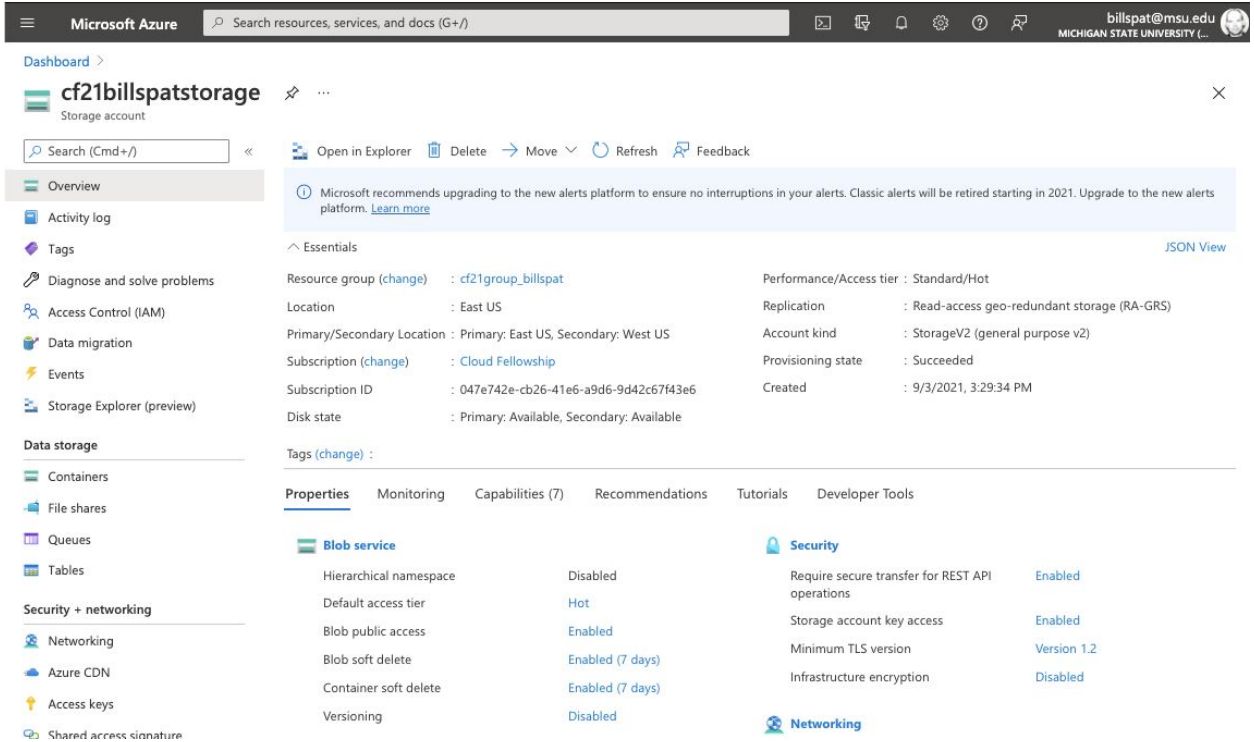
Over Simplified Control Flow

The "Cloud System Software" is what makes this all work.
The key is that virtualized hardware resources can be created and managed completely with software

What is a Cloud Resource?

Resource configuration example using Azure Portal and Cloud Storage

[Live Example]



Components of a Cloud VM

- **Cloud Service Software**
- **VM Management Software**
- **CPU** = the virtual computer itself
- **Memory** = a portion of the host computer's memory.
- **Disk** The operating system and software installed on this disk (the "OS Disk")
- **Network Interface** a virtual network card,e.g. a wifi on your laptop,
- **Address** a means to find the computer in the network
- **Virtual Network** to connect it to the rest of the world and to secure it
- **A data disk** : an optional second virtual disk to just store data
- **Operating System and Software** pre-installed and/or after creation

Which of these things would be "resources" in Azure?
(an entity you can work with)

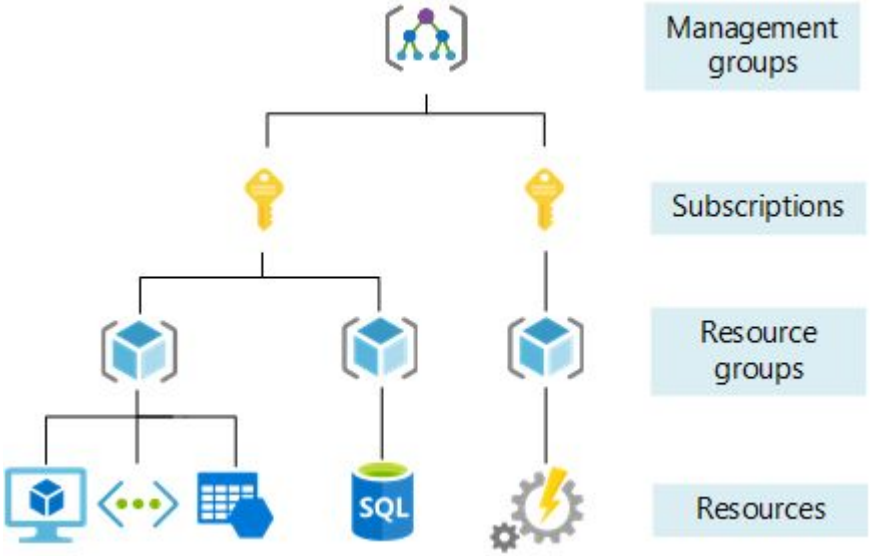
Azure Management Organization

Cloud Fellowship document:

https://msucloudfellowship.github.io/session_how_to_cloud/azure_organization/

Azure Documentation:

Organize your Cloud Resources



Using The Azure Portal to create resources

Review/Discussion

- walk-through from last session
- Tutorial and video on the website

https://msucloudfellowship.github.io/session_how_to_cloud/azure_portal_walkthrough

Hands-on Exercise : Creating a VM with the Azure Portal

Start by logging into the Azure Portal if you haven't already : https://portal.azure.com

Orient by finding your "resource group"

- use the top menu and select the resource groups option
- At this point unless you've experimented you have one item in your group
- this is where new resources will show up when you create them

Note about using cloud: please feel free to experiment because you always delete resources you've created that you don't need or like and the cost to have them created for a few minutes is minimal

Follow along during the workshop.