

TCSS 562: SOFTWARE ENGINEERING FOR CLOUD COMPUTING

AWS Demo

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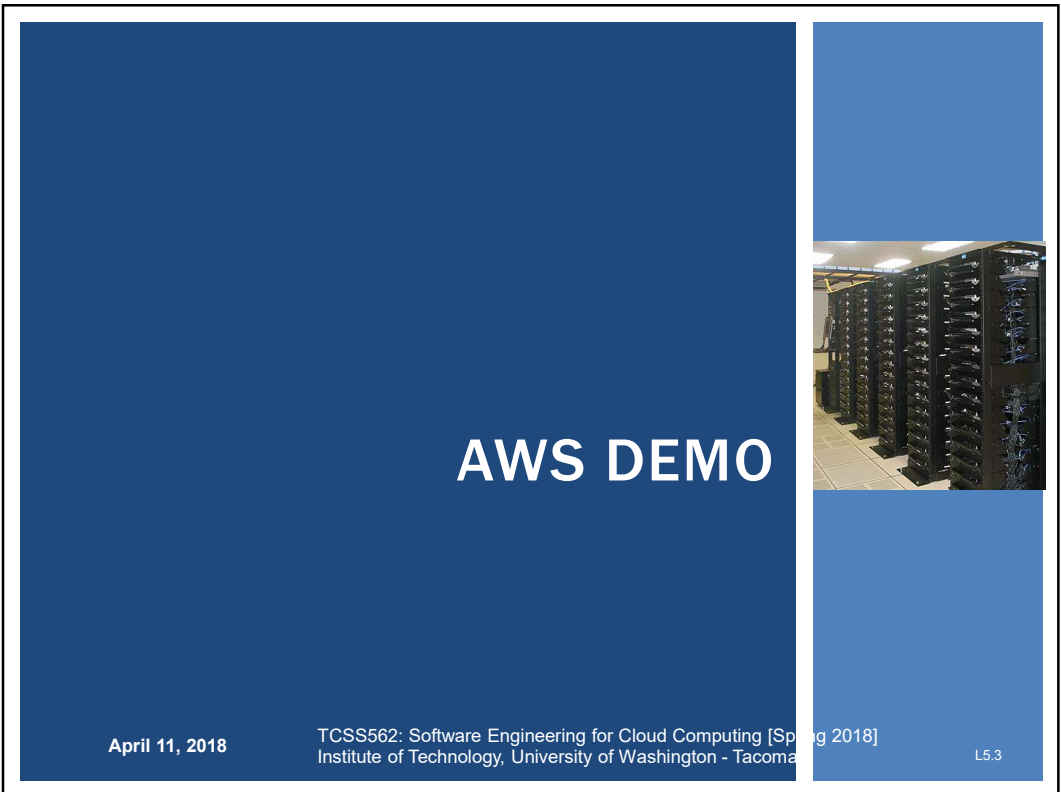
OBJECTIVES

- Term project questions
- Tutorials #1: Submit to PDF Canvas
 - Teams up to 2
- AWS Demo
- Cloud Enabling Technology (Ch. 5 Erl book)
- Online lectures to be posted, week of 4/16

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L5.2



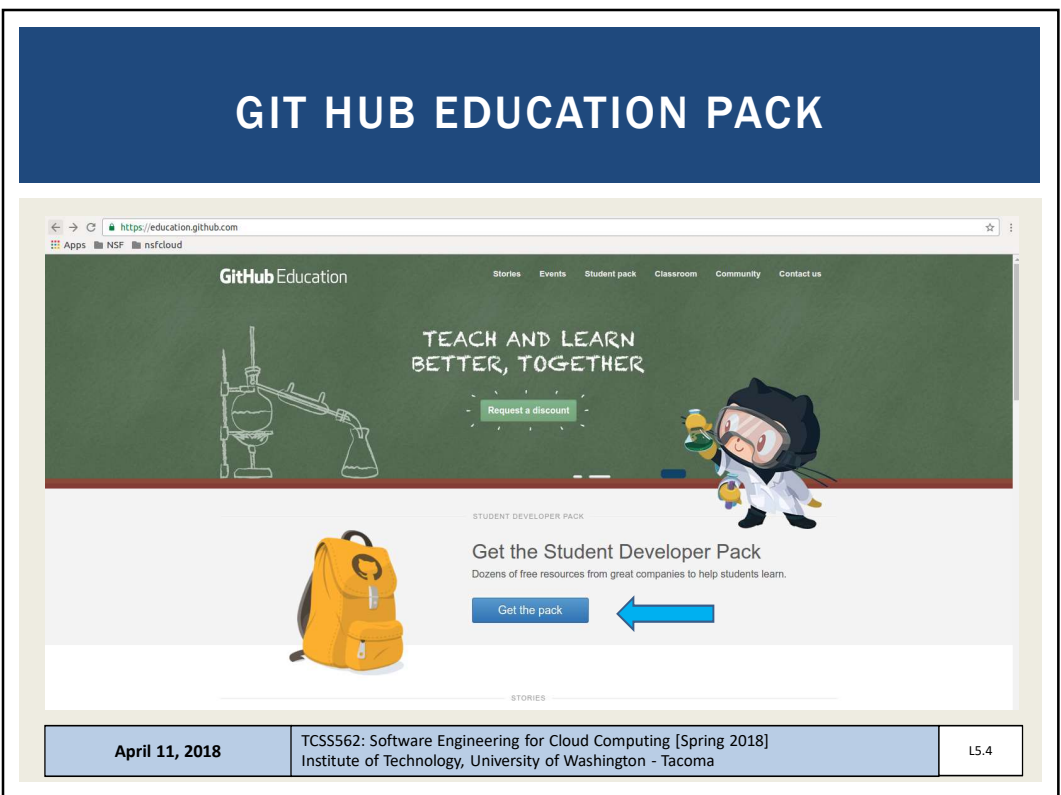
AWS DEMO

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L5.3

The slide features a dark blue background with the text 'AWS DEMO' in white. On the right side, there is a vertical image of server racks in a data center. At the bottom, there is a footer with the date 'April 11, 2018', the course name 'TCSS562: Software Engineering for Cloud Computing [Spring 2018]', the institution 'Institute of Technology, University of Washington - Tacoma', and the slide number 'L5.3'.



GIT HUB EDUCATION PACK

TEACH AND LEARN BETTER, TOGETHER

Request a discount

STUDENT DEVELOPER PACK

Get the Student Developer Pack

Dozens of free resources from great companies to help students learn.

Get the pack

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The slide shows a screenshot of the GitHub Education website. The header is dark blue with the text 'GIT HUB EDUCATION PACK'. Below that, the website content is displayed, featuring a green chalkboard background with the text 'TEACH AND LEARN BETTER, TOGETHER'. There is a 'Request a discount' button, a cartoon character in a white lab coat, and a yellow backpack. A 'Get the pack' button is highlighted with a blue arrow. At the bottom, there is a footer with the date 'April 11, 2018', the course name 'TCSS562: Software Engineering for Cloud Computing [Spring 2018]', the institution 'Institute of Technology, University of Washington - Tacoma', and the slide number 'L5.4'.


AWS EDUCATE

- All TCCS 562 students should register using new link
- Each student that sign-up grows our collective pool of shared credits...
- Link in CANVAS announcement:
- <https://www.awseducate.com/Registration?apptype=student&courseview=true#INFO-Student>
- On the second screen, please enter your existing AWS account ID...
- DO NOT Select the option for a starter account.
- For TCCS 562 assignments, can select whether to use your personal AWS account, or the IAM account for various activities throughout the quarter.

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AWS CREDITS

- Up to \$150, good for ~ 2 years
- Coupon code should arrive in email



----- Forwarded message -----
From: AWS Educate Support <support@awseducate.com>
Date: Sun, Feb 26, 2017 at 8:14 PM
Subject: AWS Educate Application Approved
To: [REDACTED]

Dear [REDACTED],

Congratulations!

Your AWS Educate application has been approved. As a member of the AWS Educate program, you will gain access to the benefits listed below:

AWS Educate Student Portal
The AWS Educate Student Portal is the hub for AWS Educate students around the world to find AWS content to help with classwork, connect to self-paced labs and training resources.

[Click here](#) to set your password / login to the AWS Educate Student Portal. After logging in, click AWS Account at the top of the page to access AWS services, whether you entered an AWS ID or selected Starter Account on your application.

Bookmark the AWS Educate Student Portal for easy access, or [click here](#) to sign in directly.

You can access a video walk-through of the AWS Educate Student portal [here](#).

AWS Promotional Credit
It's our pleasure to issue you an Amazon Web Services (AWS) promotional credit code in the amount listed below.

Credit Amount (US): \$150.00
Credit Code: [REDACTED]

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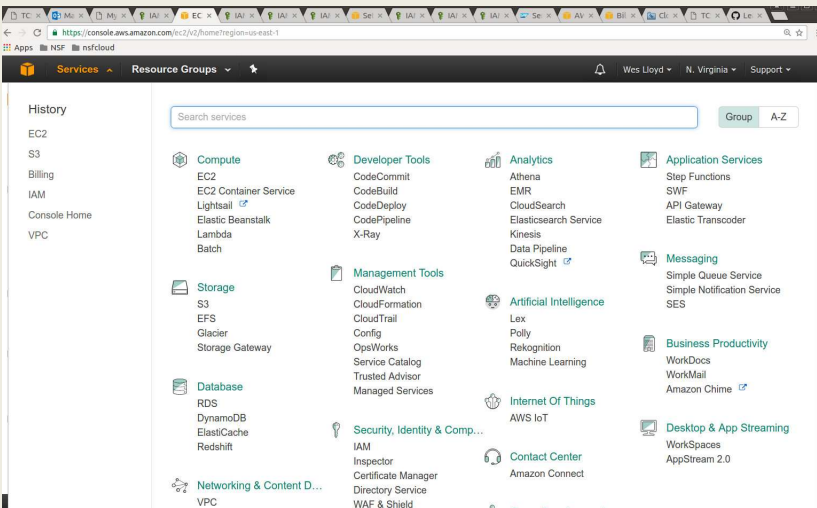
CLOUD 101 WORKSHOP

- **Course outline:**
 - eScience center @ UW Seattle
 - 1-day cloud workshop
 - AWS, Azure, Google Cloud
 - Deploying a Python DJANGO web application
 - Tutorials available

- https://cloudmaven.github.io/documentation/rc_cloud101_immersion.html

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AWS MANAGEMENT CONSOLE



The screenshot shows the AWS Management Console interface. On the left is a navigation menu with categories like History, EC2, S3, Billing, IAM, Console Home, and VPC. The main area displays a grid of service icons and names, including Compute (EC2, EC2 Container Service, Lightsail, Elastic Beanstalk, Lambda, Batch), Storage (S3, EFS, Glacier, Storage Gateway), Database (RDS, DynamoDB, ElastiCache, Redshift), and many others. A search bar is at the top of the main area.

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AWS EC2

- Elastic Compute Cloud
- Instance types
 - On demand instance – full price
 - Reserved instance – contract based
 - Spot instance – auction based, terminates with 2 minute warning
 - Dedicated/reserved host – reserved HW
 - Reserved host
 - Instance families:
General, compute-optimized, memory-optimized, GPU, etc.
- Storage types
 - Instance storage - ephemeral storage
 - Elastic block store
 - Elastic file system

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INSTANCE STORAGE

- Also called ephemeral storage
- Persisted using images saved to S3 (simple storage service)
 - ~2.3¢ per GB/month on S3
 - 5GB of free tier storage space on S3
- Requires “burning” an image
- Multi-step process:
 - Create image files
 - Upload chunks to S3
 - Register image
- Launching a VM
 - Requires downloading image components from S3, reassembling them...
is potentially slow
- VMs with instance store backed root volumes not pause-able
- Historically root volume limited to 10-GB max- **faster imaging...**

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ELASTIC BLOCK STORE

- EBS cost model is different than instance storage (uses S3)
 - ~10¢ per GB/month
 - 30GB of free tier storage space
- EBS provides “live” mountable volumes
 - Listed under volumes
 - **Data volumes:** can be mounted/unmounted to any VM, dynamically at any time
 - **Root volumes:** hosts OS files and acts as a boot device for VM
 - In Linux drives are linked to a mount point “directory”
- Snapshots back up EBS volume data to S3
 - Enables replication (required for horizontal scaling)
 - EBS volumes not actively used should be snapshotted, and deleted to save EBS costs...

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EBS VOLUME TYPES - 2

- Metric: I/O Operations per Second (IOPS)
- General Purpose 2 (GP2)
 - 3 IOPS per GB, Max 10,000 IOPS, 160MB/sec per volume
- Provisioned IOPS (IO1)
 - 32,000 IOPS, and 500 MB/sec throughput per volume
- Throughput Optimized HDD (ST1)
 - Up to 500 MB/sec throughput
 - 4.5 ¢ per GB/month
- Cold HDD (SC1)
 - Up to 250 MB/sec throughput
 - 2.5 ¢ per GB/month
- Magnetic
 - Up to 800 MB/sec throughput
 - 5 ¢ per GB/month

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ELASTIC FILE SYSTEM

- Network file system (NFSv4 protocol) for EC2 instances
- Hosted by EC2 instances
- ~ 30 ¢ per GB/month
- Enables mounting (sharing) the same disk “volume” for R/W access across multiple instances at the same time
- Different performance behavior and limitations

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AMAZON MACHINE IMAGES

- AMIs
- Unique for the operating system (root device image)
- Two types
 - Instance store
 - Elastic block store (EBS)
- Deleting requires multiple steps
 - Deregister AMI
 - Delete associated data - (*files in S3*)
- Forgetting both steps leads to costly “orphaned” data
 - No way to instantiate a VM from deregistered AMIs
 - Data still in S3 resulting in charges

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EC2 VIRTUALIZATION - PARAVIRTUAL

- 1st, 2nd, 3rd, 4th generation → XEN-based
- 5th generation instances → KVM (full virtualization)

- XEN - two virtualization modes
- XEN Paravirtualization “paravirtual”
 - 2008-2012: required because of poor performance of HVM mode
 - I/O performed in kernel mode for better performance
 - Requires special OS paravirtual kernel
 - Notice use of common **AKI** files on AWS – *Amazon kernel image(s)*

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EC2 VIRTUALIZATION - HVM

- XEN HVM mode
 - Full virtualization – no special OS kernel required
 - Computer entirely simulated
 - MS Windows runs in “hvm” mode
 - Allows work around: 10GB instance store root volume limit
 - Kernel is on the root volume
 - No AKIs (kernel images)
 - Commonly used today (*EBS-backed instances*)

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INSTANCE ACTIONS

- Stop
 - Costs of “pausing” an instance
- Terminate
- Reboot

- Image management
- Creating an image
 - EBS (snapshot)
- Bundle image
 - Instance-store

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EC2 INSTANCE: NETWORK ACCESS

- Public IP address
- Elastic IPs
 - Costs: in-use FREE, not in-use ~12 ¢/day
 - Not in-use (e.g. “paused” EBS-backed instances)
- Security groups
 - E.g. firewall
- Identity access management (IAM)
 - AWS accounts, groups
- VPC / Subnet / Internet Gateway / Router
- NAT-Gateway

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SIMPLE STORAGE SERVICE (S3)

- Key-value blob storage
- What is the difference vs. key-value stores (NoSQL DB)?
- Can mount an S3 bucket as a volume in Linux
 - Supports common file-system operations
- Eventual consistency

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AWS CLI

- Launch Ubuntu 16.04 VM
 - Instances | Launch Instance
- Install the general AWS CLI
 - `sudo apt install awscli`
- Create config file
[default]
`aws_access_key_id = <access key id>`
`aws_secret_access_key = <secret access key>`
`region = us-east-1`

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AWS CLI - 2

- **Creating access keys:** IAM | Users | Security Credentials | Access Keys | Create Access Keys

Access key ID	Created	Last used	Status
AKIAJTZVNGFP6PP6MZYQ	2017-04-02 22:56 PDT	2017-04-04 00:13 PDT with ec2 in N/A	Active Make inactive ✕

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AWS CLI - 3

- **Export the config file**
 - Add to `/home/ubuntu/.bashrc`

```
export AWS_CONFIG_FILE=$HOME/.aws/config
```
- **Try some commands:**
 - `aws help`
 - `aws command help`
 - `aws ec2 help`
 - `aws ec2 describes-instances --output text`
 - `aws ec2 describe-instances --output json`
 - `aws s3 ls`
 - `aws s3 ls vmscaleruw`

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QUESTIONS

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