

TCSS 462/562: (SOFTWARE ENGINEERING FOR) CLOUD COMPUTING

Team 2 Presentation

Wes J. Lloyd
 School of Engineering and Technology
 University of Washington – Tacoma



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OFFICE HOURS – FALL 2024

- THIS WEEK**
- Tuesday:**
 - 2:30 to 3:30 pm - CP 229
- Friday:**
 - 1:00 to 2:00 pm - Zoom

> Office Hours set based on Student Demographics survey feedback

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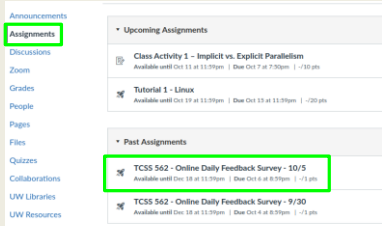
OBJECTIVES – 12/3

- Questions from 11/26**
- Tutorials Questions
- Class Presentations Schedule - Cloud Technology or Research Paper Review
- Tutorial 8: AWS Step Functions, AWS SQS
- Term Project Report / Presentation

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ONLINE DAILY FEEDBACK SURVEY

- Daily Feedback Quiz in Canvas – Take After Each Class
- Extra Credit for completing



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TCSS 562 - Online Daily Feedback Survey - 10/5
 Started: Oct 7 at 1:13am

Quiz Instructions

Question 1 (0.5 pts)
 On a scale of 1 to 10, please classify your perspective on material covered in today's class:

1 2 3 4 5 6 7 8 9 10
 Mostly Review To Me Equal New and Review Mostly New To Me

Question 2 (0.5 pts)
 Please rate the pace of today's class:

1 2 3 4 5 6 7 8 9 10
 Slow Just Right Fast

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MATERIAL / PACE

- Please classify your perspective on material covered in today's class (**41** respondents):
 - 1-mostly review, 5-equal new/review, 10-mostly new
 - Average – 5.66** (↓ - previous 6.61)
- Please rate the pace of today's class:
 - 1-slow, 5-just right, 10-fast
 - Average – 5.15** (↓ - previous 5.23)
- Response rates:**
 - TCSS 462: 27/41 – 65.9%
 - TCSS 562: 14/20 – 70.0%

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FEEDBACK FROM 11/26

- I am a bit confused on containers sharing kernels and isolation. On the "What is a container?" slide, that shows Operating System containerization and Application containerization both are described as sharing a kernel
- How would the isolation be different between the two if that is the case?
- Both operating system containerization and application containerization sharing an underlying OS kernel
- OS containers are will generally run more processes, all the processes of a full OS instance
- In multi-tenant scenarios running many OS containers may lead to greater resource contention than Application containers because they require more resources
 - Application containers are stripped down to only run processes specific to the application – OS-level processes are not duplicated

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AWS CLOUD CREDITS UPDATE

- AWS CLOUD CREDITS ARE NOW AVAILABLE FOR TCSS 462/562
- Credit codes must be securely exchanged
- Request codes by sending an email with the subject "AWS CREDIT REQUEST" to wllloyd@uw.edu
- Codes can also be obtained in person (or zoom), in the class, during the breaks, after class, during office hours, by appt
 - 58 credit requests fulfilled as of Nov 25 @ 11:59p
- Codes not provided using discord


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Don't Forget to Terminate (Shutdown) all EC2 Instances for Tutorials 3 & 7

Tutorial 3 spot instance: c5d.large instance @ ~3.2 cents / hour

\$0.78 / day
\$5.48 / week
\$23.78 / month
\$285.42 / year

AWS CREDITS → → → → → → → → 

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TUTORIAL SUBMISSION TIME

- Tutorials can now be submitted on the due date until the very last minute of the day **Anywhere-on-Earth (AOE)**
 - Equivalent to 4:59 AM Pacific Standard Time (PST)
- Anywhere-on-Earth timezone: **Baker Island, Pacific Ocean**
- <https://www.timeanddate.com/time/zones/aoe>
- Uninhabited island in Pacific Ocean
- Coordinates 0° 11' 45" N 176° 28' 45" W
- Area 2.1 km² (0.81 sq mi)
- Length 1.81 km (1.125 mi)
- Width 1.13 km (0.702 mi)
- Coastline 4.8 km (2.98 mi)
- Highest elevation 8 m (26 ft)
- Population 0 (2000)



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TUTORIAL 6 – NOV 29 AOE

- Introduction to Lambda III: Serverless Databases
- https://faculty.washington.edu/wllloyd/courses/tcss562/tutorials/TCSS462_562_f2024_tutorial_6.pdf
- Create and use Sqlite databases using sqlite3 tool
- Deploy Lambda function with Sqlite3 database under /tmp
- Compare in-memory vs. file-based Sqlite DBs on Lambda
- Create an Amazon Aurora "Serverless" v2 MySQL database
- Using an ec2 instance in the same VPC (Region + availability zone) connect and interact with the database using the mysql CLI app
- Deploy an AWS Lambda function that uses the MySQL "serverless" database

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TUTORIAL 7 - DEC 1 AOE

- Introduction to Docker
- https://faculty.washington.edu/wlloyd/courses/tcss562/tutorials/TCSS462_562_f2023_tutorial_7.pdf
- Complete tutorial using Ubuntu 22.04 (for cgroups v2)
- Complete using **c5.large ec2 Instance** (for consistency)
- Use **DOCX** file for copying and pasting Docker install commands
- Topics:
 - Installing Docker
 - Creating a container using a Dockerfile
 - Using cgroups virtual filesystem to monitor CPU utilization of a container
 - Persisting container images to Docker Hub image repository
 - Container vertical scaling of CPU/memory resources
 - Testing container CPU and memory isolation

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GROUP PRESENTATIONS

- TWO OPTIONS:**
- Cloud technology presentation**
- Cloud research paper presentation**
 - Recent & suggested papers will be posted at: <http://faculty.washington.edu/wlloyd/courses/tcss562/papers/>
- Presentation dates:**
 - Tuesday November 28, Tuesday November 30
 - Tuesday December 5, Thursday December 7
- Peer Reviews**
 - Word DOCX form will be provided, fill out, submit PDF on Canvas
 - Feedback shared with groups
 - TCSS 462: 1 review/day required, additional are extra credit
 - TCSS 562: same as 462, but no peer review req'd on day of your talk

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GROUP PRESENTATIONS

- 10 Presentation Teams
- 3 Cloud Technology Talks
- 7 Cloud Research Paper Presentations
- 3 one-person teams
- 4 two-person teams
- 3 three-person teams
- Thank you for the submissions

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PRESENTATION SCHEDULE

- <Tuesday November 26>**
 - Team 3:** Soumith Kondubhotla, Siva Srinivasa Aditya, Sri Mylavarapu
Research paper: **Sandboxing Functions for Efficient and Secure Multi-tenant Serverless Deployments**
 - Team 7:** Mingzhi Ma, Derry Cheng, Aaron Chen
Research paper: **Serverless? RISC more!**
 - Team 5:** Ishwarya Narayana Subramanian, Thanvi Yadav Sirla
Cloud Technology: **MlnIKube**
 - Team 12:** Steven Golob
Research paper: **Tiny Autoscalers for Tiny Workloads: Dynamic CPU Allocation for Serverless Functions**
- <Tuesday December 3>**
 - Team 2:** Andrew Nguyen, Pavel Braginskiy
Cloud Technology: **AWS Amplify**

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PRESENTATION SCHEDULE - 2

- <Thursday December 5>**
 - Team 4:** Viktoria Dolojan and Carla Peterson
Research paper: **FootPrinter: Quantifying Data Center Carbon Footprint**
 - Team 10:** Andrew Jang, Shrey Srivastava, Naga
Cloud Technology: **SageMaker: training configurations**
 - Team 11:** Roark Zhang
Research paper: **Process-as-a-Service: Unifying Elastic and Stateful Clouds with Serverless Processes**
 - Team 14:** Sanya Sinha, Jackson Davis
Research paper: **Goldfish: Serverless Actors with Short-Term Memory State for the Edge-Cloud Continuum**
 - Team 15:** Jackson Goldberg
Research paper: **Harmonizing Efficiency and Practicability: Optimizing Resource Utilization in Serverless Computing with Jiagu**

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TUTORIAL 8 - DEC 12 (FIRM)

- Introduction to AWS Step Functions and Amazon Simple Queue Service (SQS)
- Not Required, available for extra credit
 - adds points to overall tutorials score
- https://faculty.washington.edu/wlloyd/courses/tcss562/tutorials/TCSS462_562_f2024_tutorial_8.pdf
- Tasks
 - Adapt Caesar Cipher Lambda functions for use with AWS Step Functions
 - Create AWS Step Functions State Machine
 - Create a BASH client to invoke the AWS Step Function
 - Create Simple Queue Service Queue for messages
 - Add message to SQS queue from AWS Lambda function
 - Modify AWS Step Function Bash client script to retrieve AWS Step Function result from SQS queue

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TERM PROJECT PAPER / PRESENTATION

- **EXTRA CREDIT FOR EARLY SUBMISSION:**
- By 2pm Wednesday December 11: +5 % points
- By 2pm Thursday December 12: +3 % points
- By 2pm Friday December 13: +1 % points
- Submissions close Saturday December 14 @ 4:59 AM
 - No submissions after this time - can not grade project for Fall 2024
- TCSS 462 ONLY Teams can submit a presentation video, instead of a term project paper
- TCSS 562 and mixed teams submit term project paper

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TERM PROJECT PEER REVIEWS

- **Worth 12% of the overall term project grade (4.2% of course grade)**
- Provide anonymous feedback on team members
- Based on Dr. Josh Tenenbergs' team member evaluation originally designed for TCSS 360
- Every team member must submit for team to receive a term project grade
- Must be submitted on-time
- Must be submitted early for term project extra credit
- Extra credit applied for entire team or no one

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QUESTIONS



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