IT 610 Systems Administration

Instructor Ryan Tolboom
Email Ryan.Tolboom@njit.edu
Office 3500 Guttenberg Information Technologies Center (GITC)
Office Hours 4:00PM to 5:30PM on Tuesdays or via Zoom (email to schedule)

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Objective

This course is a hands-on project intensive exploration of the advanced topics in systems administration. In addition to learning core competencies administering a Linux environment, students will also learn about the best practices for supporting a system or multi-server system in a containerized environment. Students will work on a single container image for the midterm project and a multi-container system for the final project.

Grading

- 20% Exercises
- 20% Midterm Exam
- 20% Midterm Project
- 20% Final Exam
- 20% Final Project

Course Materials

- Docker Desktop
- git
- A GitHub account

Additional Resources

The following web pages will be very helpful while working on projects:

- Canvas - be sure your credentials are up to date
- Docker Hub - most images have excellent documentation

Project Guidelines

Each project will be given a set of common deliverables that all student projects must meet for credit. Individual project deliverables will be settled upon after submission of the project proposal. The midterm project will be a basic, single instance deployment. The final project will utilize multiple containers and an orchestration framework.

Learning Outcomes

1. Linux

1.1 Access a shell prompt and issue commands with correct syntax. Weeks 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15.
1.2 Access remote systems using SSH. Weeks 2, 8, 9, 14 and 15.
1.3 Archive, compress, unpack, and uncompress files using tar, gzip, and bzip2. Weeks 7, 8 and 15.
1.4 Create and edit text files. Weeks 4, 8 and 15.
1.5 Create, delete, copy, and move files and directories. Weeks 1, 2, 3, 4, 5, 8 and 15.
1.6 Add users, reset passwords, modify user groups, and delete users. Weeks 3, 8 and 15.
1.7 Basic git operations. Weeks 1, 8 and 15.
1.8 List, set, and change file permissions. Weeks 2, 3, 5, 8 and 15.
1.9 Utilize a package management system. Weeks 4, 8 and 15.
1.10 Create a package. Weeks 4, 8 and 15.

2. Containers

2.1 Configure container engines, create, and manage containers. Weeks 1, 6, 7, 8, 9, 10, 11, 12, 13 and 15.
2.2 Create a container image. Weeks 6, 7, 8, 13 and 15.
2.3 Build a container image. Weeks 1, 6, 7, 8, 13 and 15.
2.4 Create and backup container volumes. Weeks 6, 7, 8, 13 and 15.
2.5 Deploy a database in a container. Weeks 7, 8, 10, 11, 12 and 15.

3. Container Orchestration

3.1 Use a container orchestration system to run a multi-container environment. Weeks 9, 10, 11, 12, 13, 14 and 15.
3.2 Automate a deployment using popular automation tools. Weeks 8 and 15.
3.3 Design a custom deployment for a development environment. Weeks 10, 11 and 15.

Course Outline

Week	Topics	Learning Outcomes
1	• Introduction • UNIX Systems • Containers	1.1 Access a shell prompt and issue commands with correct syntax 1.5 Create, delete, copy, and move files and directories 1.7 Basic git operations 2.1 Configure container engines, create, and manage containers 2.3 Build a container image
2	• Best Practices • Linux Systems • Command Line Review • Project Specifications	1.1 Access a shell prompt and issue commands with correct syntax 1.2 Access remote systems using SSH 1.5 Create, delete, copy, and move files and directories 1.8 List, set, and change file permissions
3	• Permissions • Managing Users • Project Proposal Due	1.1 Access a shell prompt and issue commands with correct syntax 1.5 Create, delete, copy, and move files and directories 1.6 Add users, reset passwords, modify user groups, and delete users 1.8 List, set, and change file permissions
4	• Package Management	1.1 Access a shell prompt and issue commands with correct syntax 1.4 Create and edit text files

Week	Topics	Learning Outcomes
		1.5 Create, delete, copy, and move files and directories 1.9 Utilize a package management system 1.10 Create a package
5	• File Systems	1.1 Access a shell prompt and issue commands with correct syntax 1.5 Create, delete, copy, and move files and directories 1.8 List, set, and change file permissions
6	• Patterns of Virtualization	1.1 Access a shell prompt and issue commands with correct syntax 2.1 Configure container engines, create, and manage containers 2.2 Create a container image 2.3 Build a container image 2.4 Create and backup container volumes
7	• Backups • Disaster Recovery	1.1 Access a shell prompt and issue commands with correct syntax 1.3 Archive, compress, unpack, and uncompress files using tar, gzip, and bzip2 2.1 Configure container engines, create, and manage containers 2.2 Create a container image 2.3 Build a container image 2.4 Create and backup container volumes 2.5 Deploy a database in a container
8	• Midterm Exam • Midterm Project Due	1.1 Access a shell prompt and issue commands with correct syntax 1.2 Access remote systems using SSH 1.3 Archive, compress, unpack, and uncompress files using tar, gzip, and bzip2 1.4 Create and edit text files 1.5 Create, delete, copy, and move files and directories 1.6 Add users, reset passwords, modify user groups, and delete users 1.7 Basic git operations 1.8 List, set, and change file permissions 1.9 Utilize a package management system 1.10 Create a package 2.1 Configure container engines, create, and manage containers 2.2 Create a container image 2.3 Build a container image 2.4 Create and backup container volumes 2.5 Deploy a database in a container 3.2 Automate a deployment using popular automation tools
9	• Infrastructure as a Service	1.1 Access a shell prompt and issue commands with correct syntax 1.2 Access remote systems using SSH 2.1 Configure container engines, create, and manage containers

Week	Topics	Learning Outcomes
		3.1 Use a container orchestration system to run a multi-container environment
10	• Container Runtime Options	1.1 Access a shell prompt and issue commands with correct syntax 2.1 Configure container engines, create, and manage containers 2.5 Deploy a database in a container 3.1 Use a container orchestration system to run a multi-container environment 3.3 Design a custom deployment for a development environment
11	• Container Orchestration	1.1 Access a shell prompt and issue commands with correct syntax 2.1 Configure container engines, create, and manage containers 2.5 Deploy a database in a container 3.1 Use a container orchestration system to run a multi-container environment 3.3 Design a custom deployment for a development environment
12	• Load Balancing • High Availability	1.1 Access a shell prompt and issue commands with correct syntax 2.1 Configure container engines, create, and manage containers 2.5 Deploy a database in a container 3.1 Use a container orchestration system to run a multi-container environment
13	• Update Cycles • DevOps	1.1 Access a shell prompt and issue commands with correct syntax 2.1 Configure container engines, create, and manage containers 2.2 Create a container image 2.3 Build a container image 2.4 Create and backup container volumes 3.1 Use a container orchestration system to run a multi-container environment
14	• Kubernetes • Cloud Deployments	1.1 Access a shell prompt and issue commands with correct syntax 1.2 Access remote systems using SSH 3.1 Use a container orchestration system to run a multi-container environment
15	• Final Exam Review • Project Work Session	1.1 Access a shell prompt and issue commands with correct syntax 1.2 Access remote systems using SSH 1.3 Archive, compress, unpack, and uncompress files using tar, gzip, and bzip2 1.4 Create and edit text files 1.5 Create, delete, copy, and move files and directories 1.6 Add users, reset passwords, modify user groups, and delete users 1.7 Basic git operations 1.8 List, set, and change file permissions

Week	Topics	Learning Outcomes
		1.9 Utilize a package management system 1.10 Create a package 2.1 Configure container engines, create, and manage containers 2.2 Create a container image 2.3 Build a container image 2.4 Create and backup container volumes 2.5 Deploy a database in a container 3.1 Use a container orchestration system to run a multi-container environment 3.2 Automate a deployment using popular automation tools 3.3 Design a custom deployment for a development environment