

AWS Academy Introduction

Software Architecture

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Teacher Version

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1 Before Class

Prior to attending class, **select an open-source website** that you would be interested in deploying. In this guide, we will be deploying hextris [1], an online game similar to tetris. You may also deploy hextris, although, you can take the opportunity choose something which interests you. Note that deploying other websites is likely to be more involved than the example in the guide.

Potential ideas are:

- **Habitica:** <https://github.com/HabitRPG/habitica>
- **DailyNotes:** <https://github.com/m0ngr31/DailyNotes/>
- **kcal:** <https://github.com/kcal-app/kcal>

For the teacher

Discourage kcal unless they already have some understanding of docker.

Alternatively, browse through the impressive collection here:

<https://github.com/awesome-selfhosted/awesome-selfhosted>

2 This Week

This week our goal is to get acquainted with AWS Academy. Throughout the course we will use AWS Academy to learn how to deploy and manage infrastructure with AWS. Specifically, this week you need to:

- Enrol in
 1. AWS Academy Cloud Foundations [10906] course;
 2. AWS Academy Learner Lab - Foundation Services [10909] course; and
- Navigate the AWS Academy interface.
- Enter the AWS Console from an AWS Academy lab.
- Use the AWS Console to provision an EC2 instance with a simple web interface.

3 AWS Academy

AWS Academy is an educational platform to support teaching AWS services. In this course, we will be using it in two ways:

1. The Cloud Foundations course will be used as supplementary material to help cement your ability to use AWS. The use of Cloud Foundations is completely optional.
2. The Learner Lab provides access to an environment which will be used in these practicals to learn AWS.

4 Enrol in AWS Academy

1. Set up your AWS Academy account by responding to your email invitation and clicking **Get Started**. The email invitation will come from AWS Academy. Check your junk/spam folders.



2. Go to https://www.awsacademy.com/LMS_Login to login.
 - (a) Press **Student Login**.
 - (b) Use the email address that received the email invitation.



5 Exploring the Interface

Aside

We will just be looking at the learner lab today, please ask on the slack if you need help using the cloud foundations course.

The following steps will enter the learner lab:

1. Once you have enrolled in the course, you should see this course page (minus everything in pink):

AWS Academy Learner Lab - Foundation Services [10909]

View Course Stream
View Course Calendar
View Course Notifications

To Do
Nothing for now

AWS Academy Learner Lab - Foundation Services provides a long-running sandbox environment for ad hoc exploration of AWS services. Within this class, students will have access to a **restricted set of AWS services**. Not all AWS documentation walk-through or sample labs that operate in an AWS Production account will work in the sandbox environment. You will retain access to the AWS resources set up in this environment for the duration of this course. We limit your budget (\$100), so you should exercise caution to prevent charges that will deplete your budget too quickly. If you exceed your budget, you will lose access to your environment and lose all of your work.

Each session lasts for 4 hours by default, although you can extend a session to run longer by pressing the start button to reset your session timer. At the end of each session, any resources you created will persist. However, we automatically shut EC2 instances down. Other resources, such as RDS instances, keep running. Keep in mind that we do not stop some AWS features, so they can still incur charges between sessions. For example, an Elastic Load Balancer or a NAT. You may wish to delete those types of resources and recreate them as needed to test your work during a session. You will have access to this environment for the duration of the class they enrolled you in. When the class ends, your access to the learner lab will also end.

Educator / Teacher Only
If you are an educator using a Learner Lab in your course, see the **Resources** area of the AWS Academy Portal home page for the list of supported services for each Learner Lab class. This sandbox is for educator designed project work, lab exercises, or practice that is created and tested within Learner Lab.

Get Started

You are currently logged into Student View
Resetting the test student will clear all history for this student, allowing you to view the course as a brand new student.
Reset Student Leave Student View

2. Navigate to the **Modules** tab and select the link for “Learner Lab - Foundational Services”. You may also open and browse the “Learner Lab - Student Guide.pdf” link which covers some of the content of this guide.

AWS Academy Learner Lab - Foundation Services [10909] Modules

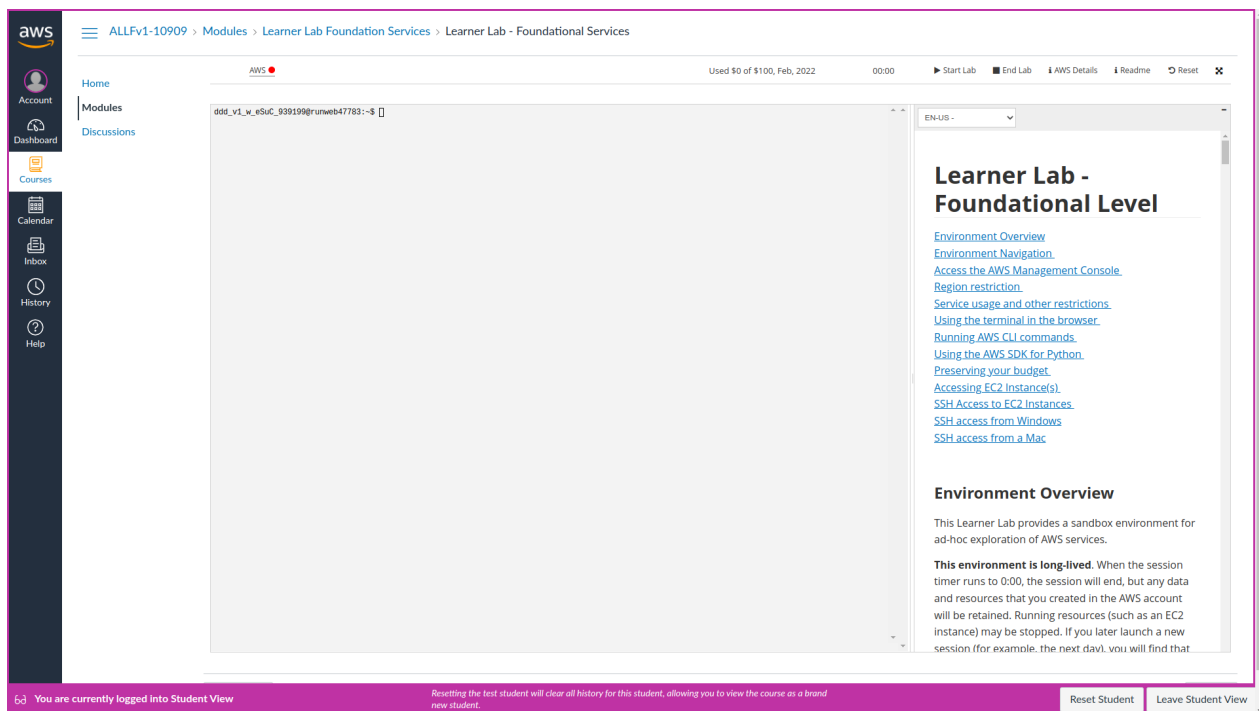
Collapse All

- Learner Lab Foundation Services
 - Learner Lab - Student Guide.pdf
 - Learner Lab - Foundational Services**
 - End of Course Feedback Survey

You are currently logged into Student View
Resetting the test student will clear all history for this student, allowing you to view the course as a brand new student.
Reset Student Leave Student View

3. Now we have entered the main part of the interface, the learner lab.
 - The AWS text with the currently red circle is the link to open the AWS console.
 - You also see your budget, note that the budget is not updated in real-time.
 - The 00:00 indicates how long your lab has been activated. A lab can only remain active for 6 hours, after which it will be closed, unless you press start lab again before the 6 hours expires.
 - AWS details will become important later but are not needed now.
 - The README button will re-open the text panel currently on the right of the terminal interface.

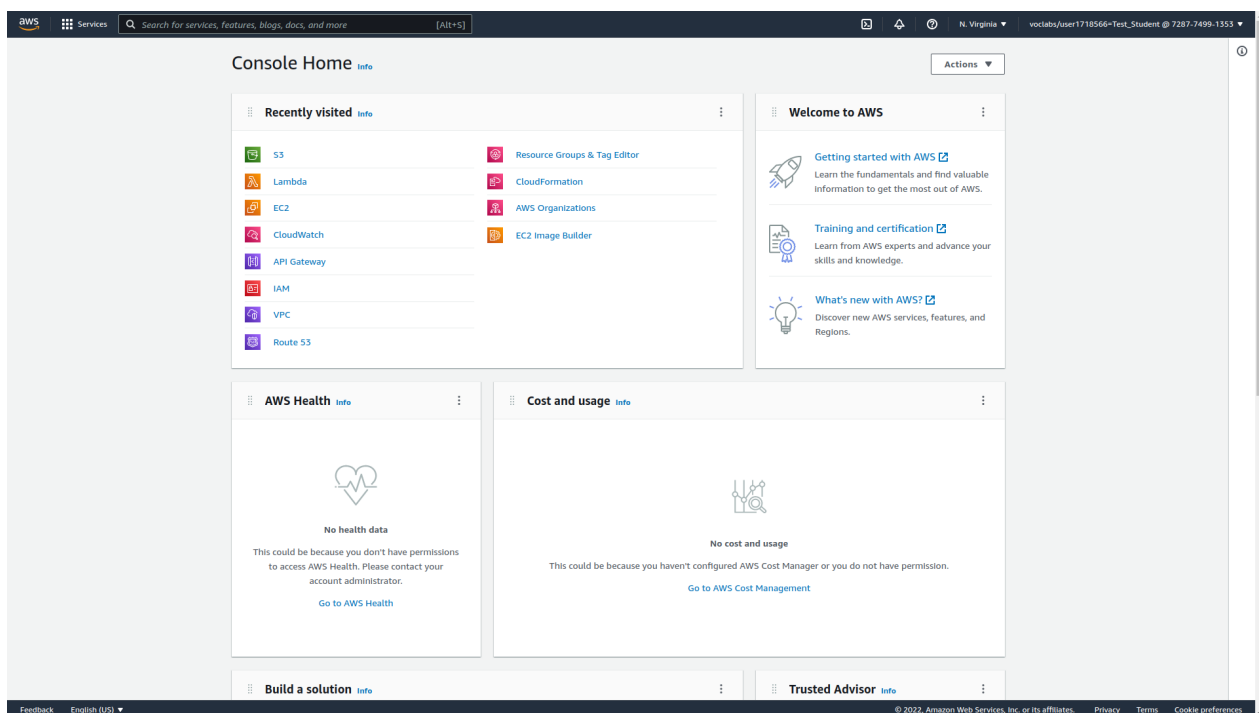
- The terminal interface is not yet important.
- The right-hand has a lot of important information including what AWS services are available in the learner labs environment, please read it.



4. Go ahead and start the lab. It will take a few moments to get ready and the red circle will turn green once it is. Click on the green circle when it is available. This will open the AWS Console in a new tab.¹ If you end up working in a company which uses AWS, welcome to your new home.

For the teacher

It can take much more than a few moments for some students.



¹Your view will be different as you will not yet have any recently visited services.

Aside

A short introduction to AWS: Amazon Web Services (AWS) is an Infrastructure as a Service (IaaS) and Software as a Service (SaaS) provider. They offer a collection of services which are helpful for development. For example, they offer virtual compute resources, database storage options, and networking to tie it all together. Services are offered with a pay as you go model, meaning you only pay for the seconds you use a service. We will get acquainted with some simple services offered by AWS now.

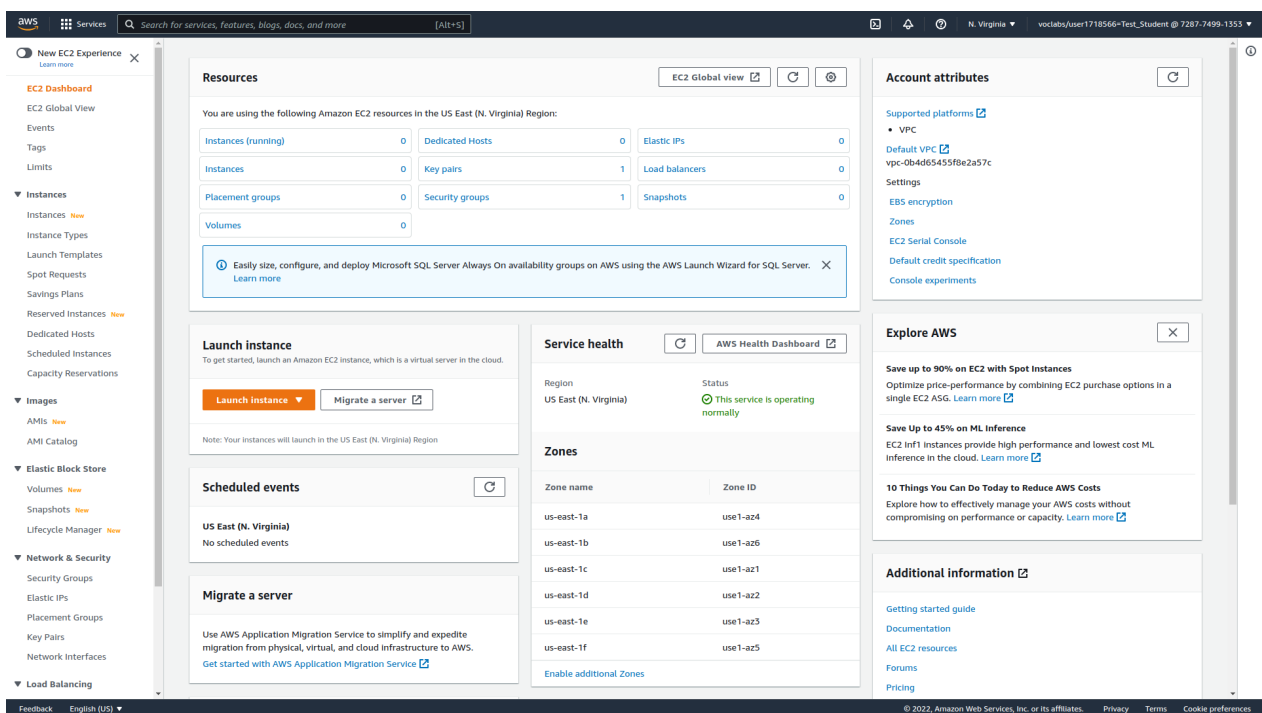
6 AWS EC2

Today we are going to focus on using AWS's EC2 service. Elastic Compute Cloud (EC2) is the primary compute service offered by AWS. It allows you to create a linux virtual machine on Amazon's infrastructure. You have full control over this machine and can configure it for whatever purpose you need.

Navigate to the search bar in the top left and find the EC2 service. You might find this interface overwhelming. It is important to note that since EC2 is one of the primary services offered by AWS, many smaller services we do not need are bundled into the service.

For the teacher

The foundation course has a module (6) that covers EC2 in more depth, feel free to direct students to it for after the hextris example.



Today, we will just need the `Instances` dashboard. Navigate to there and select “Launch instances”.

6.1 EC2 AMI

First we will need to select an Amazon Machine Image (AMI). An AMI is the template (cookie cutter) which provides instructions on how an instance should be provisioned. Amazon offers a range of built-in AMIs. There are also community AMIs or you can create your own. As we just want a simple server today, we will use one of the built-in AMIs.

Every AMI has a unique AMI code, something that looks like `ami-0a8b4cd432b1c3063`. We will use this AMI today², it is considered one of the fundamental images. Search for it via the code and select it.

For the teacher

This AMI is an instance of Amazon Linux 2 which is a RedHat style distro with yum as its package manager.

6.2 Instance Settings

The next few settings for configuring your instance are:

1. We do not need a large server, choose `t2.micro`.
2. Keep the 'Configure Instance' settings as default.
3. Keep the 'Add Storage' settings as default.
4. Add a 'Name' tag, call it the name of your website, e.g. `hextris`.
5. Choose 'Create a **new** security group'.
 - (a) Give it a meaningful name, e.g. `hextris-http-ssh-access`.
 - (b) Change the description to something meaningful, e.g. `Hextris HTTP and SSH access`.
 - (c) Add a rule, select the Type as HTTP.

For the teacher

To make the box pingable dont forget to add the All-ICMP4 with source anywhere.

6. When prompted to choose a key pair (after the clicking Launch button), select the existing `vockey` | RSA option.

7 Accessing the Instance

Return to the `Instances` dashboard. You should now see a new instance created, its instance state might not yet be `Running`, if not, wait.

²Check the requirements for your chosen website, if your website requires a specific operating system, look for it as a community AMI. Ask for help if you aren't sure.



Note the public IPv4 address, we will need to use this to connect to the server.

Notice

For terminal examples in this section, lines that begin with a \$ indicate a line which you should type while the other lines are example output that you should expect. Not all of the output is captured in the examples to save on space.

1. Return to the learner lab interface.
2. Run the following, replacing **127.0.0.1** with the public IP of your instance. This command uses the `vockey |` RSA key pair to gain SSH access to the machine.

```
1 $ ssh -i ~/.ssh/labsuser.pem ec2-user@127.0.0.1
```

example:

```
1 $ ssh -i ~/.ssh/labsuser.pem ec2-user@35.173.230.42
2 The authenticity of host '35.173.230.42 (35.173.230.42)' can not be established.
3 ECDSA key fingerprint is SHA256:W70zzZm6nhwM9tB9Kb7enONPryo1a4259hJmSAZX7HQ.
4 Are you sure you want to continue connecting (yes/no)?

6 # At this point you will want to type yes and press enter
7 Warning: Permanently added '35.173.230.42' (ECDSA) to the list of known hosts.
8 Connection to 35.173.230.42 closed by remote host.
9 Connection to 35.173.230.42 closed.
```

8 Installing Hextris

Hextris is very simple to install, using an EC2 interface is perhaps overkill for it. It is an entirely client-side application which means we just have to serve the static files.

First, we will need to enable the basic serving of static files. We can install and start the `httpd` service for this. The AMI we have picked uses the `yum` package manager, so to install `httpd` we run:

```
1  $ sudo yum install httpd
2  Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
3  Resolving Dependencies
4  .....
5  .....
6  Total download size: 1.9 M
7  Installed size: 5.2 M
8  Is this ok [y/d/N]:
10 # enter y to install
11 .....
12 .....
13 Complete!
14 $ sudo systemctl enable httpd
15 Created symlink from /etc/systemd/system/multi-user.target.wants/httpd.service to
   /usr/lib/systemd/system/httpd.service.
16 $ sudo systemctl start httpd
```

All files in the `/var/www/html` directory will now be served when accessed via HTTP. Change to this directory and notice that it is currently empty.

Next, we need to download the static files to the server. We can use `git` for this, but first `git` needs to be installed on the machine.

```
1  $ sudo yum install git
```

Finally, let's double check we are in the `/var/www/html` directory.

```
1  $ cd /var/www/html
```

For the teacher

This path will currently be owned by root, proper permissions can be done (but are not nesscary) by following https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/CHAP_Tutorials.WebServerDB.CreateWebServer.html

And clone the repository into that directory.


```
1 $ sudo git clone https://github.com/Hextris/hextris .
```

For the teacher

Mention to not forget about the "." as it is easily missed.

For the teacher

If git is prompting for a username and password then there may be a typo in the repository url.

Now if you navigate to the **http** address of the public IP address (e.g. <http://18.208.165.253>), you should be able to see your newly deployed website.

For the teacher

If they're having timeout issues, one problem could be using `https` to connect rather than `http`.

For the teacher

Make sure they delete their instances.

9 Further Work

If you picked your own website to deploy, the steps for installation will likely be more involved. Track down those instructions and try your best to deploy the site. If you get stuck, ask your neighbour or your tutor.

Once you have worked out how to deploy your chosen website, please commit an installation script or installation instructions for others to re-use: <https://github.com/CSSE6400/selfhost-cookbook>

References

- [1] L. Engstrom, G. Finucane, N. Moroze, and M. Yang, "hextris." <https://github.com/hextris/hextris/>, 2015.