

Section 3

Launch into the Cloud:

Amazon Web Services

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2020

Disclaimer

Disclaimer:

1. I don't plan to long AMZN during the course of this course.
2. I am not owning Amazon shares directly or indirectly.
3. I am not working for Amazon and I don't get paid by this except AWS educate credit.

Content

1. Sign-up for AWS Account
2. Setup AWS for EC2
3. Launch EC2
4. Running R

Amazon Web Services

History:

While Amazon standardized its internal infrastructure for all teams, it found the opportunity of open it up to the public and make computing infrastructure available to all people. Amazon thus becomes the new utility company for the Internet age, supplying crucial infrastructure like electricity and water.

We can almost attribute the inventor of “Cloud”, “Cloud services”, “Cloud computing” to Amazon.

Now the “cloud” market has many competitor, with AWS still holds about 33% (Apr 2018)

Sign-up for AWS as a student

1. Sign-up with an AWS account at <https://aws.amazon.com>
 - AWS account needs to be fully activated by completing phone verification steps and adding a valid credit card.
2. Sign-up AWS Educate account at <https://aws.amazon.com/education/awseducate/>
 - They will need to select the AWS Account option and enter their 12 digit AWS Account ID number when applying to AWS Educate.
3. (Depends) Because NTU is not (yet) listed as a institute, you may need to apply credit from AWS Educate separately
<https://aws.amazon.com/education/awseducate/contact-us/>
4. Claim credit from AWS according according to the instruction of AWS

AWS Free Tier for New Account

AWS Free Tier (12 Month Introductory Period):

These free tier offers are only available to new AWS customers, and are available for 12 months following your AWS sign-up date. When your 12 month free usage term expires or if your application use exceeds the tiers, you simply pay standard, pay-as-you-go service rates (see each service page for full pricing details). Restrictions apply; see [offer terms](#) for more details.

Elastic Compute Cloud (EC2)

- 750 hours of [Amazon EC2](#) Linux t2.micro instance usage (1 GiB of memory and 32-bit and 64-bit platform support) – enough hours to run continuously each month*
- 750 hours of [Amazon EC2](#) Microsoft Windows Server t2.micro instance usage (1 GiB of memory and 32-bit and 64-bit platform support) – enough hours to run continuously each month*
- 750 hours of an [Elastic Load Balancer](#) shared between Classic and Application load balancers, 15 GB data processing for Classic load balancers, and 15 LCUs for Application load balancers*
- 30 GB of [Amazon Elastic Block Storage](#) in any combination of General Purpose (SSD) or Magnetic, plus 2 million I/Os (with EBS Magnetic) and 1 GB of snapshot storage*
- 500 MB-month of [Amazon EC2 Container Registry](#) storage for new customers*

Amazon Simple Storage Service (S3)

- 5 GB of [Amazon S3](#) standard storage, 20,000 Get Requests, and 2,000 Put Requests*

Data Transfer

- 15 GB of data transfer out and 1GB of regional data transfer aggregated across all AWS services*

Amazon Data Pipeline

- 3 low frequency preconditions running on AWS per month*
- 5 low frequency activities running on AWS per month*

Amazon ElastiCache

- 750 hours of [Amazon ElastiCache](#) cache.t2micro Node usage - enough hours to run continuously each month.*

Amazon CloudFront

- 50 GB Data Transfer Out, 2,000,000 HTTP and HTTPS Requests of [Amazon CloudFront](#)*

Amazon API Gateway

- 1 Million API Calls per month*











Register for AWS Educate account

<https://www.awseducate.com/registration>




Apply to join AWS Educate

Step 1/3: Choose your role

 Student 	 Educator 
 US Veteran 	 Institution 
 Company/Recruiter 	

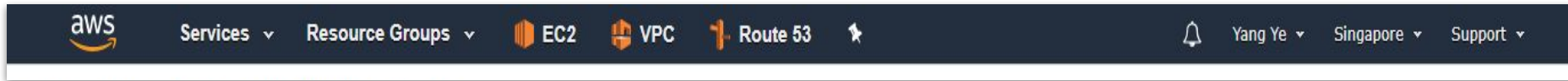
Apply AWS Educate Credit

Name	Yang Ye
Account	457734848212
Regarding*	<p><input checked="" type="radio"/> Account and Billing Support</p> <p><input type="radio"/> Service Limit Increase</p> <p><input type="radio"/> Technical Support <small>Unavailable under the Basic Support Plan</small></p>
Service*	Educate
Category*	Credit Inquiry
Subject*	Applying credit
	<div><p> Description Guidance</p><p>AWS Educate provides educators and students with grant-based access to AWS, training, and content, while also providing educators and students with a forum for collaboration. If you would like additional information about AWS Educate, please visit https://aws.amazon.com/education/awseducate/.</p></div>
Description*	I am doing a course in <u>NTU</u> Singapore. I would like to request for education credit for my <u>account.snid</u>

2. Setup AWS

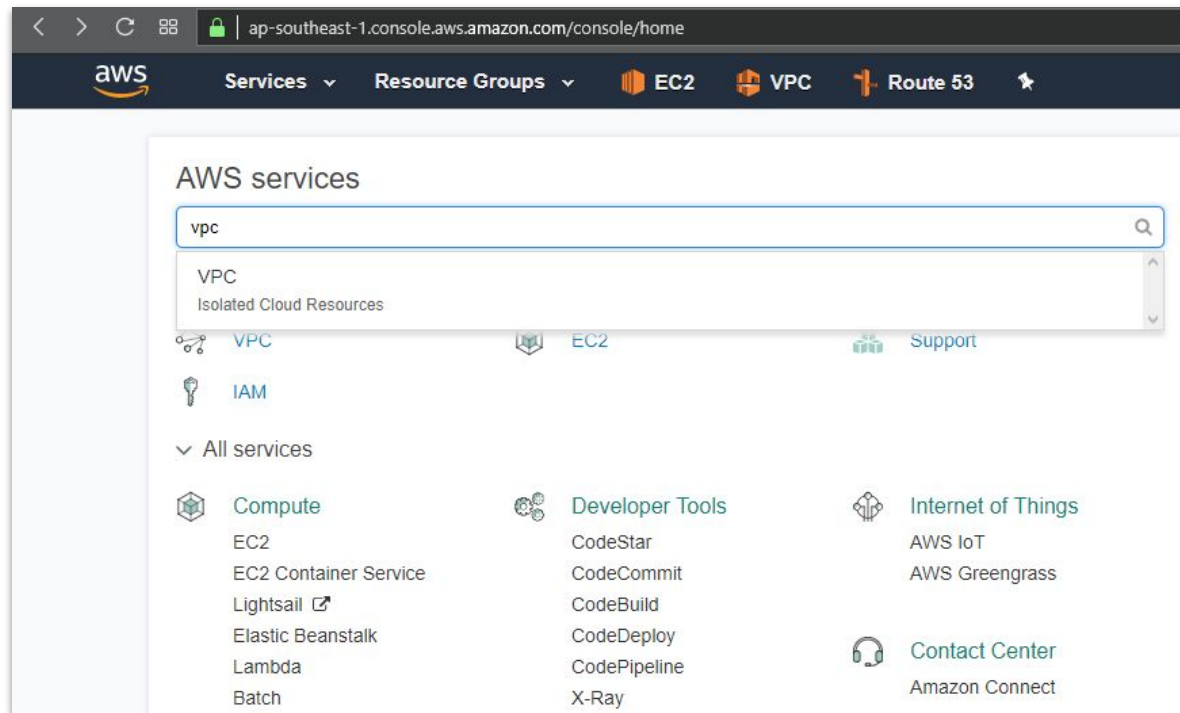
After you login to AWS

1. Change your region to **Singapore**.
2. Add shortcuts in the navigation bar
 - a. **EC2**
 - b. **VPC**

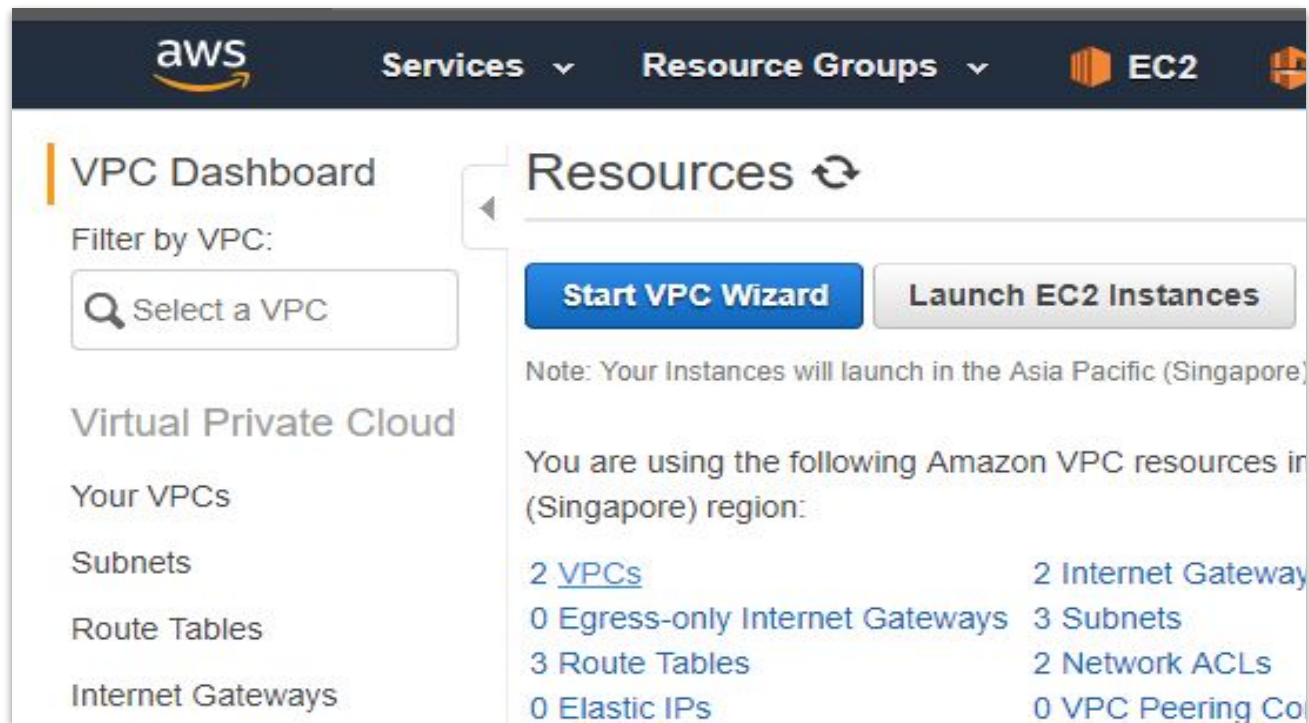


2. Create VPC Network

Search for VPC



2.1 VPC: Click “Start VPC Wizard”



2.2 VPC two steps - follow defaults, add a name

Step 1: Select a VPC Configuration

VPC with a Single Public Subnet

Your instances run in a private, isolated section of the AWS cloud with direct access to the Internet. Network access control lists and security groups can be used to provide strict control over inbound and outbound network traffic to your instances.

Creates:

A /16 network with a /24 subnet. Public subnet instances use Elastic IPs or Public IPs to access the Internet.

Select

VPC with Public and Private Subnets

VPC with Public and Private Subnets and Hardware VPN Access

VPC with a Private Subnet Only and Hardware VPN Access

Step 2: VPC with a Single Public Subnet

IPv4 CIDR block:* 10.0.0.0/16 (65531 IP addresses available)

IPv6 CIDR block: ☒ No IPv6 CIDR Block
☐ Amazon provided IPv6 CIDR block

VPC name: mfe

Public subnet's IPv4 CIDR:* 10.0.0.0/24 (251 IP addresses available)

Availability Zone:* No Preference

Subnet name: Public subnet

You can add more subnets after AWS creates the VPC.

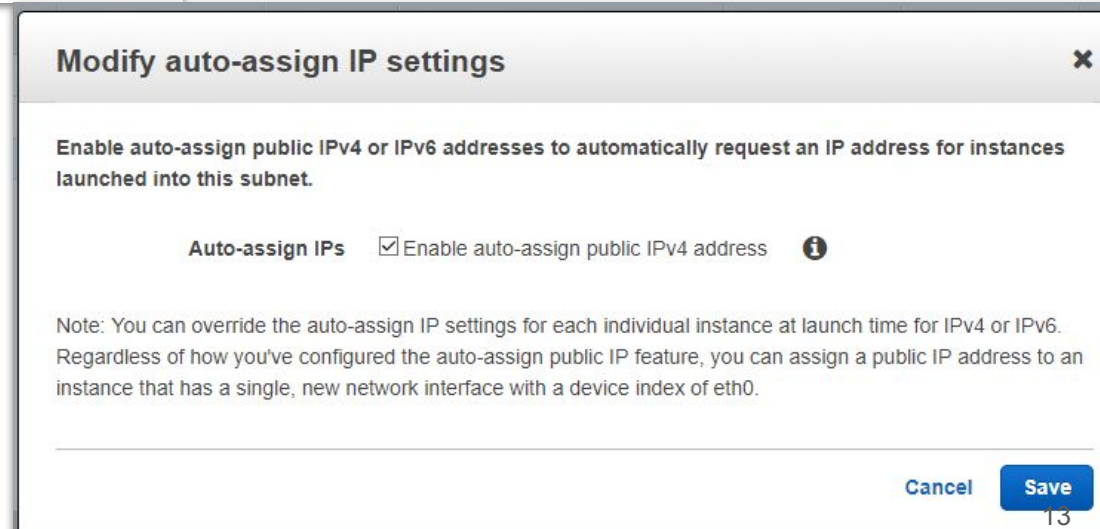
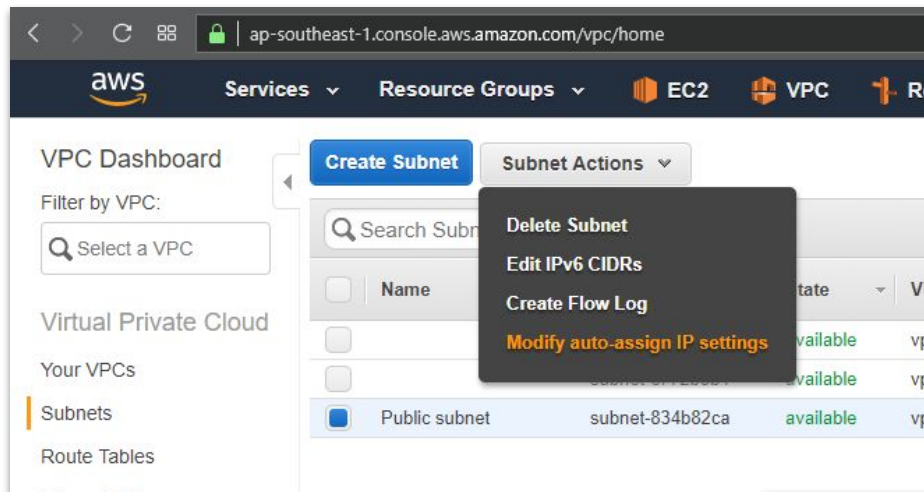
Service endpoints

Add Endpoint

Enable DNS hostnames:* ☒ Yes ☐ No

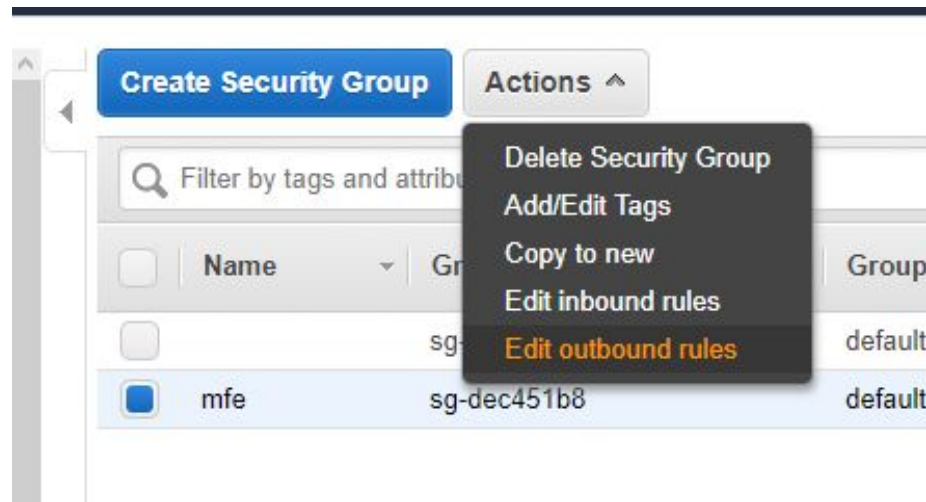
Hardware tenancy:* Default

2.3 Subnet: Change settings. Tick auto-assign public IP4 address



2.4 In VPC wizard, it created new security group.

Selected the newly created security group.
Edit Inbound rules and edit outbound rules.



2.4 Inbound/Outbound: choose All traffic/Anywhere

An inbound firewall protects the network against incoming traffic from the internet or other network segments, namely disallowed connection from outside.

Outbound rules determines what application can connect to the outside.

The screenshot shows a dialog box titled "Edit inbound rules" with a close button (X) in the top right corner. The dialog contains a table with the following columns: Type, Protocol, Port Range, Source, and Description. The "Type" column has a dropdown menu set to "All traffic". The "Protocol" column has a dropdown menu set to "All". The "Port Range" column has a text input field containing "0 - 65535". The "Source" column has a dropdown menu set to "Anywhere" and a text input field containing "0.0.0.0/0, ::/0". The "Description" column has a text input field containing "e.g. SSH for Admin Desktop" and a delete button (X). Below the table is an "Add Rule" button. A note states: "NOTE: Any edits made on existing rules will result in the edited rule being deleted and a new rule created with the new details. This will cause traffic that depends on that rule to be dropped for a very brief period of time until the new rule can be created." At the bottom right are "Cancel" and "Save" buttons.

Type	Protocol	Port Range	Source	Description
All traffic	All	0 - 65535	Anywhere	0.0.0.0/0, ::/0

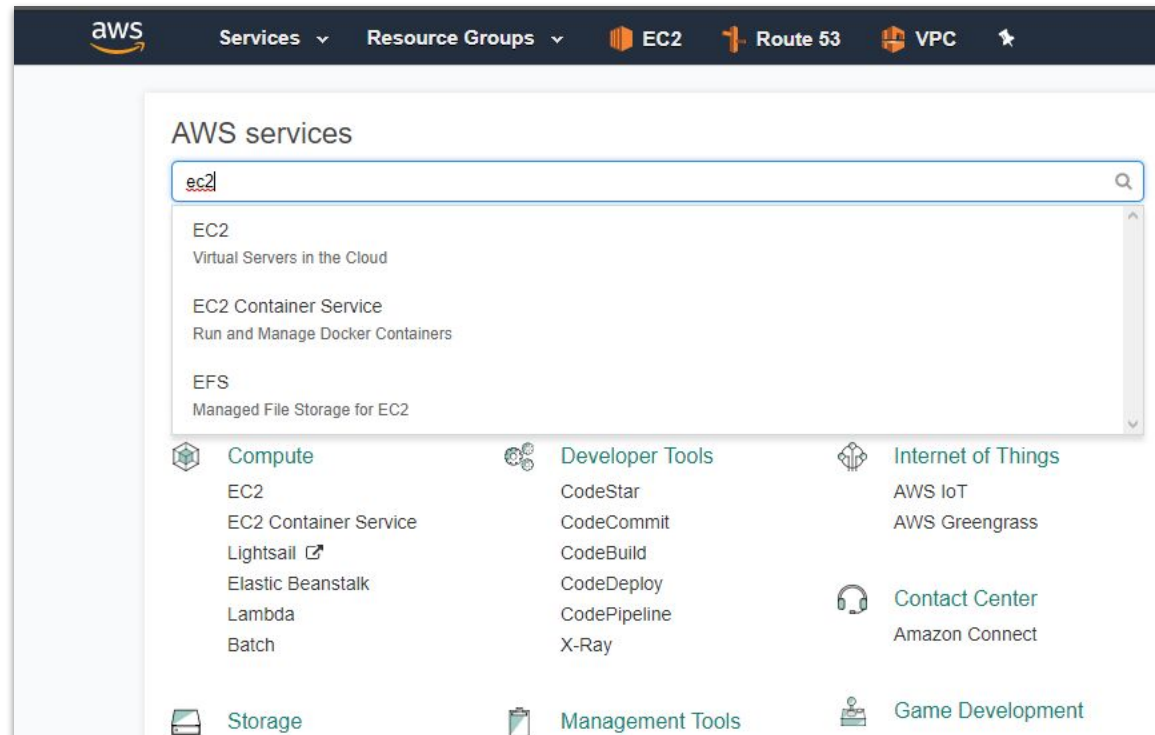
NOTE: Any edits made on existing rules will result in the edited rule being deleted and a new rule created with the new details. This will cause traffic that depends on that rule to be dropped for a very brief period of time until the new rule can be created.

The screenshot shows a dialog box titled "Edit outbound rules" with a close button (X) in the top right corner. The dialog contains a table with the following columns: Type, Protocol, Port Range, Destination, and Description. The "Type" column has a dropdown menu set to "All traffic". The "Protocol" column has a dropdown menu set to "All". The "Port Range" column has a text input field containing "0 - 65535". The "Destination" column has a dropdown menu set to "Anywhere" and a text input field containing "0.0.0.0/0, ::/0". The "Description" column has a text input field containing "e.g. SSH for Admin Desktop" and a delete button (X). Below the table is an "Add Rule" button. A note states: "NOTE: Any edits made on existing rules will result in the edited rule being deleted and a new rule created with the new details. This will cause traffic that depends on that rule to be dropped for a very brief period of time until the new rule can be created." At the bottom right are "Cancel" and "Save" buttons.

Type	Protocol	Port Range	Destination	Description
All traffic	All	0 - 65535	Anywhere	0.0.0.0/0, ::/0

NOTE: Any edits made on existing rules will result in the edited rule being deleted and a new rule created with the new details. This will cause traffic that depends on that rule to be dropped for a very brief period of time until the new rule can be created.

3. Go to EC2



3.1 Ready to Launch

The screenshot displays the Amazon EC2 Dashboard. On the left is a navigation sidebar with categories: EC2 Dashboard, INSTANCES, IMAGES, ELASTIC BLOCK STORE, NETWORK & SECURITY, LOAD BALANCING, and AUTO SCALING. The main content area is titled 'Resources' and shows a summary of EC2 resources in the US East (N. Virginia) region: 0 Running Instances, 0 Volumes, 0 Key Pairs, 0 Placement Groups, 0 Elastic IPs, 0 Snapshots, 0 Load Balancers, and 1 Security Groups. Below this is a blue banner for OpsWorks. A red rectangular box highlights the 'Create Instance' section, which includes the text 'To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.' and a prominent blue 'Launch Instance' button. Below the 'Create Instance' section is the 'Service Health' area, which reports that the US East (N. Virginia) service is operating normally across all four availability zones (us-east-1a, us-east-1b, us-east-1c, us-east-1e). To the right of the Service Health is the 'Scheduled Events' section, which shows no events for the US East (N. Virginia) region.

EC2 Dashboard

- Events
- Tags
- Reports
- Limits

INSTANCES

- Instances
- Spot Requests
- Reserved Instances

IMAGES

- AMIs
- Bundle Tasks

ELASTIC BLOCK STORE

- Volumes
- Snapshots

NETWORK & SECURITY

- Security Groups
- Elastic IPs
- Placement Groups
- Key Pairs
- Network Interfaces

LOAD BALANCING

- Load Balancers

AUTO SCALING

- Launch Configurations
- Auto Scaling Groups

Resources

You are using the following Amazon EC2 resources in the US East (N. Virginia) region:

- 0 Running Instances
- 0 Volumes
- 0 Key Pairs
- 0 Placement Groups
- 0 Elastic IPs
- 0 Snapshots
- 0 Load Balancers
- 1 Security Groups

Easily deploy and operate applications - use Chef recipes, manage SSH users, and more. [Try OpsWorks now.](#) [Hide](#)

Create Instance

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

[Launch Instance](#)

Note: Your instances will launch in the US East (N. Virginia) region

Service Health

Service Status:

- US East (N. Virginia): This service is operating normally

Availability Zone Status:

- us-east-1a: Availability zone is operating normally
- us-east-1b: Availability zone is operating normally
- us-east-1c: Availability zone is operating normally
- us-east-1e: Availability zone is operating normally

[Service Health Dashboard](#)

Scheduled Events

US East (N. Virginia):

No events

EC2 Step 1: Community AMI: search for “RStudio”

RStudio-1.1.456_R-3.5.1_CUDA-9.0_cuDNN-7.2.1_ubuntu-16.04-LTS-64bit

Id: ami-07a45f81350cb6584 in Singapore region

created by http://www.louisaslett.com/RStudio_AMI/

Newer than below

Step 1: Choose an Amazon Machine Image (AMI) Cancel and Exit

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. You can select an AMI provided by AWS, our user community, or the AWS Marketplace; or you can select one of your own AMIs.

Search: rstudio

Quick Start (0) | My AMIs (0) | AWS Marketplace (8) | **Community AMIs (9)**

Operating system

- ☐ Amazon Linux
- ☐ Cent OS
- ☐ Debian
- ☐ Fedora
- ☐ Gentoo
- ☐ openSUSE
- ☐ Other Linux
- ☐ Red Hat
- ☐ SUSE Linux
- ☐ Ubuntu
- ☐ Windows







Architecture

- ☐ 32-bit
- ☐ 64-bit

Root device type

- ☐ EBS
- ☐ Instance store

1 to 9 of 9 AMIs

	RStudio-1.1.456_R-3.5.1_CUDA-9.0_cuDNN-7.2.1_ubuntu-16.04-LTS-64bit - ami-07a45f81350cb6584	Select
Ready to run RStudio server for statistical computation (www.louisaslett.com). Connect to instance public DNS in web browser (standard port 80), username rstudio and password is instance ID		
Root device type: ebs Virtualization type: hvm		
	RStudio-1.1.383_R-3.4.2_Julia-0.6.0_CUDA-8_cuDNN-6_ubuntu-16.04-LTS-64bit - ami-5b9bde38	Select
Ready to run RStudio + Julia/Python server for statistical computation (www.louisaslett.com). Connect to instance public DNS in web browser (standard port 80), username rstudio and password rstudio		
Root device type: ebs Virtualization type: hvm		
	OMPI_R_RStudioServer - ami-979720f4	Select
[Copied ami-91b77587 from us-east-1] OMPI_R_RStudioServer		
Root device type: ebs Virtualization type: hvm		
	RStudio-1.0.153_R-3.4.1_Julia-0.6.0_ubuntu-16.04-LTS-64bit - ami-a13b59c2	Select
Ready to run RStudio + (experimental) Julia server for statistical computation (www.louisaslett.com). Connect to instance public DNS in web browser (standard port 80), username rstudio and password rstudio		
Root device type: ebs Virtualization type: hvm		
	SATT Analytics Platform - Base-a96c7627-bb8b-4cc2-89bd-a69e52b8431b-ami-65772400.2 - ami-ac091afe	Select
An Advanced Analytics Platform, based on R Foundation. The Platform is equipped with RStudio server, R web application framework, Interactive visualization and dynamic report generation packages.		
Root device type: ebs Virtualization type: hvm		
	RStudio-1.0.143_R-3.4.0_Julia-0.5.2_ubuntu-16.04-LTS-64bit - ami-c6db5da5	Select
Ready to run RStudio + (experimental) Julia server for statistical computation (www.louisaslett.com). Connect to instance public DNS in web browser (standard port 80), username rstudio and password rstudio		
Root device type: ebs Virtualization type: hvm		

EC2 Step 2: Choose instance type. You can enjoy having one instance of **t2.micro** during 12-month free-tier.

- Upgrade to higher instance type when you have received your AWS educate credit.
- T2.medium/t2.large should be good enough. There are more expensive ones.

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances are virtual servers that can run applications. They have varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the appropriate mix of resources for your applications. [Learn more](#) about instance types and how they can meet your computing needs.

Filter by: All instance types Current generation [Show/Hide Columns](#)

Currently selected: t2.micro (Variable ECUs, 1 vCPUs, 2.5 GHz, Intel Xeon Family, 1 GiB memory, EBS only)

	Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance	IPv6 Support
<input type="checkbox"/>	General purpose	t2.nano	1	0.5	EBS only	-	Low to Moderate	Yes
<input checked="" type="checkbox"/>	General purpose	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.small	1	2	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.medium	2	4	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.large	2	8	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	General purpose	t2.xlarge	4	16	EBS only	-	Moderate	Yes
<input type="checkbox"/>	General purpose	t2.2xlarge	8	32	EBS only	-	Moderate	Yes
<input type="checkbox"/>	General purpose	m4.large	2	8	EBS only	Yes	Moderate	Yes

EC2 Step 3: Make sure Auto-assign Public IP is ticked. Click “Next”.

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot instances to take advantage of on-demand instances, and more.

Number of instances ⓘ [Launch into Auto Scaling Group](#) ⓘ

Purchasing option ⓘ ☐ Request Spot instances

Network ⓘ [Create new VPC](#)

Subnet ⓘ [Create new subnet](#)
251 IP Addresses available

Auto-assign Public IP ⓘ ⓘ

IAM role ⓘ [Create new IAM role](#)

Shutdown behavior ⓘ

Enable termination protection ⓘ ☐ Protect against accidental termination

Monitoring ⓘ ☐ Enable CloudWatch detailed monitoring
[Additional charges apply.](#)

Tenancy ⓘ [Additional charges will apply for dedicated tenancy.](#)

EC 2 Step 4: Add Storage, use the default setting.

- One AMI image can be launched into many instances so its content is static.
- The author of AMI image configures a persistent storage so it saves any changes we did.
- Most importantly, we don't need to do anything now.

EC Step 6: Click “6. Configure Security Group”

Select an existing security group. Your previous changes are loaded.

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: ☐ Create a new security group ☒ Select an existing security group

Security Group ID	Name	Description	Actions
<input checked="" type="checkbox"/> sg-dec451b8	default	default VPC security group	Copy to new

Inbound rules for sg-dec451b8 (Selected security groups: sg-dec451b8)

Type	Protocol	Port Range	Source	Description
All traffic	All	All	0.0.0.0/0	
All traffic	All	All	:::0	

haha!!!


EC 2 Step 7: Review and Launch

Click the blue button.

1. Choose AMI2. Choose Instance Type3. Configure Instance4. Add Storage5. Add Tags6. Configure Security Group7. Review


Step 7: Review Instance Launch

Please review your instance launch details. You can go back to edit changes for each section. Click **Launch** to assign a key pair to your instance and complete the launch process.

 **Improve your instances' security. Your security group, default, is open to the world.**

Your instances may be accessible from any IP address. We recommend that you update your security group rules to allow access from known IP addresses only. You can also open additional ports in your security group to facilitate access to the application or service you're running, e.g., HTTP (80) for web servers. [Edit security groups](#)

▼ AMI Details

 **RStudio-1.0.153_R-3.4.1_Julia-0.6.0_ubuntu-16.04-LTS-64bit - ami-a13b59c2**

Ready to run RStudio + (experimental) Julia server for statistical computation (www.louisaslett.com). Connect to instance public DNS in web browser (standard port 80), username rstudio and password rstudio

Root Device Type: ebsVirtualization type: hvm

[Edit AMI](#)

▼ Instance Type






Instance Type	ECUs	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance
t2.micro	Variable	1	1	EBS only	-	Low to Moderate

[Edit instance type](#)

▼ Security Groups

Security Group ID	Name	Description
sg-dec451b8	default	default VPC security group

All selected security groups inbound rules

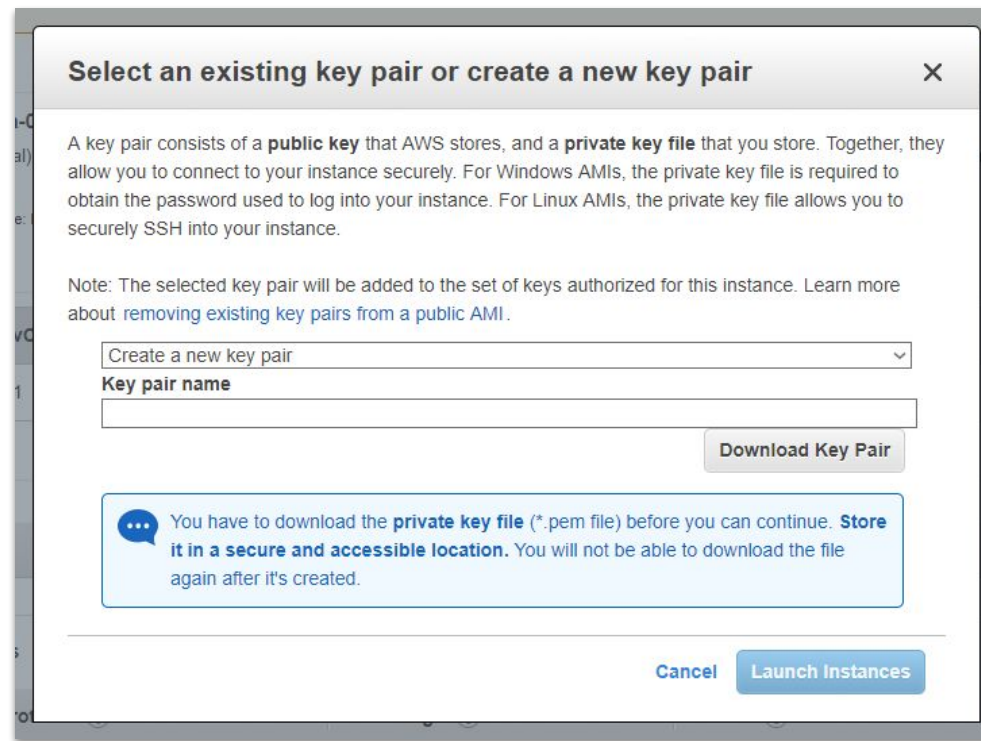
Type 	Protocol 	Port Range 	Source 	Description 
All traffic	All	All	0.0.0.0/0	
All traffic	All	All	:::0	

[Cancel](#)[Previous](#)[Launch](#)

Go to

One last thing: Key pair

Create if you didn't have an existing one or lost the previous download.



Select an existing key pair or create a new key pair [X]

A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about [removing existing key pairs from a public AMI](#).

Create a new key pair [v]

Key pair name

[Text input field]

Download Key Pair

You have to download the private key file (*.pem file) before you can continue. Store it in a secure and accessible location. You will not be able to download the file again after it's created.

Cancel Launch Instances

If you know SSH

You can connect to the server by

- Windows: Download Git for Windows from <https://git-scm.com/download/>.

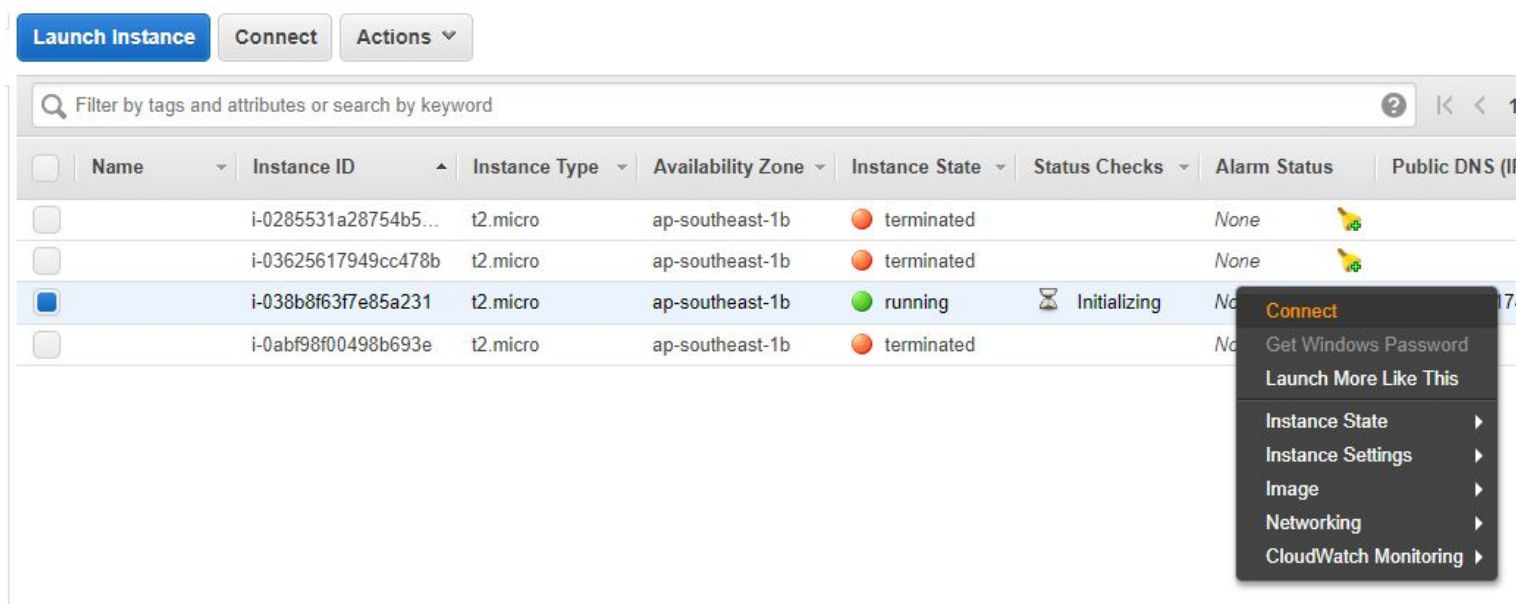
```
ssh -i 'c:\Users\yourusername\Downloads\MyKeyPair.pem' ubuntu@{IP_Address}
```

- Mac: skip download Git. Go straight

```
ssh -i ~/Downloads/MyKeyPair.pem ubuntu@{IP_Address}
```

Control the instance.

- Connect gives information.
- Stop but not to terminate, which deletes all data from EBS.
- A running instance charges.
- A stopped instance will charge a small fee for the storage. Our configured size is 10G, within the free-tier for new account within 12-month.
- Use AWS calculator

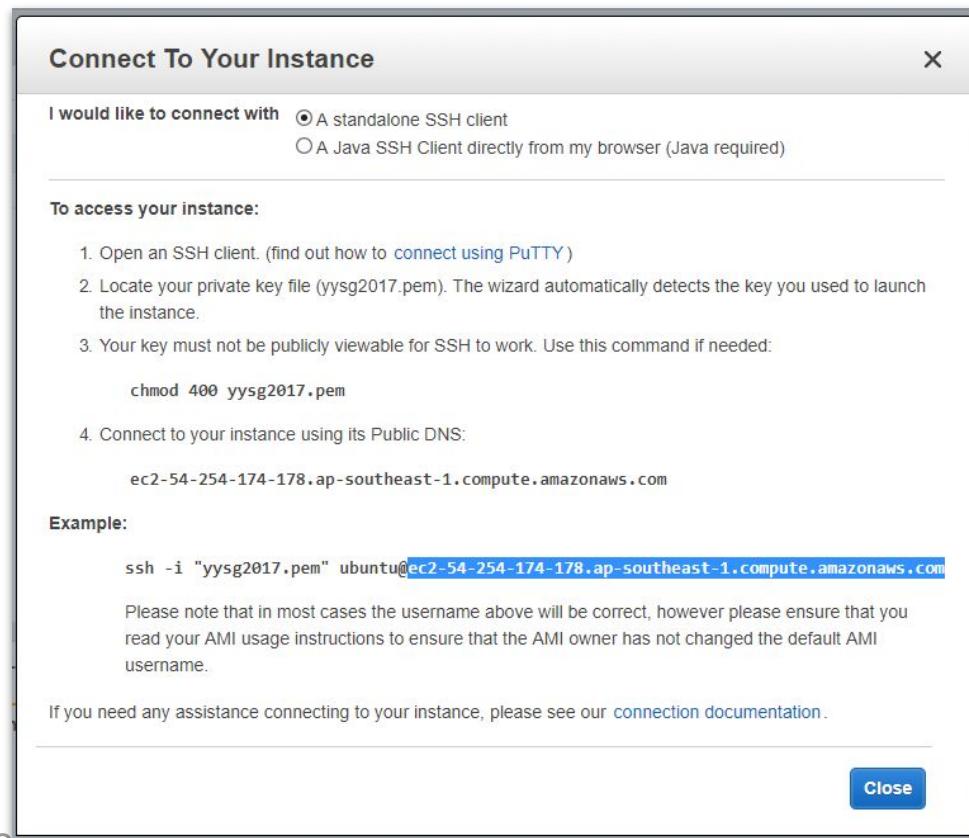


The screenshot shows the AWS Management Console interface for EC2 instances. At the top, there are buttons for 'Launch Instance', 'Connect', and 'Actions'. Below these is a search bar with the placeholder text 'Filter by tags and attributes or search by keyword'. The main area displays a table of instances with columns: Name, Instance ID, Instance Type, Availability Zone, Instance State, Status Checks, Alarm Status, and Public DNS (IP). One instance is highlighted in blue, and a 'Connect' dropdown menu is open over it, showing options: 'Connect', 'Get Windows Password', 'Launch More Like This', 'Instance State', 'Instance Settings', 'Image', 'Networking', and 'CloudWatch Monitoring'.

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IP)
	i-0285531a28754b5...	t2.micro	ap-southeast-1b	terminated		None	
	i-03625617949cc478b	t2.micro	ap-southeast-1b	terminated		None	
	i-038b8f63f7e85a231	t2.micro	ap-southeast-1b	running	Initializing	No	174
	i-0abf98f00498b693e	t2.micro	ap-southeast-1b	terminated		No	

Access it

- Copy this address



<http://ec2-54-254-174-178.ap-southeast-1.compute.amazonaws.com/>

This would change every time when you launch it.

Initial password: rstudio/Instance ID.

The screenshot displays the AWS Management Console interface. At the top, there are buttons for 'Launch Instance', 'Connect', and 'Actions'. Below these is a search bar labeled 'Filter by tags and attributes or search by keyword'. A table lists EC2 instances with columns: Name, Instance ID, Instance Type, Availability Zone, Instance State, and Status. The third instance is highlighted, with its Instance ID 'i-038b8f63f7e85a231' circled in red. Below the table, the RStudio login page is visible, featuring a 'Sign in to RStudio' form with fields for Username (filled with 'rstudio') and Password (filled with dots), a 'Stay signed in' checkbox, and a 'Sign In' button.

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status
	i-0285531a28754b5...	t2.micro	ap-southeast-1b	terminated	
	i-03625617949cc478b	t2.micro	ap-southeast-1b	terminated	
	i-038b8f63f7e85a231	t2.micro	ap-southeast-1b	running	Initiating
	i-0abf98f00498b693e	t2.micro	ap-southeast-1b	terminated	

Sign in to RStudio

Username:
rstudio

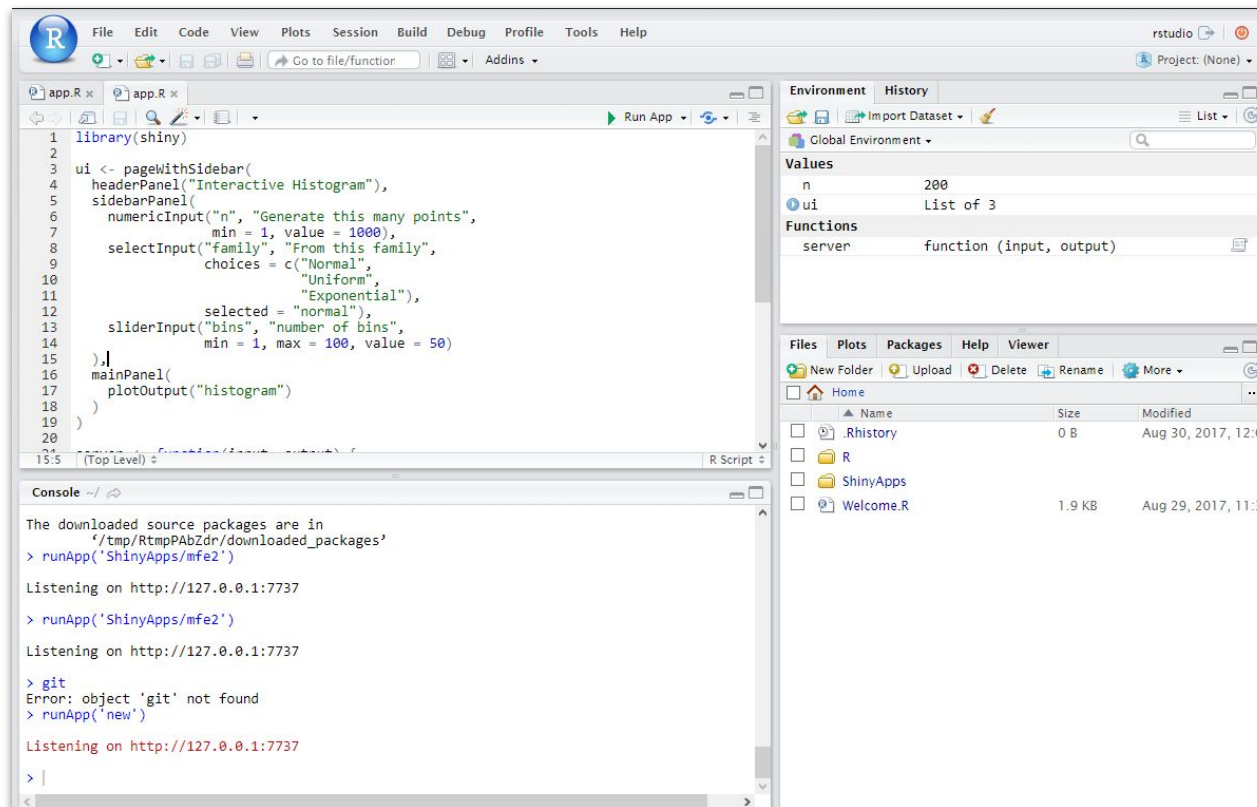
Password:

☐ Stay signed in

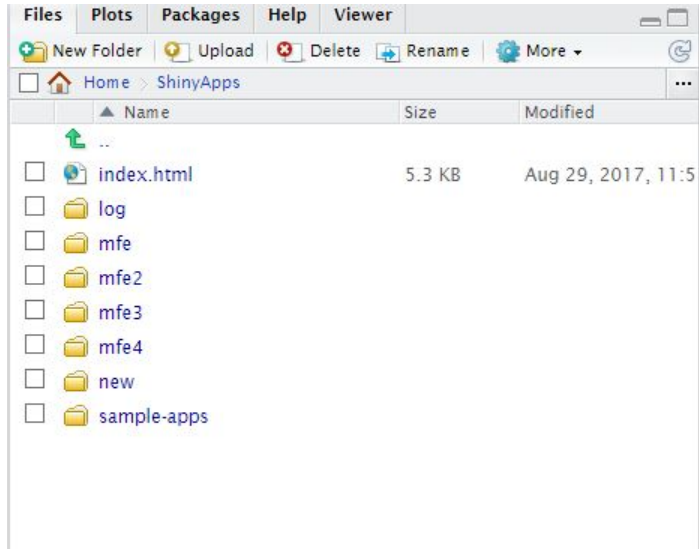
Sign In

RStudio Setup

- Install packages
 - tidyverse
 - tidyquant
 - install.packages
- Tools -> Shell
 - passwd
- Shiny
 - Directory ShinyApps
 - Create sub-directories
- Files
 - Manage upload



Shiny Server



/home/**rstudio**/ShinyApps/**new**/

/ShinyApps/**new**/

<http://ec2-13-229-181-28.ap-southeast-1.compute.amazonaws.com/shiny/rstudio/sample-apps/hello/>

AWS Recap

- AWS (Amazon Web Services) is an utility company for the internet like electricity/water.
 - We can launch many computing/storage resources as we need.
 - We use Spot instance which is expensive.
 - AWS provides other pricing plan for long-term usage.
 - It's cool to have something running in the cloud. You can show people to impress.
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- AWS setup is optional in this course.
 - You can run R Studio and application on your laptop
 - If you finishing working on it, leave the instance as Stopped. Be aware of how much you spend on AWS.