Training Course

Amazon Web Service

Course Schedule

Day	Presentations	Lab
Day 1	System Operations on AWS	
Day 2	Computing on AWS	X
Day 3	Networking on AWS	X
Day 4	Storage and Archiving in the Cloud	X
Day 5	Monitoring in the Cloud	X
Day 6	Managing Resource Consumption in the Cloud	X

Module 2:

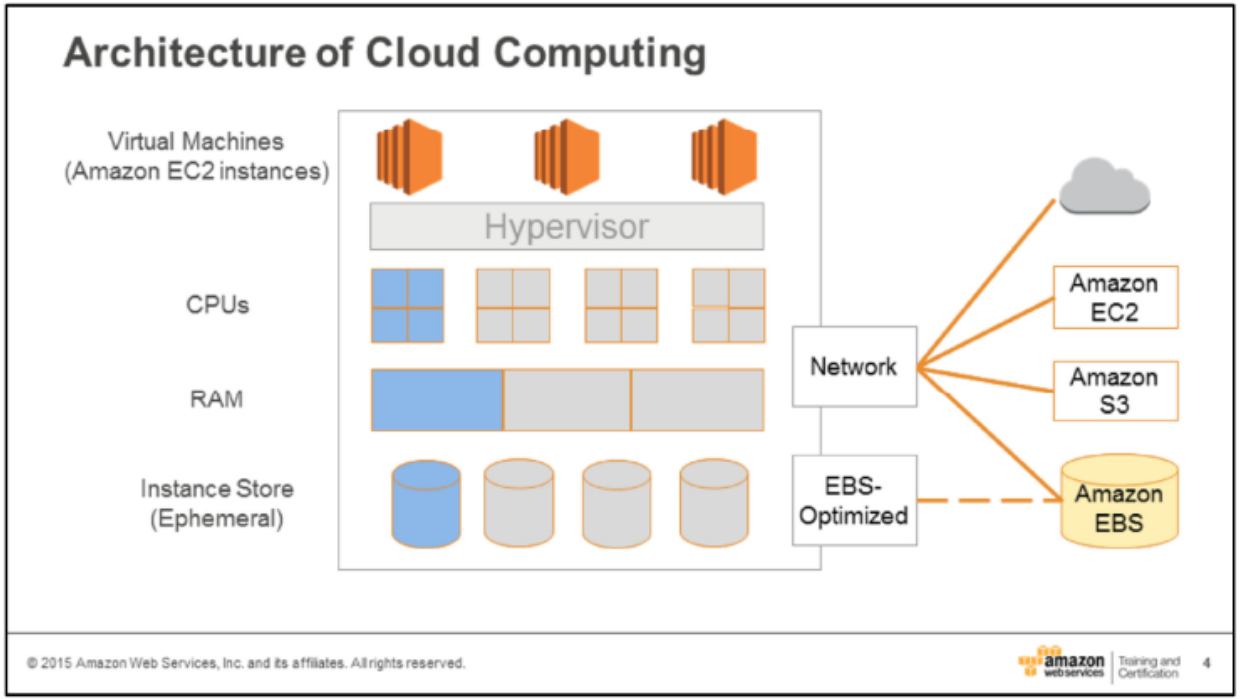
Computing in AWS

- **Goal**: Understand how to deploy instances and maintain instance health
  - ✓ Creating instances
  - ✓ Type of instance
  - ✓ Instance security
  - ✓ Pricing
  - ✓ Troubleshooting

Architecture of Cloud Computing

- ✓ Amazon EC2 instances run as virtual machines on host computers located in each Availability Zone
- ✓ Each Amazone EC2 instance receives a particular number of virtual CPUs and an amount of RAM
- ✓ Instance Store is physically attached to the host computer and provides temporary block-level storage for use with an instance, data in the instance store does not persist

- **Architecture of Cloud Computing**



- **Instance Types**

  - ✓ Instance types differ in CPU, memory, storage, and network capacity
  - ✓ Instances are described by family (T2, M3, etc,..) and size (small, medium, large, xlarge, 2xlarge, etc,…)
  - ✓ Eeach instance type family is optimized for a specific type of workload
  - ✓ Monitor CPU usage of instances to determine whether you are using the right instance type

- **Instance Types**

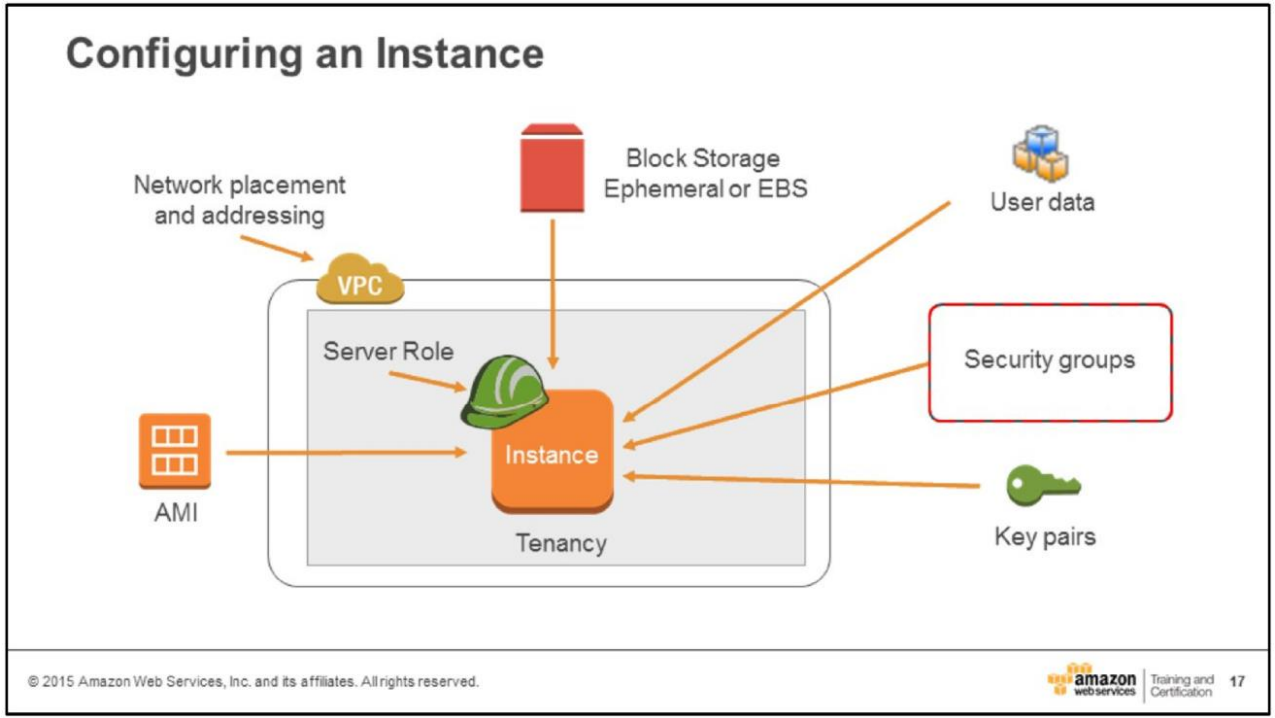
Type		Description
General Purpose	T2	• Lowest-cost general purpose instance type
	M4	• SSD-based instance storage for fast I/O performance
Compute Optimized	C3, C4	• Support for enhanced networking, clustering • Analytics, gaming, batch processing
Memory Optimized	R3	• Lowest price point per GiB of RAM • High performance databases, distributed memory caches
GPU	G2	• High-performance NVIDIA GPU, onboard video encoder
Storage Optimized	I2	• Support for TRIM, high random I/O performance
	D2	• High sequential I/O performance • Data warehousing, Hadoop/Amazon Elastic MapReduce

Creating Instances in AWS

Create An Instance

- Instance
- AMI
- Storage
- Network placement and addressing

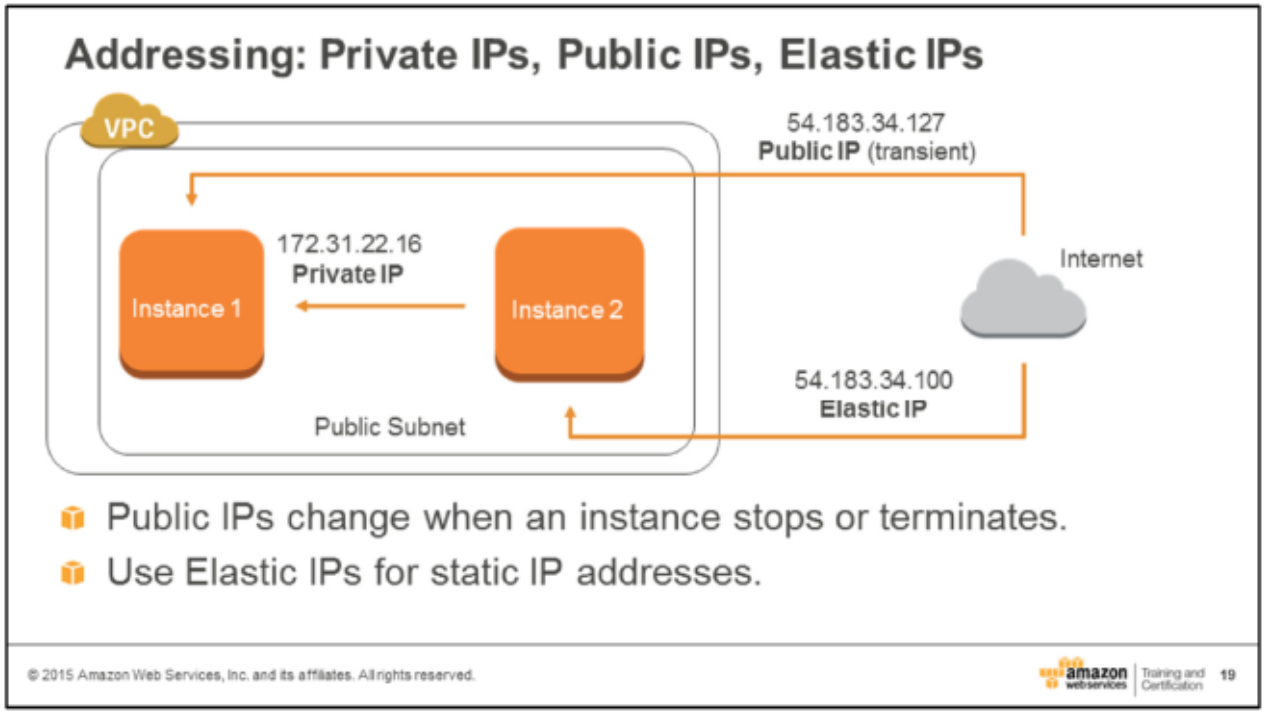
- User data
- Key pairs
- Security groups



Create An Instance

❑ **Internet Protocol**

- Private IPs
- Public IPs
- Elastic IPs



Create An Instance

❑ Amazon Elastic Block Store (EBS)

- Network-attached disk storage
- Types of EBS volumes
  - ➢ General Purpose (SSD)
  - ➢ Provisioned IOPS (SSD)
  - ➢ Magnetic options
- Data persist when instance is stopped
- Data persist when instance is terminated, provided the DeleteOnTermination attribute is false

Create An Instance

❑ Instance Store (Ephemeral)

- Instance store volumes are directly attached to a host computer
- Instance Store SSD volumes have fast disk access suitable for swap files, caches, buffers, and highly replicated data
- Instance store volume contents are lost when an instance is stopped or terminated
- Instance store volumes can offer up to 100,000 IOPS for some instance types

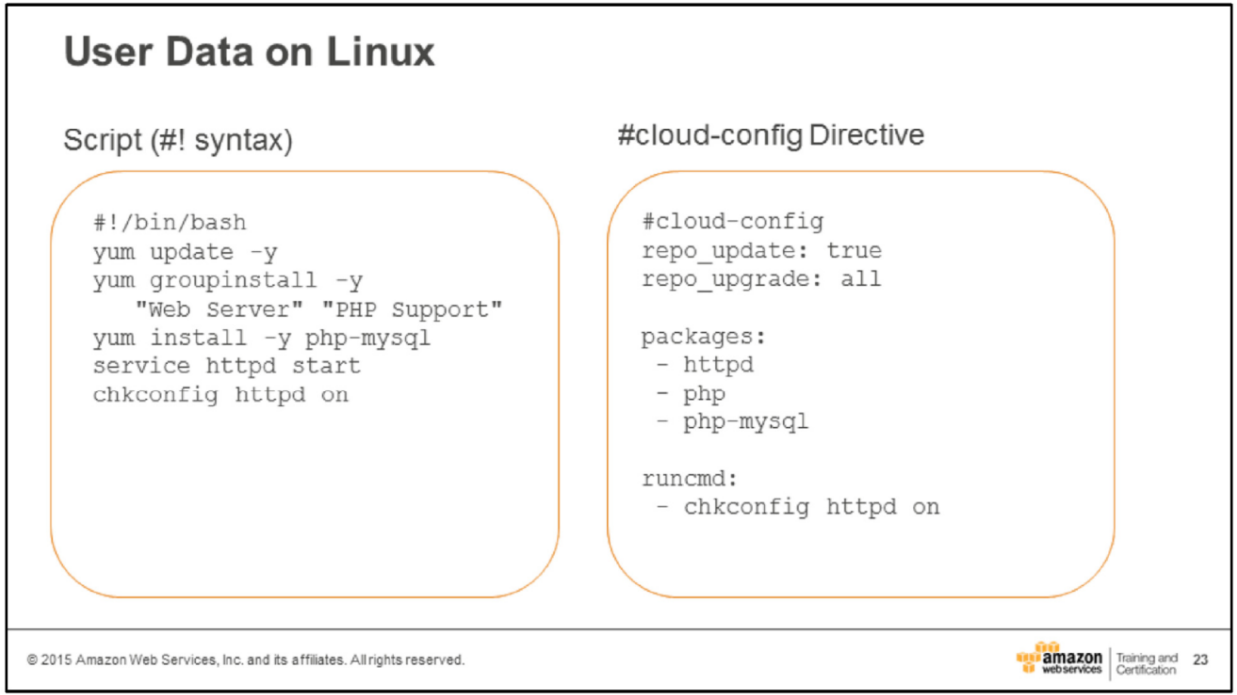
Create An Instance

❑ User Data

- User data scripts supplied to initialize instances automatically
  - ➢ Linux script
  - ➢ Window batch or PowerShell scripts
- User data scripts can install any software package
  - ➢ Web server
  - ➢ Database server
  - ➢ Configuration management tools
- User data scripts are executed by
  - ➢ Cloud-init on Linux
  - ➢ EC2 config service on Window
- User data scripts run once per instance-id default

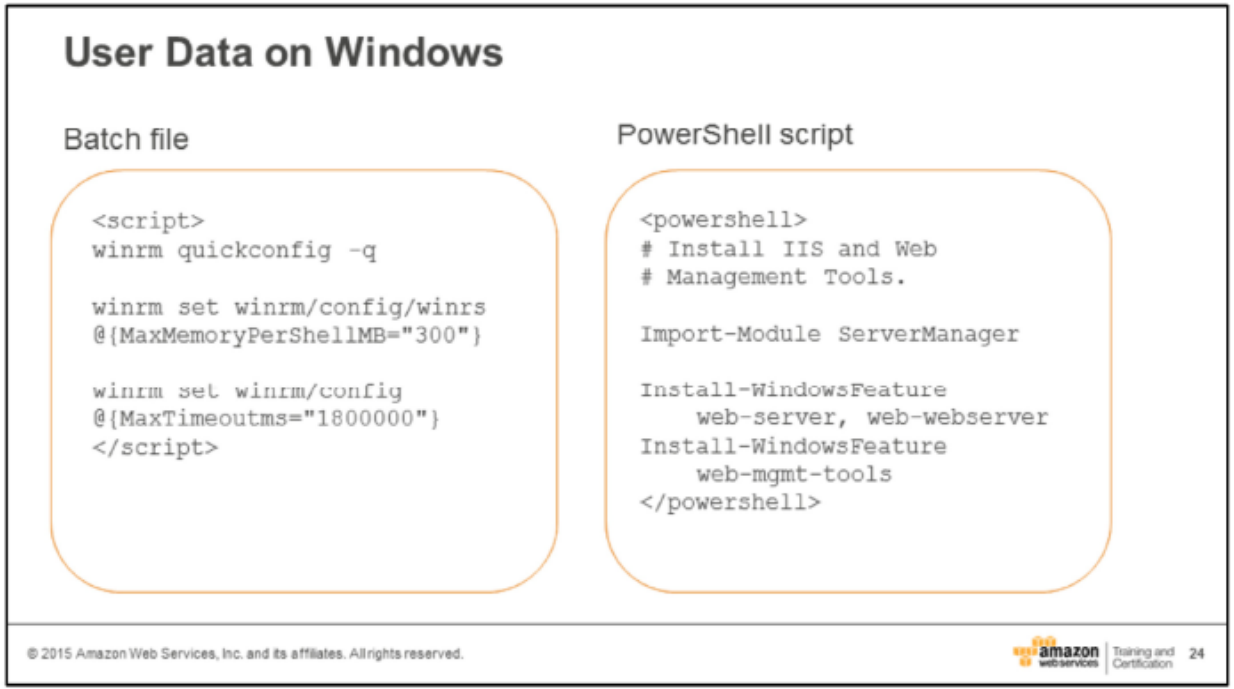
Create An Instance

- ❑ User Data



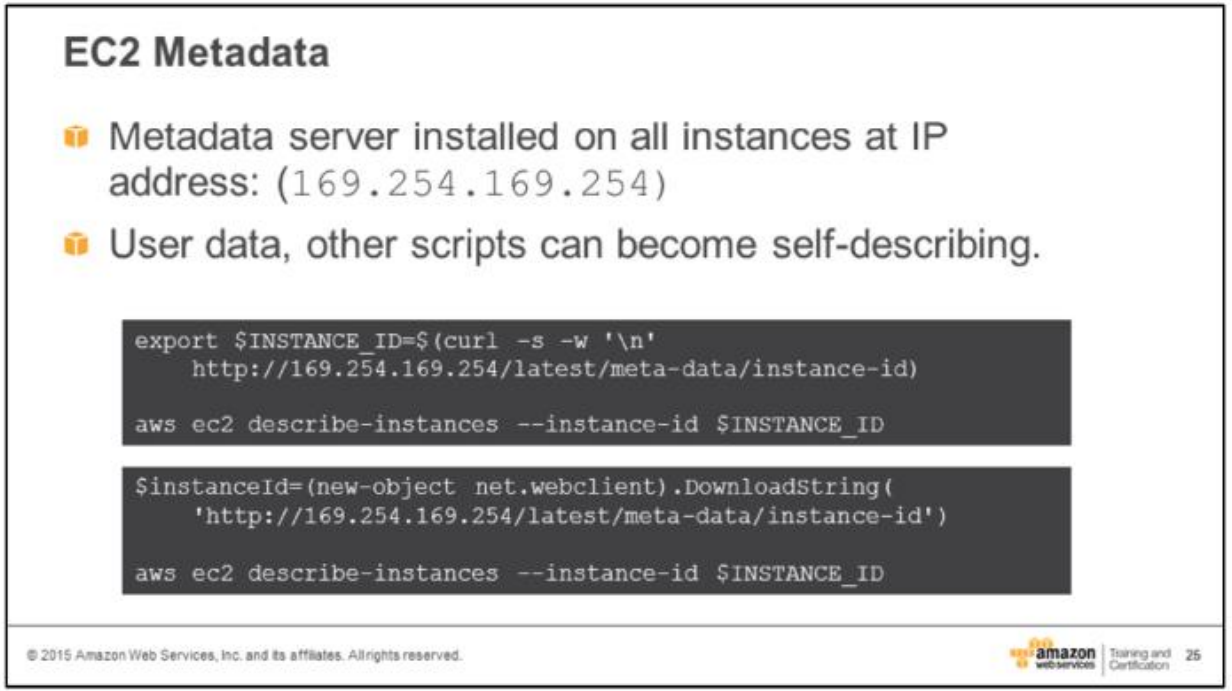
Create An Instance

- ❑ **User Data**



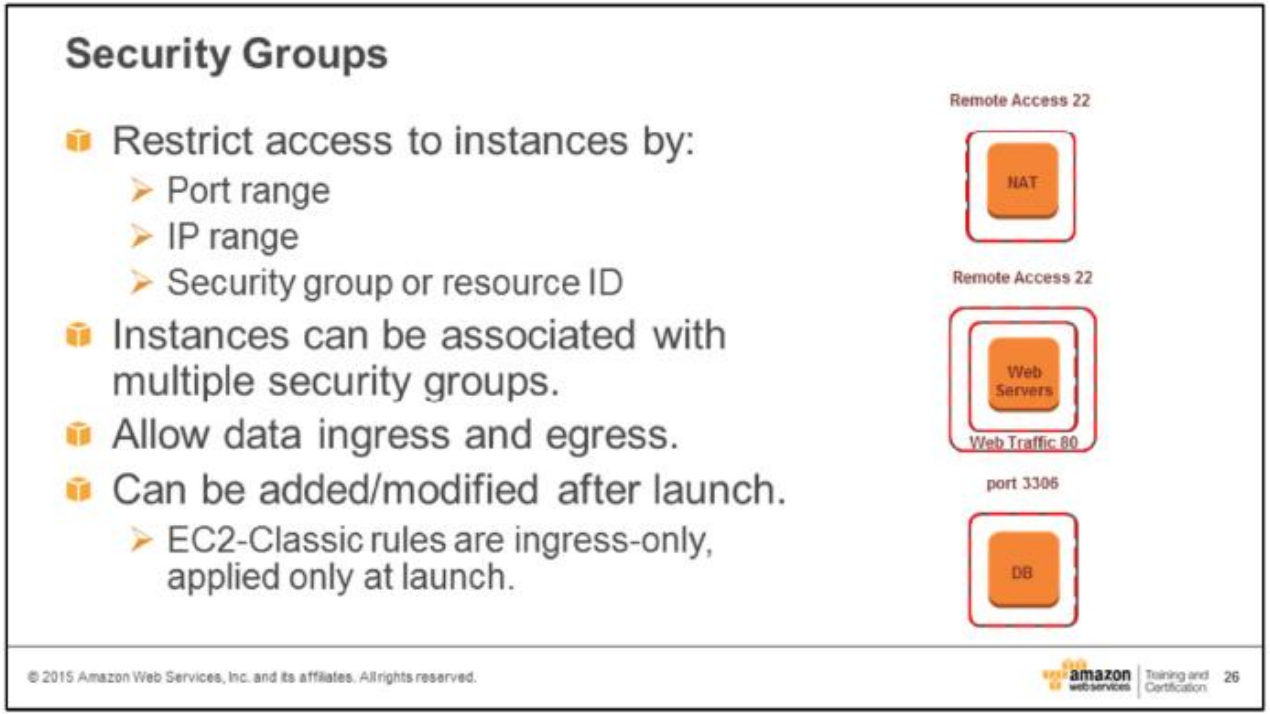
Create An Instance

- ❑ **Meta Data**



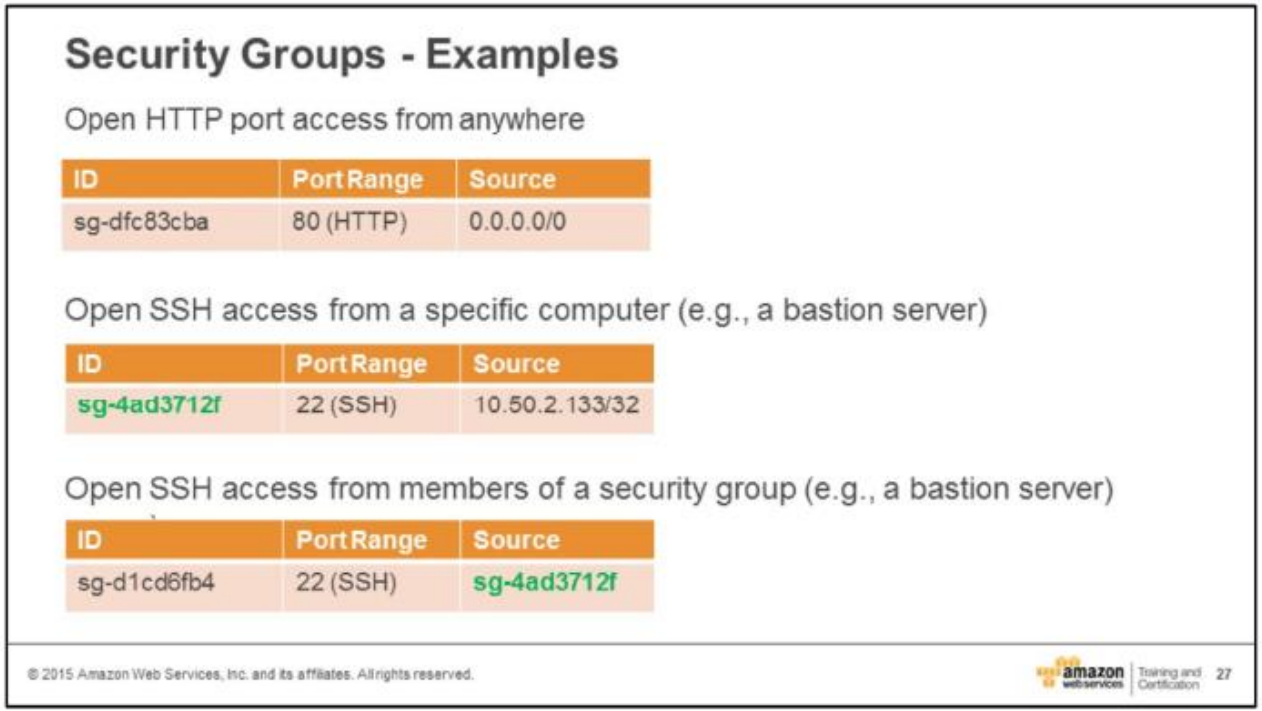
Create An Instance

- ❑ **Security Groups**



Create An Instance

- ❑ Security Groups



Security Groups - Examples

Open HTTP port access from anywhere

ID	Port Range	Source
sg-dfc83cba	80 (HTTP)	0.0.0.0/0

Open SSH access from a specific computer (e.g., a bastion server)

ID	Port Range	Source
sg-4ad3712f	22 (SSH)	10.50.2.133/32

Open SSH access from members of a security group (e.g., a bastion server)

ID	Port Range	Source
sg-d1cd6fb4	22 (SSH)	sg-4ad3712f

Create An Instance

- **Key Pairs**

Remote Access

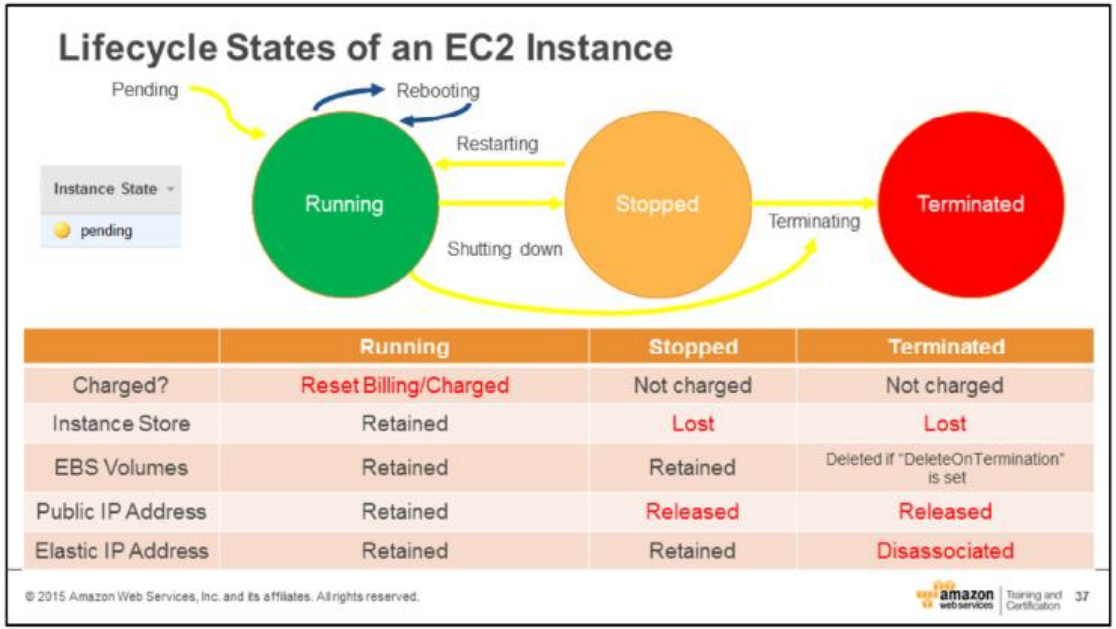
- Linux – Use SSH to log into an instance since password-only authentication is disabled on Linux by default
- Windows – Use RDP to log in to instances using an encrypted random password that can only be decrypted using a private secret access key

Public key cryptographic keys

- Only the Public Access key ID needs to be uploaded to server (in ~/.ssh/authorized_keys on Linux)
- Private secret access keys can be generated locally and must be saved when created

Managing Instances in AWS

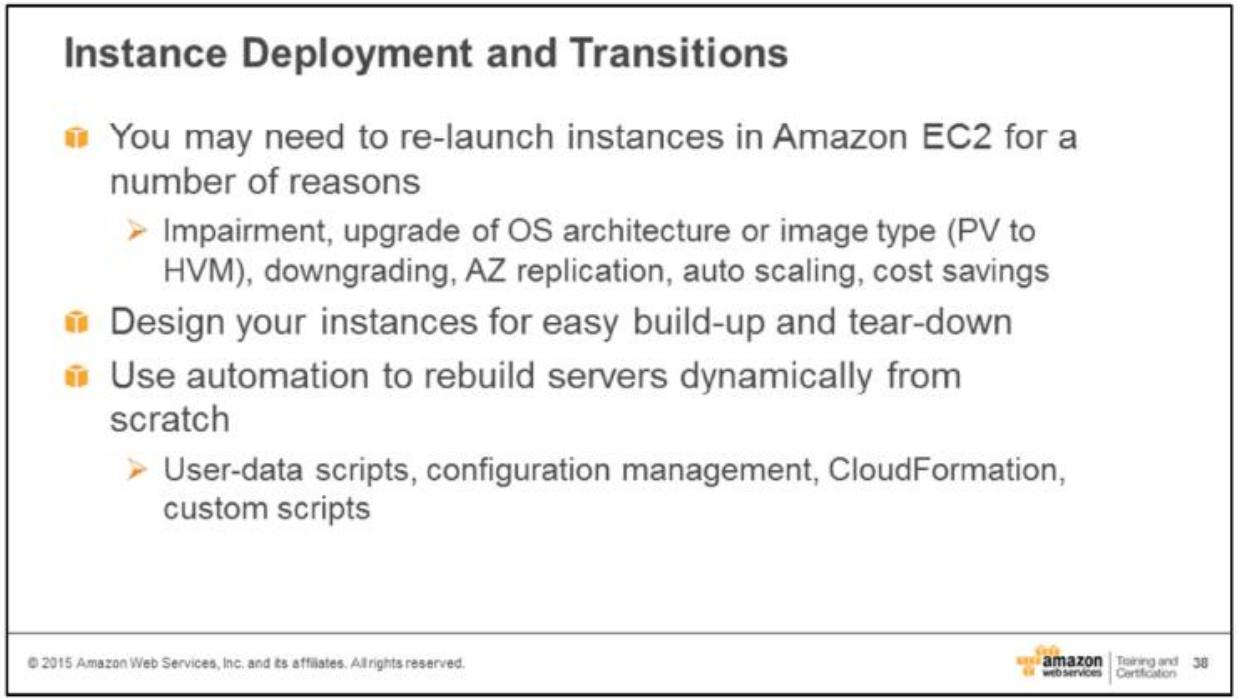
An instance enters the Pending state when it is first started. As soon as it is started, we will be charged for that instance's first hour



	Running	Stopped	Terminated
Charged?	Reset Billing/Charged	Not charged	Not charged
Instance Store	Retained	Lost	Lost
EBS Volumes	Retained	Retained	Deleted if "DeleteOnTermination" is set
Public IP Address	Retained	Released	Released
Elastic IP Address	Retained	Retained	Disassociated

Scale: Vertical or Horizontal

- Vertical: scale up/down
- Horizontal: scale out/in



Securing Your AWS Instances

EC2 Instance Security Summary

Should:

- ✓ Use IAM roles when launching instances
- ✓ Use least privilege access policies
- ✓ Guard and manage access/secret keys
- ✓ Keep security patches up to date
- ✓ Use a NAT and Bastion host or similar solutions

Shoud Not:

- ❖ Use root level access/secret keys
- ❖ Embed access/secret keys in code or commit to Git

Troubleshooting AWS Instance Issues

Troubleshooting Common EC2 Issues

- **Can't connect to the instance**
  - Check security groups
  - Automated Windows Updates sometimes a culprit
- **Instance is marked "Impaired" (fail status check)**
  - Reboot
  - Get System Log command in console for additional troubleshooting
  - (Windows) attaching a second Elastic Network Interface (ENI) may enable connecting to the instance
  - Log issue with AWS support

Understanding EC2 Instance Pricing

Mix of Pricing Type

On-Demand Instances	Reserved Instances	Spot Instances
Pay as you go for compute power Benefit: On-demand availability Pay only for what you use, no up-front commitments or long-term contracts	1- or 3- year terms Choose zero/partial/full up-front payment Receive significant hourly discount Benetfit: Cost/Predictability Helps ensure that compute capacity is available when needed	Bid on unused EC2 capacity Spot Price based on supply/demand, determined automatically, up to 90% off on-demand price Benefit: Cost/Large Scale, dynamic workload handling Spot price below bid, instances start Spot price above bid, instances terminate after a 2-minute warning

Knowledge Check 1

What disk device would be best for storing **virtual memory paging/swap files**?

- Boot volume
- Additional EBS data drive
- Instance store
- Amazon S3

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What disk device would be best for storing **virtual memory paging/swap files**?

- Boot volume
- Additional EBS data drive
- **Instance store**
- Amazon S3

Answer: Instance store. Instance storage is fast, temporary storage perfect for storing temporary data such as memory paging and swap file data.

Knowledge Check 2

You want to deploy a new version of your web application. How do you trigger the user data to run again and update your app?

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Answer: You don't. Be default, user data is run once, when the instance first boots.

Lab1 / Some practice with an AWS Instance in this module:

- Create a new an Instance
- View status change
- Change instance type
- SSH to EC2 instance
- Set security group for instance