EC2

(ELASTIC COMPUTE CLOUD)

BY

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EC2(ELASTIC COMPUTE CLOUD)

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11. EBS SNAPSHOTS
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14. LAB : EC2 BACKUP SOLUTIONS WITH AMI'S AND SNAPSHOTS
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WHAT IS EC2?

- AMAZON **ELASTIC COMPUTE CLOUD**(AMAZON EC2) IS A **WEB SERVICE** THAT PROVIDES **RESIZABLE COMPUTE CAPACITY** IN THE CLOUD.
- AMAZON EC2 REDUCES THE TIME REQUIRED TO OBTAIN AND BOOT NEW SERVER INSTANCES TO MINUTES, ALLOWING YOU TO QUICKLY SCALE CAPACITY, BOTH UP AND DOWN, AS YOUR COMPUTING REQUIREMENTS CHANGE.
- AMAZON EC2 CHANGES THE **ECONOMICS OF COMPUTING** BY ALLOWING YOU TO **PAY ONLY FOR** CAPACITY THAT YOU **ACTUALLY USE**.
- AMAZON EC2 PROVIDES **DEVELOPERS THE TOOLS** TO BUILD FAILURE RESILIENT APPLICATIONS AND ISOLATE THEMSELVES FROM COMMON FAILURE SCENARIOS.

EC2 OPTIONS?

- **ON DEMAND** – ALLOW YOU TO PAY A FIXED RATE BY THE HOUR(OR BY SECOND) WITH NO COMMITMENT.(*FOR LINUX BY THE SECOND & FOR WINDOWS BY THE HOUR*)

- **RESERVED** – PROVIDE YOU WITH A CAPACITY RESERVATION, AND OFFER A SIGNIFICANT DISCOUNT ON THE HOURLY CHARGE FOR AN INSTANCE. 1 OR 3 YEAR CONTRACT.

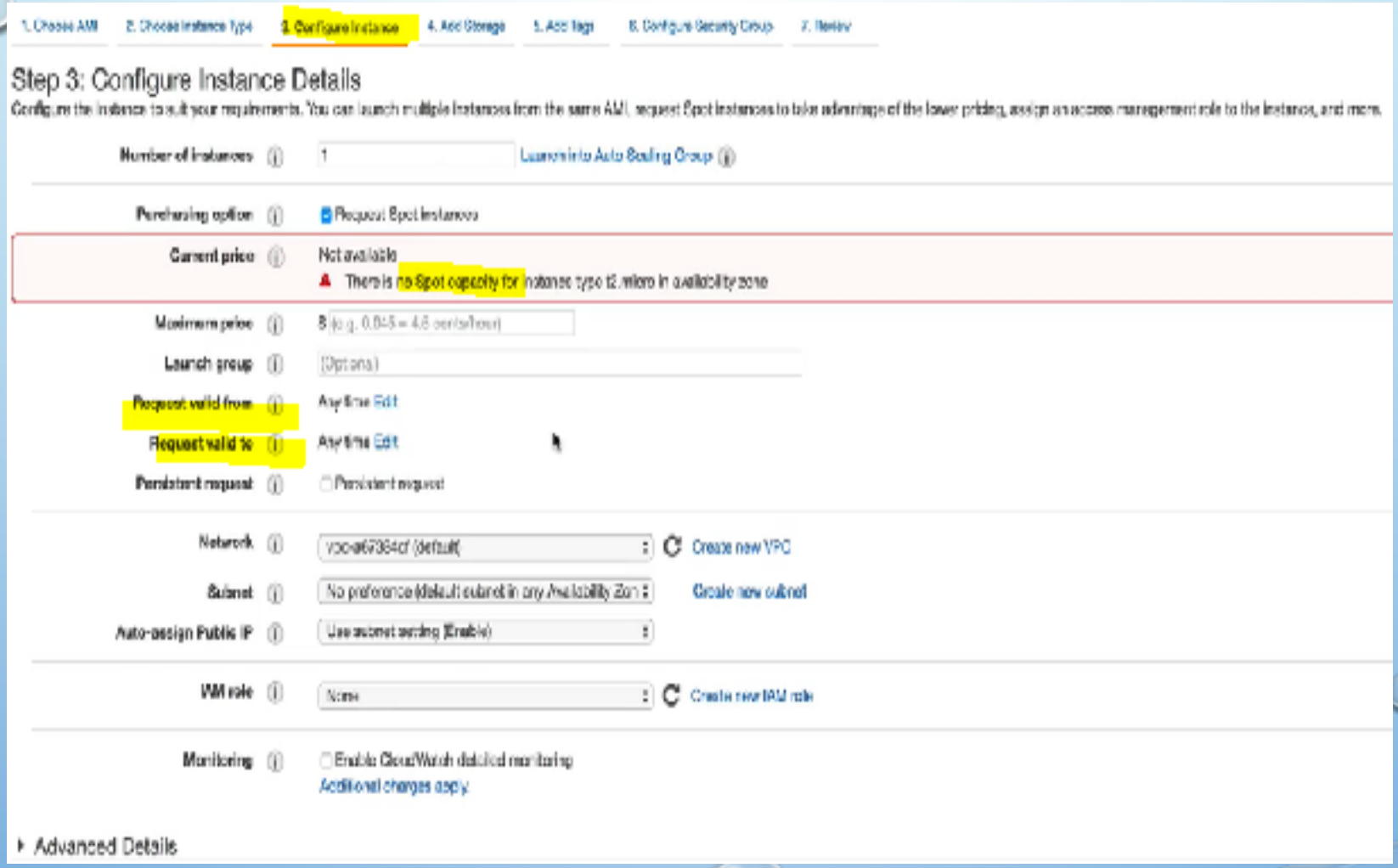
- **SPOT** – ENABLE YOU TO **BID** WHATEVER PRICE YOU WANT FOR INSTANCE CAPACITY, PROVIDING FOR EVEN GREATER SAVINGS IF YOUR APPLICATIONS HAVE FLEXIBLE **START** AND **END** TIMES.

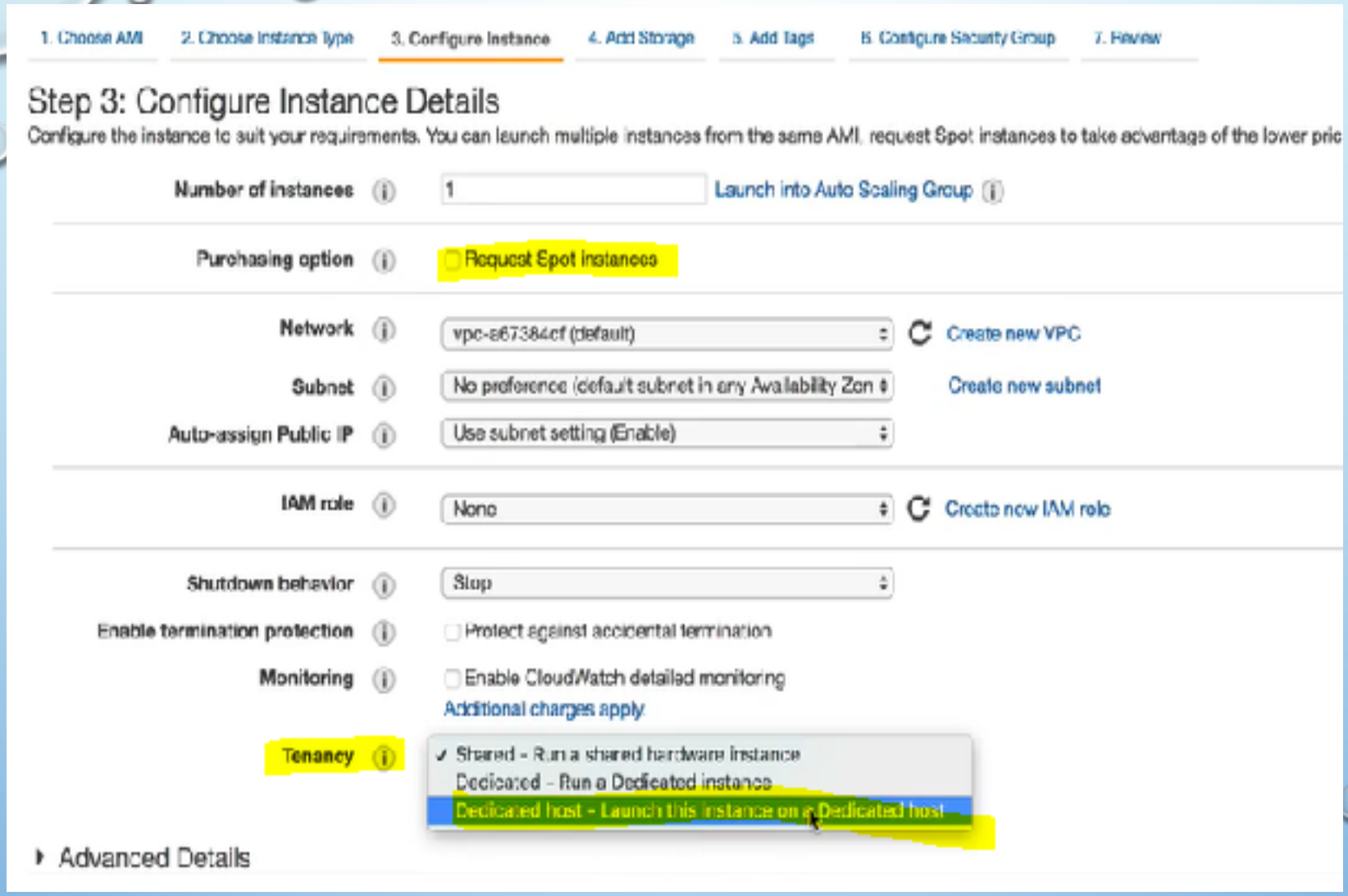
- **DEDICATED HOSTS** – PHYSICAL EC2 SERVER DEDICATED FOR YOUR USE. DEDICATED HOSTS CAN HELP YOU REDUCE COSTS BY ALLOWING YOU TO USE YOUR EXISTING SERVER-BOUND SOFTWARE LICENSES.

- **ON DEMAND**
- USERS THAT WANT THE LOW COST AND FLEXIBILITY OF AMAZON EC2 WITHOUT ANY UP-FRONT PAYMENT OR LONG-TERM COMMITMENT
- APPLICATIONS WITH SHORT TERM, SPIKY, OR UNPREDICTABLE WORKLOADS THAT CAN NOT BE INTERRUPTED.
- APPLICATIONS BEING DEVELOPED OR TESTED ON AMAZON EC2 FOR THE FIRST TIME.
- **RESERVED**
- APPLICATIONS WITH STEADY STATE OR PREDICTABLE USAGE
- APPLICATIONS THAT REQUIRE RESERVED CAPACITY
- USERS ABLE TO MAKE UPFRONT PAYMENTS TO REDUCE THEIR TOTAL COMPUTING COSTS EVEN FURTHER
  - STANDARD RI'S (UP TO 75% OFF ON DEMAND)
  - CONVERTIBLE RI'S(UP TO 54% OFF ON DEMAND) CAPABILITY TO CHANGE THE ATTRIBUTES OF THE RI AS LONG AS THE EXCHANGE RESULTS IN THE CREATION OF RESERVED INSTANCES OF EQUAL OR GREATER VALUE.
  - SCHEDULED RI'S AVAILABLE TO LAUNCH WITHIN THE TIME WINDOWS YOU RESERVE. THIS OPTION ALLOW YOU TO MATCH YOUR CAPACITY RESERVATION TO A PREDICTABLE RECURRING SCHEDULE THAT ONLY REQUIRES A FRACTION OF A DAY, A WEEK, OR A MONTH

- **SPOT**
- APPLICATIONS THAT HAVE FLEXIBLE START AND END TIMES.
- APPLICATIONS THAT ARE ONLY FEASIBLE AT VERY LOW COMPUTE PRICES.
- **DEDICATED HOSTS**
- USEFUL FOR REGULATORY REQUIREMENTS THAT MAY NOT SUPPORT MULTI-TENANT VIRTUALIZATION.
- GREAT FOR LICENSING WHICH DOES NOT SUPPORT MULTI-TENANCY OR CLOUD DEPLOYMENTS.
- CAN BE PURCHASED ON-DEMAND(HOURLY)
- CAN BE PURCHASED AS A RESERVATION FOR UP TO 70% OFF THE ON-DEMAND PRICE.

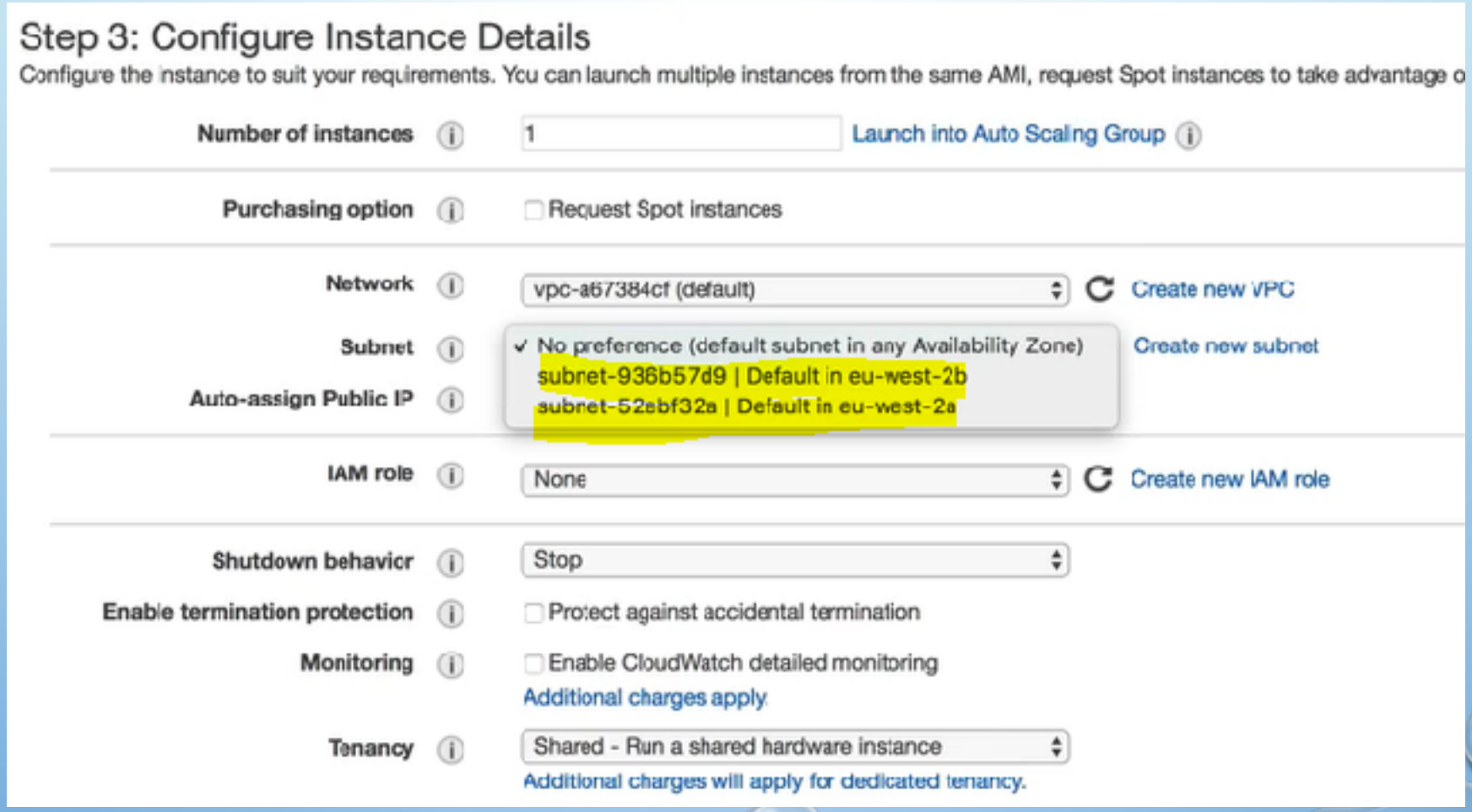
SPOT VS ON-DEMAND




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 the lower pric
Number of instances
1
Launch into Auto Scaling Group
Purchasing option
Request Spot instances
Network
vpc-a67384cf (default)
Create new VPC
Subnet
No preference (default subnet in any Availability Zon
Create new subnet
Auto-assign Public IP
Use subnet setting (Enable)
IAM role
None
Create new IAM role
Shutdown behavior
Stop
Enable termination protection
Protect against accidental termination
Monitoring
Enable CloudWatch detailed monitoring
Additional charges apply
Tenancy
Shared - Run a shared hardware instance
Dedicated - Run a Dedicated instance
Dedicated host - Launch this instance on a Dedicated host
Advanced Details

NOTES

- ONE SUBNET IS EQUAL TO ONE AVAILABILITY ZONE
- ONE SUBNET CAN NOT SHARED WITH MULTIPLE AVAILABILITY ZONES.



EC2 - TERMINATION

- Termination Protection is turned off by default, you must turn it on.
- On an EBS-backed instance, the default action is for the root EBS volume to be deleted when the instance is terminated.
- EBS Root Volumes of your DEFAULT AMI's cannot be encrypted. You can also use a third party tool (such as bit locker etc) to encrypt the root volume, or this can be done when creating AMI's (lab to follow) in the AWS console or using the API.
- Additional volumes can be encrypted.

EC2 INSTANCE TYPES

Family	Speciality	Use case
D2	Dense Storage	Fileservers/Data Warehousing/Hadoop
R4	Memory Optimized	Memory Intensive Apps/DBs
M4	General Purpose	Application Servers
C4	Compute Optimized	CPU Intensive Apps/DBs
G2	Graphics Intensive	Video Encoding/ 3D Application Streaming
I2	High Speed Storage	NoSQL DBs, Data Warehousing etc
F1	Field Programmable Gate Array	Hardware acceleration for your code.
T2	Lowest Cost, General Purpose	Web Servers/Small DBs
P2	Graphics/General Purpose GPU	Machine Learning, Bit Coin Mining etc
X1	Memory Optimized	SAP HANA/Apache Spark etc

EC2 INSTANCE TYPES - DIRTMCGFPX

- DR MC GIFT PX

1. **D** FOR DENSITY
2. **R** FOR RAM
3. **M** FOR MAIN CHOICE FOR GENERAL PURPOSE APPS
4. **C** FOR COMPUTE
5. **G** FOR GRAPHICS
6. **I** FOR IOPS
7. **F** FOR FPGA
8. **T** FOR CHEAP GENERAL PURPOSE(T2 MICRO)
9. **P** FOR GRAPHICS
10. **X** FOR EXTREME MEMORY

WHAT IS EBS?

- AMAZON EBS ALLOWS YOU TO **CREATE STORAGE VOLUMES** AND ATTACH THEM TO AMAZON EC2 INSTANCES.

- ONCE ATTACHED, YOU CAN **CREATE A FILE SYSTEM** ON TOP OF THESE VOLUMES, RUN A DATABASE, OR USE THEM IN ANY OTHER WAY YOU WOULD USE A BLOCK DEVICE.

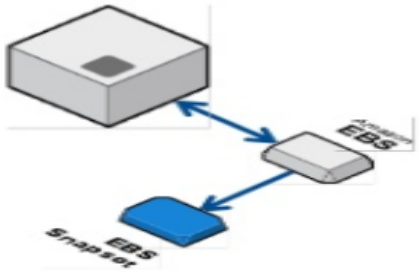
- AMAZON EBS VOLUMES ARE PLACED IN A SPECIFIC **AVAILABILITY ZONE**, WHERE THEY ARE AUTOMATICALLY REPLICATED TO PROTECT YOU FROM THE **FAILURE OF A SINGLE COMPONENT**.

WHAT IS MEANT BY IOPS?

- WHEN EVALUATING A NEW STORAGE SYSTEM, ESPECIALLY AN ALL-FLASH ARRAY, THE NUMBER OF IOPS (**INPUTS/OUTPUTS PER SECOND**) THAT THE STORAGE SYSTEM CAN SUSTAIN IS OFTEN USED TO DIFFERENTIATE ONE STORAGE SYSTEM FROM ANOTHER.

Amazon Elastic Block Store (EBS)

Elastic Block Storage: Persistent Storage for EC2



High performance block storage device
Mount as drives to instances
Persistent and independent of instance lifecycle

Feature	Details
High performance file system	Mount EBS as drives and format as required
Flexible size	Volumes from 1GB to 1TB in size
Secure	Private to your instances
Available	Replicated within an Availability Zone
Backups	Volumes can be snapshotted for point in time restore
Monitoring	Detailed metrics captured via Cloud Watch

EBS VOLUME TYPES

1. GENERAL PURPOSE SSD(GP2) : [**BOOT OS FROM THIS STORAGE**]

- GENERAL PURPOSE, BALANCES BOTH PRICE AND PERFORMANCE.
- RATIO OF 3 IOPS PER GB WITH UP TO 10,000 IOPS AND THE ABILITY TO BURST UP TO 3000 IOPS FOR EXTENDED PERIODS OF TIME FOR VOLUMES AT 3334 GIB & ABOVE.

2. PROVISIONED IOPS SSD(IO1): [**BOOT OS FROM THIS STORAGE**]

- DESIGNED FOR I/O INTENSIVE APPLICATIONS SUCH AS LARGE RELATIONAL OR NOSQL DATABASES.
- USE IF YOU NEED MORE THAN 10,000 IOPS
- CAN PROVISION UP TO 20,000 IOPS PER VOLUME.

3. THROUGHPUT OPTIMIZED HDD(ST1):

- BIG DATA
- DATA WAREHOUSES
- LOG PROCESSING
- ***CAN NOT BE A BOOT VOLUME***

4. COLD HDD(SC1):

- LOWEST COST STORAGE FOR INFREQUENTLY ACCESSED WORKLOADS
- FILE SERVER
- *CAN NOT BE A BOOT VOLUME*

5. MAGNETIC(STANDARD): [BOOT OS FROM THIS STORAGE]

- LOWEST COST PER GIGABYTE OF ALL EBS VOLUME TYPES THAT IS BOOTABLE.
- MAGNETIC VOLUMES ARE IDEAL FOR WORKLOADS WHERE DATA IS ACCESSED INFREQUENTLY, AND APPLICATIONS WHERE THE LOWEST STORAGE COST IS IMPORTANT.

EBS - **ELASTIC BLOCK STORE**

	Solid-State Drives (SSD)		Hard disk Drives (HDD)	
Volume Type	General Purpose SSD (gp2)*	Provisioned IOPS SSD (io1)	Throughput Optimized HDD (st1)	Cold HDD (sc1)
Description	General purpose SSD volume that balances price and performance for a wide variety of workloads	Highest-performance SSD volume for mission-critical low-latency or high-throughput workloads	Low cost HDD volume designed for frequently accessed, throughput-intensive workloads	Lowest cost HDD volume designed for less frequently accessed workloads
Use Cases	• Recommended for most workloads • System boot volumes • Virtual desktops • Low-latency interactive apps • Development and test environments	• Critical business applications that require sustained IOPS performance, or more than 10,000 IOPS or 160 MiB/s of throughput per volume • Large database workloads, such as: ◦ MongoDB ◦ Cassandra ◦ Microsoft SQL Server ◦ MySQL ◦ PostgreSQL ◦ Oracle	• Streaming workloads requiring consistent, fast throughput at a low price • Big data • Data warehouses • Log processing • Cannot be a boot volume	• Throughput-oriented storage for large volumes of data that is infrequently accessed • Scenarios where the lowest storage cost is important • Cannot be a boot volume
API Name	gp2	io1	st1	sc1
Volume Size	1 GiB - 16 TiB	4 GiB - 16 TiB	500 GiB - 16 TiB	500 GiB - 16 TiB
Max IOPS/Volume**	10,000	32,000	500	250
Max Throughput/Volume	160 MiB/s	500 MiB/s***	500 MiB/s	250 MiB/s
Max IOPS/Instance	80,000	80,000	80,000	80,000
Max Throughput/Instance†	1,750 MiB/s	1,750 MiB/s	1,750 MiB/s	1,750 MiB/s
Dominant Performance Attribute	IOPS	IOPS	MiB/s	MiB/s

SUMMARY

- **KNOW THE DIFFERENCES BETWEEN:**

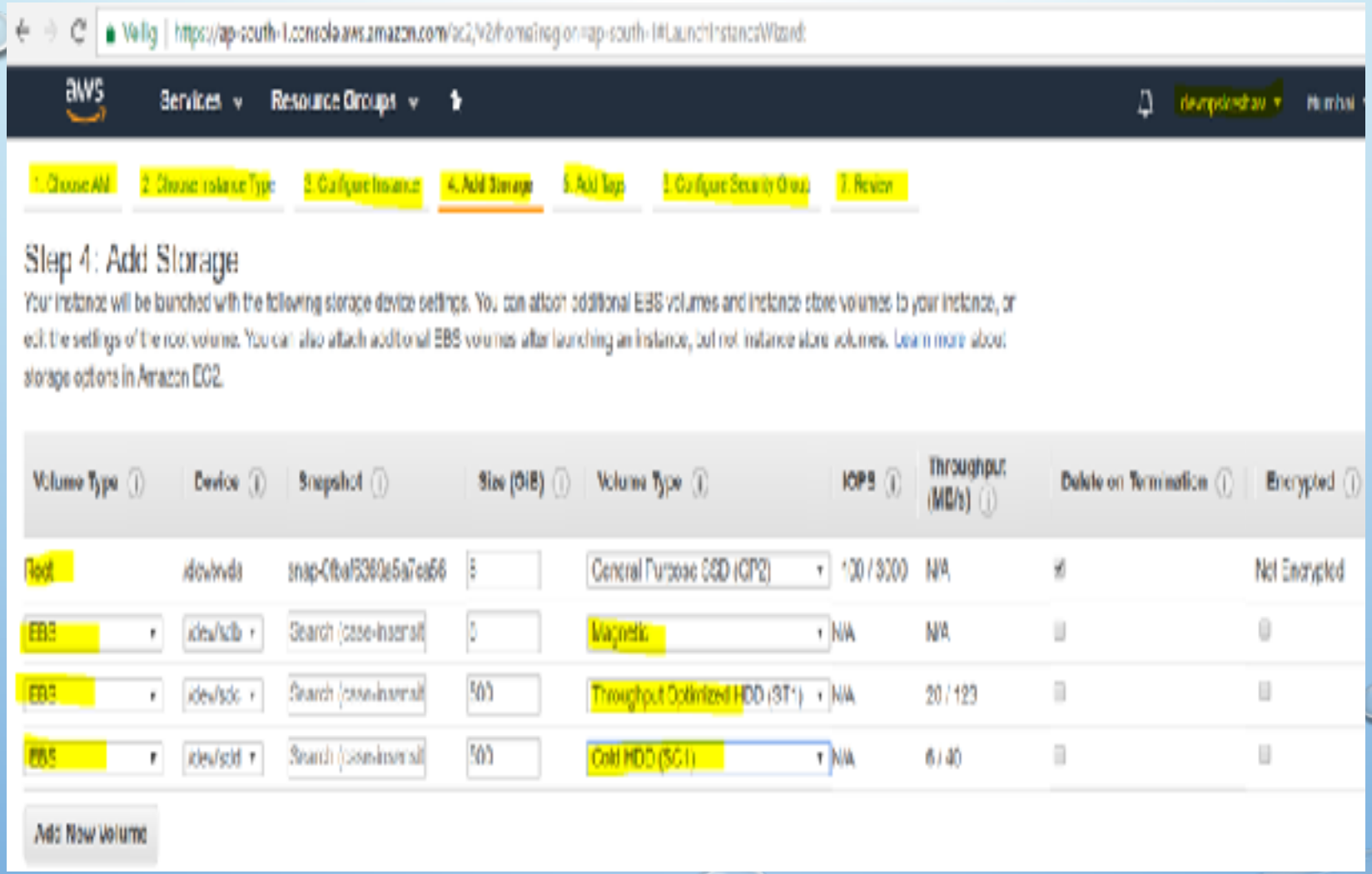
  1. ON DEMAND 2. SPOT 3. RESERVED & 4. DEDICATED HOSTS

- **REMEMBER WITH SPOT INSTANCES:**
  - IF YOU TERMINATE THE INSTANCE, YOU PAY FOR THE HOUR.
  - IF AWS TERMINATES THE SPOT INSTANCE, YOU GET THE HOUR IT WAS TERMINATED IN FOR FREE.

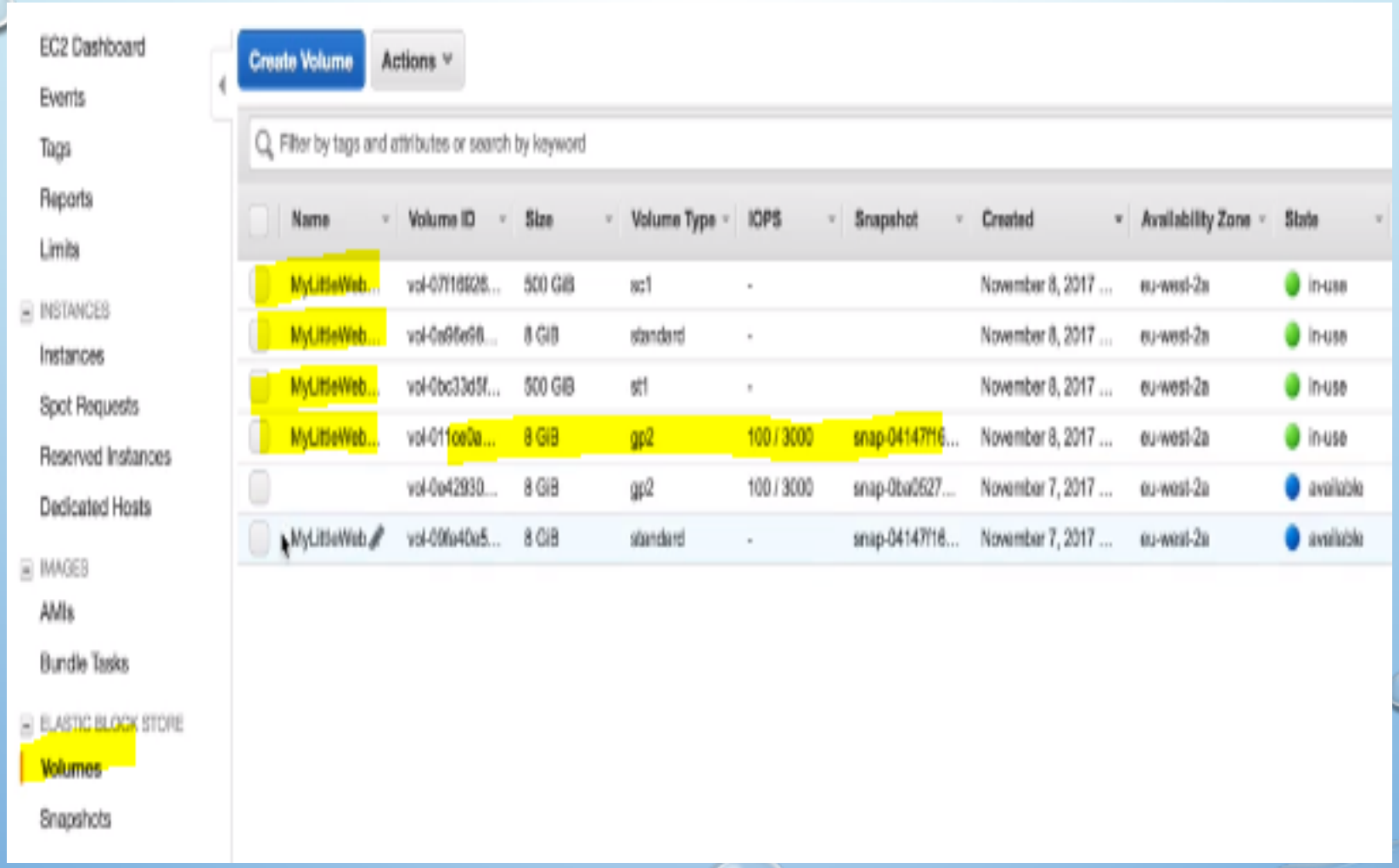
- **EBS CONSISTS OF:**
  1. SSD, GENERAL PUPOSE – GP2 (UP TO 10,000 IOPS)
  2. SSD, PROVISIONED IOPS – IO1 (MORE THAN 10,000 IOPS)
  3. HDD, THROUGHPUT OPTIMIZED – ST1 (FREQUENTLY ACCESSED WORKLOADS) [***NOT BOOTABLE***]
  4. HDD, COLD – SC1(LESS FREQUENTLY ACCESSED DATA) [***NOT BOOTABLE***]
  5. HDD, MAGNETIC – STANDARD(CHEAP, INFREQUENTLY ACCESSED STORAGE)

- *NOTE: YOU CAN NOT MOUNT 1 EBS VOLUME TO MULTIPLE EC2 INSTANCES, INSTEAD USE EFS:*

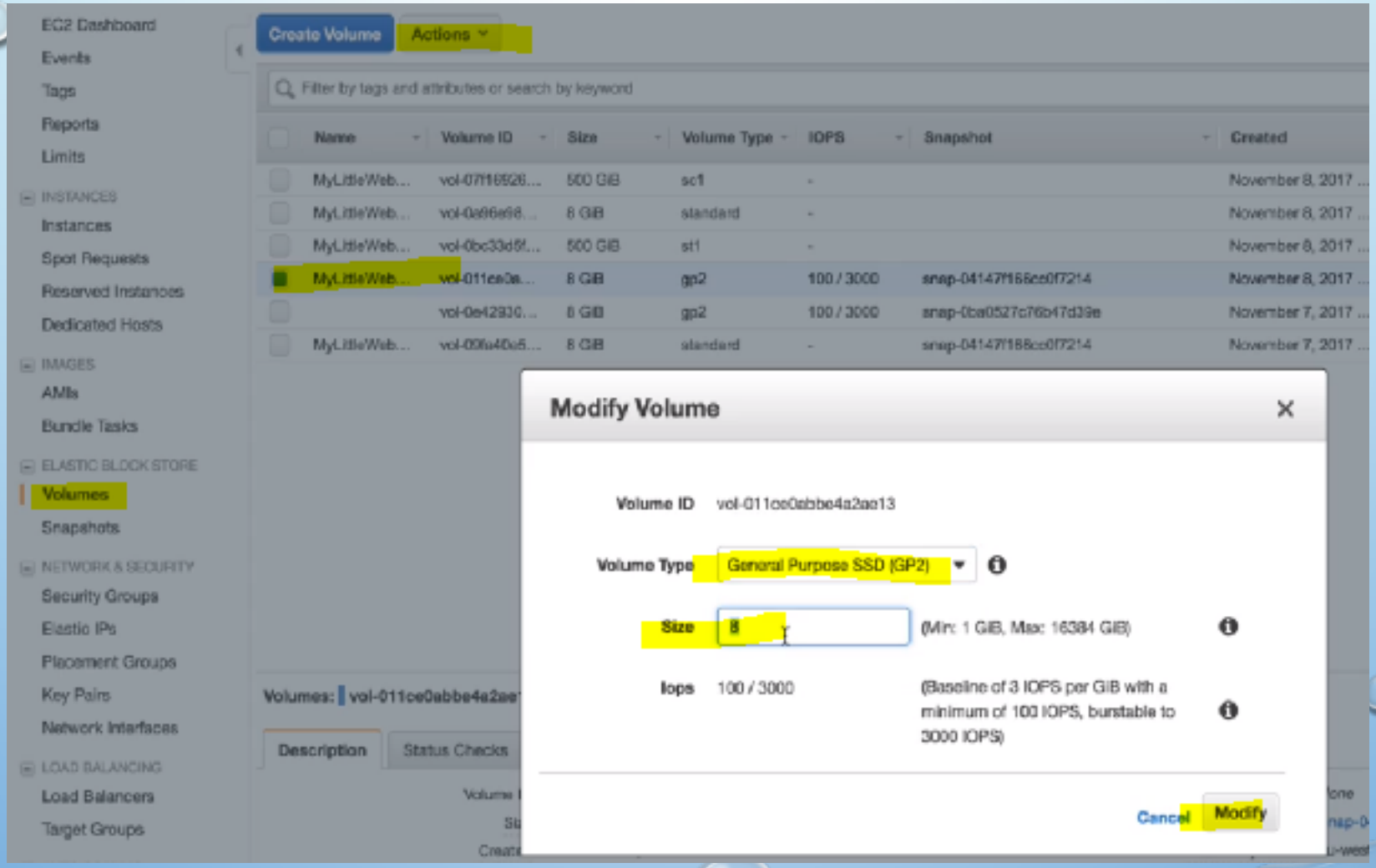
EBS SNAPSHOTS



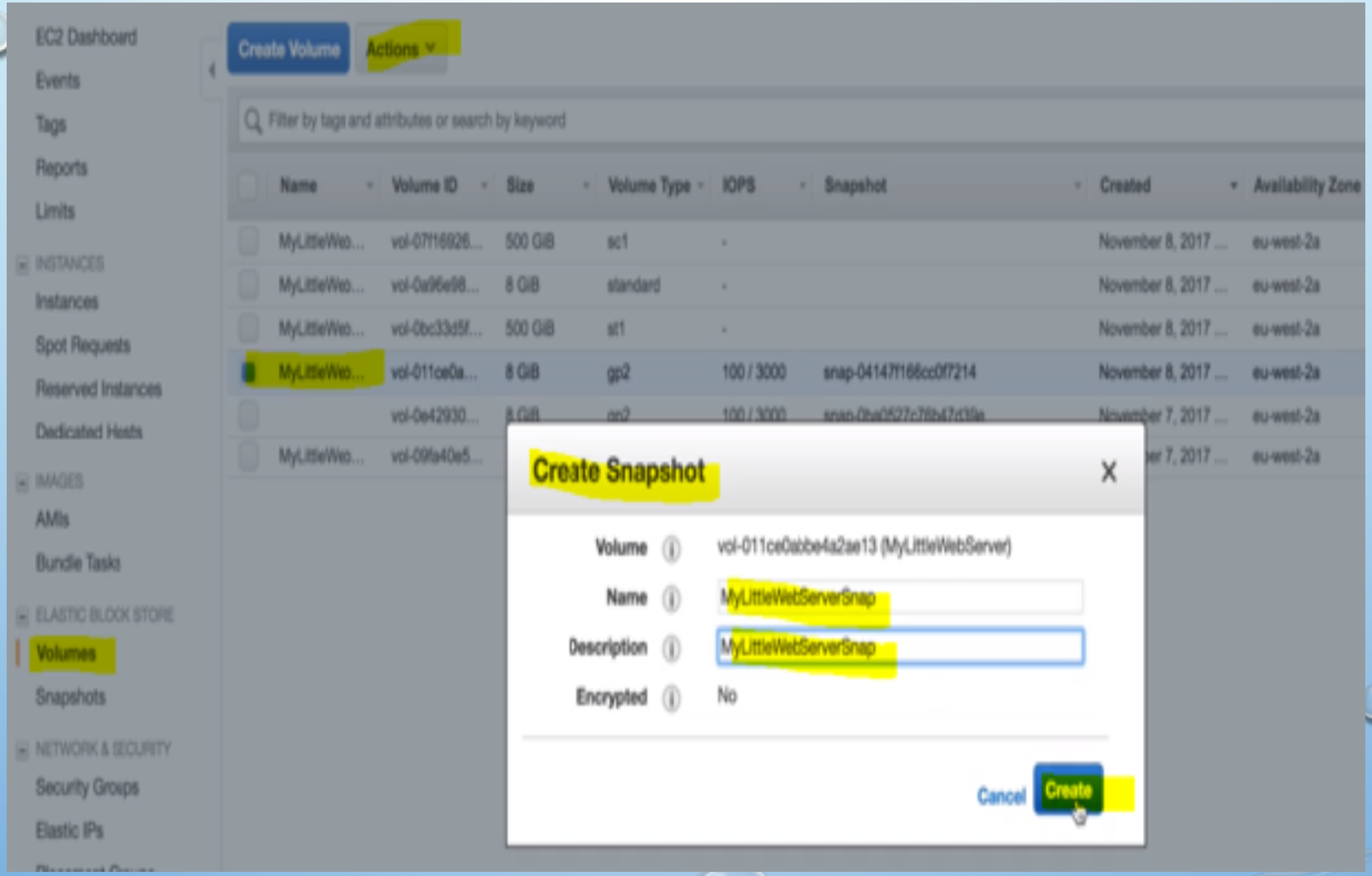
EBS - PARTITIONS(VOLUMES)



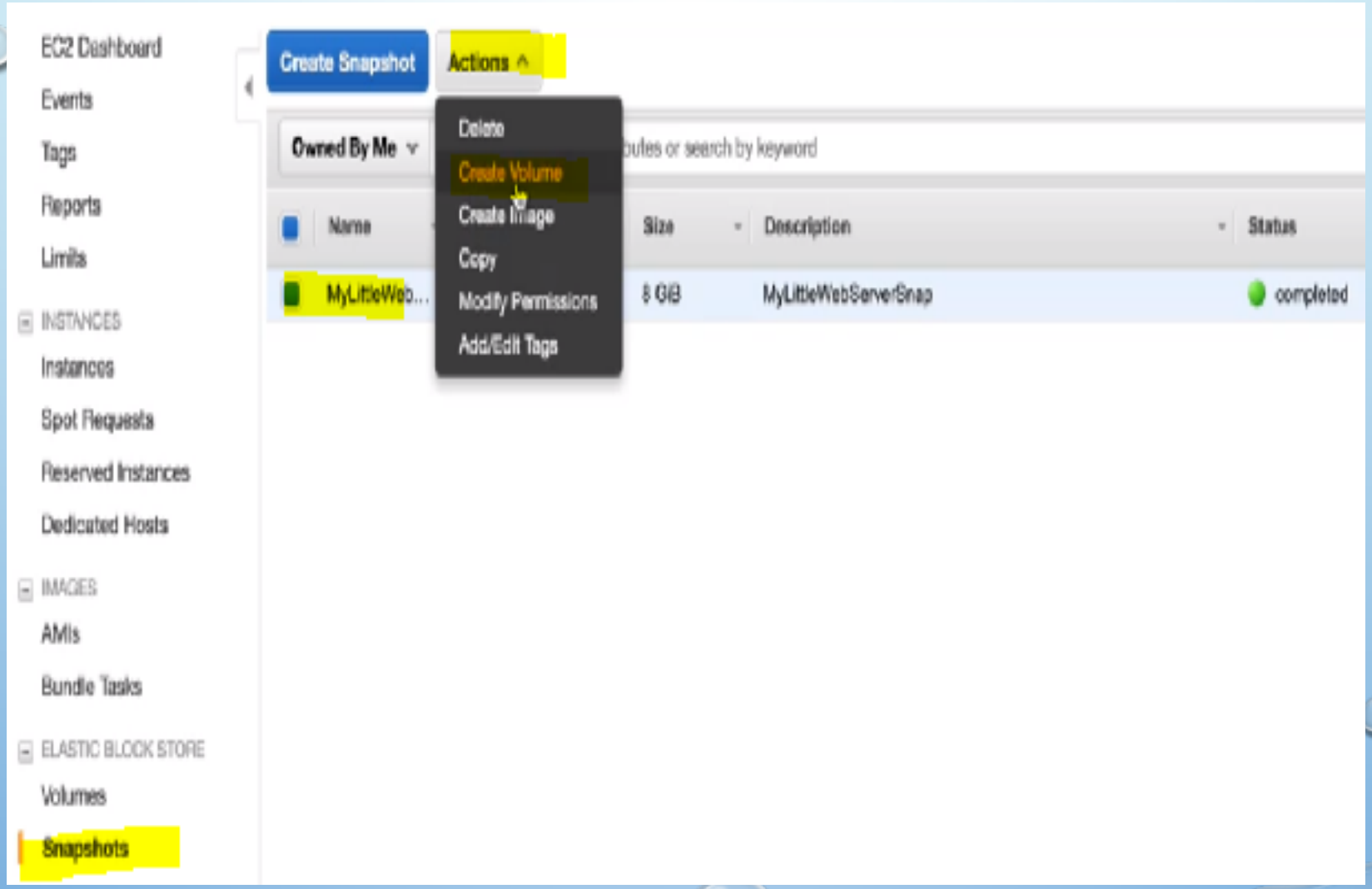
EBS – MODIFY THE VOLUME SNAPSHOT



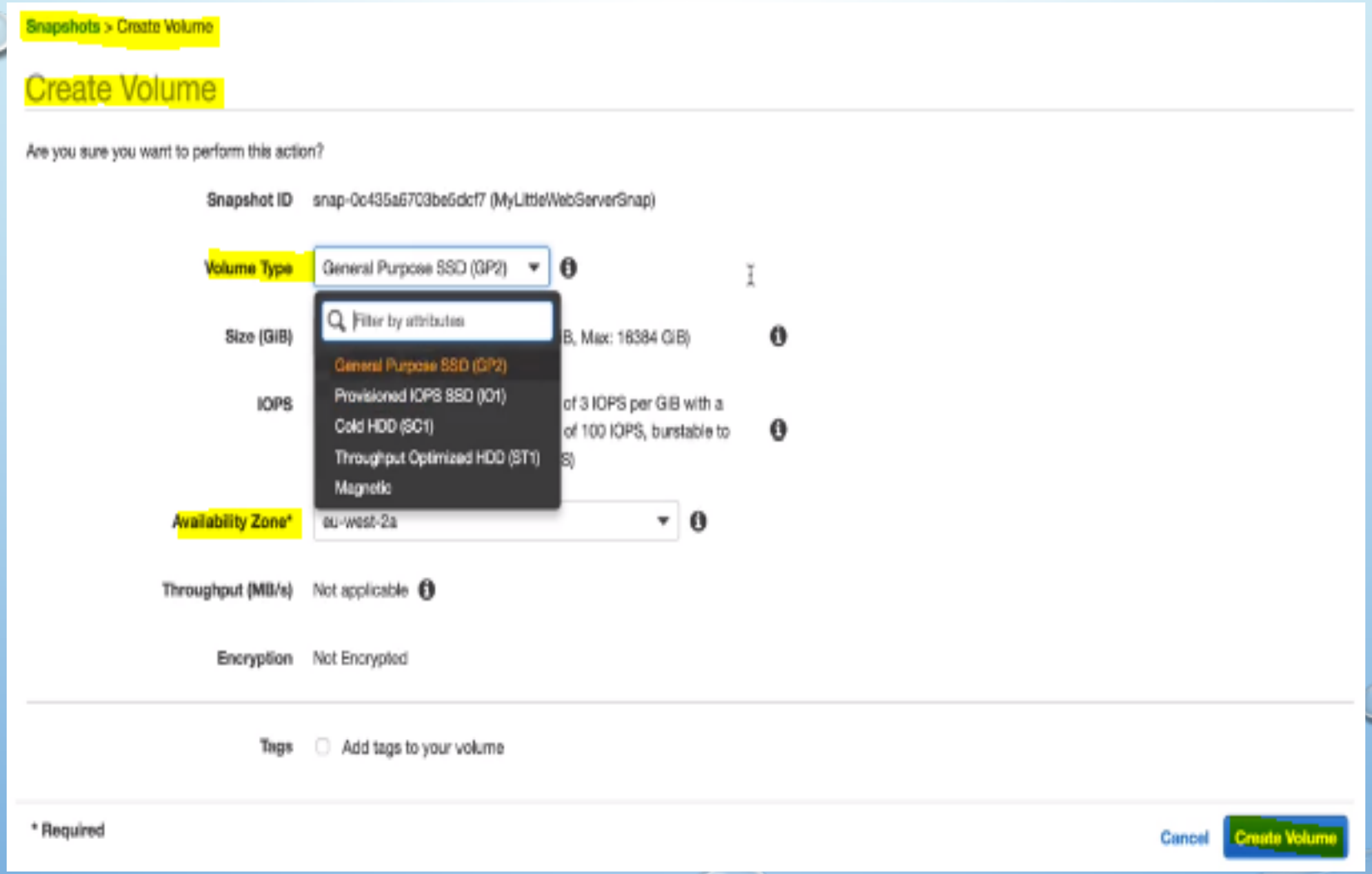
EBS – CREATING SNAPSHOTS



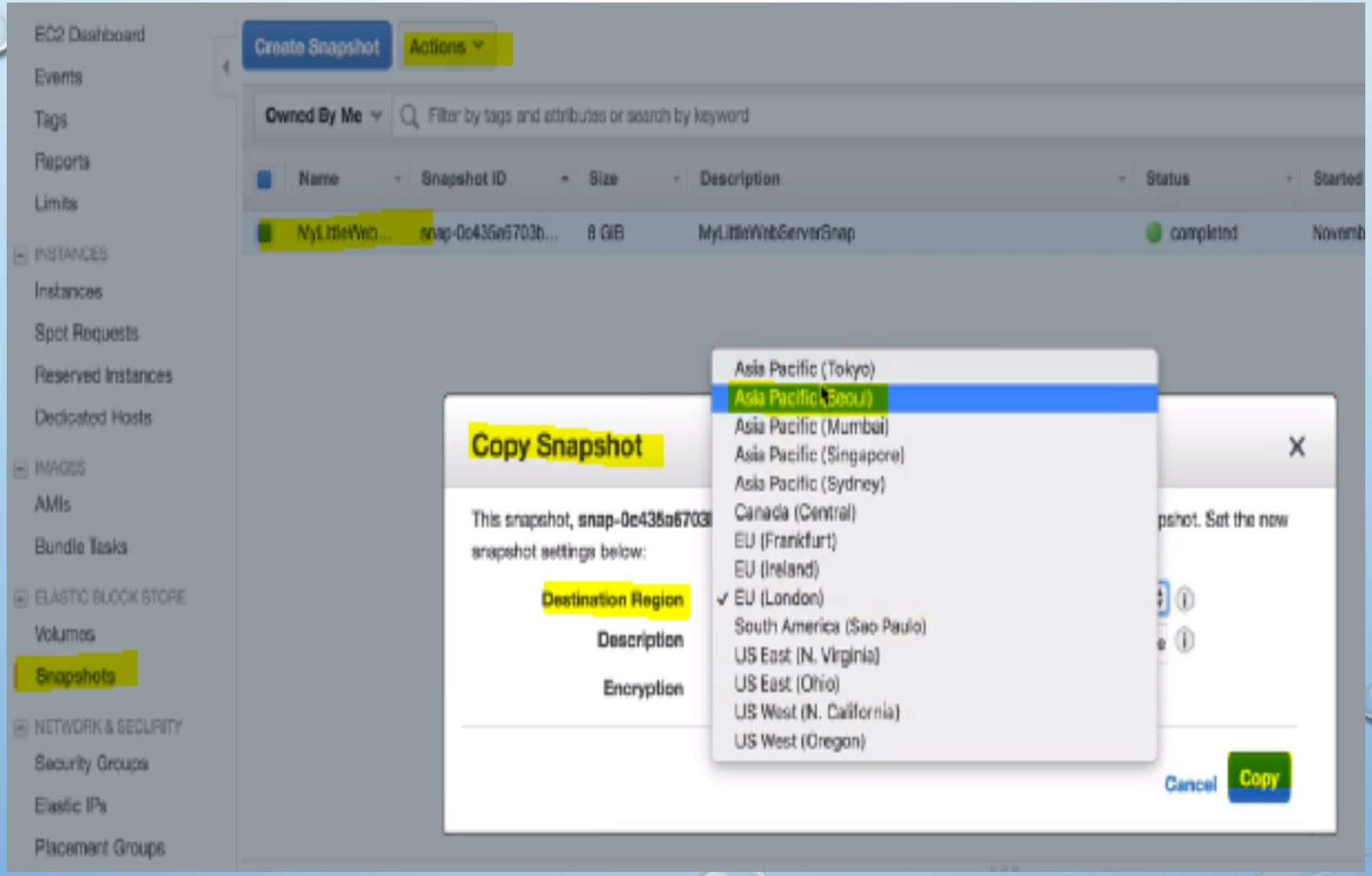
EBS – CREATING VOLUMES



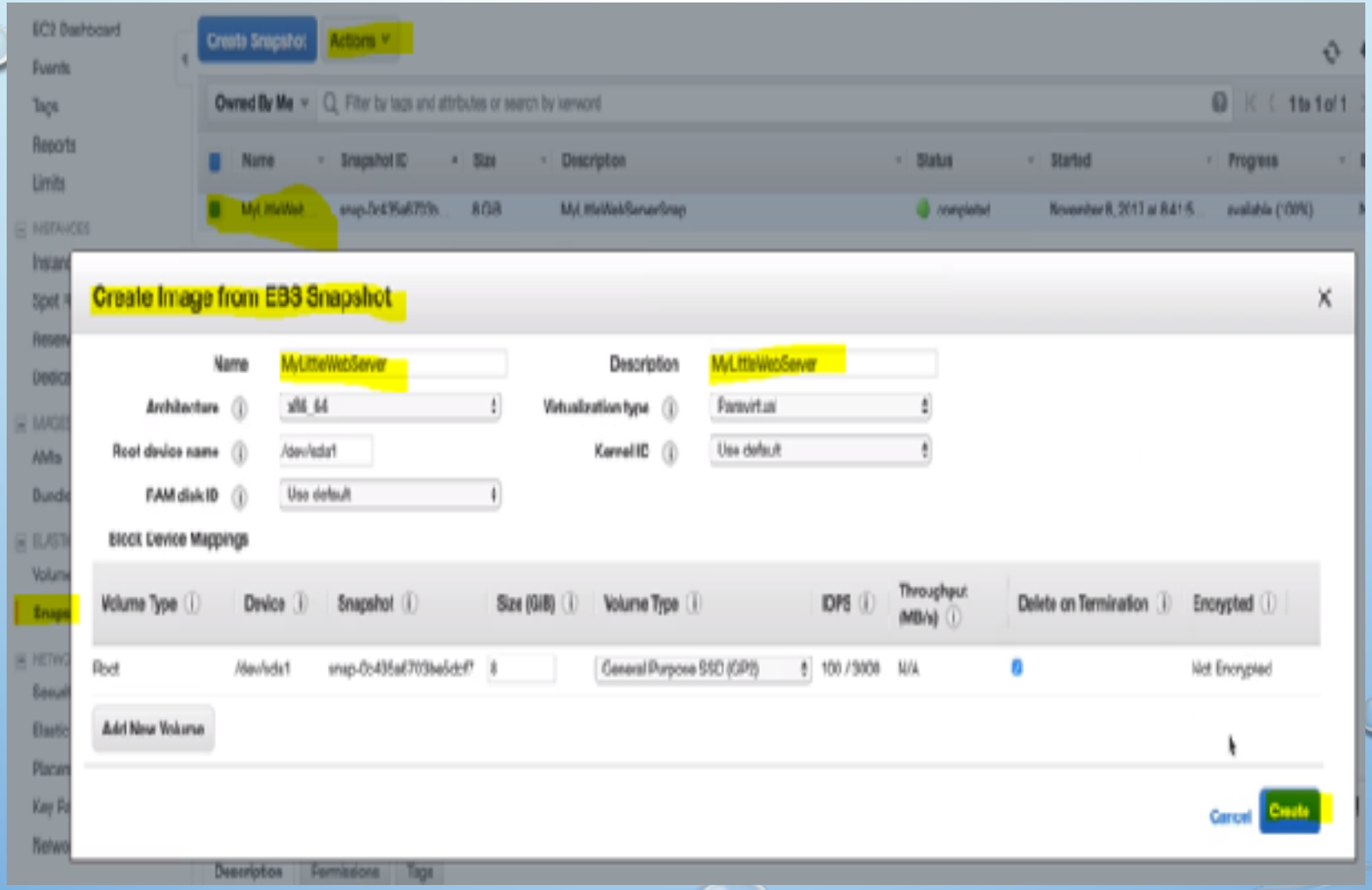
EBS – CREATE VOLUMES



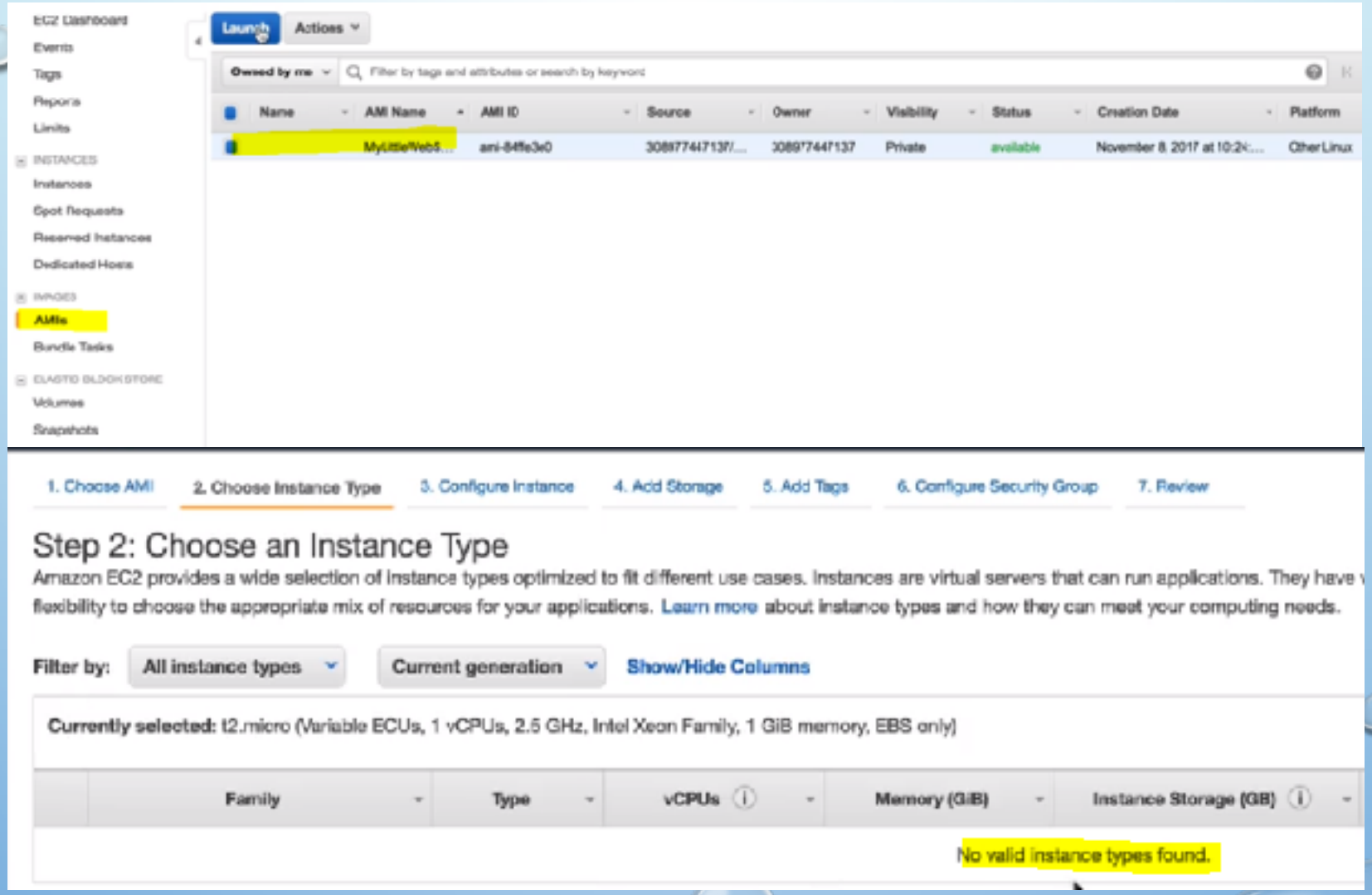
EBS – COPYING SNAPSHOTS



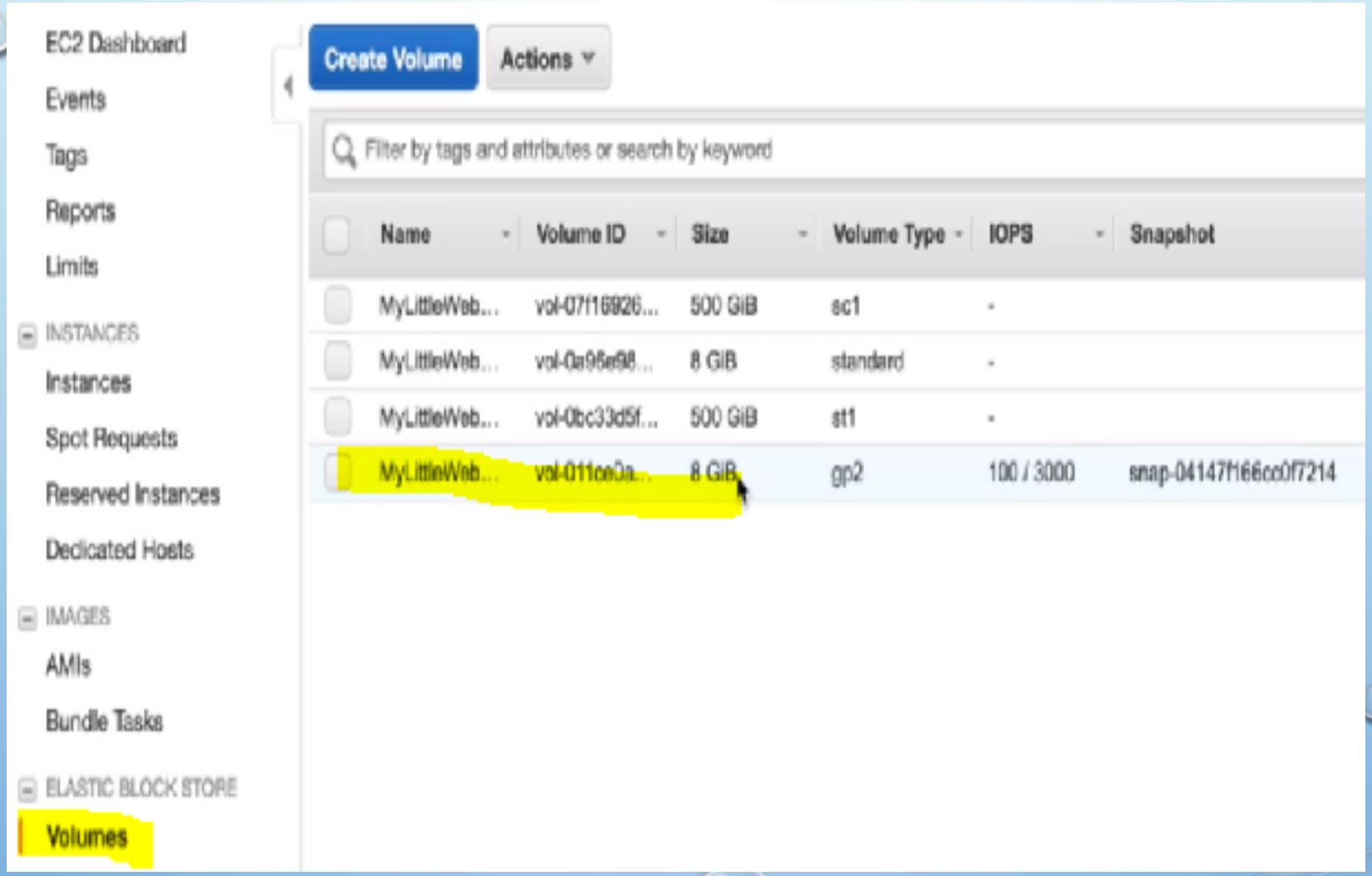
EBS – CREAING IMAGE FROM EBS SNAPSHOT



AMI'S – CREATING A IMAGE



WHILE CREATING A SNAPSHOT, WE GOT THE ERROR AND THAT IS BECAUSE OF ONLY ONE PRIMARY PARITION WAS TAKEN AS SNAPSHOT.



GO TO INSTANCES & TAKE THE SNAPSHOT OF EC2 INSTANCE & REMOVE VOLUMES IF ANY

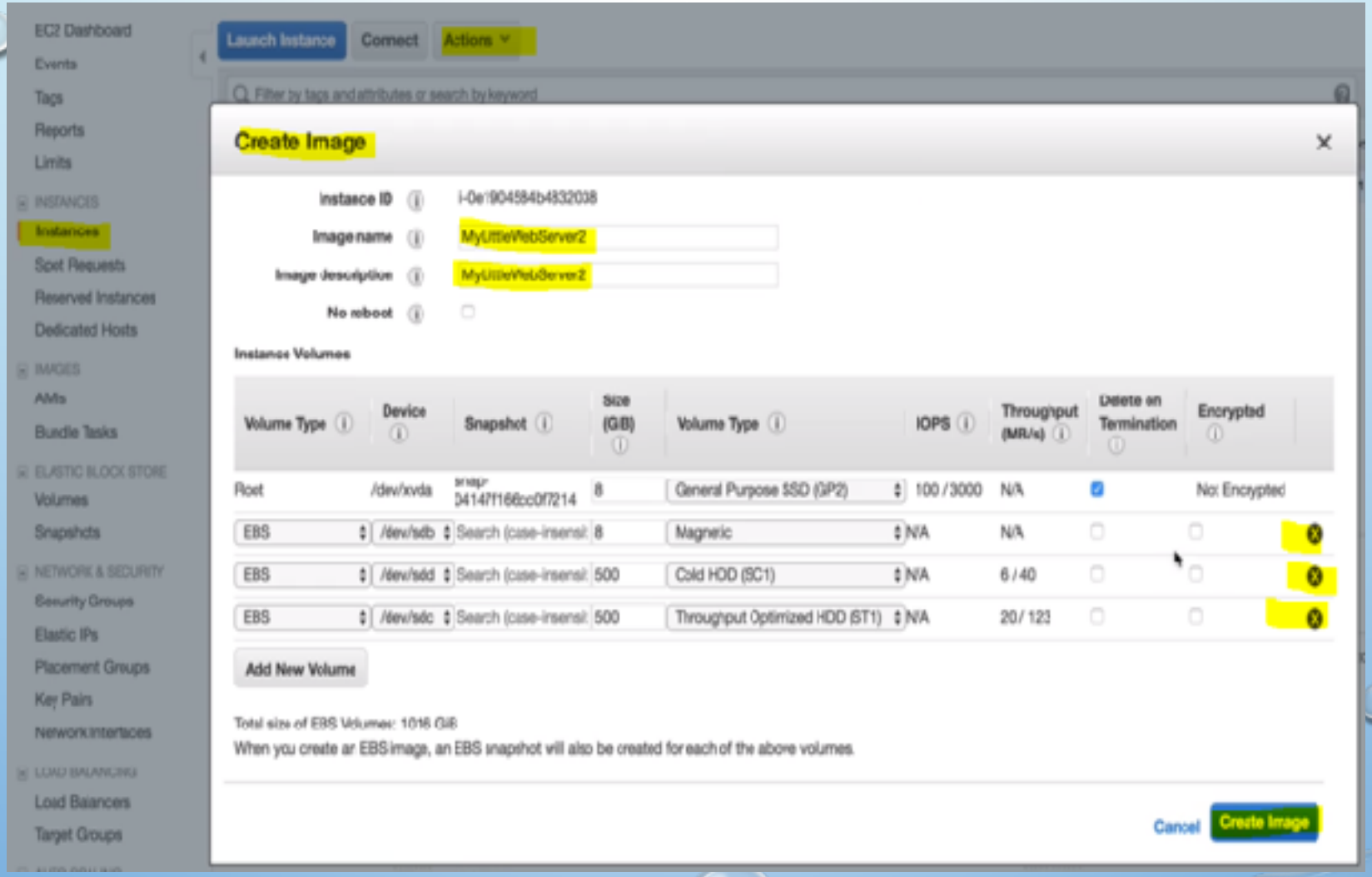
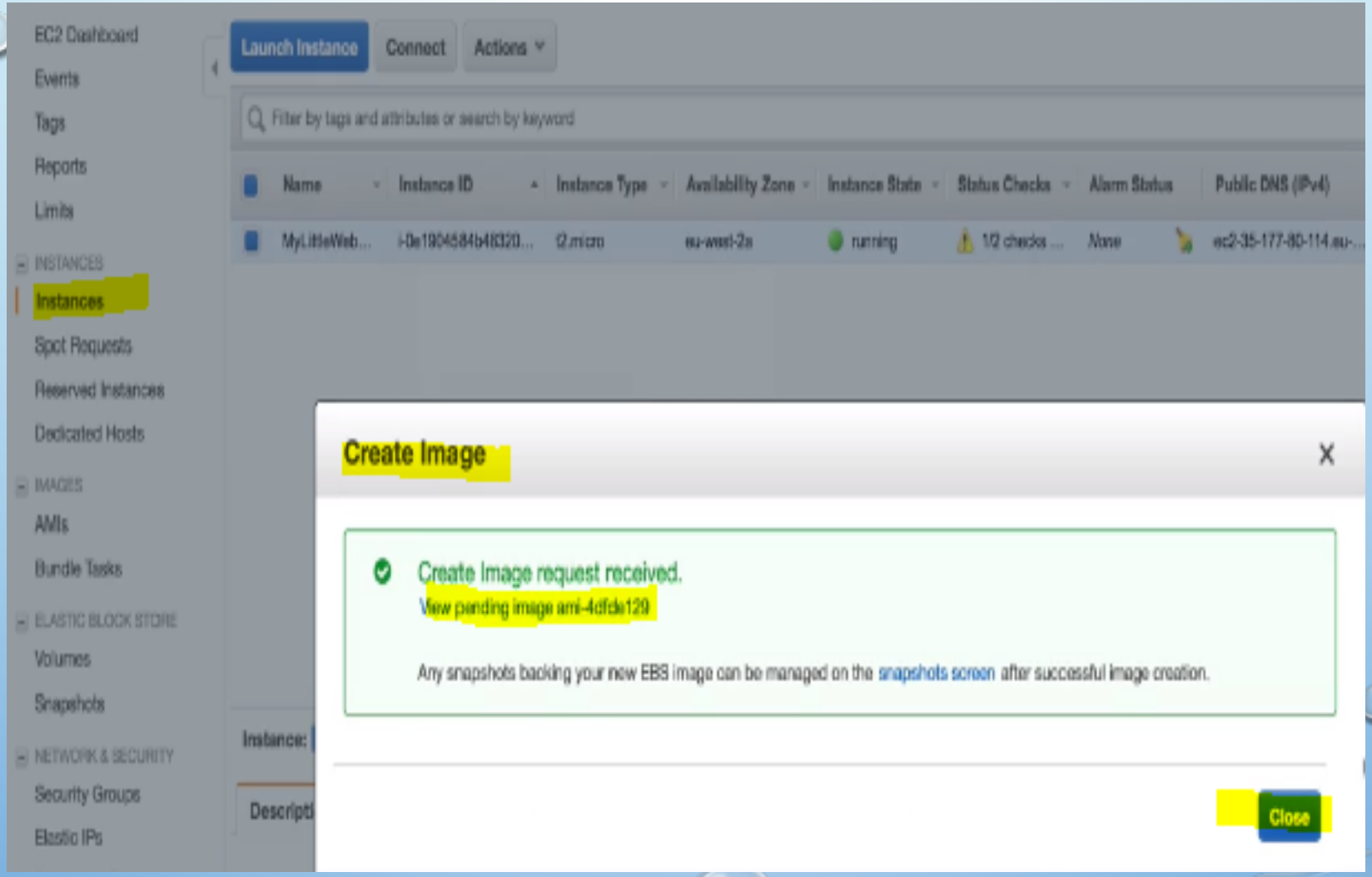
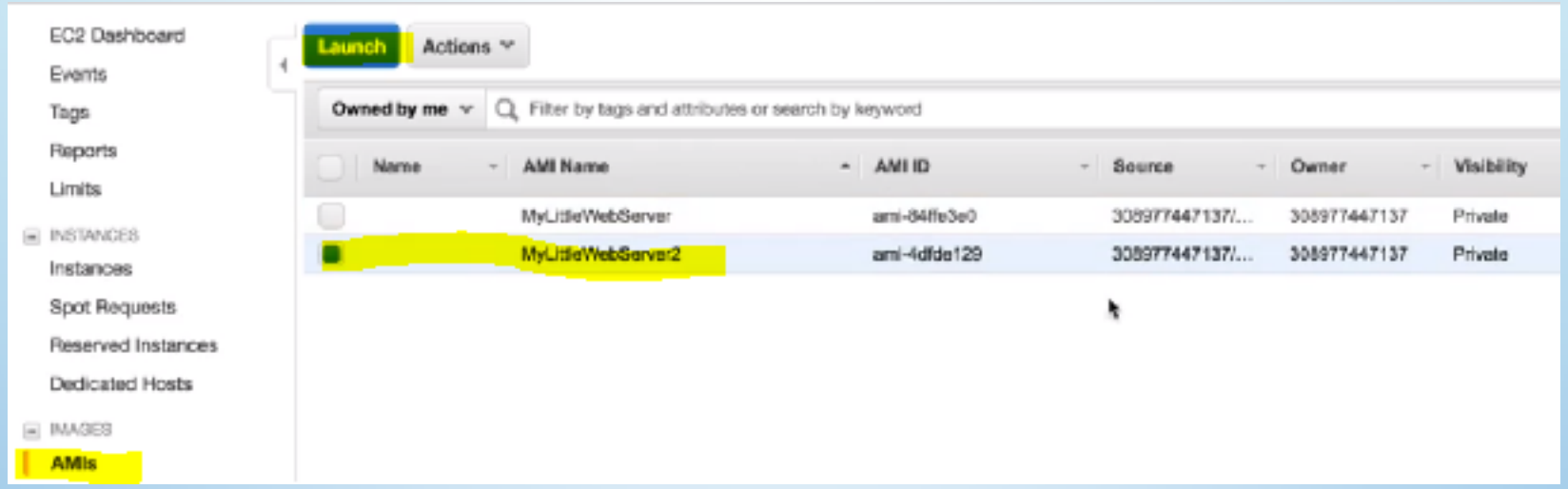


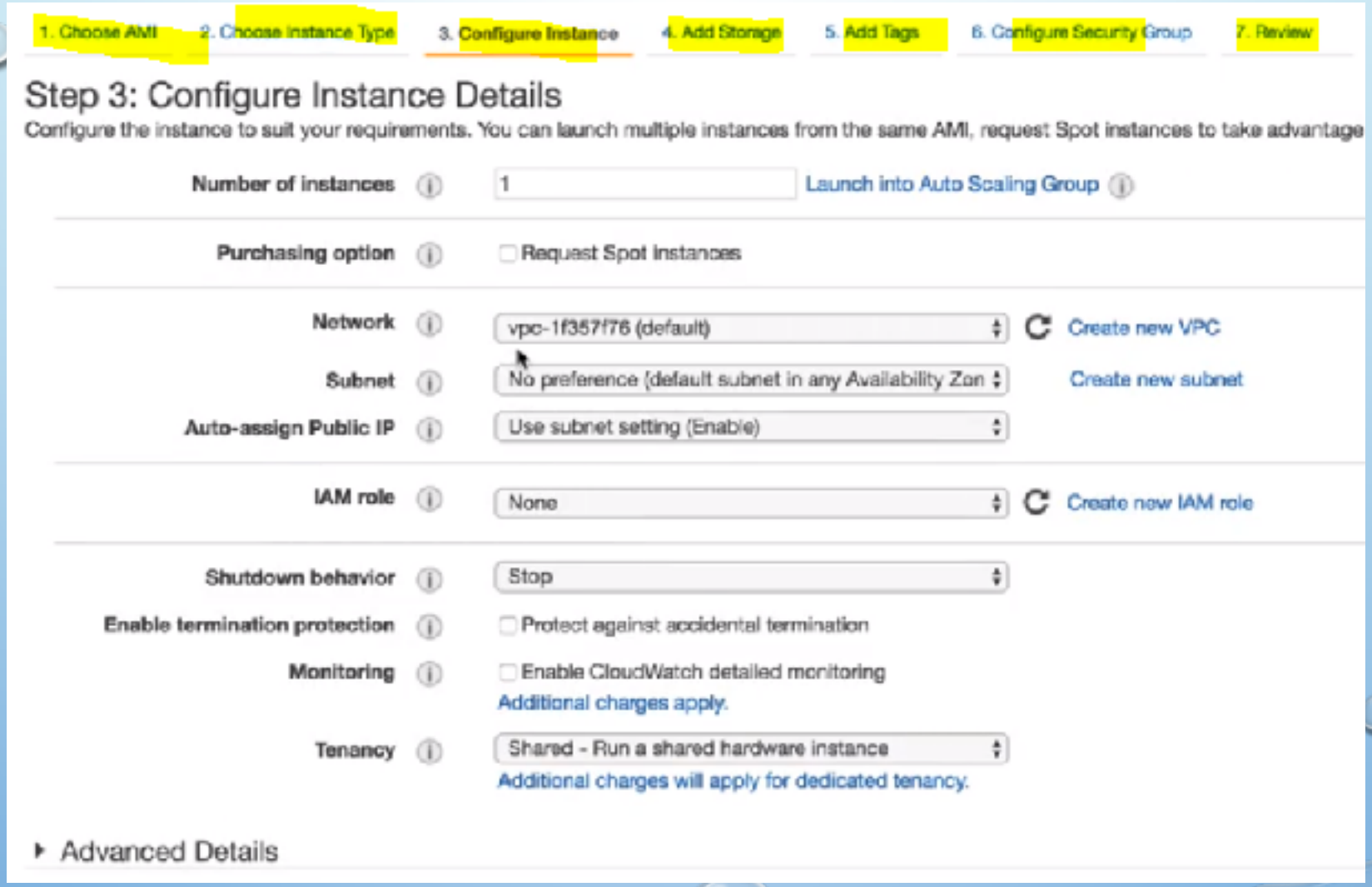
IMAGE HAS BEEN CREATED



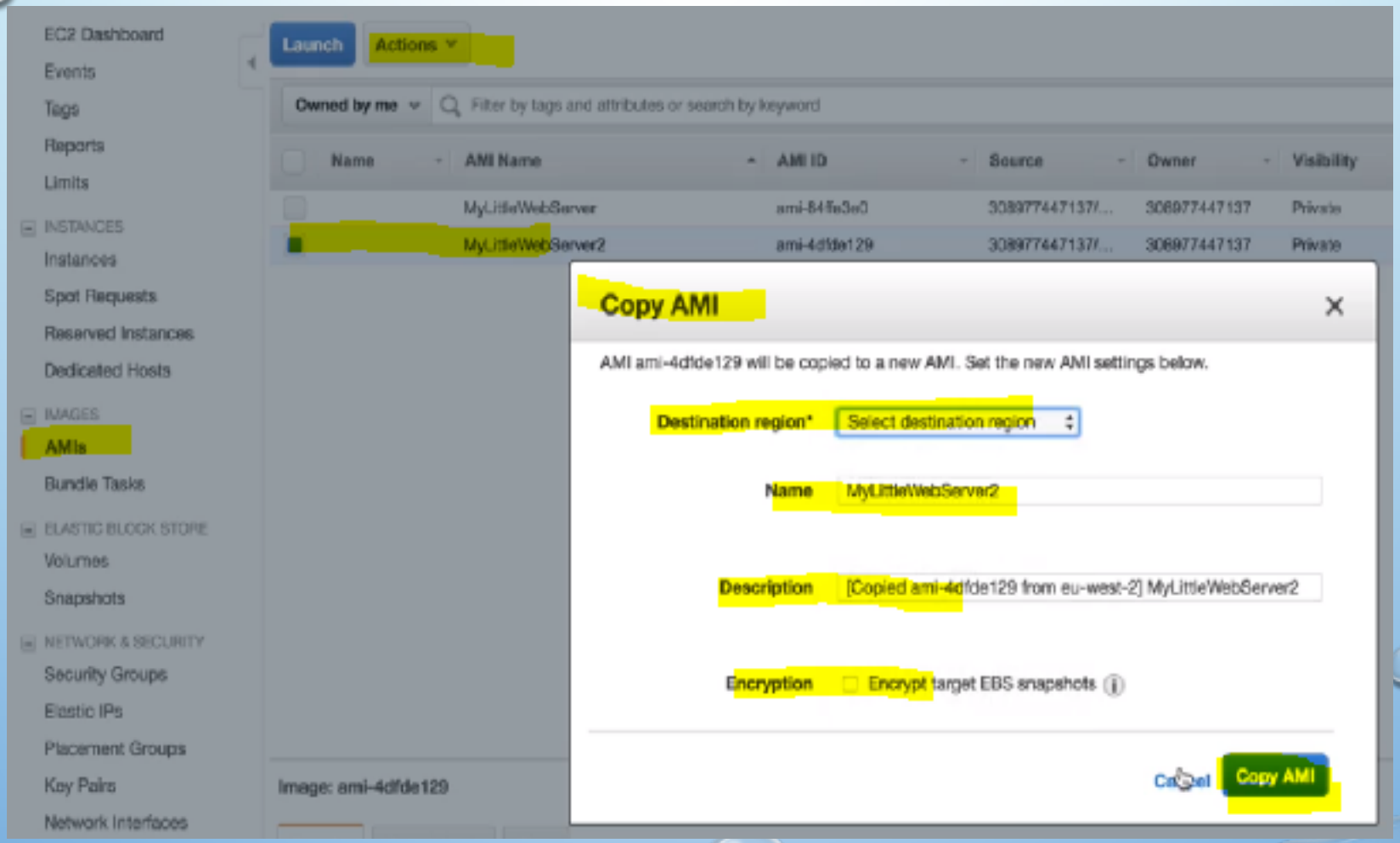
CLICK ON LAUNCH TO CREATE A EC2 INSTANCE



CREATING EC2 INSTANCE FROM IMAGES



COPY AMI


EC2 Dashboard
Events
Tags
Reports
Limits
INSTANCES
Instances
Spot Requests
Reserved Instances
Dedicated Hosts
IMAGES
AMIs
Bundle Tasks
ELASTIC BLOCK STORE
Volumes
Snapshots
NETWORK & SECURITY
Security Groups
Elastic IPs
Placement Groups
Key Pairs
Network Interfaces
Launch
Actions
Owned by me
Filter by tags and attributes or search by keyword
Name
AMI Name
AMI ID
Source
Owner
Visibility
MyLittleWebServer
ami-84fe3e0
306977447137/...
306977447137
Private
MyLittleWebServer2
ami-4dfde129
306977447137/...
306977447137
Private
Image: ami-4dfde129
Copy AMI
AMI ami-4dfde129 will be copied to a new AMI. Set the new AMI settings below.
Destination region*
Select destination region
Name
MyLittleWebServer2
Description
[Copied ami-4dfde129 from eu-west-2] MyLittleWebServer2
Encryption
Encrypt target EBS snapshots
Cancel
Copy AMI

VOLUMES & SNAPSHOTS

- VOLUMES EXISTS ON EBS: VIRTUAL HARD DISK
- SNAPSHOTS EXISTS ON S3
- SNAPSHOTS ARE POINT IN TIME COPIES OF VOLUMES
- SNAPSHOTS ARE INCREMENTAL - THIS MEANS THAT ONLY THE BLOCKS THAT HAVE CHANGED SINCE YOUR LAST SINCE YOUR LAST SNAPSHOT ARE MOVED TO S3.
- IF THIS IS YOUR FIRST SNAPSHOT, IT MAY TAKE SOME TIME TO CREATE.

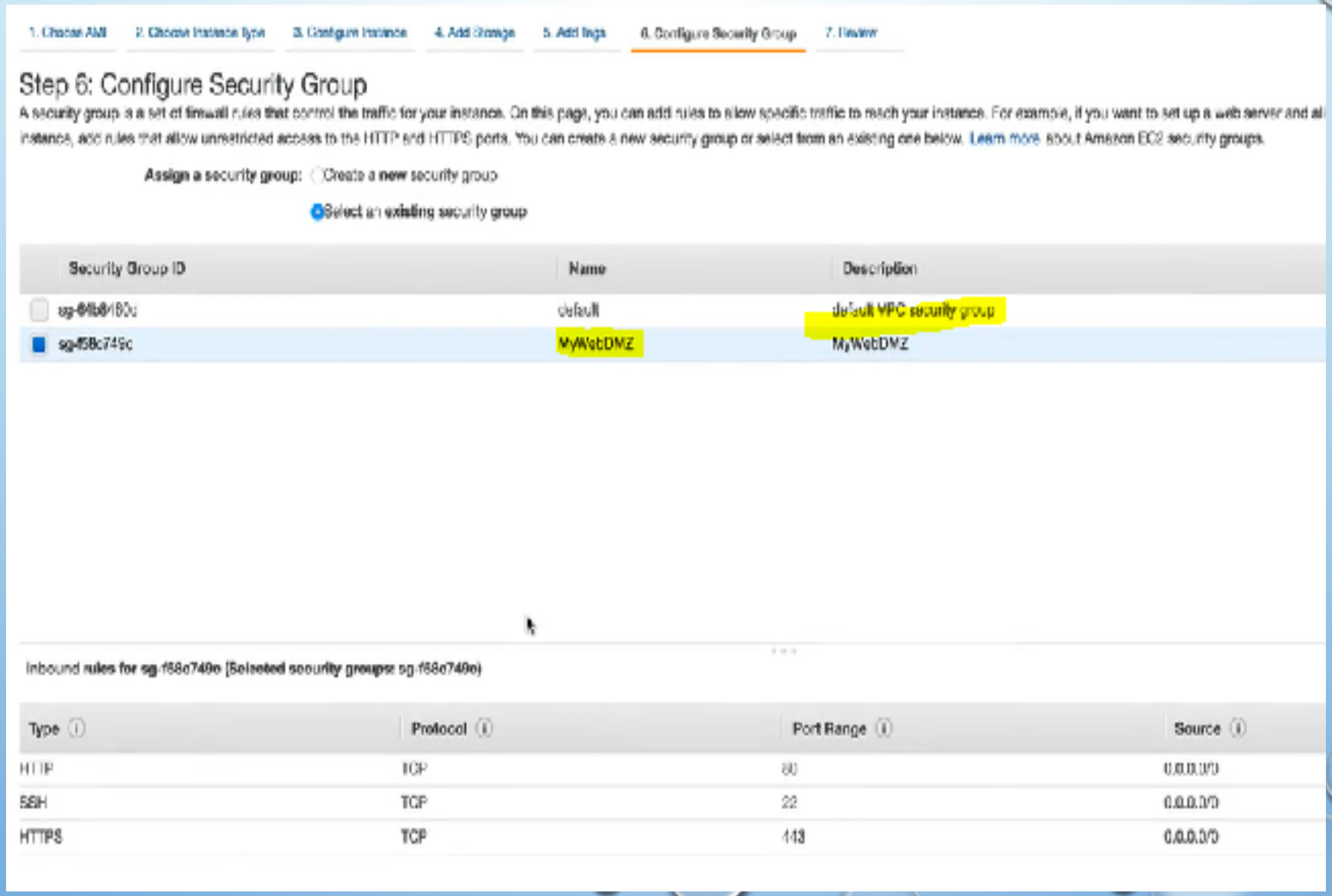
SNAPSHOTS OF ROOT DEVICE VOLUMES

- TO CREATE A SNAPSHOT FOR AMAZON EBS VOLUMES THAT SERVE AS ROOT DEVICES, YOU SHOULD STOP THE INSTANCE BEFORE TAKING THE SNAPSHOT.
- HOWEVER YOU CAN TAKE A SNAP WHILE THE INSTANCE IS RUNNING
- YOU CAN CREATE AMI'S FROM BOTH VOLUMES AND SNAPSHOTS
- YOU CAN CHANGE EBS VOLUME SIZES ON THE FLY INCLUDING CHANGING THE SIZE AND STORAGE TYPE.
- VOLUMES WILL ALWAYS BE IN THE SAME AVAILABILITY ZONE AS THE EC2 INSTANCE
- TO MOVE AN EC2 VOLUME FROM ONE AZ/REGION TO ANOTHER, TAKE A SNAP OR AN IMAGE OF IT, THEN COPY IT TO THE NEW AZ/REGION.

VOLUMES VS SNAPSHOTS - SECURITY

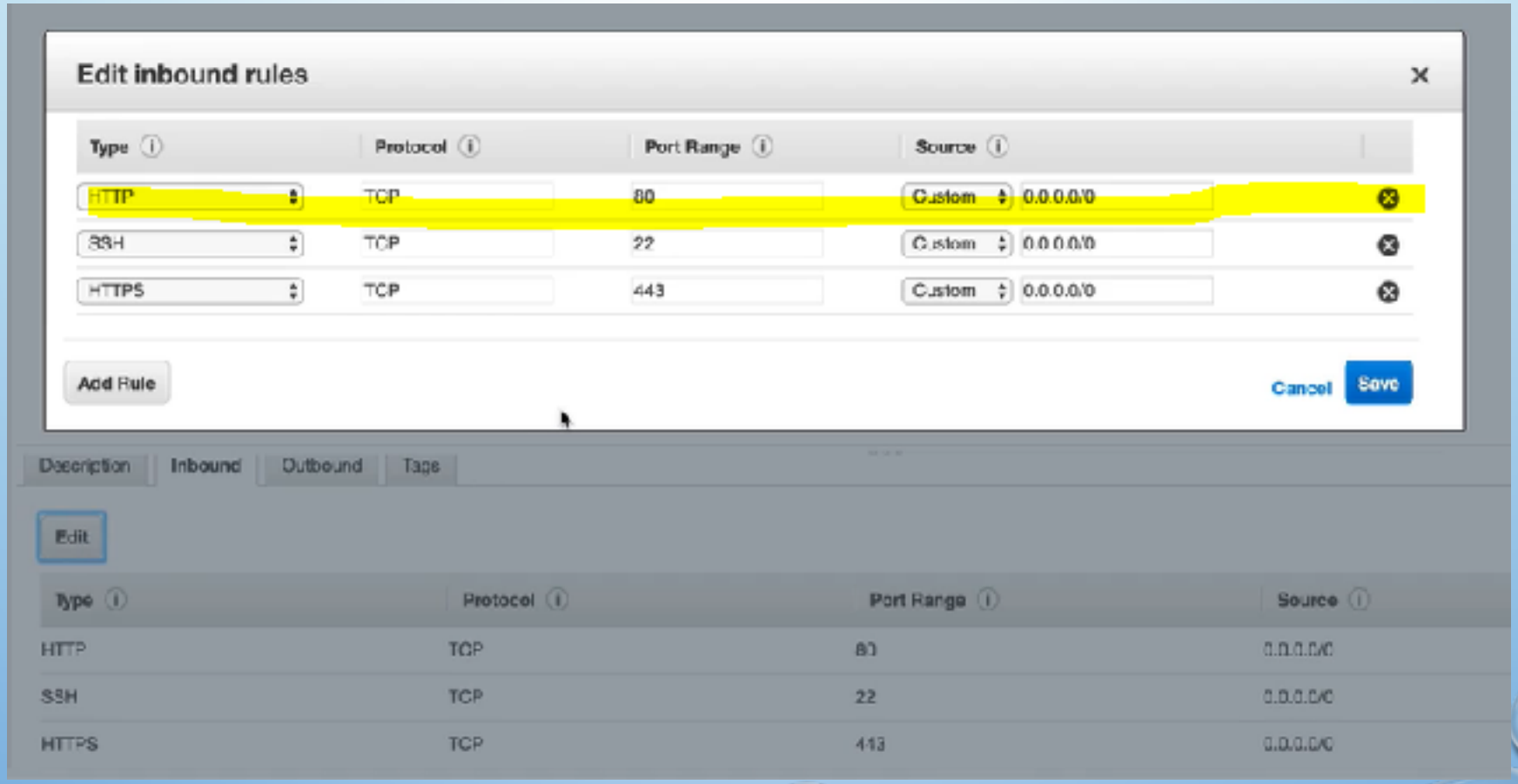
- SNAPSHOTS OF ENCRYPTED VOLUMES ARE ENCRYPTED AUTOMATICALLY.
- VOLUMES RESTORED FROM ENCRYPTED SNAPSHOTS ARE ENCRYPTED AUTOMATICALLY.
- YOU CAN SHARE SHANPSHOTS, BUT ONLY IF THEY ARE UNENCRYPTED.
- THESE SNAPSHOTS CAN BE SHARED WITH OTHER AWS ACCOUNTS OR MADE PUBLIC.

SECURITY GROUPS BASICS



LAUNCH A WEBSITE AND TEST SECURITY GROUP

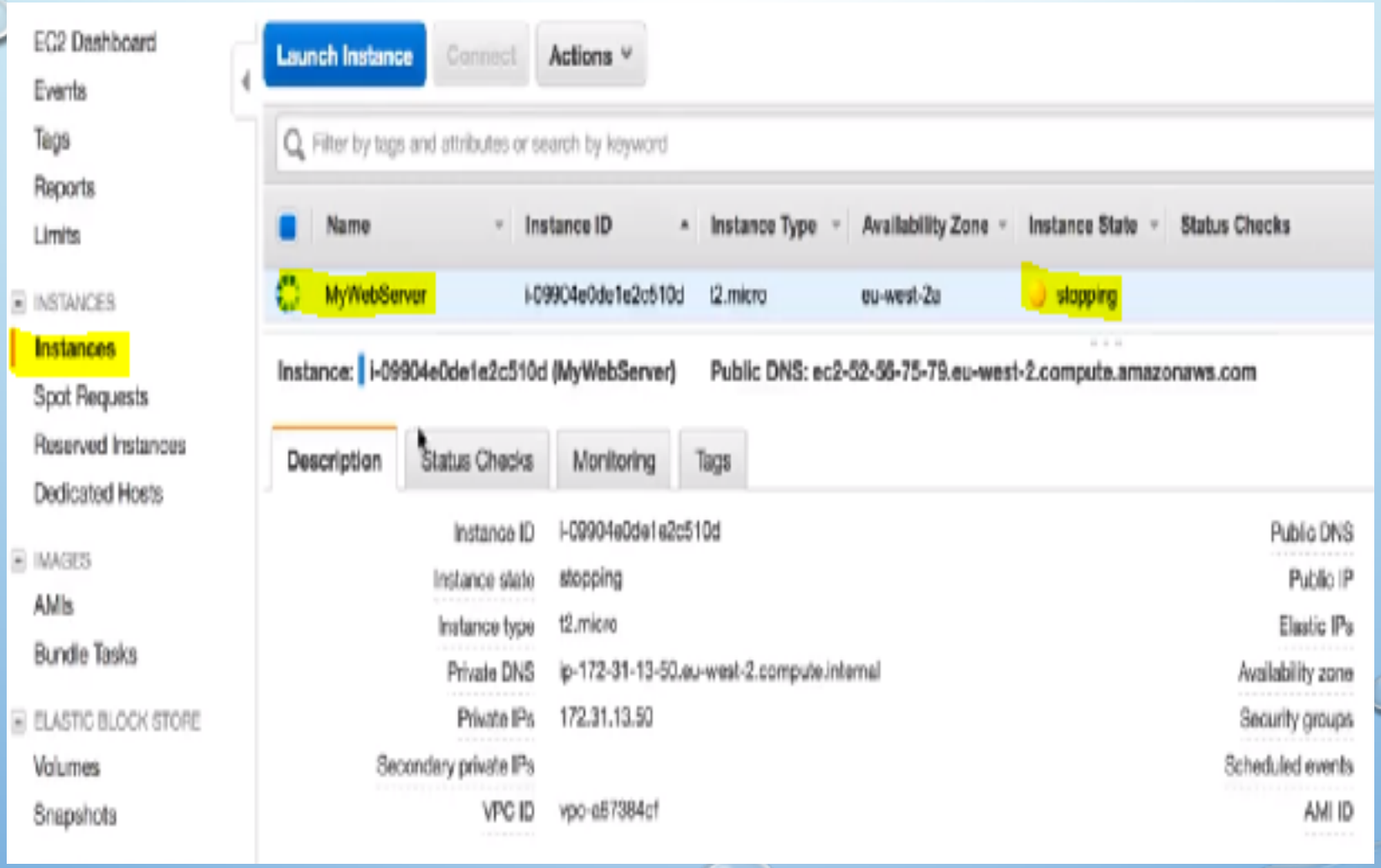
- DOWNLOAD APACHE WEBSERVER AND LAUNCH A WEBSITE AND CROSS CHECK ON THE BROWSER
- REMOVE THE SECURITY GROUP AND CROSS CHECK AGAIN.



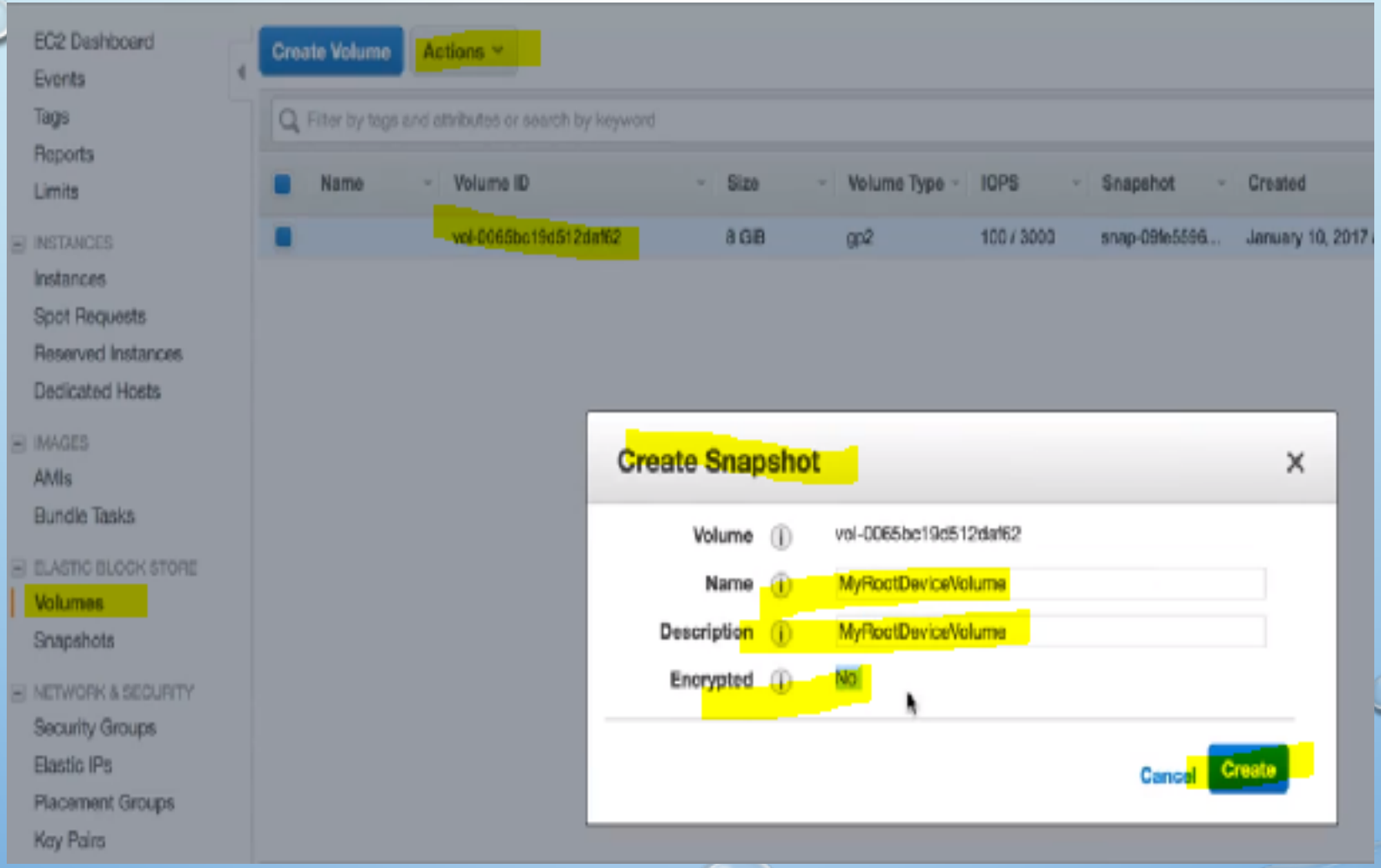
SECURITY GROUP SUMMARY

- All Inbound Traffic is Blocked By Default
- All Outbound Traffic is Allowed
- Changes to Security Groups take effect immediately
- You can have any number of EC2 instances within a security group.
- You can have multiple security groups attached to EC2 Instances
- Security Groups are **STATEFUL**.
  - If you create an inbound rule allowing traffic in, that traffic is automatically allowed back out again.
- You cannot block specific IP addresses using Security Groups, instead use Network Access Control Lists.
- You can specify allow rules, but not deny rules.

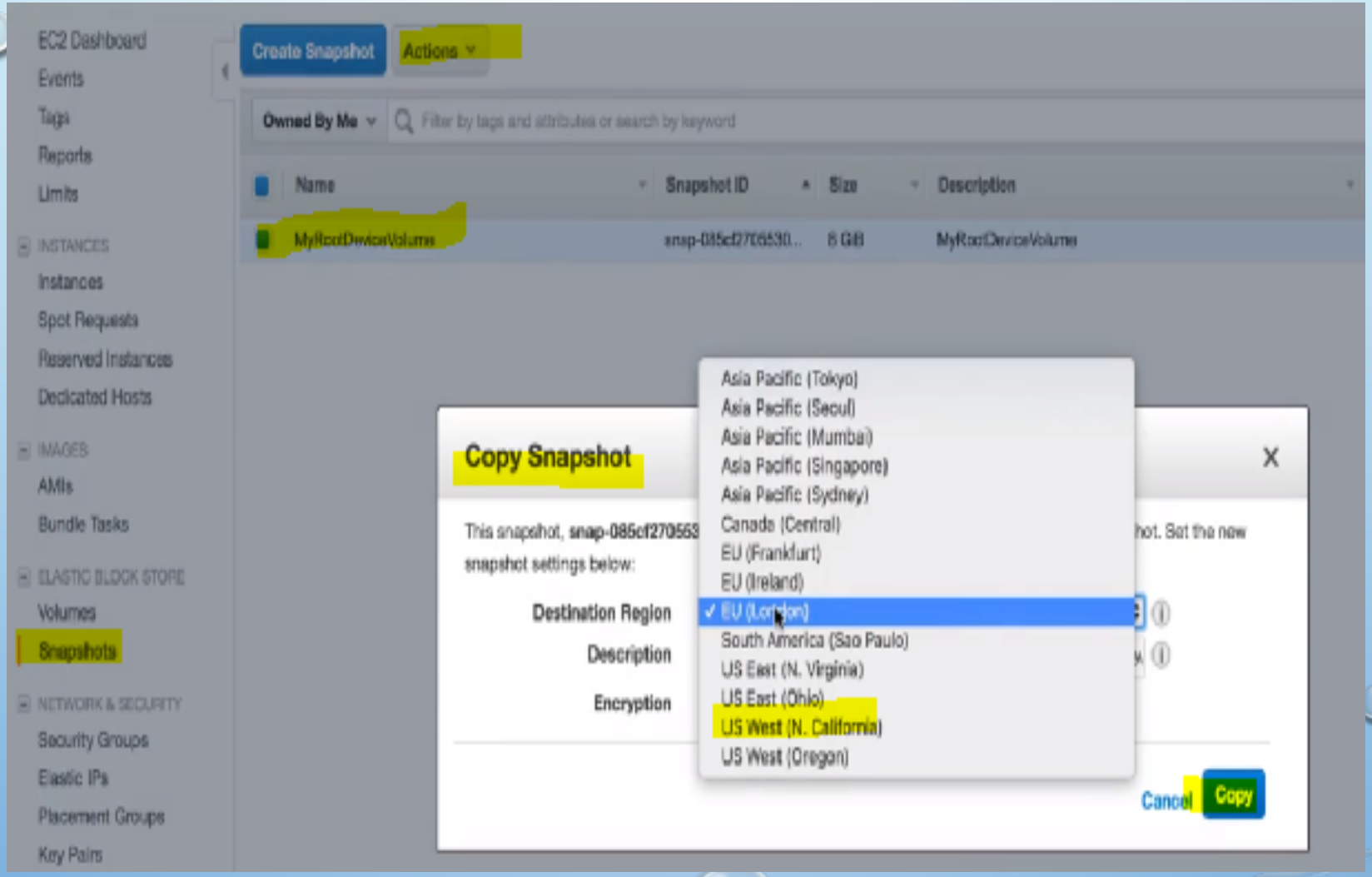
ENCRYPT ROOT DEVICE VOLUME & CREATE AN AMI



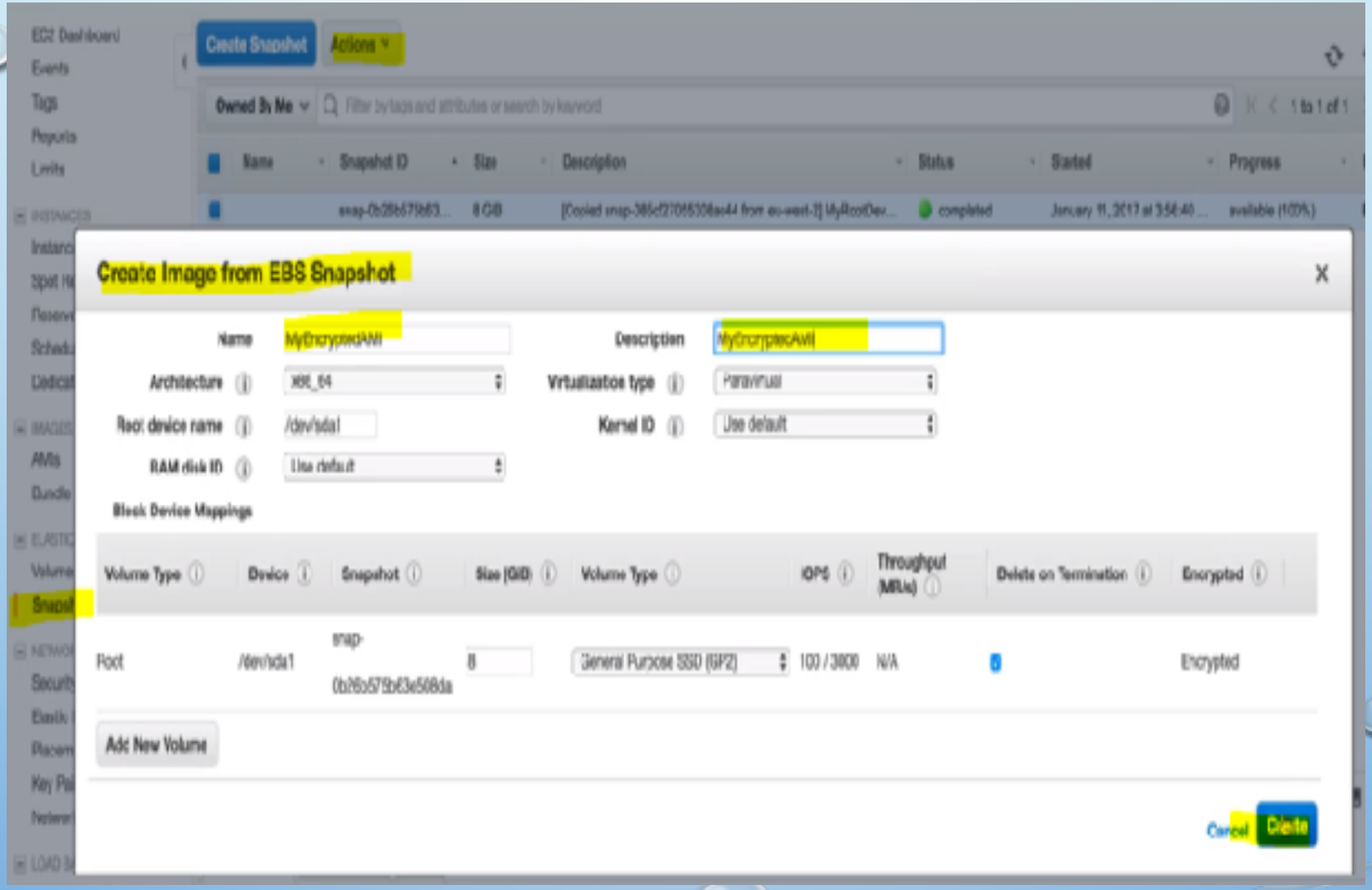
VOLUME – CREATING A SNAPSHOT



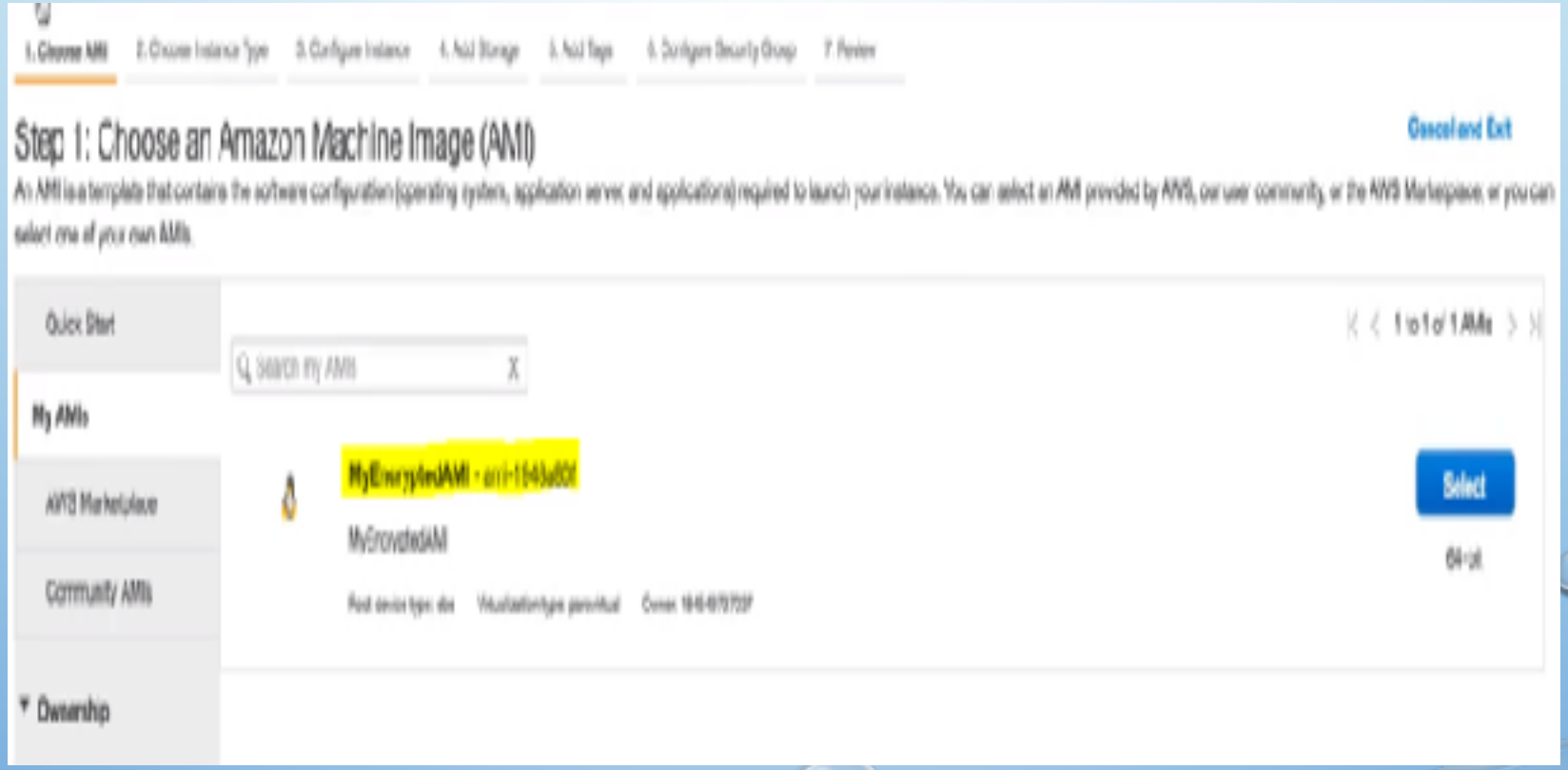
COPYING A SNAPSHOT & CHANGING THE REGION



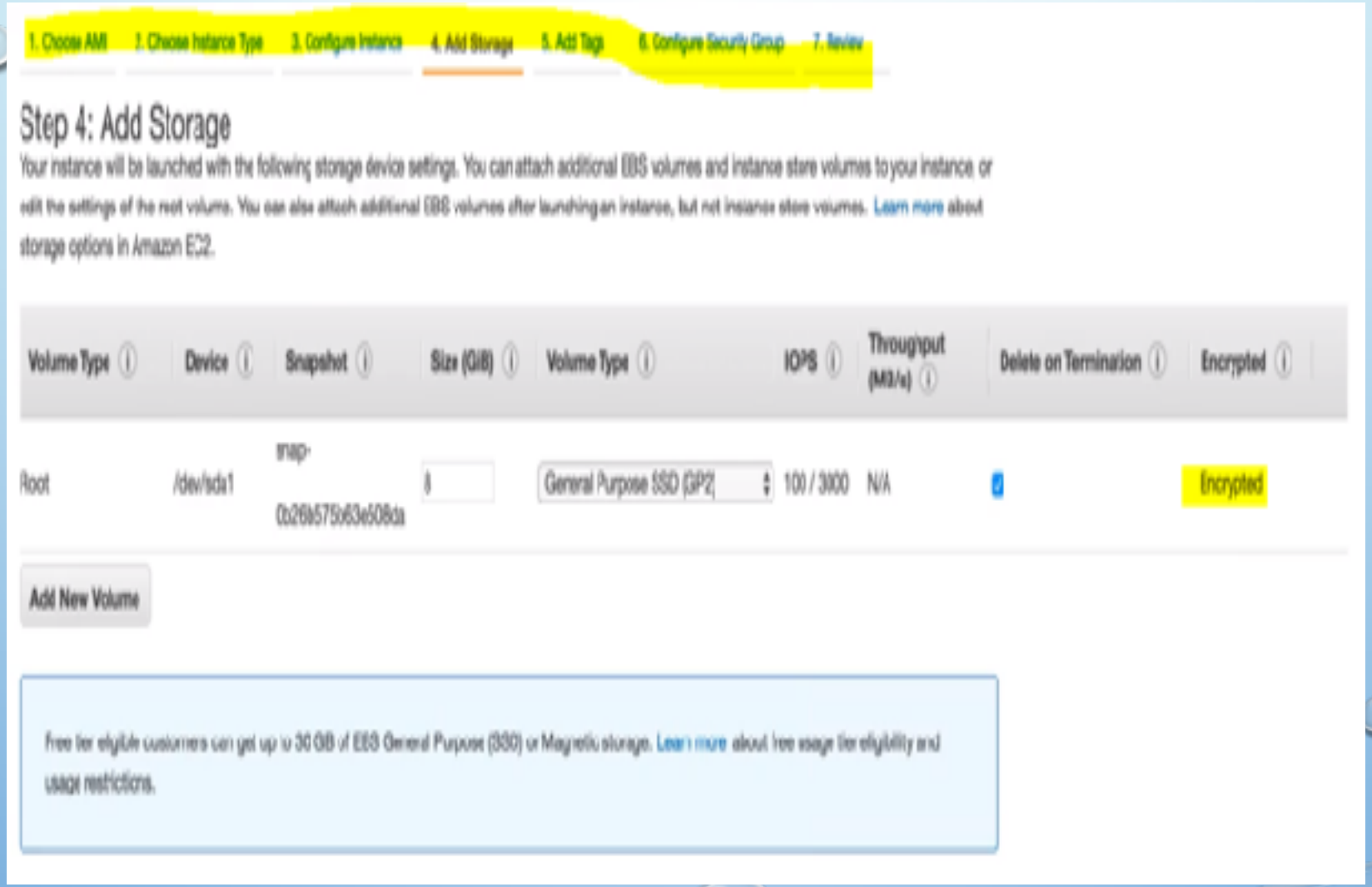
CREAING ANCRYPTED AMI



SELECT AN AMI



CREATE A EC2 INSTANCE USING ENCRYPTED SNAPSHOT



SUMMARY

- Snapshots of encrypted volumes are encrypted automatically.
- Volumes restored from encrypted snapshots are encrypted automatically.
- You can share snapshots, but only if they are unencrypted.
  - These snapshots can be shared with other AWS accounts or made public