



AWS Foundation

Compute - EC2 Part I



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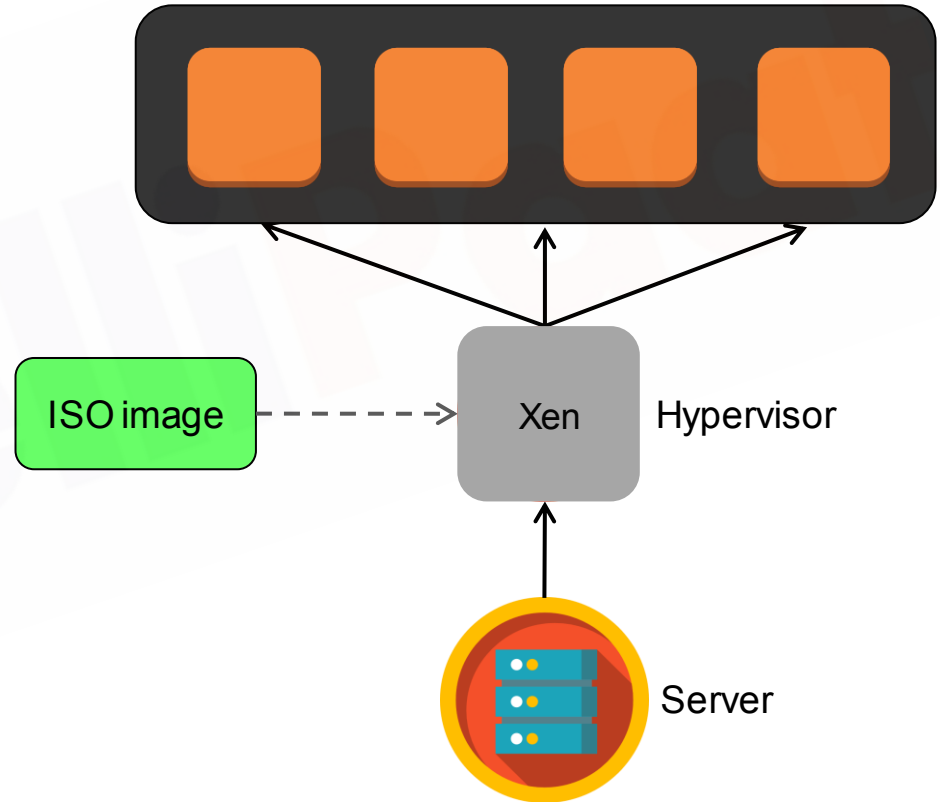
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EC2 Instance



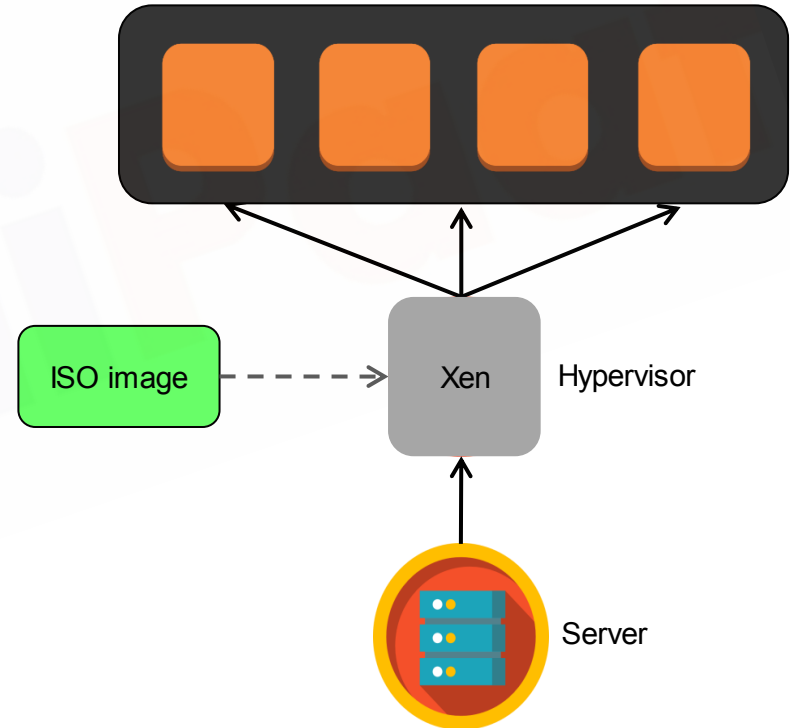
EC2 Concepts

AMI

Amazon Machine Image: AMI contains information required to launch an instance.

- Operating System
- Architecture
- Storage for the root device (Instance Store or EBS backed)
- Virtualization Type (HVM or PV)

OS
Perl
Ruby
Python
AWS CLI



EC2 Concepts

Instance Types

Instance type determines the hardware of the underlying host computer on which ec2 instances are launched. These are segregated into compute (processor), memory (RAM), storage optimized, general purpose etc. types.

General Purpose:
T2 Burstable

M5
M4
M3

Compute Optimized:

C5
C4
C3

Accelerated
Computing:

P3
P2
G3
F1

Memory Optimized:

X1e
X1
R4
R3

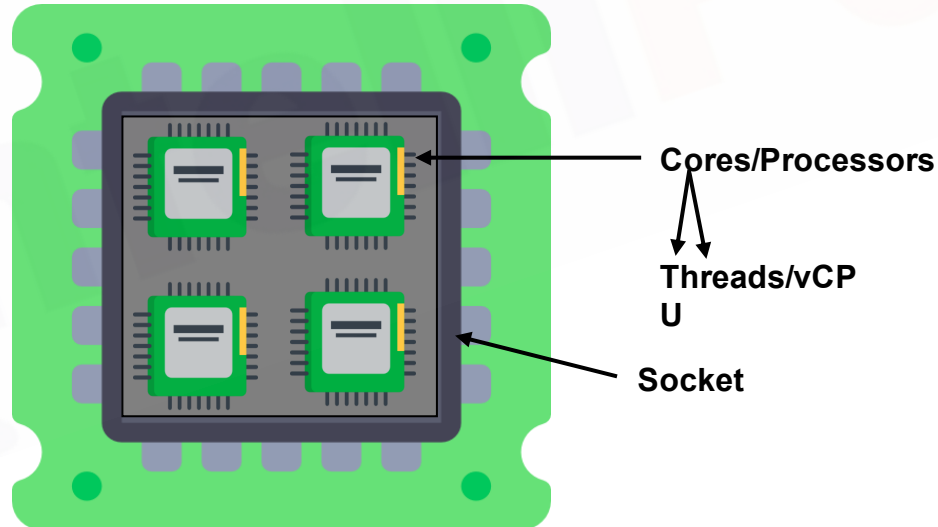
Storage Optimized:

H1
I3
D2

EC2 Concepts

vCPU, Root Device Volume

Definition: Each vCPU is a hyper-thread of an Intel Xeon core except for t2 and m3.medium instances (AWS Definition).
Root Device Volume: Contains the image using which the instance is booted.



EC2 Demo

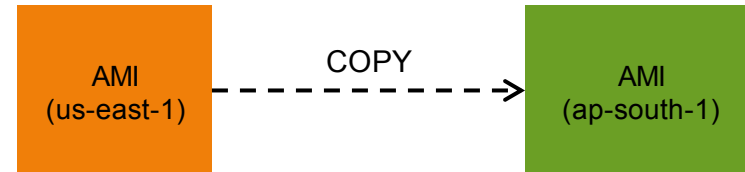
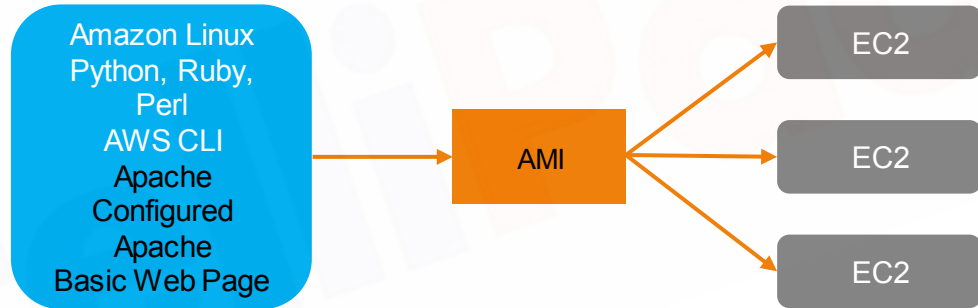
- Spin up an EC2 Instance.
- Key Pair.
- Instance Id.
- Instance State, Instance Type.
- Availability Zone.
- AMI Id.
- Launch Time.
- Virtualization.

- Network Interface.
- Root device and Block device.
- Root device type.
- Elastic IP.
- Public DNS, Public IP, Private DNS, Private IP.
- Set up a basic web server.
- Add a different user and login using that.
- Check CPU and Instance Metadata.

EC2 Concepts

AMI Again

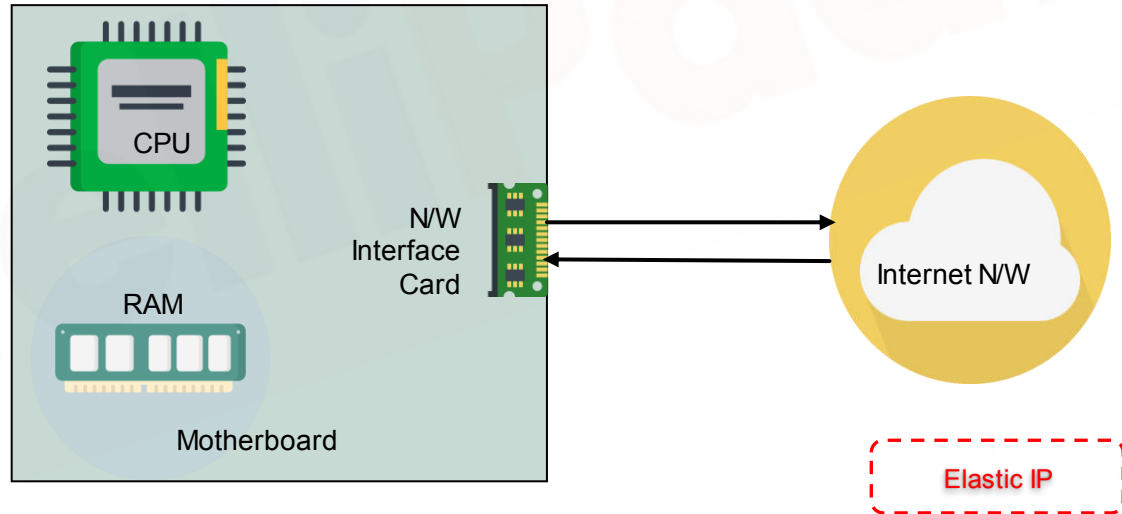
- Create AMI from an Instance.
- Launch multiple instances from it.
- Copy AMI.
- AMI Permissions.



EC2 Concepts

Elastic Network Interface

- Network interface is the interface between a computer and an internet network. Network IO happens through n/w interface cards.

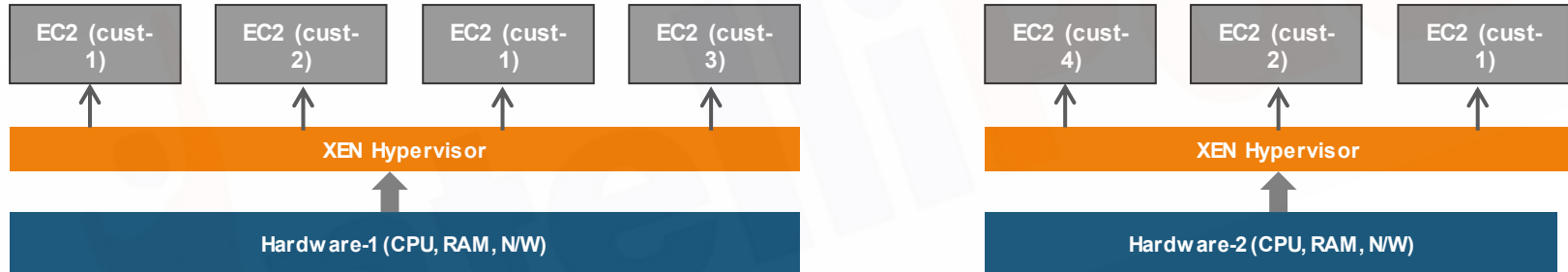


- N/W interfaces contain – Elastic IP, Public IP, Private IP, Security Groups.

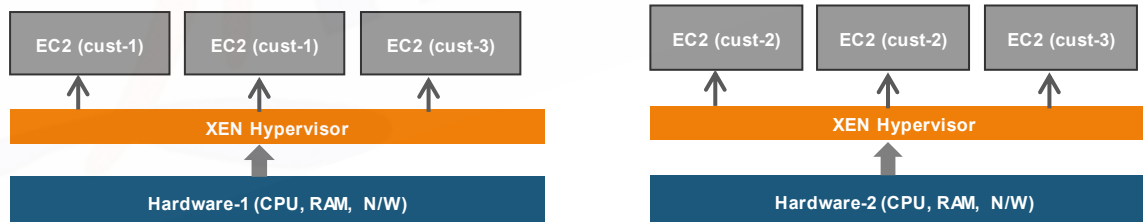
EC2 Concepts

Tenancy

- Shared/Default



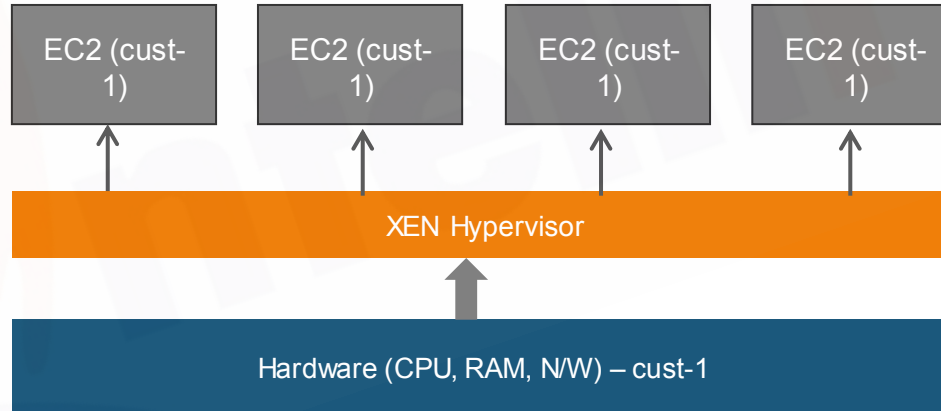
- Dedicated Instance



EC2 Concepts

Tenancy

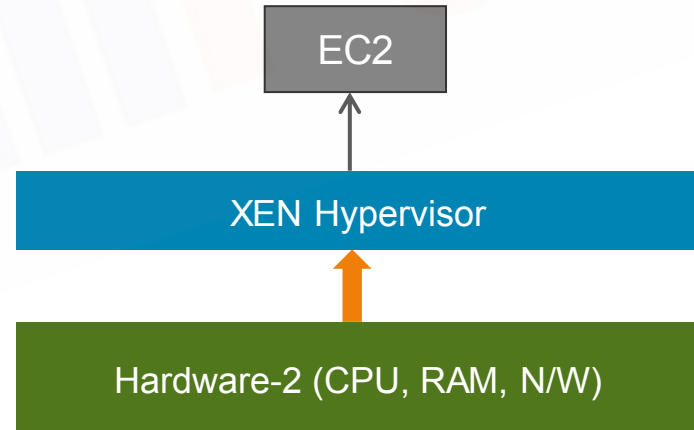
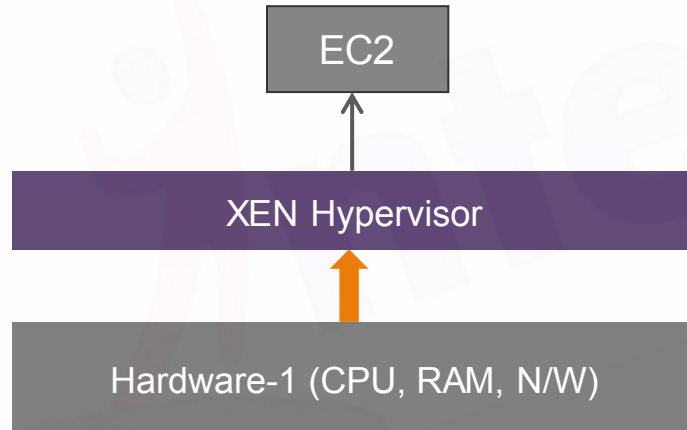
- **Dedicated Instance**



EC2 Concepts

Instance Restart

- What Happens during a restart?



EC2 Concepts

Enhanced Networking

- SR-IOV
- Faster N/W performance.
- No Additional charge for using Enhanced Networking.
- TWO TYPES
 - Intel 82599 Virtual Function (VF) Interface - up to 10 Gbps
 - Elastic Network Adapter (ENA) – up to 25 Gbps

Intel 82599 VF
C3, C4,
D2, I2,
R3, M4

ENA
C5, M5, R4, I3, X1,
G3, P2, P3,
F1, H1

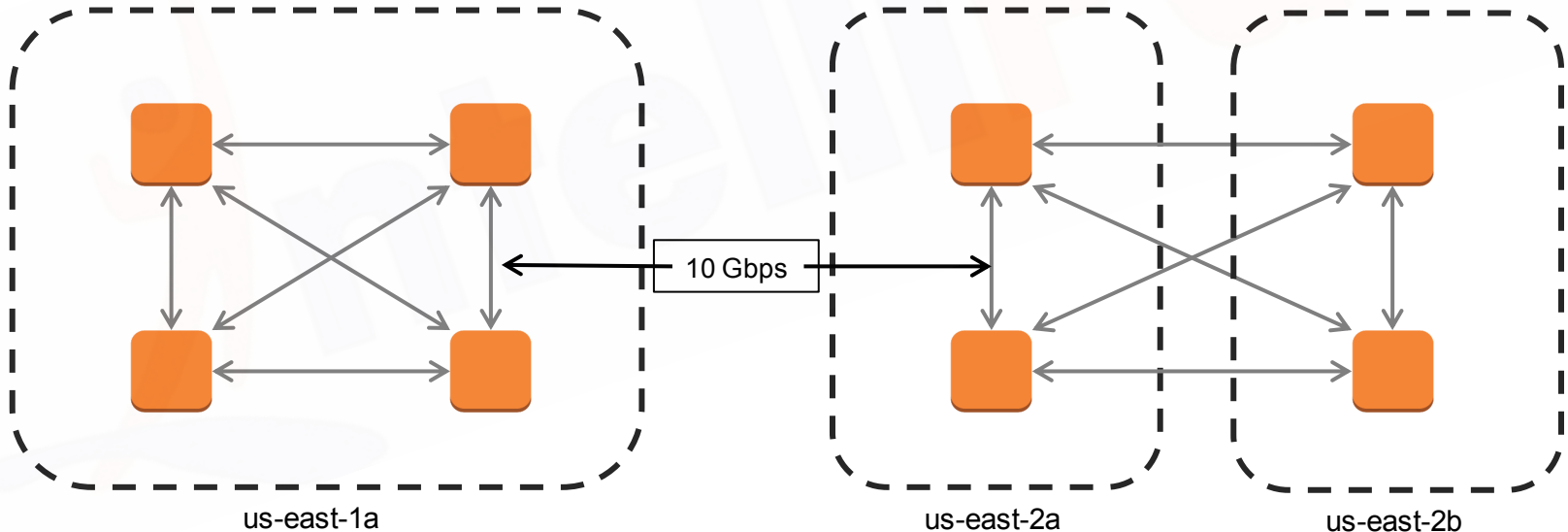
EC2 Concepts

Placement Group

- Cluster Placement Group

- Spread Placement Group

EC2 instances should support Enhanced N/W



EC2 Pricing (us-east-1)

- Pay as you use.
- Free Tier: 750 Hours per month of Amazon Linux, RHEL, SLES, Windows t2.micro single instance usage.
- Visit <https://aws.amazon.com/ec2/pricing/> for details.

On-demand price:
m5.large = \$0.096/Hour
c5.large = \$0.085/Hour
r4.large = \$0.133/Hour

Data Transfer IN:
FREE from anywhere

SLA = 99.99% Uptime

Data Transfer OUT:

From EC2 To

- S3, Glacier, DynamoDB, SES, SQS in same region = FREE
- S3, Glacier, DynamoDB, SES, SQS in different region = \$0.020/GB
- EC2, RDS, Redshift, ElastiCache, ELB, ENI in same AZ = FREE with private IP. \$0.010/GB with public IP.
- EC2, RDS, Redshift, ElastiCache, ELB, ENI in different AZ = \$0.010/GB.

EC2 Concepts

Purchasing Options - RI

- Reserved Instance? 1 or 3 year term
- Pricing (on-demand us-east-1 region)

M5.XLARGE = \$0.192/hr

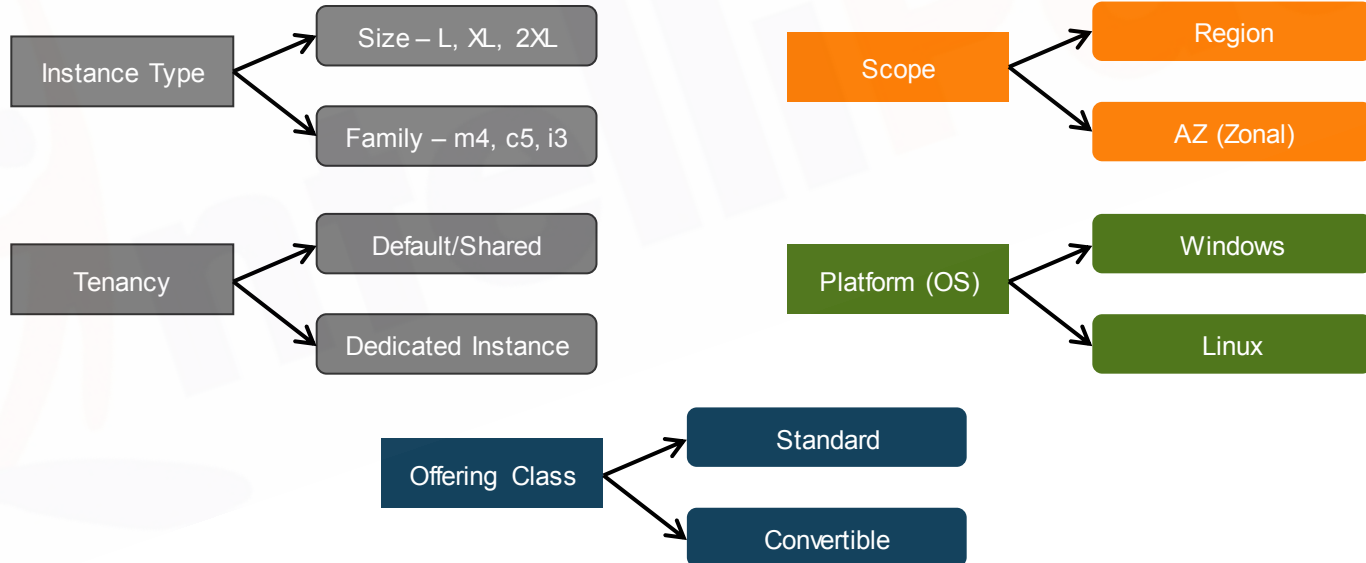
Yearly = \$1681.92

Payment Type	One Time Payment	Total Yearly Cost	Savings
No Upfront	\$0	$\$89.79 \times 12 = \1077.48	36%
Partial Upfront	\$512	$512 + (42.34 \times 12) = \1020.08	39%
Full Upfront	\$1003	\$1003	40%

EC2 Concepts

Purchasing Options - RI

- Reserved Instance



EC2 Concepts

Reserved Instances

- Normalization Factor
- Regional RI – AZ and Instance Size Flexibility (default tenancy only).
- Zonal RI Capacity Reservation
- us-east-1a
- c4.xlarge

Running Instance	RI bought
4 m3.large Linux, Default tenancy in AZ us-east-1a	4 m3.large, Linux, default tenancy, AZ us-east-1a
2 m4.4xlarge Amazon Linux, Default Tenancy in us-east-1b	4 m4.large, Amazon Linux, default tenancy, region us-east-1
c4.xlarge RHEL Dedicated tenancy in AZ us-east-1c	C4.large, RHEL, default tenancy, region us-east-1

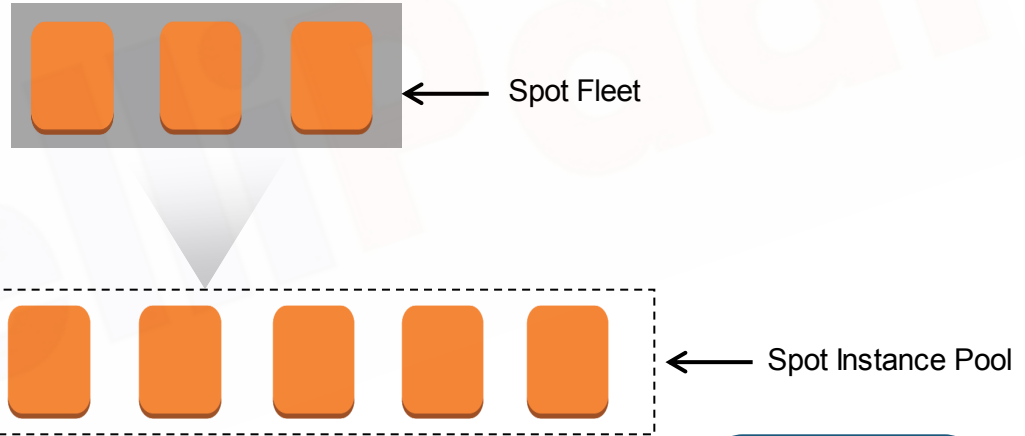
- Scheduled RI

Instance size	Normalization factor
nano	0.25
micro	0.5
small	1
medium	2
large	4
xlarge	8
2xlarge	16
4xlarge	32
8xlarge	64
9xlarge	72
10xlarge	80
12xlarge	96
16xlarge	128
18xlarge	144
24xlarge	192
32xlarge	256

EC2 Concepts

Spot Instances

- Works like stock markets – supply and demand
- Spot Instance terminologies



- Instance is terminated if Spot Price increases than bid price.
- Significant price reduction.
- Use cases...

EC2 Summary

- Regions and Availability Zones (AZs)
- Amazon Machine Images
- Instance Types
- vCPU, Key Pair, Root Device Volume
- Instance metadata
- Instance tenancy attributes – Dedicated Host, Dedicated Instance and Default Tenancy
- ENI
- Cost Optimization – Reserved Instances



India : +91-7847955955

US : 1-800-216-8930 (TOLL FREE)



sales@intellipaath.com



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