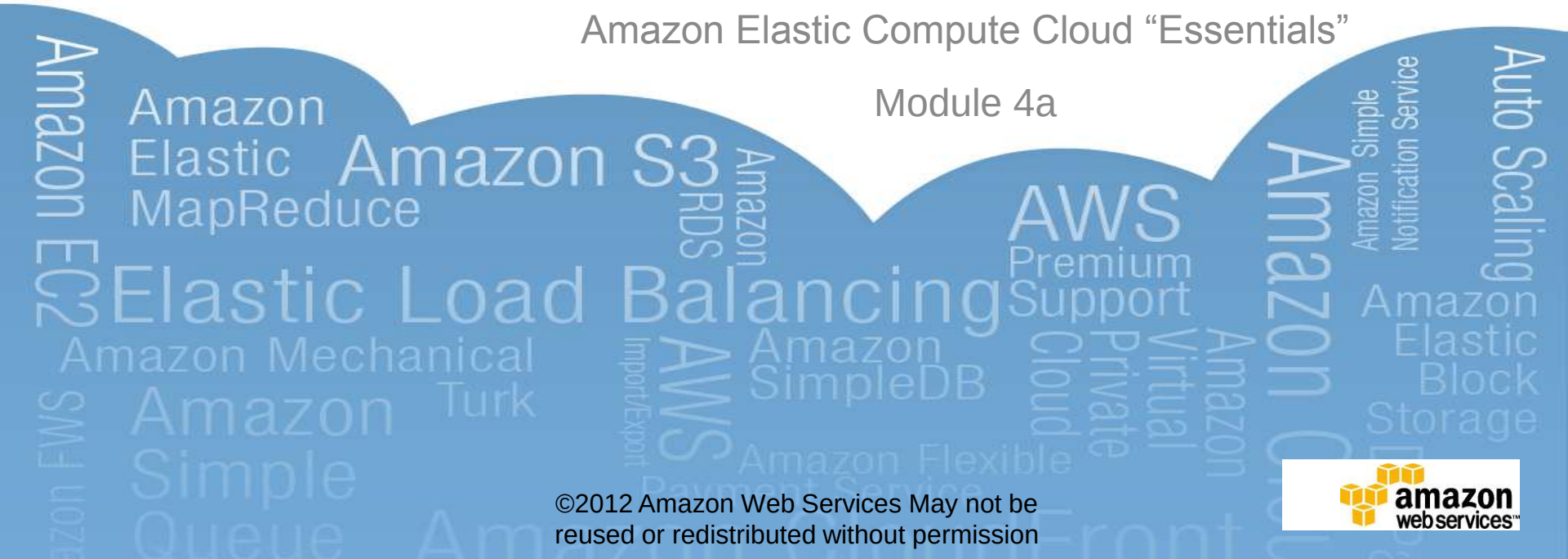
AWS Architecture Training EC2

Amazon Elastic Compute Cloud “Essentials”

Module 4a



Module Overview

- EC2 Terminology
- EC2 Instance Types
- EC2 Architecture

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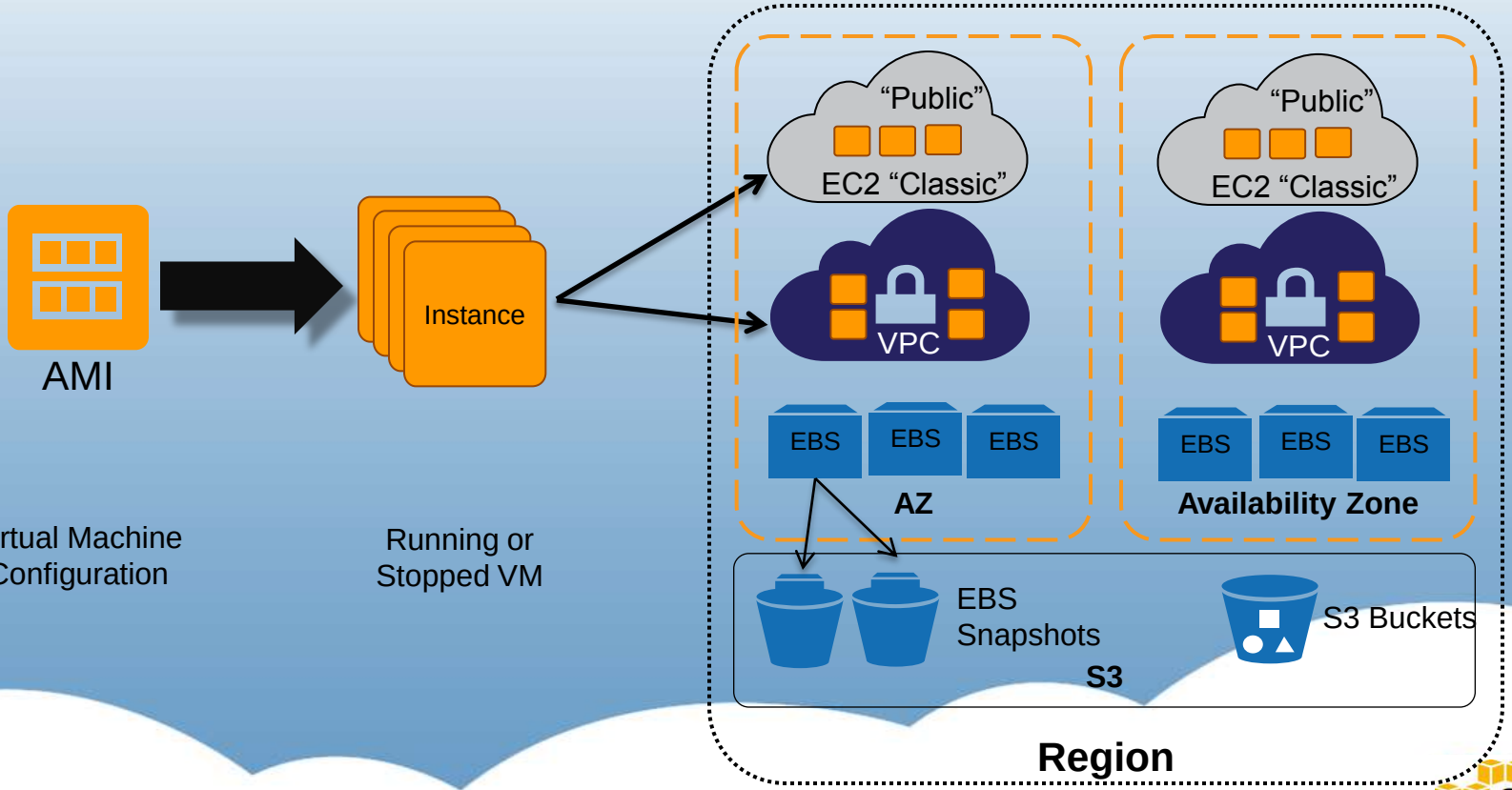
EC2 Terminology



Virtual Machine Configuration

Running or Stopped VM

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EC2 INSTANCE TYPE

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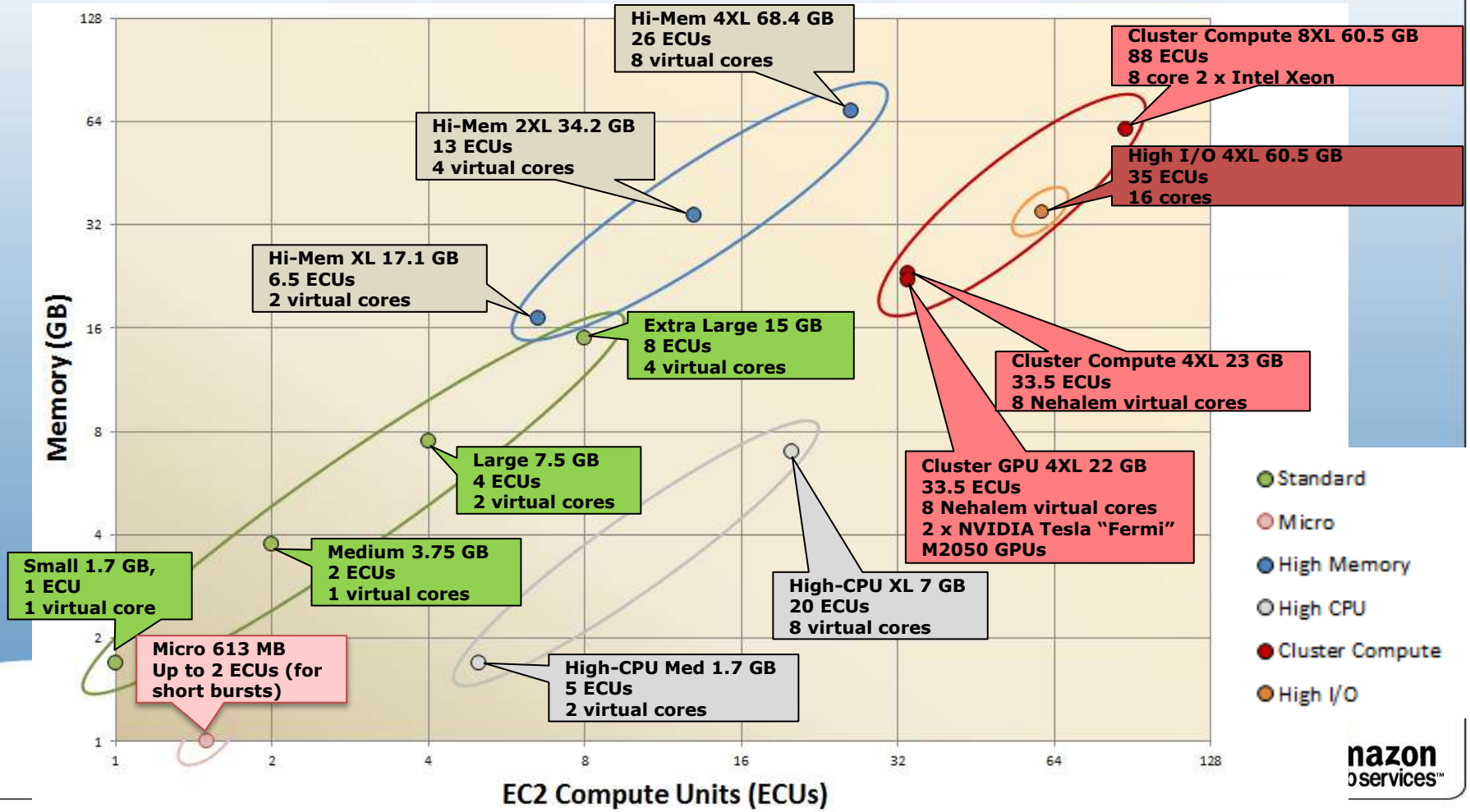
EC2 Instances



Amazon EC2 Pricing Options

On-Demand Instances

Unix/Linux instances start at $0.085/hour USD in the US East Region

Pay as you go for compute power

Benefit:
Low cost and flexibility

Pay only for what you use, no up-front commitments or long-term contracts

Use Cases:

- Applications with short term, spiky, or unpredictable workloads;
- Application development or testing

Reserved Instances

1- or 3-year terms

Pay low up-front fee, receive significant hourly discount

Benefit:
Cost / Predictability

Helps ensure compute capacity is available when needed

Use Cases:

- Applications with steady state or predictable usage
- Applications that require reserved capacity, including disaster recovery
- Users able to make upfront payments to reduce total computing costs even further

Spot Instances

Bid on unused EC2 capacity

Spot Price based on supply/demand, determined automatically

Benefit:
Cost / Large Scale, dynamic workload handling

Spot Price below bid, instances start

Spot Price above bid, instances stop

Use Cases:

- Applications with flexible start and end times
- Applications only feasible at very low compute prices
- Users with urgent computing needs for large amounts of additional capacity

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Reserved Instances

- Save $$ vs. On-Demand rates
  - Save up to a 58% discount
  - Low, Medium & High Utilization Options
- Capacity Assurance
  - AWS reserves capacity in a particular AZ for you
  - Programmatic, not legal guarantee
- Tradeoff

  Have to choose a particular AZ, instance type, and OS up front

Choose a Region → Choose an Availability Zone → Locate the Reserved Instance Offering → Purchase a Reservation

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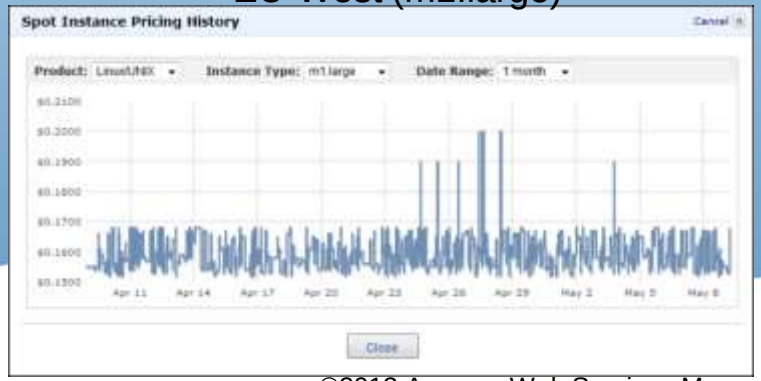
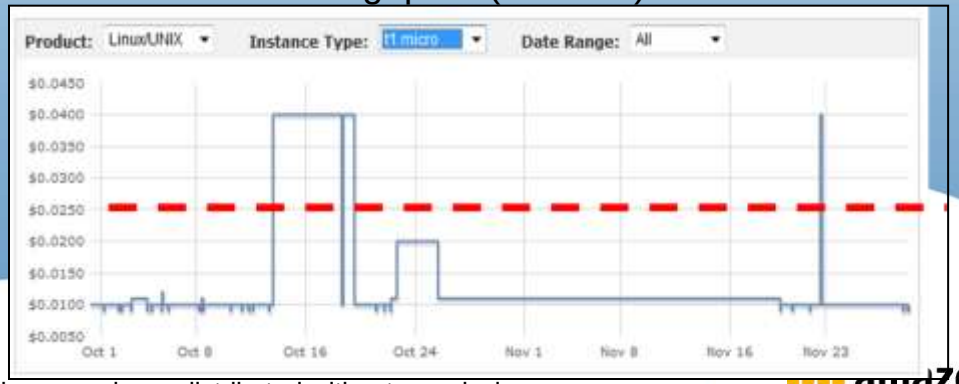
Spot Instances

- Bid for unused AWS capacity
- Prices controlled by AWS based on supply and demand
- AWS can terminate Spot Instances without notice
- Best approach to temporary requests for large numbers of servers
- Default maximum = 100 servers
  (instead of 20 on-demand)

EU-West (m1.large)



Singapore (t1.micro)



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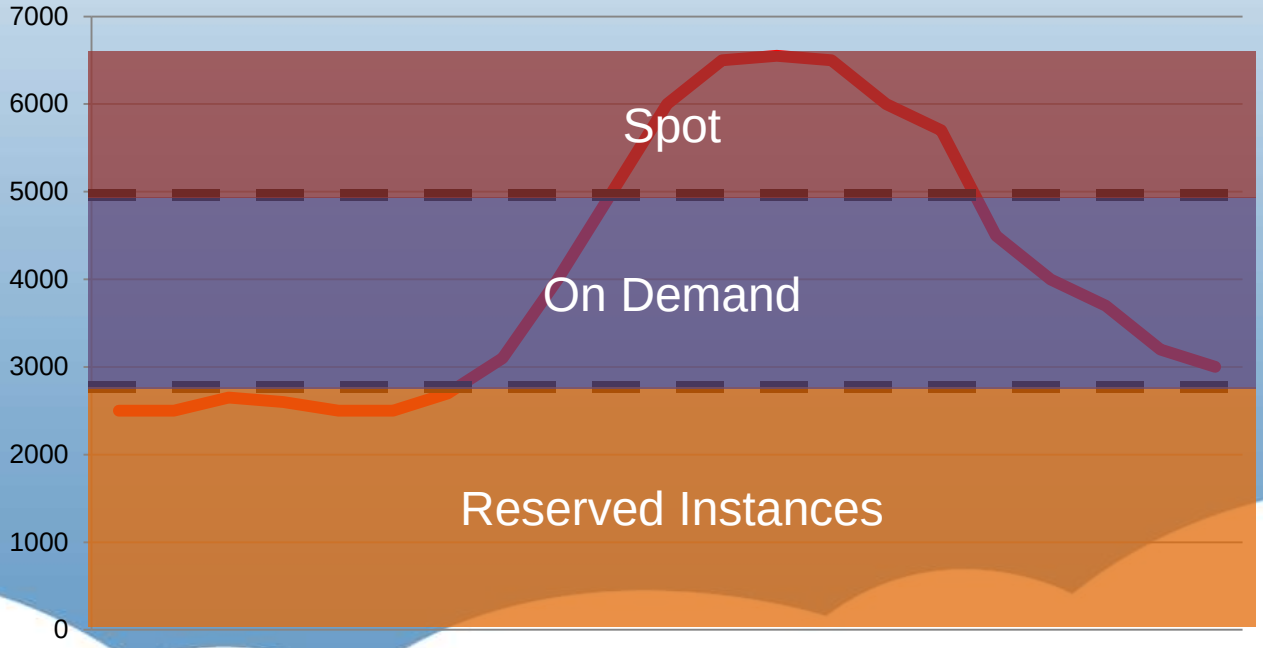
Spot Use Cases

Use Case	Types of Applications
Batch Processing	Generic background processing (scale out computing)
Web/Data Crawling	Analyze data
Financial	Hedge fund analytics, energy trading, etc
Elastic Map Reduce	Hadoop (large data processing)
Grid Computing	Scientific trials/simulations in chemistry, physics, and biology
Transcoding	Transform videos into specific formats
Gaming	Backend servers for Facebook games
Testing	Scale to large server pool to test of software, Web sites, etc.

Leverage All Three Models



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HOW DOES AN EC2 VIRTUAL MACHINE WORK?

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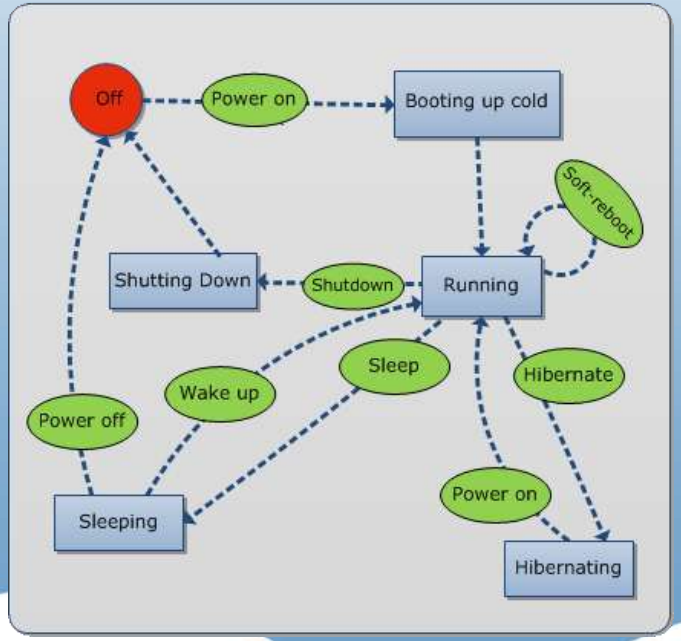
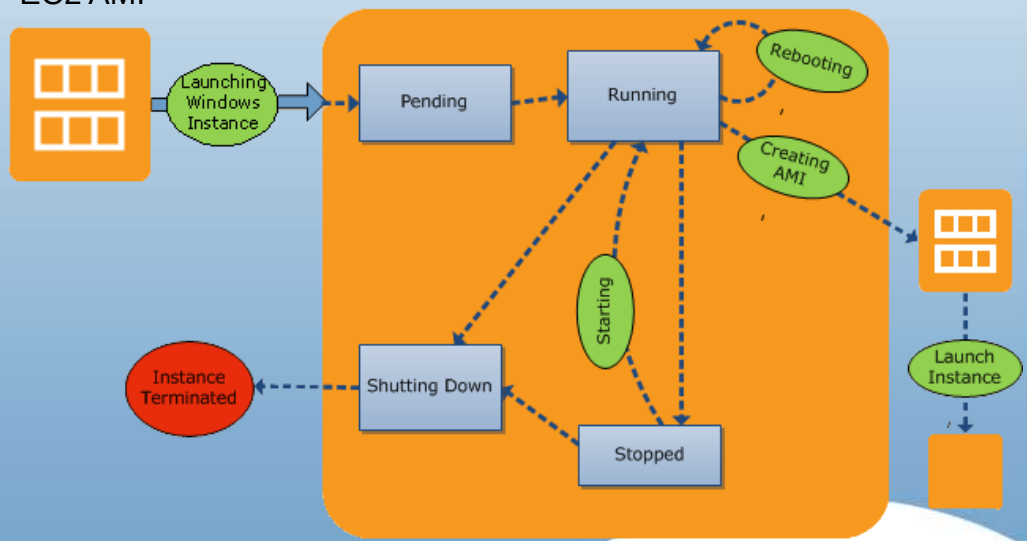
Server/Instance States

Traditional Hardware-Based Server States



Amazon EC2 AMI

Amazon EC2 Instance States



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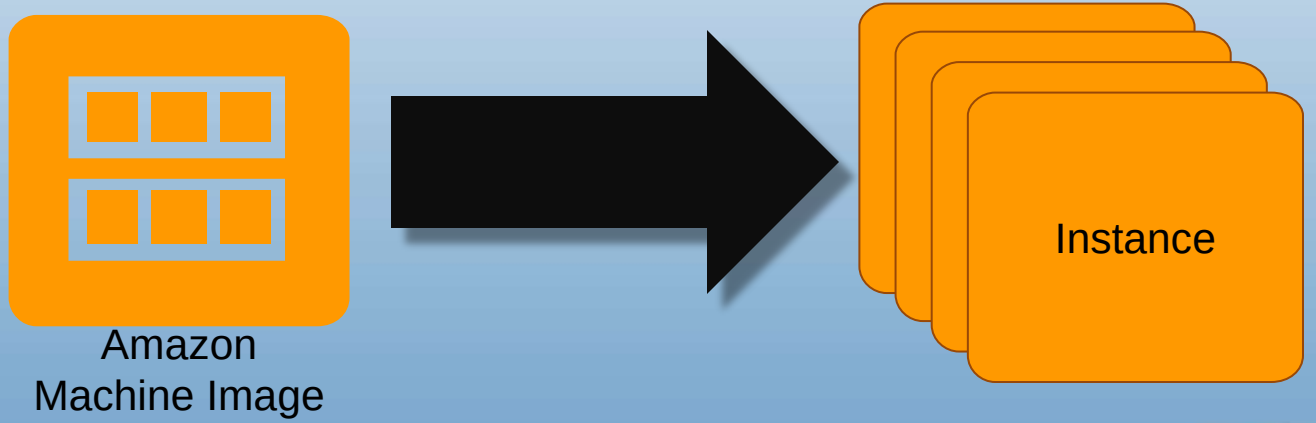
1:Many Relationship Between AMIs and Instances



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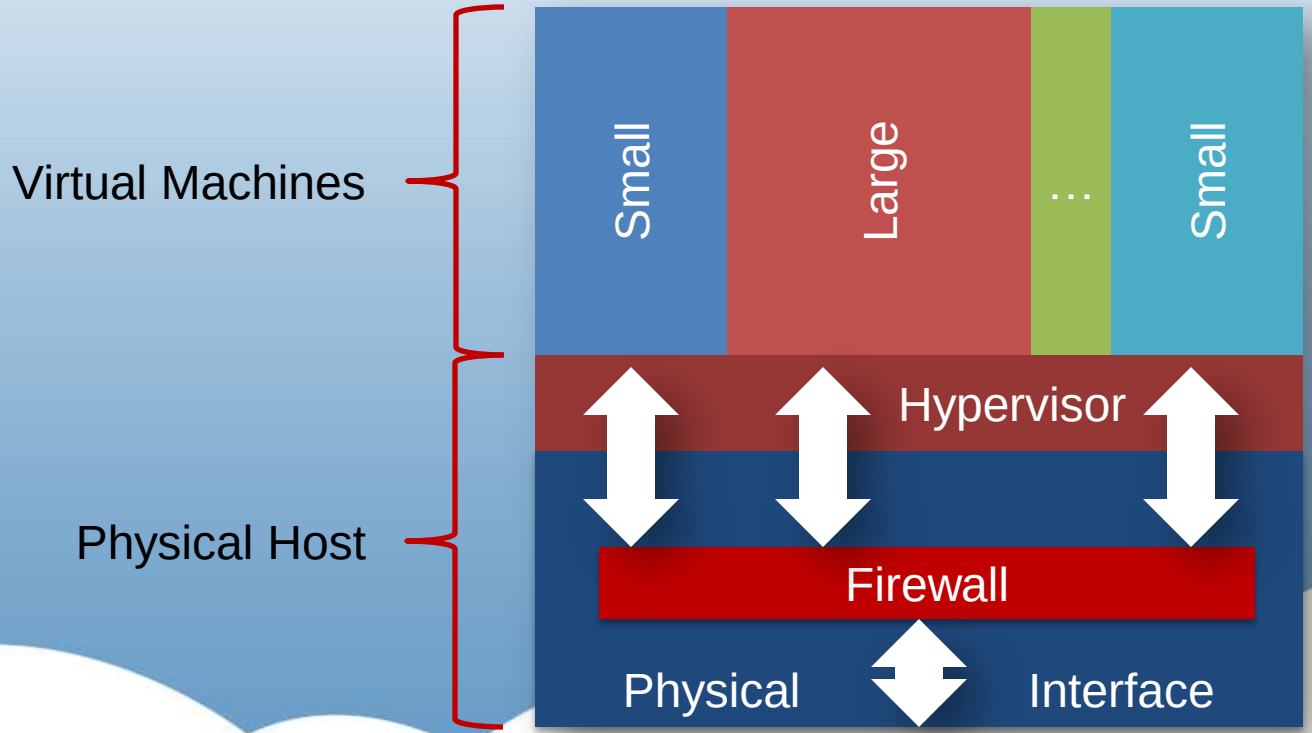
A Physical Host Has Multiple VMs



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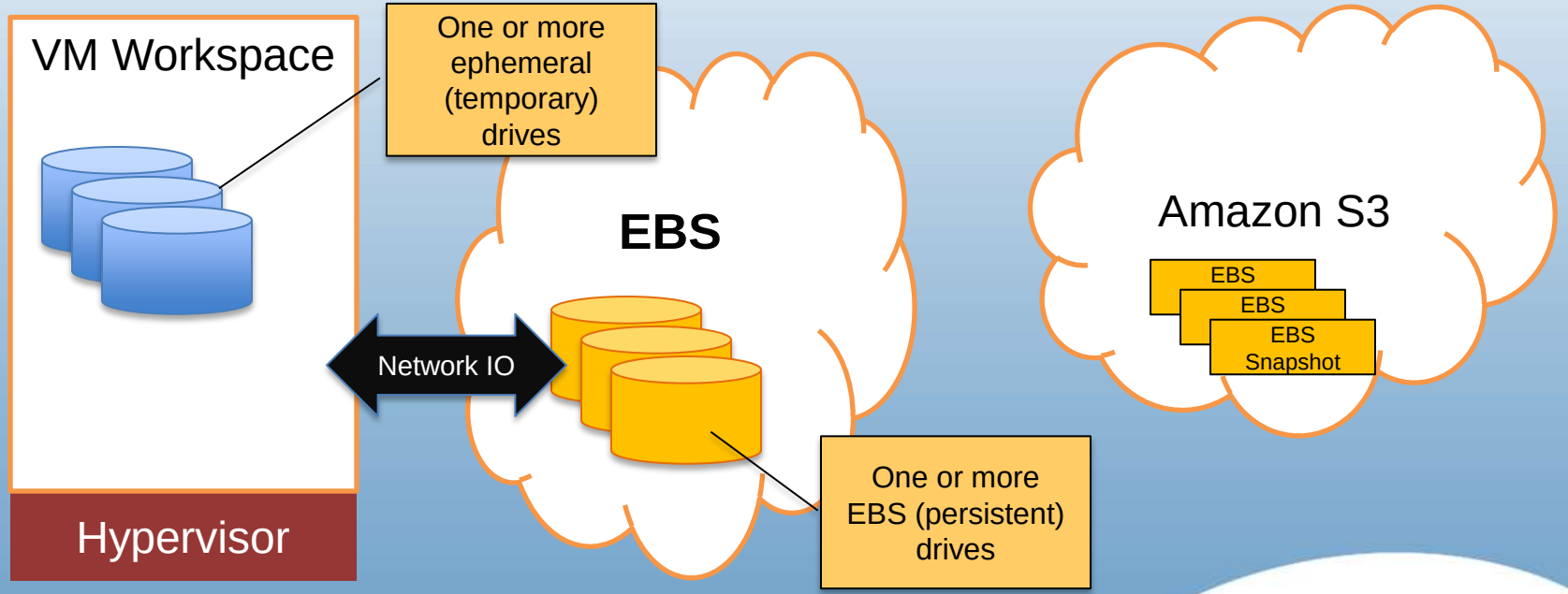
Details of a Virtual Machine



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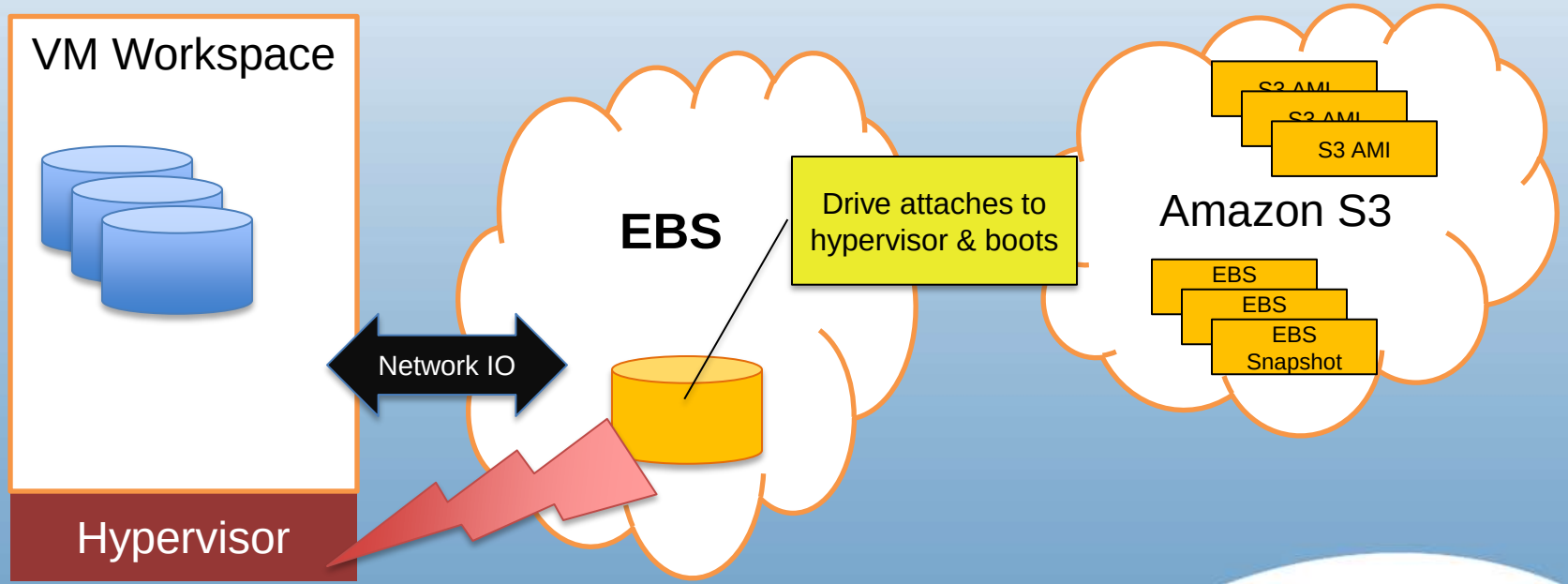
How an EBS AMI Boots (First Time)



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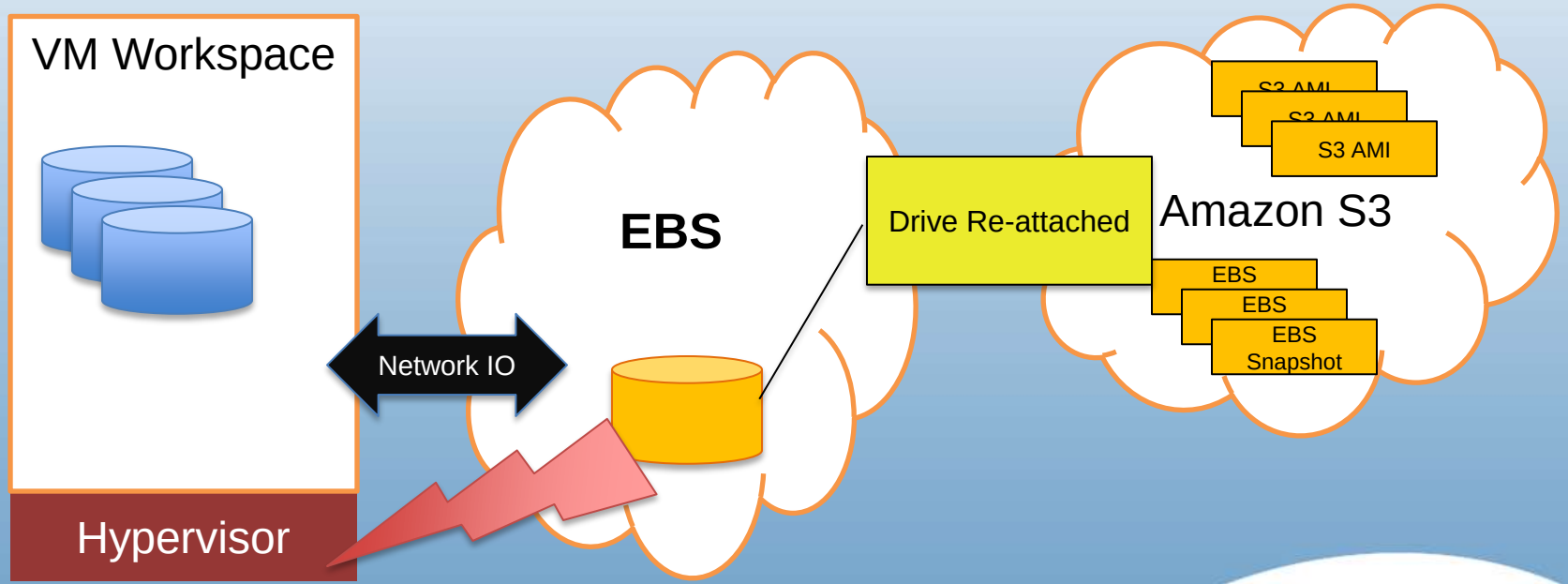
How an EBS AMI Restarts



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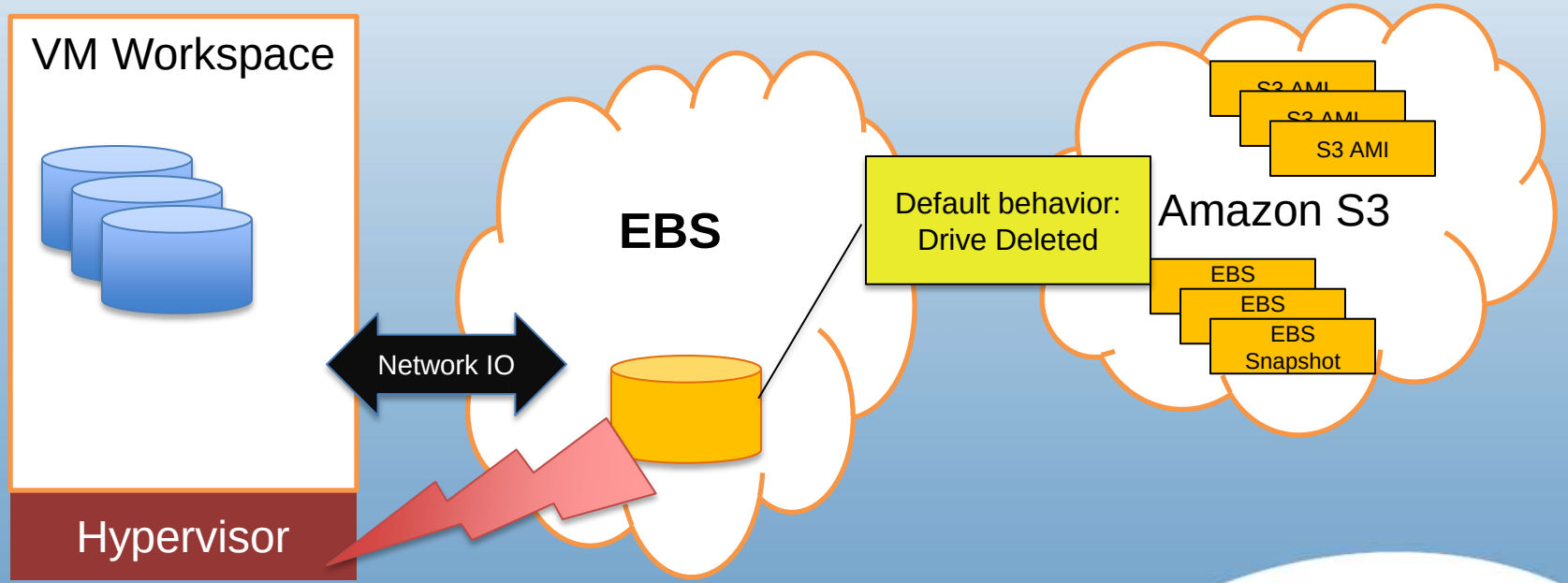
How an EBS AMI Terminates (Default)



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EC2 ARCHITECTURE

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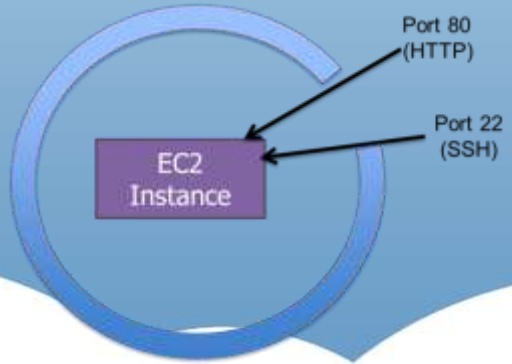
EC2 Security Groups

- **Security Group:**
  - Name
  - Description
  - Protocol
  - Port range
  - IP Address, range, or another security group

Public EC2	Virtual Private Cloud
Inbound Only	Inbound and Outbound
TCP, UDP, ICMP only	Any Internet Protocol
Assigned at launch	Assigned at launch or when stopped
Modify anytime	Modify anytime



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EC2 Instance Addressing

Public EC2	Virtual Private Cloud
Dynamic Private IP	Dynamic or Static Private IP Address
Dynamic Public IP	None by default
Optional Static Public IP (EIP)	Optional Static Public IP (EIP)
AWS Provided DNS names • Private DNS name • Public DNS name	AWS provided public DNS lookup server Customer controlled DNS options

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AWS SECURITY CREDENTIALS

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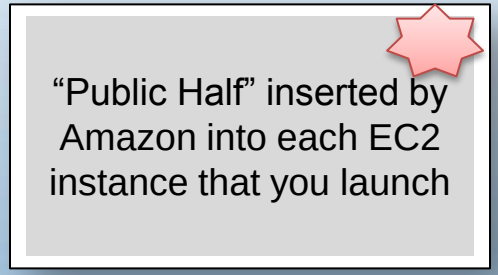
Instance Key Pairs

- Standard SSH RSA Key pair
  - Public/Private Keys
  - **Private keys are not stored by AWS**

Public key provided by AWS to a generic OS instance for secure, personalized, initial, non-generic access

- Supports NIST and other security standards for providing non-default user access
- You are responsible for following good OS identity and access management practices
- Although it is tempting and easy to do: **Don't share your private key** (create individual user accounts or tie your instances into a central user repository like LDAP or AD)



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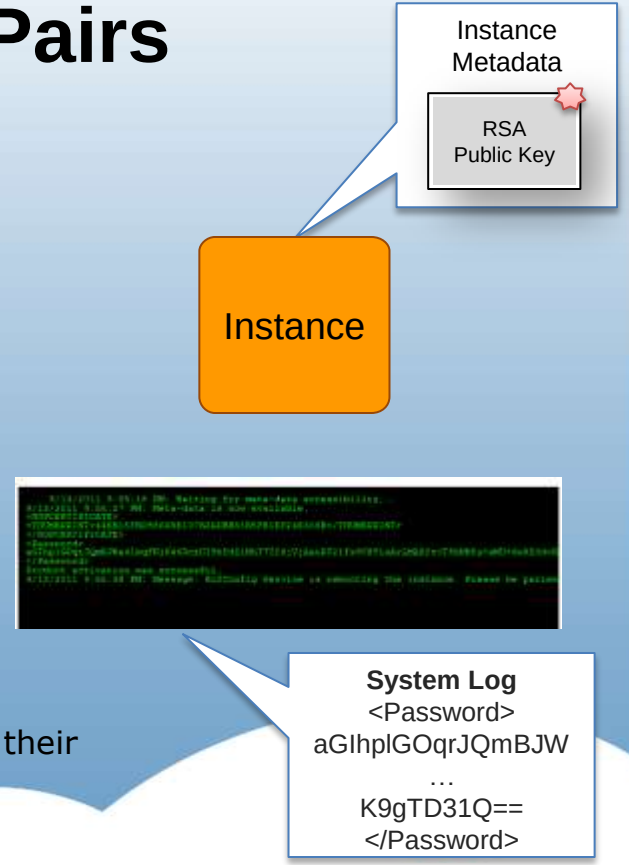
Instrumenting Key Pairs

- Linux Launch (First Boot)
  - **Public Key** made available through metadata
  - Instance initialization scripts insert public key into ~/.ssh/authorized_keys
  - User connects with SSH using their **Private Key**

- Windows Launch (First Boot Sequence)
  - **Public Key** made available through metadata
  - Windows runs Sysprep (reboots)
  - Instance initialization scripts:
    - Create a random Administrator password
    - Encrypt random password with Public Key
    - Report encrypted password to Windows System Log
  - User retrieves the encrypted password and decrypts it with their **Private Key** (using AWS Console or API Call)



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How Can I Obtain Info about Myself from a Running Instance?

http://169.254.169.254/latest/meta-data contains a wealth of info

- ami-id
- ami-launch-index
- ami-manifest-path
- block-device-mapping/
- hostname
- instance-action
- instance-id
- Instance-type
- kernel-id
- local-hostname
- local-ipv4
- mac
- network/
- placement/
- profile
- public-hostname
- public-ipv4
- public-keys/
- reservation-id

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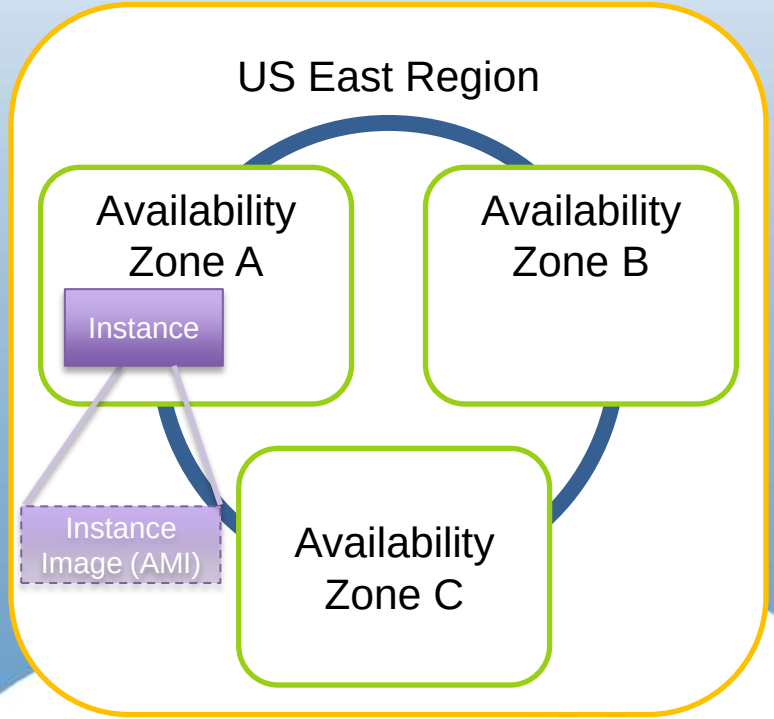
EC2 Hands On Use Case

- Choose an OS (Linux/Windows)
- Launch & Configure an Instance
  - Choose AMI
  - Choose Instance Type
  - Create Key Pairs
  - Create Security Group
  - Login to instance
- Create AMI
- Assign a fixed IP address
- Don't terminate yet!



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