CS 524 Homework #2

1. **Complete reading Chapter 3 of the textbook and the lecture materials. Please note the errata: The references to [19] on p. 56 of the book should be replaced with references to [20]! Please also read [20] (available free) at https://www.kernel.org/doc/ols/2007/ols2007v2-pages-87-96.pdf.**

   Completed the reading

2. **(10 points) Explain the advantage that paravirtualization provides for handling timers in virtual machines.**

   All modern operating systems rely on clock interrupts to maintain their internal timers, a feature that is particularly essential for real-time media processing. For this, even an idle virtual machine needs to process the clock interrupts. With paravirtualization, the virtual machine code is changed to request a notification at the specified time; without it, the hypervisor would need to schedule timer interrupts for idle machines, is not scalable.

   (Reference: Cloud Computing: Business Trends and Technologies)

3. **(10 points) Explain how paravirtualization helps in minimizing access to APIC.**

   Another advantage is in working with multi-processor architectures. Until now we have assumed there to be only one CPU in our simplified computer architecture, but this is not necessarily the case with modern machines. Conceptually, an operating system deals with multiple CPUs in the same way it deals with one; with modular design, it is just the scheduler and the interrupt handlers that need to be fully aware of the differences. The x86-based multi-processor architectures use the Advanced Programmable Interrupt Controller (APIC) for interrupt redirection in support of Symmetric Multi-Processing (SMP). Accessing APIC in virtual mode is expensive because of the transitions into and out of the hypervisor. With paravirtualization, which has the full view of the code, the multiple APIC access requests can be replaced with a single hypercall.

   (Reference: Cloud Computing: Business Trends and Technologies)

4. **(5 points) Find out if Linux (like Unix) has both the user-mode and system mode stacks for each process it runs.**

Linux like Unix has both user-mode and system mode stacks for each process it runs. The CPU has (at least) two modes of execution: the user mode and the system mode. The former is reserved for user programs and some non-critical system code. The latter is reserved for the critical operating system code (or kernel). With that, certain instructions must be executed only in the system mode. Correspondingly, both CPUs and modern operating systems have evolved to support this principle.

The CPU may have more than one set of identical registers. The least the operating system will work is to set one set of register reserved for user mode where application program executes and other for the system mode in which only the operating system software executes. The switch between the modes will not be done automatically by the CPU. The interrupt handler switches between the user mode and system mode when interrupts occur in the CPU.

(Reference: Cloud Computing: Business Trends and Technologies)

5. **(10 points) Find out what "unscrambled" means in the description of the Intel LSL instruction (you can, for example, use the Intel manual referenced in the lecture).**

   With Intel Manual section 3.2 Instruction Set Reference, A-L, Pg. 646, "Unscrambled" in Intel load Segment Limit (LSL) instruction means the ideal limit scaled according to the setting of the G flag in the segment descriptor. When the privilege level and type checks pass into destination register and set a ZF flag in the EFLAGS register then the unscrambled limit is loaded. If the segment selector is not visible at the current privilege level or is an invalid type for the LSL instruction, the instruction does not modify the destination register and clears the ZF flag. It's since the limit field is spread across several bits within GDT entry.

   The software can perform the limit checking using the LSL (LOAD SEGMENT LIMIT) instruction. The LSL instruction specifies the segment selector for the segment descriptor whose limit is to be checked and destination register. Based on the G flag, the limits are interpreted. When the G flag is clear, the effective limit is the value of the 20-bit limit in the segment descriptor. The limit ranges from 0 to 1 MB, when the G flag is set 4KB page granularity, the processor scales the value in the limit field by a factor of 212(4000 bytes). It ranges from 4000bytes to 4GB.

   (Reference: https://www.intel.com/content/www/us/en/architecture-and-technology/64-ia-32-architectures-software-developer-instruction-set-reference-manual-325383.html)

6. **(25 points) Read the following two papers:**
   • Carl Waldspurger and Rosenblum, M. (2012) I/O Virtualization. Communications of

the ACM, vol. 55, No 1. January 2012. Pages 66-72; and

• Muli Ben-Yehuda; Xenidis, J.; Ostrowski, M.; Rister, K.; Bruemmer, A.; Van Doorn, L. (2007). The Price of Safety: Evaluating IOMMU Performance. Proceedings of the Linux Symposium on June 27th–30th, 2007. Ottawa, Ontario. Pages 225-230.

1) Explain the advantages and disadvantages of using I/O MMU by citing the appropriate text from the paper;

Advantages:
a. I/O MMU translates the I/O virtual memory address to corresponding physical memory, making direct access by devices safe and efficient and allows the driver in the VM to program device DMA using its virtual memory address.
b. Devices that do not support memory address long enough to address the entire physical memory can still address the entire memory through the I/O MMU, avoiding overheads associated with copying buffers to and from the peripheral's addressable memory space.
c. The ability to multiplex logical I/O devices, allowing multiple logical devices to be implemented by a smaller number of physical devices.
d. VM features such as the ability to suspend and resume a VM and the ability to move a running VM between physical machines known as live migration.
e. This virtualization layer may also change mappings to physical devices even when the VM does not move.
f. One useful capability enabled by I/O virtualization is device aggregation where multiple physical devices can be combined into a single more capable logical device that is exported to the VM.
g. By interposing and transforming virtual I/O requests transparently enhancing unmodified software with new capabilities, features can be added to existing systems.

Dis-Advantages of I/O MMU
a. It is only applicable to a hypervisor scenario. In a bare-metal scenario, getting rid of map and uncap isn't practical because it renders the I/O MMU useless
b. In a hypervisor scenario, pre-allocation is only viable if the set of machine frames owned by the guest is "mostly constant" through the guest's lifetime. If the guest wishes to use page flipping or ballooning, or any other operation which modifies the guest's pseudo-physical to machine mapping, the I/OMMU mapping needs to be updated as well so that the I/O to machine mapping will again correspond exactly to the pseudo-physical to machine mapping.
c. Another downside of this optimization is that it protects other guests and the hypervisor from the guest but provides no protection inside the guest itself.

(Reference: https://cacm.acm.org/magazines/2012/1/144808-i-o-virtualization/fulltext , I/O Virtualization by Carl Waldspurger, Mendel Roseblum, Wikipedia Input Output Memory management unit)

2) Research the Web to find what is meant by "carrier-grade hypervisors". What products are available?

Carrier Grade can be defined as virtualization services that fulfil some or all expected properties existing in edge and core network elements such as IP Multimedia Systems nodes.
Features include Real time Behavior, configurable security, Availability, High performance scaling, Upgrade capabilities, fault tolerance and easy analysis.

Products available are: BareMetal Xen Hypervisors, Oracle Solaris, NEC CGHV.

7. **(5 points) Find out what hypervisors Amazon is using in EC2 and describe their major characteristics.**

   Amazon EC2 uses bare metal hypervisors in Xen.
   Major characteristics are:

- **Live Storage Migration**: It supports virtual machine running and their associated virtual disk image within and across resource tools and leveraging local and shared storage.

- **Live VM Migration**: Supports migration from one host to another allows workload balancing and the avoidance of downtime.

- **Host power protection**: Take advantage of embedded hardware features to lower data center electricity consumption by dynamically consolidating by VMs on fewer systems and then powering off underutilized servers as demand for services fluctuates.

- **Host failure protection**: Deliver high availability by automatically restarting virtual machines if a failure occurs at VM hypervisor level.

- **Memory Overcommit**: Helps improve application performance and reduce costs and protection by sharing unused server memory between VMs on the host server.

(References: https://en.wikipedia.org/wiki/Amazon_Elastic_Compute_Cloud)

8. **(10 points) Examine the Amazon EC2 VM offer capabilities and particularly the Amazon Machine Image (AMI) ((https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/AMIs.html) and answer the following questions:**

a. How (i.e., in what units) does EC2 measure the CPU power of a virtual machine and how is the unit in question translated into the power of the physical processors)?

The amount of CPU that is allocated to a particular instance is expressed in terms of these EC2 Compute Units. We use several benchmarks and tests to manage the consistency and predictability of the performance from an EC2 Compute Unit. One EC2 Compute Unit provides the equivalent CPU capacity of a 1.0-1.2 GHz 2007 Opteron or 2007 Xeon processor. This is also the equivalent to an early-2006 1.7 GHz Xeon processor referenced in our original documentation.

(Reference:
https://aws.amazon.com/ec2/faqs/#What_is_an_EC2_Compute_Unit_and_why_did_you_introduce_it)

b. What kinds of machine instances are there as characterized by the power of their respective CPUs, platform (i.e., 32-bit or 64-bit), memory, storage, etc.? Please list all the instances in the nomenclature along with their respective characteristics;

Amazon EC2 provides a wide selection of different instance types and provides the flexibility to choose the combination of instance to meet the computing need most appropriately and these sets of instance combinations can be changed later depending upon change in business need.

The various types of instances are:

General Purpose:

This instance family includes A1, T2, M5, and M5a,T3 which is often the first choice because of variety of CPU size range.

1. Amazon EC2 A1 instances deliver significant cost savings and are ideally suited for scale-out and Arm-based workloads that are supported by the extensive Arm ecosystem. A1 instances are the first EC2 instances powered by AWS Graviton Processors that feature 64-bit Arm Neoverse cores and custom silicon designed by AWS. Features: Custom built AWS Graviton Processor with 64-bit Arm Neoverse cores Support for Enhanced Networking with Up to 10 Gbps of Network bandwidth EBS-optimized by default

2. T2 instances are Burstable Performance Instances that provides a baseline level of CPU performance with the ability to burst above the baseline, which is governed by CPU Credits.

These instances are good choices for workloads that don't use the full CPU often or

consistently, but occasionally need to burst (examples web servers, development environments and databases).

Features:
• High frequency Intel Xeon processors
• Burstable CPU, governed by CPU credits, and consistent baseline performance
• Lowest-cost general purpose instance type, and Free Tier eligible (t2.micro only)
• Balance of computing, memory and network resources

3. M4 instances are the latest generation of General-Purpose Instances. This provides a balance of computing, memory and network resources, and it is a good choice for many applications.
Features:
• 2.3 GHz Intel Xeon E5-2686 v4 (Broadwell) processors or 2.4 GHz Intel Xeon E5-2676 (Haswell) processors
• EBS-optimized by default at no additional cost
• Support for Enhanced Networking
• Balance of computing, memory, and network resources

Compute Optimized: C4, C5, C5n are the compute optimized instances.
1. C5 instances are optimized for compute-intensive workloads and deliver cost-effective high performance at a low price per compute ratio.

Features:
• 3.0 GHz Intel Xeon Platinum processors with Intel Advanced Vector Extension 512 (AVX-512) instruction set.
• Run each core at up to 3.5 GHz using Intel Turbo Boost Technology
• Larger instance size, c5.18xlarge, offering 72 vCPUs and 144 GiB of memory
• Requires HVM AMIs that include drivers for ENA and NVMe

2. C4 instances are optimized for compute-intensive workloads and deliver very cost-effective high performance at a low price per compute ratio.

Features:
High frequency Intel Xeon E5-2666 v3 (Haswell) processors optimized specifically for EC2 Default EBS-optimized for increased storage performance at no additional cost Higher networking performance with Enhanced Networking supporting Intel 82599 VF.

Memory Optimized: R5, R5a, X1, X1e, R4 are the instances
1. R4 instances are optimized for memory intensive applications and offer lower price per GiB of RAM than R3.

Features:
• 2.3 GHz Intel Xeon E5-2686 v4 (Broadwell) processors

• DDR4 Memory

2. R5 instances deliver 5% additional memory per vCPU than R4 and the largest size provides 768 GiB of memory. In addition, R5 instances deliver a 10% price per GiB improvement and a ~20% increased CPU performance over R4.

Features:
• Up to 3.1 GHz Intel Xeon® Platinum 8175 processors with new Intel Advanced Vector Extension (AXV-512) instruction set

• Up to 768 GiB of memory per instance
• Powered by the AWS Nitro System, a combination of dedicated hardware and lightweight hypervisor

3. X1 instances are optimized for large-scale, enterprise-class and in-memory applications, and offer one of the lowest price per GiB of RAM among Amazon EC2 instance types.
Features:
• High frequency Intel Xeon E7-8880 v3 (Haswell) processors
• One of the lowest prices per GiB of RAM
• Up to 1,952 GiB of DRAM-based instance memory
Accelerated Computing: P2, P3 G3, F1 are the instances available.
1. P2 instances are intended for general-purpose GPU compute applications.
Features:
• High frequency Intel Xeon E5-2686 v4 (Broadwell) processors
• High-performance NVIDIA K80 GPUs, each with 2,496 parallel processing cores and 12GiB of GPU memory
• Supports GPUDirectTM for peer-to-peer GPU communications

2. P3 instances are the latest generation of general-purpose GPU instances.
Features:
• Up to 8 NVIDIA Tesla V100 GPUs, each pairing 5,120 CUDA Cores and 640 Tensor Cores
• High frequency Intel Xeon E5-2686 v4 (Broadwell) processors for p3.2xlarge, p3.8xlarge, and p3.16xlarge.
• High frequency 2.5 GHz (base) Intel Xeon P-8175M processors for p3dn.24xlarge.
• Supports NVLink for peer-to-peer GPU communication

3. G3 instances are optimized for graphics-intensive applications.
Features:
• High frequency Intel Xeon E5-2686 v4 (Broadwell) processors
• NVIDIA Tesla M60 GPUs, each with 2048 parallel processing cores and 8 GiB of video memory

• Enables NVIDIA GRID Virtual Workstation features, including support for 4 monitors with resolutions up to 4096x2160. Each GPU included in your instance is licensed for one “Concurrent Connected User"
• Enables NVIDIA GRID Virtual Application capabilities for application virtualization software like Citrix XenApp Essentials and VMware Horizon, supporting up to 25 concurrent users per GPU Storage Optimized: This instance family includes the H1, I3 and D2 instance types, and provides you with direct attached storage options optimized for applications with specific disk I/O and storage capacity requirements.
• I3 also offers Bare Metal instances (i3.metal), powered by the Nitro System, for non-virtualized workloads, workloads that benefit from access to physical resources, or workloads that may have license restrictions.

Features:
• High Frequency Intel Xeon E5-2686 v4 (Broadwell) Processors with base frequency of 2.3 GHz
• Up to 25 Gbps of network bandwidth using Elastic Network Adapter (ENA)-based Enhanced Networking
• High Random I/O performance and High Sequential Read throughput

• D2 – Dense Storage instances feature up to 48TB of HDD-based local storage, deliver high disk throughput, and offer the lowest price per disk throughput performance on Amazon EC2.
Features:
• High-frequency Intel Xeon E5-2676v3 (Haswell) processors
• HDD storage
• Consistent high performance at launch time
• High disk throughput
• Support for Amazon EC2 Enhanced Networking

3.H1 instances feature up to 16 TB of HDD-based local storage, deliver high disk throughput, and a balance of compute and memory.
Features:
• Powered by 2.3 GHz Intel® Xeon® E5 2686 v4 processors (codenamed Broadwell)
• Up to 16TB of HDD storage
• High disk throughput
• ENA enabled Enhanced Networking up to 25 Gbps

(References: https://aws.amazon.com/blogs/aws/choosing-the-right-ec2-instance-type-for-your-application/, https://aws.amazon.com/ec2/instance-types/)

c. **Which operating systems are available on the above systems?**

Amazon EC2 supports almost all operating systems.

Some of them are: Amazon Linux, CentOS, CoreOS, Debian, Fedora, FreeBSD, Genymotion, Oracle Linux, RancherOS, Red Hat Enterprise Linux (RHEL), SUSE, SUSE Linux Enterprise Server, TurnKey Core, Windows Server,and Ubuntu Server 18.08 LTS

(Reference
https://docs.aws.amazon.com/opsworks/latest/userguide/workinginstances-os.html)

d. **What is an AMI and what is its relationship to an instance?**

An instance is a virtual machine with specifications and OS that you choose while creating them. An AMI (Amazon Machine Image) is a complete backup of an instance. When you make AMI of an instance, two things happen
1. AMI Creation that has all its launch configurations and
2. Snapshot attached to this AMI which has disk backup of the instance.

(Reference: https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/AMIs.html)

e. What are the components of an AMI?

Each Amazon Machine Image includes the following:

- A template for the instance's root device volume
- Set up permissions that control which Amazon Web Services (AWS) accounts can use the machine images to set up an instance
- The block devices that specify the root device volume to attach to the E2C instance once it's launched.

A read-only filesystem image - the main component of a machine image - is normally compressed, encrypted and uploaded into Amazon S3 for storage. The file used to store information about the machine image is known as a manifest file.
Information stored in this file includes name, architecture, decryption key and default kernel id. Note that an AMI does not include an image but rather a pointer to the default kernel id.

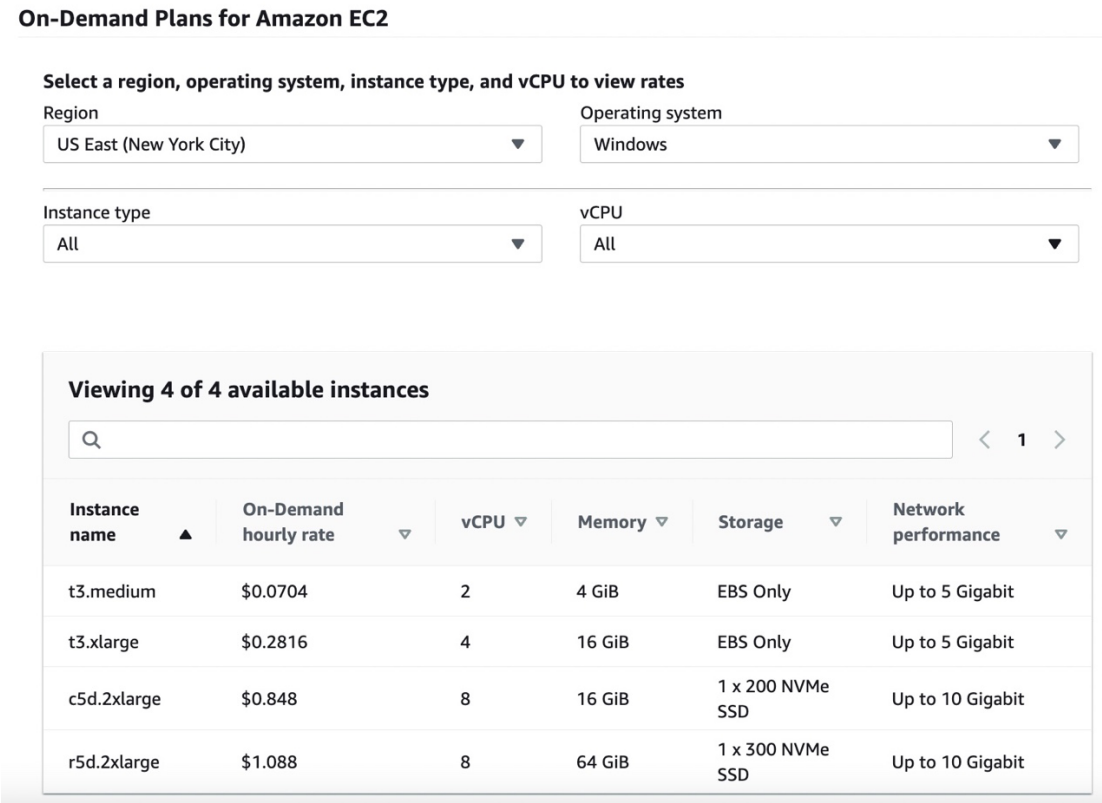
(Reference: https://www.linkeit.com/blog/what-are-amazon-machine-images-ami)

9. **(10 points) Find out about the pricing of the EC2 platforms and provide a few examples.**

Amazon EC2 is free to try. There are five ways to pay for Amazon EC2 instances: On-Demand, Savings Plans, Reserved Instances, and Spot Instances.

On-Demand: With On-Demand instances, one can pay for compute capacity by the hour or the second depending on which instances one runs. No longer-term commitments or

upfront payments are needed. We can increase or decrease our compute capacity depending on the demands of the application and only pay the specified per hourly rates for the instance we use.



On-Demand Plans for Amazon EC2

Select a region, operating system, instance type, and vCPU to view rates

Region: US East (New York City)

Operating system: Windows

Instance type: All

vCPU: All

Viewing 4 of 4 available instances

1

Instance name	On-Demand hourly rate	vCPU	Memory	Storage	Network performance
t3.medium	$0.0704	2	4 GiB	EBS Only	Up to 5 Gigabit
t3.xlarge	$0.2816	4	16 GiB	EBS Only	Up to 5 Gigabit
c5d.2xlarge	$0.848	8	16 GiB	1 x 200 NVMe SSD	Up to 10 Gigabit
r5d.2xlarge	$1.088	8	64 GiB	1 x 300 NVMe SSD	Up to 10 Gigabit

The on Demand Plan pricing for Amazon EC2 for Windows OS for New York city is listed above.

Spot instances**:** Amazon EC2 Spot instances allow you to request spare Amazon EC2 computing capacity for up to 90% off the On-Demand price.

Spot Instances

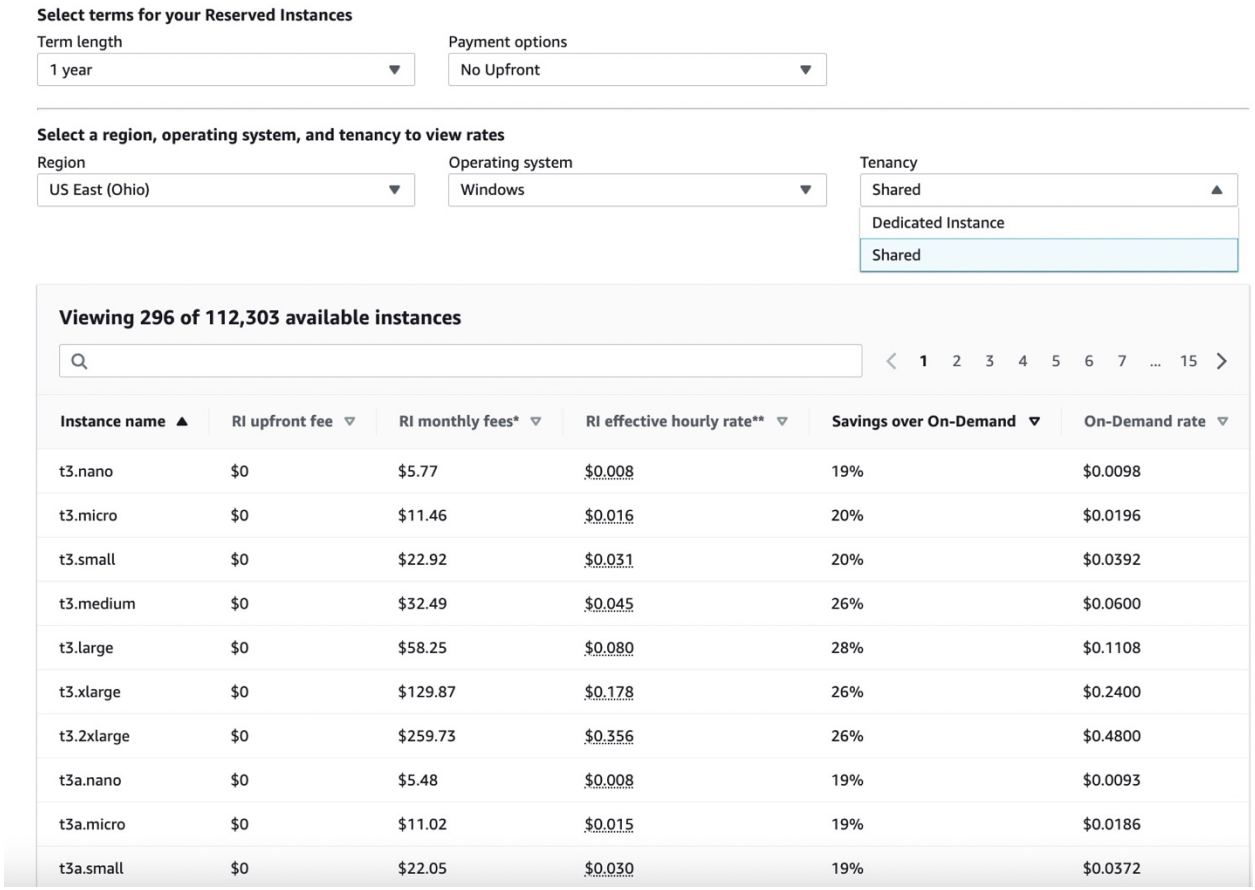
Note: T4g and T3 instances launch as unlimited by default. If you launch T4g or T3 Spot Instances as unlimited and plan to use them immediately and for a short duration, with no idle time for accruing CPU credits, you will incur charges for surplus credits. If the average CPU usage over a 24-hour period exceeds the baseline, you will also incur charges for surplus credits. We recommend that you launch your T4g or T3 Spot Instances in standard mode to avoid paying higher costs. For more information, see Surplus Credits Can Incur Charges and Spot Instance limits.

Region: US East (Ohio)

	US East (Ohio)	
	Linux/UNIX Usage	**Windows Usage**
General Purpose - Current Generation		
a1.medium	$0.0049 per Hour	N/A*
a1.large	$0.0098 per Hour	N/A*
a1.xlarge	$0.0197 per Hour	N/A*
a1.2xlarge	$0.0394 per Hour	N/A*
a1.4xlarge	$0.0788 per Hour	N/A*
a1.metal	$0.0788 per Hour	N/A*
t2.micro	$0.0035 per Hour	$0.0081 per Hour
t2.small	$0.0069 per Hour	$0.0159 per Hour
t2.medium	$0.0139 per Hour	$0.0319 per Hour
t2.large	$0.0278 per Hour	$0.0558 per Hour
t2.xlarge	$0.0557 per Hour	$0.0967 per Hour
t2.2xlarge	$0.1114 per Hour	$0.1734 per Hour
t3.nano	$0.0017 per Hour	$0.0062 per Hour

The Spot Instance Plan pricing for Amazon EC2 for Ohio is listed above.

Reserved Instance**:** Reserved Instances provide us with a significant discount (up to 72%) compared to On-Demand Instance pricing. In addition, when Reserved Instances are assigned to a specific Availability Zone, they provide a capacity reservation, giving us additional confidence in our ability to launch instances when we need them.



Reserved Instance pricing for Ohio with Windows and Shared tenancy are listed above.

Dedicated Hosts: A Dedicated Host is a physical EC2 server dedicated for your use. Dedicated Hosts can help us reduce costs by allowing us to use our existing server-bound software licenses, including Windows Server, SQL Server, and SUSE Linux Enterprise Server (subject to your license terms), and can also help us meet compliance requirements.

On-Demand Pricing

When you pay On-Demand for Dedicated Hosts, you pay for each second (minimum of 60 seconds) that the Dedicated Host is active in your account (or allocated). You can terminate billing for any particular On-Demand Dedicated Host by releasing it. On-Demand gives you the flexibility to scale up or down without long-term commitments. To learn more about how to allocate or release a Dedicated Host, visit Dedicated Hosts Getting Started.

Please note that On-Demand Mac1 Dedicated Hosts have a minimum host allocation and billing duration of 24 hours.

Region: US East (Ohio)

General Purpose	Price Per Hour
a1	$0.449
t3	$8.786
m6g	$2.71
m6gd	$3.182
m6i	$6.758
m5	$5.069
m5d	$5.966
m5dn	$7.181
m5n	$6.283
m5zn	$4.36
m4	$2.42
mac1	$1.083

On Demand for Dedicated Hosts for Ohio region are stated above.

(Reference: https://aws.amazon.com/ec2/pricing/?trkCampaign=acq_paid_search_brand&sc_channel=PS&sc_campaign=acquisition_US&sc_publisher=Google&sc_category=Cloud%20Computing&sc_country=US&sc_geo=NAMER&sc_outcome=acq&sc_detail=%2Baws%20%2Bec2&sc_content={ad%20group}&sc_matchtype=b&sc_segment=488982705483&sc_medium=ACQ-P|PS-GO|Brand|Desktop|SU|Cloud%20Computing|EC2|US|EN|Sitelink&s_kwcid=AL!4422!3!488982705483!b!!g!!%2Baws%20%2Bec2&ef_id=Cj0KCQiA0p2QBhDvARIsAACSOOPcUaumvZbL0g8g2rzu3Z_PfA-mEE-K4LaPQsotj7rXDp2uMwYFKHsaAjteEALw_wcB:G:s&s_kwcid=AL!4422!3!488982705483!b!!g!!%2Baws%20%2Bec2)

10. **(15 points) From the above exercise, you will learn that it is possible to create a free machine instance. Please, do the following:**

a. Find out and document the essence of the respective Service Level Agreement (SLA) on ; in particular write down what one needs to do in order to maintain this service free;

The Amazon AWS Free Tier applies to participating services across the global regions. The free usage under the AWS Free Tier is calculated each month across all regions and automatically applied to the bill – free usage does not accumulate. The AWS Free Tier is not available in the AWS GovCloud (US) Regions or the China (Beijing) region currently.

There are 3 types of Free Offers:

12-Months Free: 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.

Always Free: These free tier offers do not automatically expire at the end of your 12-month AWS Free Tier term but are available to both existing and new AWS customers indefinitely.

Trials: These free tier offers are short term trial offers that start from the time of first usage begins. Once the trial period expires you simply pay standard, pay-as-you-go service rates (see each service page for full pricing details).

In order to maintain free services of Amazon EC2, one needs to sign up under the Free Tier, to get hands on experience for 12-month period. Then the one need to create an account and use the services provided under certain usage limits. We need to follow the steps:
i. Sign up for an AWS account,
ii. Must provide credit card information and billing address. Until the free usage exceeds the limits, you would not be charged for the services.
iii. Get started with AWS Cloud services by choosing any of the products listed under the Free Tier service.

(Reference: https://aws.amazon.com/free/?all-free-tier.sort-by=item.additionalFields.SortRank&all-free-tier.sort-order=asc&c=ml&awsf.Free%20Tier%20Types=tier%23always-free&awsf.Free%20Tier%20Categories=*all)

b. Describe the process (i.e., what exactly one needs to do) to create a free machine instance that could be used as a server. (Do not, however, create anything yet!)

i. First, must create an instance of Amazon EC2 which can be used as a server for hosting an application on the cloud.
ii. Then must create a server for the database which would be a database instance.
iii. After performing above steps, a web app can be deployed on the server.
iv. After that, load balancing and scaling needs to be done so that the traffic is distributed across the number of servers or application servers.
v. In the last, user can associate or use a name with your web application.

(References: http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/AMIs.html)

c. Can you create a machine instance equivalent to your own PC and then transfer your own PC image there? If so, how would you achieve that?

Yes, we can create a machine instance equivalent to my own PC and then transfer our own PC image there. All of this can be done by creating an EC2 instance on the Amazon Cloud and host it as a server. After that, we need to connect our own PC to that server and then transfer the image.

VM Import/Export enables us to easily import virtual machine images from our existing environment to Amazon EC2 instances and export them back to our on-premises environment. This offering allows us to leverage our existing investments in the virtual machines that we have built to meet our IT security, configuration management, and compliance requirements by bringing those virtual machines into Amazon EC2 as ready-to-use instances. VM Import/Export is available at no additional charge beyond standard usage charges for Amazon EC2 and Amazon S3.

(Reference: https://aws.amazon.com/premiumsupport/knowledge-center/, https://aws.amazon.com/ec2/vm-import/)