CLOUD COMPUTING

Project Report

Understanding the Cost of Computing in the Cloud

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by

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ABSTRACT

Cloud computing is becoming one of hottest topics in the modern day computing where you get computing service at a very cheap price when compared to one's own private computer. In this report, I am going to present if the public cloud like (Amazon AWS) or private cloud would prove too be cheaper if we needed computing for the up-coming 5 years. I am also presenting the comparison between public cloud computing cost and private cloud computing cost and utilization of private cloud over public cloud. Here, I used AMAZON AWS EC2 as a public cloud[1].

INTRODUCTION

One of the major companies that have set a firm foot into this business is Amazon and google with amazon being one of the oldest players in the game. The popularity of amazon is bit more because of it dynamic provisioning and scalability that it provides over the cloud. A public cloud consists of a service or set of services that are purchased by a business or organization and delivered via the Internet by a third-party provider.

The amazon EC2 of them all are very known to the developers as Amazon EC2 is built on commodity hardware, over time there may be several different types of physical hardware underlying EC2 instances. AMAZON EC2 provides wide range of instances that all have used for different purposes like General Purpose, Storage Optimized, GPU, Memory Optimized , Compute Optimized etc..

Here, I have to find cost break down of private cloud and compare it with public (Amazon EC2) cloud. I considered 8 different categories instances from AMAZON EC2 named m4.10xlarge, m3.large, m3.2xlarge, c3.8xlarge, g2.2xlarge, r3.4xlarge, i2.8xlarge, and d2.8xlarge

CONSIDERATION

Before, I go further with the making of private cloud I make some consideration as following:

- Electricity rates is $0.08 /kW/hour on an average in Chicago. [10]
- Chasis has capacity of 2 machine per chasis
- There are internal fans in the chassis and also in the rack because of which I have not chosen additional cooling system.
- 1 System Admin is in consideration for my private cloud. The Salary of System Admin is $90000 per year. [6]

Public Instances

Instance Type	vCPU	IPC	Gflops	Memory (GiB)	Storage (GB)	Networking Performance	Physical Processor	Clock Speed (GHz)	Price
m4.10xlarge	40	16	768	160	EBS Only	10Gbps	Intel Xeon E5-2676 v3	2.4	$2.394
m3.large	2	8	20	7.5	1 * 32 SSD	Moderate (500Mbps)	Intel Xeon E5-2670 v2	2.5	$0.133
m3.2xlarge	8	8	80	30	2 * 80 SSD	High (1Gbps)	Intel Xeon E5-2670 v2	2.5	$0.532
c3.8xlarge	32	8	358.4	60	2 * 320 SSD	10Gbps	Intel Xeon E5-2680 v2	2.8	$1.680
g2.2xlarge	8	8	2183.2	15	1 * 60 SSD	High (1Gbps)	Intel Xeon E5-2670	2.6	$0.650
r3.4xlarge	16	8	160	122	1 * 320 SSD	High (1Gbps)	Intel Xeon E5-2670 v2	2.5	$1.33
i2.8xlarge	32	8	320	244	8 * 800 SSD	10Gbps	Intel Xeon E5-2670 v2	2.5	$6.82
d2.8xlarge	36	16	691.2	244	24 * 2000	10Gbps	Intel Xeon E5-2676 v3	2.4	$5.52

- The above table describes about the ec2 instances of AWS. Each EC2 instances have hardware configuration mentioned above. Each VCPU of the instance is a hyper thread of the Intel Xeon processor.
- I consider eight instance named m4.10xlarge.private, m3.large.private, m3.2xlarge.private, c3.8xlarge.private, g2.2xlarge.private, r3.4xlarge.private, i2.8xlarge.private, and d2.8xlarge.private which are compared to the AMAZON EC2 instances m4.10xlarge, m3.large, m3.2xlarge, c3.8xlarge, g2.2xlarge, r3.4xlarge, i2.8xlarge, and d2.8xlarge

Private Instances

- I build a private cloud for all eight AMAZON instances and compare the cost of each instances per hour. To build a private cloud the factors we consider are Processor, Storage, Memory, Network Adapter, Network Switch, System Admin, Cooling Power, System Power, Chassis, Rack, UPS, Motherboard, Housing and Firewall.
- I calculated GFLOPS for all the instances based on its processor clock speed, cores and IPC using following formula:

GFLOPS = (IPC) * (Clock Speed (Ghz)) * (No. of cores)

- All cost is in dollar ($) and Total cost is for 5 years. 2nd Table has rate of Cost/Instance/Hour of instance.

1.) m4.10xlarge.private

Sr. No	Device	Details	Cost
1.	Chassis	SUPERMICRO CSE-825TQ-R700LPB Black 2U Rackmount Server Case w/ 700W Redundant Power Supply	$570
2.	Processor	2 INTEL XEON E5-2676 V3 2.40GHz SR1Y5 30Mb 12 Cores 24 Thread	$3600
3.	Storage	Intel 320 Series 2.5" 300GB SATA II MLC SSD	$320
4.	Memory	3 Kingston 64GB (4 x 16GB) 288-Pin DDR4 SDRAM ECC Registered DDR4	$1095
5.	Mother Board	ASUS Z10PE-D16/2L/10G-2T EEB Server Motherboard 2 x Socket R3 LGA 2011-3 Intel C612	$600
6.	Network Switch	Cisco SG200-26FP 26-port Gigabit Full-PoE Smart Switch	$462
7.	Network Adapter	Intel X540-BT2 10 Gigabit Ethernet Card	$448
8.	Rack	Tripp Lite SR4POST25 25U	$294
9.	System Admin	90k * 5	$450000
10.	Cooling Power	583.1	$2043.19
11.	System Power	1889.3	$6620.1072
12.	UPS	APC Smart-UPS SMC1500-2U 1440 VA 900 Watts 6 Outlets UPS	$490
13.	Firewall	Cisco Meraki MX400 Security Appliance + 7yr of Enterprise License and Support	$38219
15.			
16.	TOTAL		$504761.2896
		GFLOPS	**768**

GFLOPS	1	10	100	1000	10000	100000	1000000
INSTANCES	1	1	1	2	11	109	1086
COST/ INSTANCES/ HOUR	11.5680766	11.5680766	11.5680766	5.974069753	1.133495172	0.466130453	0.396825707

- This instance is the latest generation of General Purpose Instances.
- The m4.10xlarge.private has a 12 core processor and Amazon EC2 m4.10xlarge need 20 cores so that I took 2 x 12 core processor.
- The memory, storage, chassis, rack, motherboard, are also considered to fit 1 instance per Machine.
- The GFLOPS of private instance is 16 * 2.4 * 20 = 768
- The Total amortized cost for 5 years is $504761.2896
- Cost for a single instance $ 11.568

2.) m3.large.private

Sr. No	Device	Details	Cost
1.	Chassis	SUPERMICRO CSE-825TQ-R700LPB Black 2U Rackmount Server Case w/ 700W Redundant Power Supply	$570
2.	Processor	Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz	$1560
3.	Storage	Intel DC S3710 2.5" 400GB SATA III MLC Internal SSD	$570
4.	Memory	8 * Kingston 16GB 240-Pin DDR3 SDRAM ECC Registered DDR3	$776
5.	Mother Board	SUPERMICRO MBD-X9DRD-IF-O Extended ATX Server Motherboard Dual LGA 2011 DDR3 1600	$365
6.	Network Switch	Cisco SG200-26FP 26-port Gigabit Full-PoE Smart Switch	$462
7.	Network Adapter	Intel Ethernet Server Adapter I350-T2	$130
8.	Rack	Tripp Lite SR4POST25 25U	$294
9.	System Admin	90k * 5	$450000
10.	Cooling Power	423.54	$2043.19
11.	System Power	1331.4	$6620.1072
12.	UPS	APC Smart-UPS SMC1500-2U 1440 VA 900 Watts 6 Outlets UPS	$490
13.	Firewall	Cisco Meraki MX400 Security Appliance + 7yr of Enterprise License and Support	$38219
15.			
16.	TOTAL		$499585.3098
		GFLOPS	**20**

GFLOPS	1	10	100	1000	10000	100000	1000000
INSTANCES	0.05	0.5	5	50	500	5000	50000
COST/ INSTANCES/ HOUR	11.4060573	11.4060573	2.28121146	0.246085182	0.045018561	0.024941342	0.022932143

- This instance is the latest generation of General Purpose Instances.
- The m3.xlarge.private has a 10 core processor and Amazon EC2 m3.xlarge need 1 cores so that I took 1 x 10 core processor.
- The memory, storage, chassis, rack, motherboard, are also considered to fit 10 instance per Machine.
- The GFLOPS of private instance is 8 * 2.5 * 1 = 20
- The Total amortized cost for 5 years is $499585.3098
- Cost for a single instance $11.40

3.) m3.2xlarge.private

Sr. No	Device	Details	Cost
1.	Chassis	SUPERMICRO CSE-825TQ-R700LPB Black 2U Rackmount Server Case w/ 700W Redundant Power Supply	$570
2.	Processor	Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz	$1560
3.	Storage	Intel DC S3710 2.5" 400GB SATA III MLC Internal SSD	$570
4.	Memory	4 * Kingston 16GB 240-Pin DDR3 SDRAM ECC Registered DDR3	$388
5.	Mother Board	SUPERMICRO MBD-X9DRD-IF-O Extended ATX Server Motherboard Dual LGA 2011 DDR3 1600	$365
6.	Network Switch	Cisco SG200-26FP 26-port Gigabit Full-PoE Smart Switch	$462
7.	Network Adapter	Intel Ethernet Server Adapter I350-T2	$130
8.	Rack	Tripp Lite SR4POST25 25U	$294
9.	System Admin	90k * 5	$450000
10.	Cooling Power	465.6	$2043.19
11.	System Power	1721.7	$6620.1072
12.	UPS	APC Smart-UPS SMC1500-2U 1440 VA 900 Watts 6 Outlets UPS	$490
13.	Firewall	Cisco Meraki MX400 Security Appliance + 7yr of Enterprise License and Support	$38219
15.			
16.	TOTAL		$500712.2992
		GFLOPS	**80**

GFLOPS	1	10	100	1000	10000	100000	1000000
INSTANCES	1	1	2	13	125	1250	12500
COST/ INSTANCES/ HOUR	11.4317877	11.4317877	5.71589383	0.995743053	0.216764721	0.135347781	0.127302303

- This instance is the latest generation of General Purpose Instances.
- The m3.2xlarge.private has a 10 core processor and Amazon EC2 m3.2xlarge need 4 cores so that I took 1 x 10 core processor.
- The memory, storage, chassis, rack, motherboard, are also considered to fit 2 instance per Machine.
- The GFLOPS of private instance is 8 * 2.5 * 4 = 80
- The Total amortized cost for 5 years is $500712.2992
- Cost for a single instance $11.43

4.) c3.8xlarge.private

Sr. No	Device	Details	Cost
1.	Chassis	SUPERMICRO CSE-825TQ-R700LPB Black 2U Rackmount Server Case w/ 700W Redundant Power Supply	$570
2.	Processor	2 * Intel Xeon E5-2680 v2 Ivy Bridge-EP 2.8 GHz LGA 2011 115W BX80635E52680V2 Server Processor	$3540
3.	Storage	Intel DC S3610 2.5" 800GB SATA III MLC Internal SSD	$638
4.	Memory	Kingston 64GB (4 x 16GB) 288-Pin DDR4 SDRAM ECC Registered DDR4	$365
5.	Mother Board	ASUS Z10PE-D16/2L/10G-2T EEB Server Motherboard 2 x Socket R3 LGA 2011-3 Intel C612	$600
6.	Network Switch	Cisco SG200-26FP 26-port Gigabit Full-PoE Smart Switch	$462
7.	Network Adapter	Intel X540-BT2 10 Gigabit Ethernet Card	$448
8.	Rack	Tripp Lite SR4POST25 25U	$294
9.	System Admin	90k * 5	$450000
10.	Cooling Power	489.8 W	$2043.19
11.	System Power	1598.3 W	$6620.1072
12.	UPS	APC Smart-UPS SMC1500-2U 1440 VA 900 Watts 6 Outlets UPS	$490
13.	Firewall	Cisco Meraki MX400 Security Appliance + 7yr of Enterprise License and Support	$38219
15.			
16.	TOTAL		$502942.7024
		GFLOPS	**358.4**

GFLOPS	1	10	100	1000	10000	100000	1000000
INSTANCES	1	1	1	3	28	280	2791
COST/ INSTANCES/ HOUR	11.4827101	11.4827101	11.4827101	4.028372201	0.702525006	0.343592276	0.307744727

- This instance is the latest generation of Compute-optimized instances, featuring the highest performing processors.
- The c3.8xlarge.private has a 10 core processor and Amazon EC2 c3.8xlarge need 16 cores so that I took 2 x 10 core processor.
- The memory, storage, chassis, rack, motherboard, are also considered to fit 1 instance per Machine.
- The GFLOPS of private instance is 8 * 2.8 * 16 = 358.4
- The Total amortized cost for 5 years is $502942.7024
- Cost for a single instance $11.48

5.) g2.2xlarge.private

Sr. No	Device	Details	Cost
1.	Chassis	SUPERMICRO CSE-825TQ-R700LPB Black 2U Rackmount Server Case w/ 700W Redundant Power Supply	$570
2.	Processor	Intel Xeon E5-2670 2.6 GHz 8-Core Processor	$1350
3.	Storage	Intel 320 Series 160 GB SATA SSD	$270
4.	Memory	Kingston 16GB 240-Pin DDR3 SDRAM ECC Registered DDR3	$97
5.	Mother Board	SUPERMICRO MBD-X9DRD-IF-O Extended ATX Server Motherboard Dual LGA 2011 DDR3 1600	$365
6.	Network Switch	Cisco SG200-26FP 26-port Gigabit Full-PoE Smart Switch	$462
7.	Network Adapter	Intel Ethernet Server Adapter I350-T2	$130
8.	Rack	Tripp Lite SR4POST25 25U	$294
9.	GPU	NVIDIA® Quadro® K5000 4GB 2.1 Tflops	$1837
10.	System Admin	90k * 5	$450000
11.	Cooling Power	383.3	$1343.0832
12.	System Power	1980.6	$6940.0224
13.	UPS	APC Smart-UPS SMC1500-2U 1440 VA 900 Watts 6 Outlets UPS	$490
14.	Firewall	Cisco Meraki MX400 Security Appliance + 7yr of Enterprise License and Support	$38219
16.	TOTAL		$502367.1056
		GFLOPS	**2183.2**

GFLOPS	1	10	100	1000	10000	100000	1000000
INSTANCES	1	1	1	1	5	46	459
COST/ INSTANCES/ HOUR	11.4695686	11.4695686	11.4695686	11.46956862	2.409138433	0.387836723	0.169932715

- g2 instances intended for graphics and general purpose GPU compute applications.
- The g2.2xlarge.private has a 10 core processor and Amazon EC2 g2.2xlarge need 4 cores so that I took 1 x 10 core processor. I took GPU has a 2.1 TFLOPs for GPU compute applications.
- The memory, storage, chassis, rack, motherboard, are also considered to fit 2 instance per Machine.
- The GFLOPS of private instance is 8 * 2.6 * 4 = 83.2 + GPU FLOPS (2100) =2183.2
- The Total amortized cost for 5 years is $ 502367.1056
- Cost for a single instance $11.469

6.) r3.4xlarge.private

Sr. No	Device	Details	Cost
1.	Chassis	SUPERMICRO CSE-825TQ-R700LPB Black 2U Rackmount Server Case w/ 700W Redundant Power Supply	$570
2.	Processor	Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz	$1560
3.	Storage	Intel DC S3710 2.5" 400GB SATA III MLC Internal SSD	$570
4.	Memory	2 * Kingston 64GB (4 x 16GB) 240-Pin DDR3 SDRAM	$726
5.	Mother Board	SUPERMICRO MBD-X9DRD-IF-O Extended ATX Server Motherboard Dual LGA 2011 DDR3 1600	$365
6.	Network Switch	Cisco SG200-26FP 26-port Gigabit Full-PoE Smart Switch	$462
7.	Network Adapter	Intel Ethernet Server Adapter I350-T2	$130
8.	Rack	Tripp Lite SR4POST25 25U	$294
9.	System Admin	90k * 5	$450000
10.	Cooling Power	543.2	$1903.3728
11.	System Power	1982.3	$6945.9792
12.	UPS	APC Smart-UPS SMC1500-2U 1440 VA 900 Watts 6 Outlets UPS	$490
13.	Firewall	Cisco Meraki MX400 Security Appliance + 7yr of Enterprise License and Support	$38219
15.			
16.	TOTAL		$502235.352
		GFLOPS	**160**

GFLOPS	1	10	100	1000	10000	100000	1000000
INSTANCES	1	1	1	7	63	625	6250
COST/ INSTANCES/ HOUR	11.4665605	11.4665605	11.4665605	1.884009993	0.464861628	0.305468457	0.289377501

- R3 instances are optimized for memory-intensive applications and have the lowest cost per GiB of RAM
- The r3.4xlarge.private has a 10 core processor and Amazon EC2 r3.4xlarge need cores so that I took 1 x 10 core processor.
- The memory, storage, chassis, rack, motherboard, are also considered to fit 1 instance per Machine.
- The GFLOPS of private instance is 8 * 2.5 * 8 = 160
- The Total amortized cost for 5 years is $502235.352
- Cost for a single instance $11.466

7.) i2.8xlarge.private

Sr. No	Device	Details	Cost
1.	Chassis	SUPERMICRO CSE-825TQ-R700LPB Black 2U Rackmount Server Case w/ 700W Redundant Power Supply	$570
2.	Processor	2 * Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz	$3120
3.	Storage	4 * Intel DC S3500 1.6TB SATA III MLC Internal SSD	$5600
4.	Memory	4 * Kingston 64GB (4 x 16GB) 288-Pin DDR4 SDRAM ECC Registered DDR4	$1460
5.	Mother Board	ASUS Z10PE-D16/2L/10G-2T EEB Server Motherboard 2 x Socket R3 LGA 2011-3 Intel C612	$600
6.	Network Switch	Cisco SG200-26FP 26-port Gigabit Full-PoE Smart Switch	$462
7.	Network Adapter	Intel X540-BT2 10 Gigabit Ethernet Card	$448
8.	Rack	Tripp Lite SR4POST25 25U	$294
9.	System Admin	90k * 5	$450000
10.	Cooling Power	645.2	$2260.7808
11.	System Power	1952.3	$6840.8592
12.	UPS	APC Smart-UPS SMC1500-2U 1440 VA 900 Watts 6 Outlets UPS	$490
13.	Firewall	Cisco Meraki MX400 Security Appliance + 7yr of Enterprise License and Support	$38219
15.			
16.	TOTAL		$509964.64
		GFLOPS	**320**

GFLOPS	1	10	100	1000	10000	100000	1000000
INSTANCES	1	1	1	4	32	313	3125
COST/ INSTANCES/ HOUR	11.6430283	11.6430283	11.6430283	3.255271461	0.813027597	0.49976544	0.467632482

- This family includes the High Storage Instances that provide very fast SSD-backed instance storage optimized for very high random I/O performance, and provide high IOPS at a low cost.
- The i2.8xlarge.private has a 10 core processor and Amazon EC2 m4.10xlarge need 16 cores so that I took 2 x 10 core processor.
- The memory, storage, chassis, rack, motherboard, are also considered to fit 1 instance per Machine.
- The GFLOPS of private instance is 8 * 2.5 * 16 = 320
- The Total amortized cost for 5 years is $509964.64
- Cost for a single instance $11.64

8.) d2.8xlarge.private

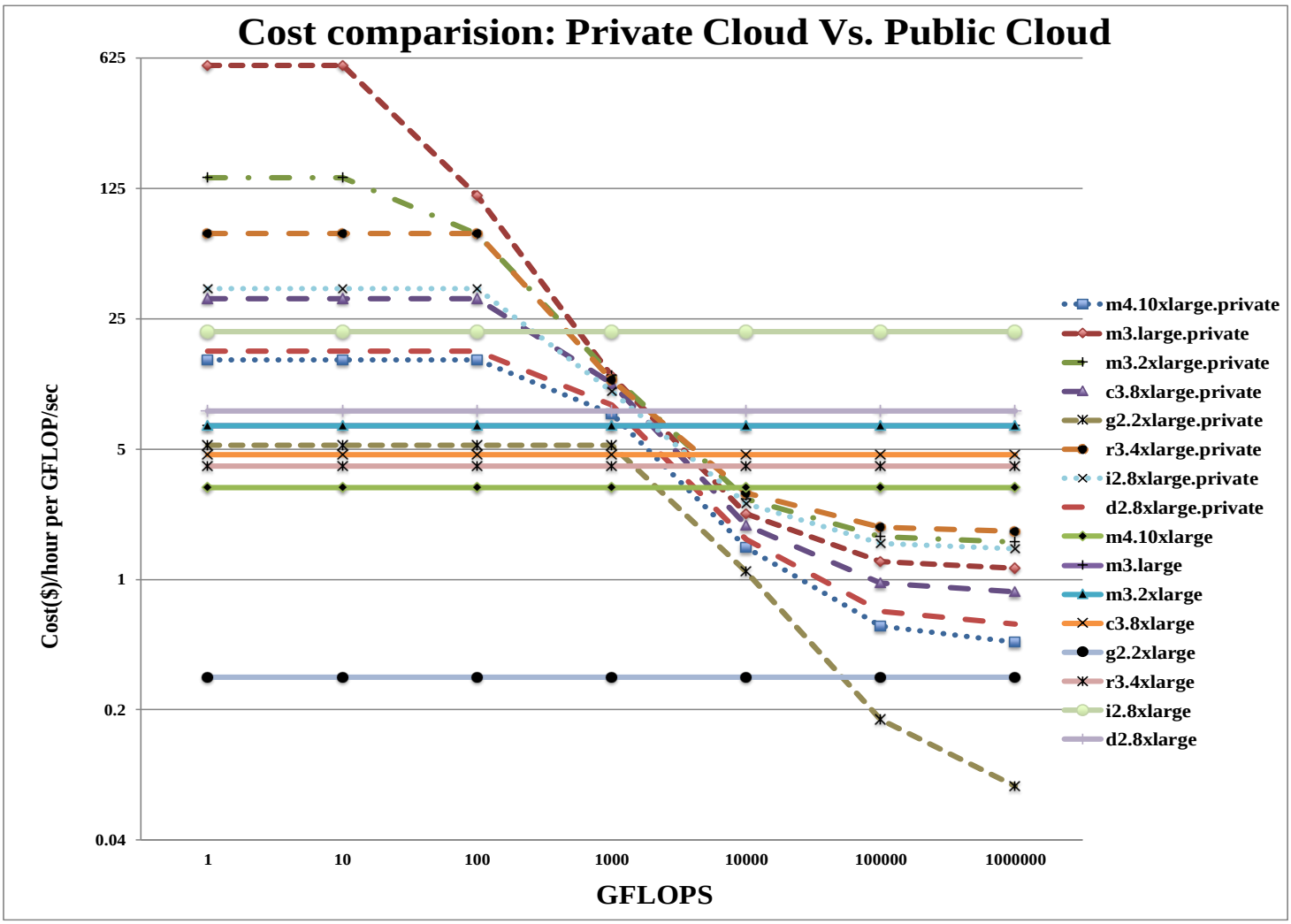
Sr. No	Device	Details	Cost
1.	Chassis	SUPERMICRO CSE-825TQ-R700LPB Black 2U Rackmount Server Case w/ 700W Redundant Power Supply	$570
2.	Processor	2 INTEL XEON E5-2676 V3 2.40GHz SR1Y5 30Mb 12 Cores 24 Thread	$3600
3.	Storage	6 * Seagate Archive HDD v2 ST8000AS0002 8TB	$1380
4.	Memory	4 * Kingston 64GB (4 x 16GB) 288-Pin DDR4 SDRAM ECC Registered DDR4	$1460
5.	Mother Board	ASUS Z10PE-D16/2L/10G-2T EEB Server Motherboard 2 x Socket R3 LGA 2011-3 Intel C612	$600
6.	Network Switch	Cisco SG200-26FP 26-port Gigabit Full-PoE Smart Switch	$462
7.	Network Adapter	Intel X540-BT2 10 Gigabit Ethernet Card	$448
8.	Rack	Tripp Lite SR4POST25 25U	$294
9.	System Admin	90k * 5	$450000
10.	Cooling Power	634.5 W	$2223.288
11.	System Power	1979.3 W	$6935.4672
12.	UPS	APC Smart-UPS SMC1500-2U 1440 VA 900 Watts 6 Outlets UPS	$490
13.	Firewall	Cisco Meraki MX400 Security Appliance + 7yr of Enterprise License and Support	$38219
15.			
16.	TOTAL		$506681.7552
		GFLOPS	**691.2**

GFLOPS	1	10	100	1000	10000	100000	1000000
INSTANCES	1	1	1	2	15	145	1447
COST/ INSTANCES/ HOUR	11.5680766	11.5680766	11.5680766	5.974069753	1.133495172	0.466130453	0.396825707

- This instance is the latest generation of General Purpose Instances.
- The d2.8xlarge.private has a 12 core processor and Amazon EC2 d2.8xlarge need 18 cores so that I took 2 x 12 core processor.
- The memory, storage, chassis, rack, motherboard, are also considered to fit 1 instance per Machine.
- The GFLOPS of private instance is 16 * 2.4 * 18 = 691.2
- The Total amortized cost for 5 years is $506681.7552
  Cost for a single instance $ 11.56

PLOT #1 Cost Comparision of Private Cloud and Public Cloud

	1	10	100	1000	10000	100000	1000000
m4.10xlarge.private	15.0055083	15.0055083	15.0055083	7.72164519	1.48767704	0.56058682	0.46072995
m3.large.private	570.302865	570.302865	114.060573	12.3042591	2.25092805	1.2470671	1.14660716
m3.2xlarge.private	142.897346	142.897346	71.4486728	12.4467882	2.70955902	1.69184726	1.59127879
c3.8xlarge.private	32.0388117	32.0388117	32.0388117	11.2398778	1.96017022	0.95868381	0.85866274
g2.2xlarge.private	5.25355836	5.25355836	5.25355836	5.25355836	1.10348957	0.17764599	0.07783653
r3.4xlarge.private	71.6660034	71.6660034	71.6660034	11.7750625	2.90538517	1.90917785	1.80860938
i2.8xlarge.private	36.3844635	36.3844635	36.3844635	10.1727233	2.54071124	1.561767	1.46135151
d2.8xlarge.private	16.7362219	16.7362219	16.7362219	8.64304073	1.63989464	0.67437855	0.57411127
m4.10xlarge	3.117188	3.117188	3.117188	3.117188	3.117188	3.117188	3.117188
m3.large	6.65	6.65	6.65	6.65	6.65	6.65	6.65
m3.2xlarge	6.65	6.65	6.65	6.65	6.65	6.65	6.65
c3.8xlarge	4.6875	4.6875	4.6875	4.6875	4.6875	4.6875	4.6875
g2.2xlarge	0.297728	0.297728	0.297728	0.297728	0.297728	0.297728	0.297728
r3.4xlarge	4.0625	4.0625	4.0625	4.0625	4.0625	4.0625	4.0625
i2.8xlarge	21.3125	21.3125	21.3125	21.3125	21.3125	21.3125	21.3125
d2.8xlarge	7.98611111	7.98611111	7.98611111	7.98611111	7.98611111	7.98611111	7.98611111



- The above graph represents the compute capacity rate in terms of **$/hour per GFLOP/sec** public cloud as well as private cloud's each instances.
- The values are scaled by 1000 because small value of g2.2xlarge.private. All values in dollar($).
- This graph shows the values for each of the amazon instances and the private cloud across 1Gflop to 1PFlop. Here, the break-down cost point is 10000 GFLOP for almost all instances.
- Private cloud instances are useful for more no of GFLOPs rather smaller GFLOPs because its took less no of instances for smaller GFLOPs so because of machine cost is higher it's not preferable for it.
- It is observed that as the compute capacity is scaled from 1GFLOP to 1PFLOP, the cost per instance per hour decreases gradually, as the initial admin costs, housing costs and other fixed costs are amortized

PLOT #2 Cost Utilization of Private Cloud (%)

	1	10	100	1000	10000	100000	1000000
m4.10xlarge.private				100	47.7249777	17.9837377	14.7803091
m3.large.private				100	33.84854218	18.7528887	17.242213
m3.2xlarge.private				100	40.74524838	25.4413122	23.9290044
c3.8xlarge.private				100	41.81696464	20.4519212	18.3181385
g2.2xlarge.private					100	59.6671881	26.1434946
r3.4xlarge.private				100	34.9520021	22.9675531	21.7577069
i2.8xlarge.private			100	47.7312531	11.92122576	7.327939	6.85678126
d2.8xlarge.private				100	20.53433283	8.44439226	7.18887151

- This plot represents the utilization of private cloud as the compute capacity varied from 1 GFLOP to 1 PFLOP. It shows that the break-even cost of each private instances. It shows the points from where my private instances are more preferable to use rather than AMAZON EC2 instances.

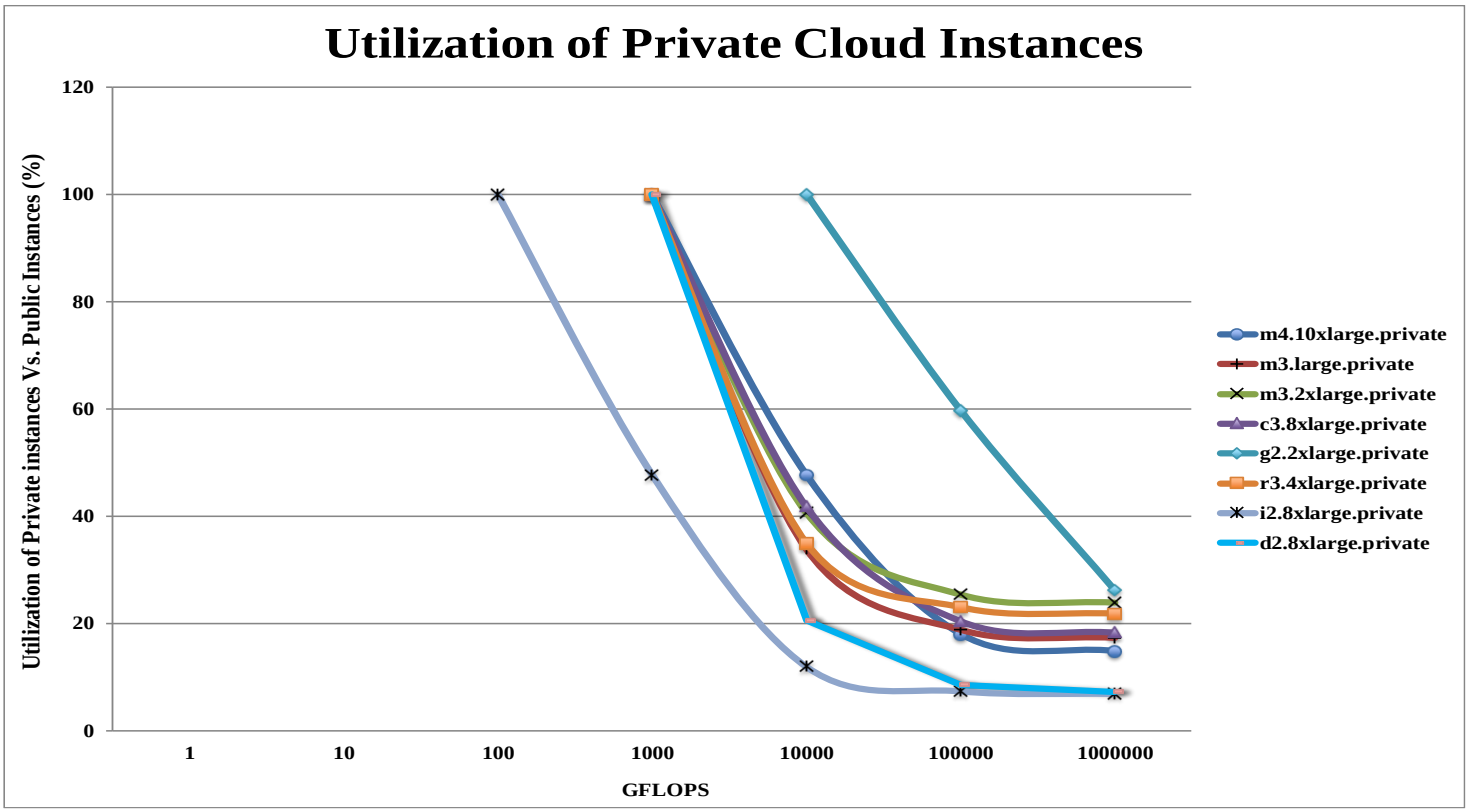
- We can see for m4.10xlarge , m3 large and also for 1Gflop to 1TFlop where the amazon instance prove to cheaper. But if there is requirement for 10TGflop and above we can see that the private cloud seems to be cheaper. We can also see a similar pattern in m3.2xlarge,r3x.large,c3.8xlarge and also d2.8xlarge.

- From our observation we find the break-even point to be approximately at 1TFlops after which it's cheaper to use a private cloud.

- For i2.8xlarge the break-even cost point is 100 GFLOP. After it, It is preferable to use private cloud rather than public AMAZON EC2 instances.

- At the same time we observe that cost of higher instances in amazon is expensive as compared to private cloud. This might be because of the number of users using higher processing instances (such as 1Pflop) are limited and maintainability cost is more in case of these higher instances . One who has to use higher processing instance for few hours will choose amazon but compared to usage for 5 years one will opt for its own private cloud or they might use these amazon instances in hybrid cloud

- Utilization of Private cloud compare to Public cloud instances of AMAZON EC2

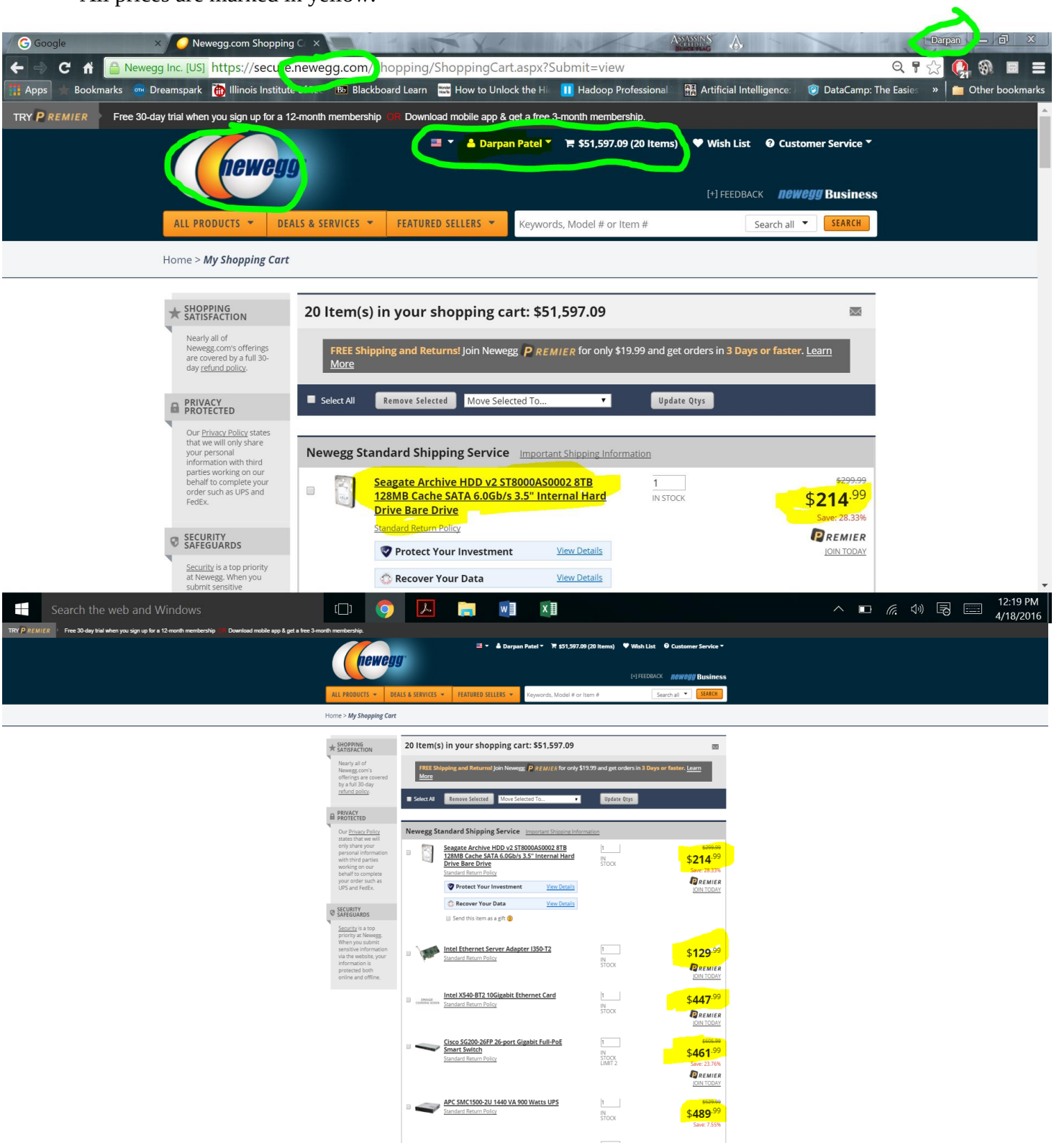


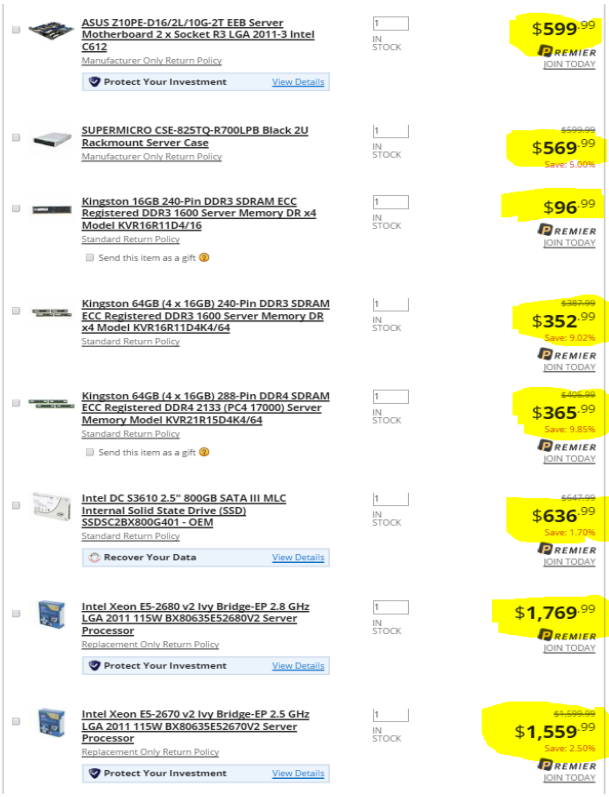
SUMMARY:

The goal is to provide an idea to end users of public clouds like Amazon EC2 on how to determine if they should pick the public cloud or build a private computing cloud by their own. The study shows that the decision depends on the desired computing capability and utilization rate. For relatively low capability it is normally cheaper to go to EC2 because maintaining the administration staff dominates the cost.

SCREENSHOT of KART

- All different items are covered in 4 screenshot. Total 20 different items are used in this project.
- All prices are marked in yellow.




ASUS Z10PE-D16/2L/10G-2T EEB Server Motherboard 2 x Socket R3 LGA 2011-3 Intel C612
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$599.99
SUPERMICRO CSE-825TQ-R700LPB Black 2U Rackmount Server Case
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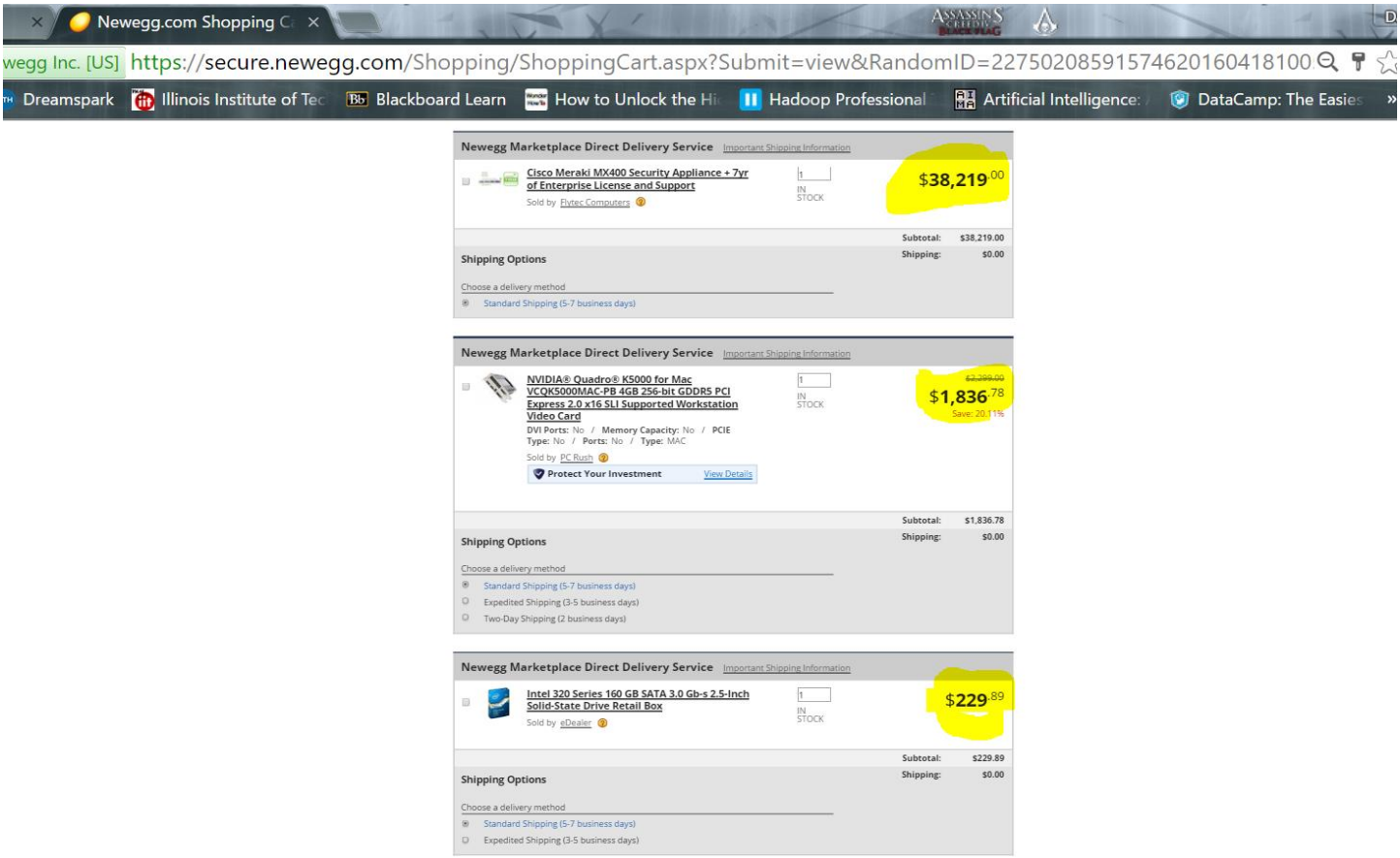
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$1,836.78
Subtotal: $1,836.78
Shipping: $0.00
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Newegg Marketplace Direct Delivery Service Important Shipping Information
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Sold by eDealer
$229.89
Subtotal: $229.89
Shipping: $0.00
Shipping Options
Choose a delivery method
Standard Shipping (5-7 business days)
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