

# CS553: Cloud Computing

## CS553 Project: Understanding the Cost of Computing in the Cloud

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### **Introduction:**

The basic purpose of this project is to understand and compare the cost of Public and Private Cloud. I have to find the cost breakdown of a private cloud and compared it with what Amazon is charging for those instances. As I have to calculate/estimate the cost of private cloud, I have to take hardware cost into consideration. For those hardware I have referred Newegg.com <http://www.newegg.com/> site. This site is good source of low cost as well as many varieties of hardware.

In this assignment we have given few list of instances and we need to tell which type of cloud would be better for those instances. Like to own the cloud environment or rent it for time period.

In this process of building private cloud, we have selected best components for that instance to satisfy the minimum requirement. Components taken into considerations are

- CPU
- Mother Board
- Memory
- Hard Disk
- Network Adapter
- Switch
- GPU

While calculating the cost of owned cloud network we have calculated cost for 5 yrs. In addition, with **administration** cost.

**Rack** – We have selected a Rack with capacity of 42 Chassis, so while calculating the cost of Rack in setup we have taken 1 Rack cost up to 42 instance and after that we have taken cost in multiple of 42 Chassis.

**Switch** – Similar to Rack we have selected Switch with 48 port in it. So up to 48 connections we are using only 1 Switch and after that we have increased switch after every 48 instances.

**Network** – As Network cost is directly related to switch, so we calculated Network cost according to number of switch we required multiply by cost of switch.

**Electricity** – I have calculated Electricity cost using this site

[http://energyusecalculator.com/electricity\\_computer.htm](http://energyusecalculator.com/electricity_computer.htm) Here we have fixed the Price (kWh) as 0.07 and Hours Used Per Day equal to 24. Result of 1 year multiplied by 5 years as we need it for 5 years.

**Administrator** – I have taken 500000 annual cost for admin and one admin will handle maximum of 1000 instances.

## m4.10xlarge:

- Hardware Details.

Component	Details	Unit Cost	Quantity	Total Cost
CPU	Matched PAIR INTEL XEON E5-2676 V3 2.40GHz SR1Y5 30Mb 12 Cores 24 Thread E5-2670	1800	2	3600
Motherboard	Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600	710.06	1	710.06
Memory	Kingston 32GB (4 x 8GB) 240-Pin DDR3 SDRAM Unbuffered DDR3 1333 Server Memory STD Height 30mm Model KVR1333D3N9HK4/32G	137.99	5	689.95
SSD	SAMSUNG 850 EVO 2.5" 1TB SATA III 3-D Vertical Internal Solid State Drive (SSD) MZ-75E1T0B/AM	291.99	1	291.99
Chassis	iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis	44.99	1	44.99
RACK	StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks	1048.99	1	1048.99
Network Adapter	Intel X540T2 Ethernet Converged Network Adapter 100Mbps/1Gbps/10Gbps PCI Express 2.1 x8 2 x RJ45	444.99	1	444.99
Network Switch	Dell Networking N2048 - 48 ports - managed switch - rack-mountable	1975.31	1	1975.31

- Cost Details for 5 years.

GFlops	Instance Required	Cost of Computing hardware	Rack Cost	Network Switch's Cost	Network power Cost	Electricity Cost	Cooling Cost	Administration Cost	Total Cost	Cost / Hour	Cost / GFLOP
1	1	5781.98	1048.99	1975.31	165.3	1007.9	335.9666667	500000	510315.4467	11.6510376	0.01264218
10	1	5781.98	1048.99	1975.31	165.3	1007.9	335.9666667	500000	510315.4467	11.6510376	0.01264218
100	1	5781.98	1048.99	1975.31	165.3	1007.9	335.9666667	500000	510315.4467	11.6510376	0.01264218
1000	2	11563.96	1048.99	1975.31	165.3	2015.8	671.9333333	500000	517441.2933	11.8137282	0.00640936
10000	11	63601.78	1048.99	1975.31	165.3	11086.9	3695.6333333	500000	581573.9133	13.2779432	0.00130977
100000	109	630235.82	3146.97	5925.93	495.9	109861.1	36620.36667	500000	1286286.087	29.3672623	0.00029234
1000000	1085	6273448.3	27273.74	45432.13	3801.9	1093571.5	364523.8333	1000000	8808051.403	201.097064	0.00020111

## Points-

- According to Amazon EC M4 instances are latest generation of general purpose instances.
- They have balanced compute, memory and network resources.
- I have calculated GFLOPS for m4.10xlarge according to specification of CPU and number of instances are calculated while scaling up.
- GFLOPS = (Number of Cores \* IPC \* CPU Frequency \* number of CPU)  

$$= (12 * 16 * 2.4 * 2)$$

$$= 921.6$$

### m3.large:

- Hardware Details.

Component	Details	Unit Cost	Quantity	Total Cost
CPU	Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz 25MB L3 Cache LGA 2011 115W BX80635E52670V2 Server Processor	1559.99	1	1559.99
Motherboard	Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600	710.06	1	710.06
Memory	Kingston 8GB (2 x 4GB) 240-Pin DDR3 SDRAM DDR3 1066 (PC3 8500) Desktop Memory Model KVR1066D3N7K2/8G	78.99	1	78.99
SSD	OCZ Vector 180 2.5" 960GB SATA III MLC SSD with Toshiba 32GB USB 2.0 Flash Drive Bundle VTR180-25SAT3-960G-B	399.99	1	399.99
Chassis	iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis	44.99	1	44.99
RACK	StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks	1048.99	1	1048.99
Network Adapter	AddOn - Network Upgrades CN-GP1011-S3-AOK Network Adapter 1 Gbps PCI-Express	16.76	1	16.76
Network Switch	Dell Networking N2048 - 48 ports - managed switch - rack-mountable	1975.31	1	1975.31

- Cost Details for 5 years.

GFlops	Instance Required	Cost of Computing hardware	Rack Cost	Network Switch's Cost	Network power Cost	Electricity Cost	Cooling Cost	Administration Cost	Total Cost	Cost / Hour	Cost / Hour / GFLOP
1	1	2810.78	1048.99	1975.31	165.3	584.45	194.8166667	500000	506779.65	11.57031	0.057852
10	1	2810.78	1048.99	1975.31	165.3	584.45	194.8166667	500000	506779.65	11.57031	0.057852
100	1	2810.78	1048.99	1975.31	165.3	584.45	194.8166667	500000	506779.65	11.57031	0.057852
1000	5	14053.9	1048.99	1975.31	165.3	2922.25	974.0833333	500000	521139.83	11.89817	0.011898
10000	50	140539	2097.98	3950.62	165.3	29222.5	9740.833333	500000	685716.23	15.65562	0.001566
100000	500	1405390	12587.88	21728.41	1818.3	292225	97408.33333	500000	2331157.9	53.22278	0.000532
1000000	5000	14053900	125878.8	207407.55	17356.5	2922250	974083.3333	2500000	20800876	474.9058	0.000475

### Points-

- m3.large Instances provides balanced compute, memory and network resources.
- I have calculated GFLOPS for m3.large as
- GFLOPS = (Number of Cores \* IPC \* CPU Frequency \* number of CPU)  

$$= (10 * 8 * 2.5 * 1)$$

$$= 200$$

## m3.2xlarge:

- Hardware Details.

Component	Details	Unit Cost	Quantity	Total Cost
CPU	Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz 25MB L3 Cache LGA 2011 115W BX80635E52670V2 Server Processor	1559.99	1	1559.99
Motherboard	Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600	710.06	1	710.06
Memory	Kingston 16GB 240-Pin DDR3 SDRAM ECC Registered DDR3 1600 Server Memory DR x4 Model KVR16R11D4/16	96.99	2	193.98
SSD	Intel 320 Series 2.5" 80GB SATA II MLC Internal Solid State Drive (SSD) SSDSA2CW080G3B5	139.99	2	279.98
Chassis	iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis	44.99	1	44.99
RACK	StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks	1048.99	1	1048.99
Network Adapter	AddOn - Network Upgrades CN-GP1011-S3-AOK Network Adapter 1 Gbps PCI-Express	16.76	1	16.76
Network Switch	Dell Networking N2048 - 48 ports - managed switch - rack-mountable	1975.31	1	1975.31

- Cost Details for 5 years.

GFlops	Instance Required	Cost of Computing hardware	Rack Cost	Network Switch's Cost	Network power Cost	Electricity Cost	Cooling Cost	Administration Cost	Total Cost	Cost / Hour	Cost / Hour / GFLOP
1	1	2805.76	1048.99	1975.31	165.3	597.3	199.1	500000	506791.76	11.57059	0.057853
10	1	2805.76	1048.99	1975.31	165.3	597.3	199.1	500000	506791.76	11.57059	0.057853
100	1	2805.76	1048.99	1975.31	165.3	597.3	199.1	500000	506791.76	11.57059	0.057853
1000	5	14028.8	1048.99	1975.31	165.3	2986.5	995.5	500000	521200.4	11.89955	0.0119
10000	50	140288	2097.98	3950.62	165.3	29865	9955	500000	686321.9	15.66945	0.001567
100000	500	1402880	12587.88	21728.41	1818.3	298650	99550	500000	2337214.59	53.36106	0.000534
1000000	5000	14028800	125878.8	207407.55	17356.5	2986500	995500	2500000	20861442.9	476.2886	0.000476

## Points-

- m3.2xlarge Instances provides balanced compute, memory and network resources.
- I have calculated GFLOPS for m3. 2xlarge as
- GFLOPS = (Number of Cores \* IPC \* CPU Frequency \* number of CPU)  

$$= (10 * 8 * 2.5 * 1)$$
  

$$= 200$$

### c3.8xlarge:

- Hardware Details.

Component	Details	Unit Cost	Quantity	Total Cost
CPU	Intel Xeon E5-2680 v2 Ivy Bridge-EP 2.8 GHz 25MB L3 Cache LGA 2011 115W BX80635E52680V2 Server Processor	1769.99	2	3539.98
Motherboard	Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600	710.06	1	710.06
Memory	Kingston 32GB (4 x 8GB) 240-Pin DDR3 SDRAM Unbuffered DDR3 1333 Server Memory STD Height 30mm Model KVR1333D3N9HK4/32G	137.99	2	275.98
SSD	Intel 535 Series 2.5" 360GB SATA III MLC Internal Solid State Drive (SSD) SSDSC2BW360H601 - OEM	183	2	366
Chassis	iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis	44.99	1	44.99
RACK	StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks	1048.99	1	1048.99
Network Adapter	Intel X540T2 Ethernet Converged Network Adapter 100Mbps/1Gbps/10Gbps PCI Express 2.1 x8 2 x RJ45	444.99	1	444.99
Network Switch	Dell Networking N2048 - 48 ports - managed switch - rack-mountable	1975.31	1	1975.31

- Cost Details for 5 years.

GFlops	Instance Required	Cost of Computing hardware	Rack Cost	Network Switch's Cost	Network power Cost	Electricity Cost	Cooling Cost	Administration Cost	Total Cost	Cost / Hour	Cost / Hour / GFLOP
1	1	5382	1048.99	1975.31	165.3	959.45	319.8166667	500000	509850.87	11.64043	0.025983
10	1	5382	1048.99	1975.31	165.3	959.45	319.8166667	500000	509850.87	11.64043	0.025983
100	1	5382	1048.99	1975.31	165.3	959.45	319.8166667	500000	509850.87	11.64043	0.025983
1000	3	16146	1048.99	1975.31	165.3	2878.35	959.45	500000	523173.4	11.9446	0.008887
10000	23	123786	1048.99	1975.31	165.3	22067.35	7355.783333	500000	656398.73	14.98627	0.001454
100000	224	1205568	6293.94	9876.55	826.5	214916.8	71638.93333	500000	2009120.7	45.87034	0.000457
1000000	2233	12018006	56645.46	92839.57	7769.1	2142451.85	714150.6167	1500000	16531863	377.4398	0.000377

### Points-

- c3.8xlarge Instances High Frequency Intel Xeon E5-2680 v2 (Ivy Bridge) Processors
- I have calculated GFLOPS for c3.8xlarge as
- GFLOPS = (Number of Cores \* IPC \* CPU Frequency \* number of CPU)  

$$= (10 * 8 * 2.8 * 2)$$

$$= 448$$

## g2.2xlarge:

- Hardware Details.

Component	Details	Unit Cost	Quantity	Total Cost
CPU	Intel Xeon E5-2670 Sandy Bridge-EP 2.6GHz (3.3GHz Turbo Boost) 20MB L3 Cache LGA 2011 115W BX80621E52670 Server Processor	575	1	575
Motherboard	Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600	710.06	1	710.06
Memory	Kingston 16GB 240-Pin DDR3 SDRAM ECC Registered DDR3 1600 Server Memory DR x4 Model KVR16R11D4/16	96.99	1	96.99
SSD	Intel 320 Series 2.5" 80GB SATA II MLC Internal Solid State Drive (SSD) SSDSA2CW080G3B5	139.99	2	279.98
Chassis	iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis	44.99	1	44.99
RACK	StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks	1048.99	1	1048.99
Network Adapter	AddOn - Network Upgrades CN-GP1011-S3-AOK Network Adapter 1 Gbps PCI-Express	16.76	1	16.76
Network Switch	Dell Networking N2048 - 48 ports - managed switch - rack-mountable	1975.31	1	1975.31
GPU	GIGABYTE GTX 960 WindForce 2X OC 4 GB	219.99	1	219.99

- Cost Details for 5 years.

GFlops	Instance Required	Cost of Computing hardware	Rack Cost	Network Switch's Cost	Network power Cost	Electricity Cost	Cooling Cost	Administration Cost	Total Cost	Cost / Hour	Cost / Hour / GFLOP
1	1	1943.77	1048.99	1975.31	165.3	1561.5	520.5	500000	507215.37	11.58025959	0.004358725
10	1	1943.77	1048.99	1975.31	165.3	1561.5	520.5	500000	507215.37	11.58025959	0.004358725
100	1	1943.77	1048.99	1975.31	165.3	1561.5	520.5	500000	507215.37	11.58025959	0.004358725
1000	1	1943.77	1048.99	1975.31	165.3	1561.5	520.5	500000	507215.37	11.58025959	0.004358725
10000	4	7775.08	1048.99	1975.31	165.3	6246	2082	500000	519292.68	11.85599726	0.001115628
100000	38	73863.26	3146.97	5925.93	495.9	59337	19779	500000	662548.06	15.12666804	0.000149831
1000000	377	732801.29	29371.72	49382.75	4132.5	588685.5	196228.5	1000000	2600602.26	59.37448082	5.92788E-05

### Points-

- g2.2xlarge Instances High Frequency Intel Xeon E5-2680 v2 (Ivy Bridge) Processors
- GFLOPS = (Number of Cores \* IPC \* CPU Frequency \* number of CPU)  

$$= (8 * 8 * 2.6 * 1)$$
  

$$= 166.4$$
- But as we have extra video card in picture GFLOPS value get changed to 166.4 + GFLOPS for Video Card (GIGABYTE GTX 960 WindForce 2X OC 4 GB) 2490.4
- So, final GFLOPS are 166.4 + 2490.4 = 2656.8

## r3.4xlarge:

- Hardware Details.

Component	Details	Unit Cost	Quantity	Total Cost
CPU	Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz 25MB L3 Cache LGA 2011 115W BX80635E52670V2 Server Processor	1559.99	1	1559.99
Motherboard	Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600	710.06	1	710.06
Memory	Kingston 32GB (4 x 8GB) 240-Pin DDR3 SDRAM Unbuffered DDR3 1333 Server Memory STD Height 30mm Model KVR1333D3N9HK4/32G	137.99	4	551.96
SSD	Intel 535 Series 2.5" 360GB SATA III MLC Internal Solid State Drive (SSD) SSDSC2BW360H601 - OEM	183	1	183
Chassis	iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis	44.99	1	44.99
RACK	StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks	1048.99	1	1048.99
Network Adapter	AddOn - Network Upgrades CN-GP1011-S3-AOK Network Adapter 1 Gbps PCI-Express	16.76	1	16.76
Network Switch	Dell Networking N2048 - 48 ports - managed switch - rack-mountable	1975.31	1	1975.31

- Cost Details for 5 years.

GFlops	Instance Required	Cost of Computing hardware	Rack Cost	Network Switch's Cost	Network power Cost	Electricity Cost	Cooling Cost	Administration Cost	Total Cost	Cost / Hour	Cost / GFLOP
1	1	3066.76	1048.99	1975.31	165.3	607.45	202.4833333	500000	507066.29	11.57686	0.057884
10	1	3066.76	1048.99	1975.31	165.3	607.45	202.4833333	500000	507066.29	11.57686	0.057884
100	1	3066.76	1048.99	1975.31	165.3	607.45	202.4833333	500000	507066.29	11.57686	0.057884
1000	5	15333.8	1048.99	1975.31	165.3	3037.25	1012.416667	500000	522573.07	11.93089	0.011931
10000	50	153338	2097.98	3950.62	165.3	30372.5	10124.16667	500000	700048.57	15.98284	0.001598
100000	500	1533380	12587.88	21728.41	1818.3	303725	101241.6667	500000	2474481.3	56.49501	0.000565
1000000	5000	1533380	125878.8	207407.55	17356.5	3037250	1012416.667	2500000	22234110	507.6281	0.000508

## Points-

- r3.4xlarge instances are optimized for memory intensive application
- These instances have the lowest cost per GiB of RAM within Amazon EC2 instances
- I have calculated GFLOPS for r3.4xlarge as
- GFLOPS = (Number of Cores \* IPC \* CPU Frequency \* number of CPU)  
 $= (10 * 8 * 2.5 * 1)$   
 $= 200$

## i2.8xlarge:

- Hardware Details.

Component	Details	Unit Cost	Quantity	Total Cost
CPU	Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz 25MB L3 Cache LGA 2011 115W BX80635E52670V2 Server Processor	1559.99	2	3119.98
Motherboard	Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600	710.06	1	710.06
Memory	Kingston 32GB (4 x 8GB) 240-Pin DDR3 SDRAM Unbuffered DDR3 1333 Server Memory STD Height 30mm Model KVR1333D3N9HK4/32G	137.99	8	1103.92
SSD	Intel DC S3610 2.5" 800GB SATA III MLC Internal Solid State Drive (SSD) SSDSC2BX800G401 - OEM	637.99	8	5103.92
Chassis	iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis	44.99	1	44.99
RACK	StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks	1048.99	1	1048.99
Network Adapter	Intel X540T2 Ethernet Converged Network Adapter 100Mbps/1Gbps/10Gbps PCI Express 2.1 x8 2 x RJ45	444.99	1	444.99
Network Switch	Dell Networking N2048 - 48 ports - managed switch - rack-mountable	1975.31	1	1975.31

- Cost Details for 5 years.

GFlops	Instanc e Req uire	Cost of Computin g hardware	Rack Cost	Network Switch's Cost	Netwo rk power Cost	Electricit y Cost	Cooling Cost	Adminis tration Cost	Total Cost	Cost / Hour	Cost / GFLOP
1	1	10527.86	1048.99	1975.31	165.3	1036.75	345.5833333	500000	515099.79	11.76027	0.029401
10	1	10527.86	1048.99	1975.31	165.3	1036.75	345.5833333	500000	515099.79	11.76027	0.029401
100	1	10527.86	1048.99	1975.31	165.3	1036.75	345.5833333	500000	515099.79	11.76027	0.029401
1000	3	31583.58	1048.99	1975.31	165.3	3110.25	1036.75	500000	538920.18	12.30411	0.010253
10000	25	263196.5	1048.99	1975.31	165.3	25918.75	8639.583333	500000	800944.43	18.2864	0.001829
100000	250	2631965	6293.94	11851.86	991.8	259187.5	86395.83333	500000	3496685.9	79.83301	0.000798
1000000	2500	26319650	62939.4	104691.43	8760.9	2591875	863958.3333	1500000	31451875	718.0793	0.000718

## Points-

- i2.8xlarge instances are storage Optimized, High I/O Instances
- Provides the very fast SSD-backed instance storage for high IO operation at lower cost.
- These instances have the lowest cost per GiB of RAM within Amazon EC2 instances
- I have calculated GFLOPS for i2.8xlarge as
- GFLOPS = (Number of Cores \* IPC \* CPU Frequency \* number of CPU)  

$$= (10 * 8 * 2.5 * 2)$$

$$= 400$$

## d2.8xlarge:

- Hardware Details.

Component	Details	Unit Cost	Quantity	Total Cost
CPU	Matched PAIR INTEL XEON E5-2676 V3 2.40GHz SR1Y5 30Mb 12 Cores 24 Thread E5-2670	1800	2	3600
Motherboard	Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600	710.06	1	710.06
Memory	Kingston 32GB (4 x 8GB) 240-Pin DDR3 SDRAM Unbuffered DDR3 1333 Server Memory STD Height 30mm Model KVR1333D3N9HK4/32G	137.99	8	1103.92
SSD	SAMSUNG 850 EVO 2.5" 2 TB SATA III 3-D Vertical Internal Solid State Drive (SSD) MZ-75E2T0B/AM	602.73	24	14465.52
Chassis	iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis	44.99	1	44.99
RACK	StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks	1048.99	1	1048.99
Network Adapter	Intel X540T2 Ethernet Converged Network Adapter 100Mbps/1Gbps/10Gbps PCI Express 2.1 x8 2 x RJ45	444.99	1	444.99
Network Switch	Dell Networking N2048 - 48 ports - managed switch - rack-mountable	1975.31	1	1975.31

- Cost Details for 5 years.

GFlops	Instance Requir e	Cost of Computing hardware	Rack Cost	Networ k Switch's Cost	Networ k power Cost	Electricit y Cost	Cooling Cost	Administr ation Cost	Total Cost	Cost / Hour	Cost / Hour / GFLOP
1	1	20369.48	1048.99	1975.31	165.3	1150.8	383.6	500000	525093.48	11.98844	0.013008
10	1	20369.48	1048.99	1975.31	165.3	1150.8	383.6	500000	525093.48	11.98844	0.013008
100	1	20369.48	1048.99	1975.31	165.3	1150.8	383.6	500000	525093.48	11.98844	0.013008
1000	2	40738.96	1048.99	1975.31	165.3	2301.6	767.2	500000	546997.36	12.48852	0.006775
10000	11	224064.28	1048.99	1975.31	165.3	12658.8	4219.6	500000	744132.28	16.98932	0.001676
100000	109	2220273.32	3146.97	5925.93	495.9	125437.2	41812.4	500000	2897091.7	66.14365	0.000658
1000000	1086	22121255.3	27273.74	45432.13	3801.9	1249768.8	416589.6	1000000	24864121	567.674	0.000567

## Points-

- d2.8xlarge instances feature up to 48 TB of HDD-based local storage, deliver high disk throughput.
- I have calculated GFLOPS for d2.8xlarge as
- GFLOPS = (Number of Cores \* IPC \* CPU Frequency \* number of CPU)  

$$= (12 * 16 * 2.4 * 2)$$

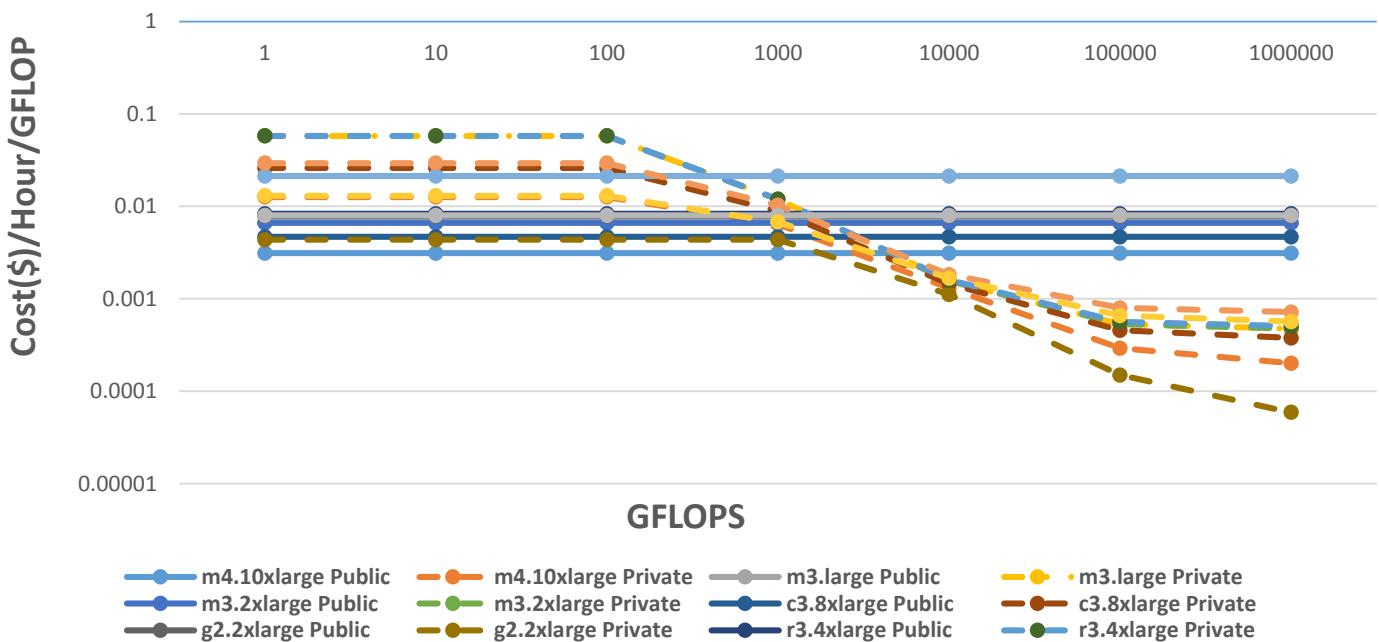
$$= 921.6$$

## Comparison between AMAZON EC2 Public Instances cost and Private Cloud Cost.

GFLOP	m4.10xlarge Public	m3.large Public	m3.2xlarge Public	c3.8xlarge Public	g2.2xlarge Public	r3.4xlarge Public	i2.8xlarge Public	d2.8xlarge Public
1	0.00311719	0.00665	0.00665	0.0046875	0.0078125	0.0083125	0.0213125	0.007986111
10	0.00311719	0.00665	0.00665	0.0046875	0.0078125	0.0083125	0.0213125	0.007986111
100	0.00311719	0.00665	0.00665	0.0046875	0.0078125	0.0083125	0.0213125	0.007986111
1000	0.00311719	0.00665	0.00665	0.0046875	0.0078125	0.0083125	0.0213125	0.007986111
10000	0.00311719	0.00665	0.00665	0.0046875	0.0078125	0.0083125	0.0213125	0.007986111
100000	0.00311719	0.00665	0.00665	0.0046875	0.0078125	0.0083125	0.0213125	0.007986111
1000000	0.00311719	0.00665	0.00665	0.0046875	0.0078125	0.0083125	0.0213125	0.007986111

GFLOP	m4.10xlarge Private	m3.large Private	m3.2xlarge Private	c3.8xlarge Private	g2.2xlarge Private	r3.4xlarge Private	i2.8xlarge Private	d2.8xlarge Private
1	0.012642185	0.0578516	0.057852941	0.0259831	0.00435872	0.057884	0.02940067	0.01300829
10	0.012642185	0.0578516	0.057852941	0.0259831	0.00435872	0.057884	0.02940067	0.01300829
100	0.012642185	0.0578516	0.057852941	0.0259831	0.00435872	0.057884	0.02940067	0.01300829
1000	0.006409358	0.0118982	0.011899553	0.0088873	0.00435872	0.011931	0.01025343	0.00677546
10000	0.001309772	0.0015656	0.001566945	0.0014544	0.00111563	0.001598	0.00182864	0.00167587
100000	0.000292344	0.0005322	0.000533611	0.0004571	0.00014983	0.000565	0.00079833	0.00065844
1000000	0.00020111	0.0004749	0.000476289	0.0003773	5.9279E-05	0.000508	0.00071808	0.00056719

## Comparison between AMAZON EC2 Public Instances cost and Private Cloud Cost



## In the given graph

X-Axis -> Number of GFLOPS

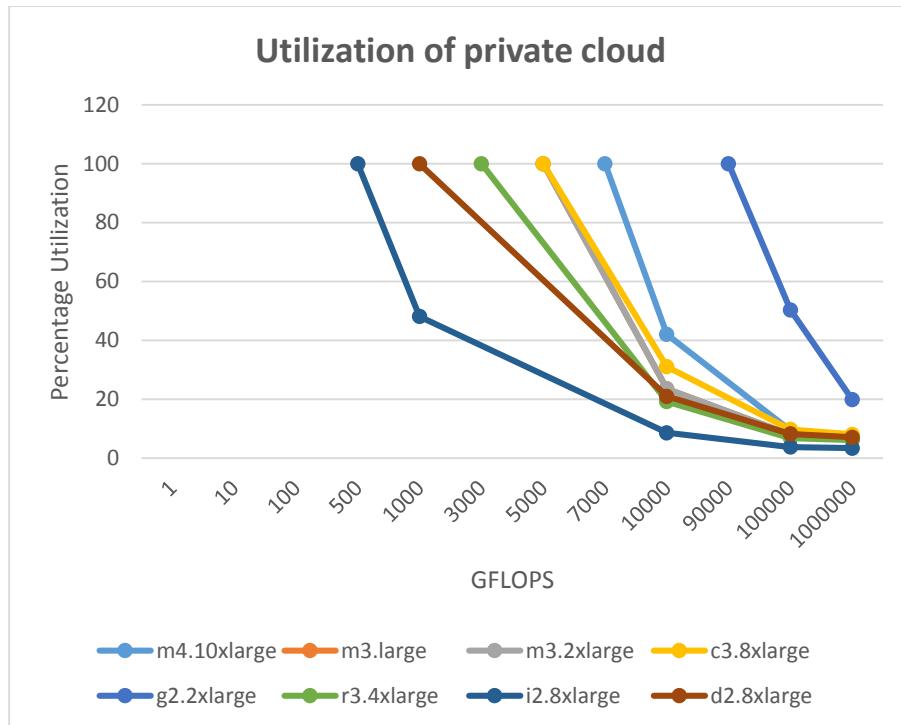
Y-Axis -> Cost (\$) per Hour per GFLOP

## Observations

- From graph we can conclude that public cloud cost lower than private cloud for small compute power.
- But if we see trend public cloud cost more than private cloud for larger period of time like for 5 years.
- We have 4 different scenarios to choose private and public cloud.
- First, if we have small requirement for small amount of time then we should go for public cloud because it would be wastage of hardware cost if we are going to utilize them for long period of time
- Second, if we have large requirement for small amount of time then also we can go for Public cloud, in this case Amazon like companies are ready to provide whatever your requirement (like infinite processing power) with high end hardware (if you want this because this is optional and depends on your requirement).
- Instead if we go for purchasing a high end hardware and we are going to use them for very short period of time then we are not going to recover the cost of hardware itself.
- Third, if we have small requirement for larger period of time then also we have option to go for public cloud.
- Forth, if we have large requirement for longer period of time then we to go or private cloud.
- In forth case, as our requirement is large and we need them for longer period of time we have to think the cost of service provided by public cloud service provider here in this case is Amazon. And cost of hardware we required.
- These two factors are important because after certain amount of time we are going to recover the cost of hardware. But if we keep paying for those to Amazon then it will cost more.
- Also if we are getting private cloud, administrator cost is not related to computing power, it is fixed as mentioned for 1000 instances.
- So it is always better to go for private cloud under these scenarios. There are other reasons like Dedicated hardware means increased security, the transition from physical to virtual servers leads to better flexibility, fully utilization of hardware with better resource management, it could benefit from virtualization point of view.

## Needed utilization of private cloud from 1 GFLOP to 1 PFLOP for different private instance type.

GFLOP	m4.10xlarge	m3.large	m3.2xlarge	c3.8xlarge	g2.2xlarge	r3.4xlarge	i2.8xlarge	d2.8xlarge
500							100	
1000							48.10993	100
3000						100		
5000		100	100	100				
7000	100							
10000	42.01774394	23.542288	23.56308236	31.02747919		19.22748149	8.58013	20.98483382
90000					100			
100000	9.378460886	8.0034261	8.024220105	9.75134697	50.32467548	6.796391682	3.74583	8.244870185
1000000	6.451647039	7.1414413	7.162235331	8.048957953	19.91039052	6.106803864	3.369287	7.102174985



#### In the given graph

- X-Axis -> Number of GFLOPS
- Y-Axis -> Percentage of Utilization
- We have considered the utilization of private cloud is 100% at break-even point.
- After that point private cloud actually start cost lower than public cloud so graph shows percentage of utilization of private cloud after that.

#### Observations

- From graph we can conclude utilization of private cloud, that is 100% at break-even point.
- From graph we can conclude that higher the GFLOPS (Compute power) the utilization of private cloud decreases.
- So under large requirement/ GFLOPS for large period of time, we should go for private cloud as its cost is very less than public cloud.

# Screen Shots

## m4.10xlarge

### Processor /CPU

The screenshot shows an eBay listing for a "Matched Pair Intel Xeon E5-2676 V3 2.40GHz SR1Y5 30Mb 12 Cores 24 Thread E5-2670". The item is listed as used and is priced at US \$1,800.00. There are buttons for "Buy It Now", "Add to cart", and "Make Offer". The seller information shows plainmetal (1386 reviews) with 100% positive feedback. The item has 4 watching. Shipping is free and international items may be subject to customs processing. Delivery is estimated between Mon. Apr. 25 and Tue. May. 10. The item ships worldwide. Payment methods accepted include PayPal, Visa, MasterCard, American Express, and Discover. The listing is from Ayer Keroh, Melaka, Malaysia. The Windows taskbar at the bottom shows various application icons.

## RAM and SSD

The screenshot shows a Newegg shopping cart with 3 items totaling \$1,142.14. The cart includes a Kingston 32GB (4 x 8GB) 240-Pin DDR3 SDRAM Unbuffered DDR3 1333 Server Memory STD Height 30mm Model KVR1333D3N9HK4/32G and a SAMSUNG 850 EVO 2.5" 1TB SATA III 3-D Vertical Internal Solid State Drive (SSD) MZ-75E1T0B/AM. Both items are in stock and Premier eligible. The total subtotal is \$429.98 and shipping is \$0.00. The Windows taskbar at the bottom shows various application icons.

## Motherboard and Rack

The screenshot shows a shopping cart page with two items:

- Tripp Lite SR2400 42U SmartRack Value Series Rack Enclosure Cabinet (includes doors and side panels)**  
Subtotal: \$1,048.99  
Save: 9.80%
- Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600**  
Subtotal: \$712.16  
Save: 25.83%

Shipping Options:  
Choose a delivery method:  
 Large Item Delivery - Front Door (Adult Signature Required)  
 Large Item Delivery - White Glove (Adult Signature Required)

Bottom status bar: 12:57 AM 4/13/2016

## Netwrok Adapter and Chassis

The screenshot shows a shopping cart page with two items:

- Intel X540T2 100Mbps/1Gbps/10Gbps PCI Express 2.1 x8 Ethernet Converged Network Adapter**  
Subtotal: \$444.99  
Save: 25.83%  
Premier JOIN TODAY
- iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis**  
Subtotal: \$44.99  
Save: 10.00%  
Premier JOIN TODAY

Shipping Options:  
Will Call Service  
Shipping: \$0.00

Bottom status bar: 12:59 AM 4/13/2016

## Network Switch

The screenshot shows a Newegg shopping cart page for a Dell Networking N2048 - 48 ports - managed switch - rack-mountable. The item is listed at \$1,975.31, with a quantity of 1 selected. The page includes shipping options, a promotional banner for Amex Everyday Credit Card, and a section for applying promo codes.

Newegg Marketplace Direct Delivery Service [Important Shipping Information](#)

Dell Networking N2048 - 48 ports - managed switch - rack-mountable [View Details](#)

Sold by DataVision [View Details](#)

IN STOCK

\$1,975.31

Subtotal: \$1,975.31  
Shipping: \$0.00

Shipping Options

Choose a delivery method

Standard Shipping (5-7 business days)  
 Two-Day Shipping (2 business days)

Are you a Small Business Owner?  
Get \$100 Back.  
[Apply Now](#)

Get \$25 Back + 1 Year of Newegg Premier

Credit Card Statement Credit\*: -\$25.00  
Total After the Statement Credit: \$2,440.29

Amex Everyday® Credit Card \*Statement credit will be issued approximately 6-8 weeks after making your first qualifying purchase with your new Card. Terms and Conditions apply.

Apply Now

Apply Promo Codes

Promo codes have usage limitations that require you to enter your email address to enable Promo Codes.

Windows Taskbar: 1:00 AM 4/13/2016

## m3.large

### Chassis, SSD, CPU

The screenshot shows a Newegg shopping cart page for a server build. It includes items such as an iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis, an OCZ Vector 180 2.5" 960GB SATA III MLC SSD with Toshiba 32GB USB 2.0 Flash Drive Bundle, and an Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz Processor. The total subtotal for the items is \$1,559.99.

Newegg Standard Shipping Service [Important Shipping Information](#)

iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis [View Details](#)

IN STOCK

\$44.99  
Save: 10.00%  
**\$44.99**

PREMIER [JOIN TODAY](#)

OCZ Vector 180 2.5" 960GB SATA III MLC SSD with Toshiba 32GB USB 2.0 Flash Drive Bundle VTR180-25SAT3-960G-B [View Details](#)

IN STOCK LIMIT 2

\$399.99  
**\$399.99**  
Save: 10.00%  
PREMIER [JOIN TODAY](#)

Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz Processor [View Details](#)

IN STOCK

\$1,559.99  
Save: 2.50%  
**\$1,559.99**  
PREMIER [JOIN TODAY](#)

Subtotal: \$2,004.97  
Data Recovery: \$14.00  
Shipping: \$0.00

Shipping Options

Windows Taskbar: 1:09 AM 4/13/2016

## Rack and Motherboard

The screenshot shows a Windows desktop with a taskbar at the bottom. The taskbar icons include: File Explorer, Microsoft Word, Microsoft Project, Kingston 8GB (2x4GB), Newegg.com Shopping (two instances), and a browser window for Newegg Inc. [US] showing the shopping cart. The desktop background is white.

**Newegg Large Item Delivery Service** Important Shipping Information

Tripp Lite SR2400 42U SmartRack Value Series Rack Enclosure Cabinet (includes doors and side panels)

1 IN STOCK \$1,048.99  
Save: 9.80%

Subtotal: \$1,048.99

**Shipping Options**

Choose a delivery method ⓘ

Large Item Delivery - Front Door (Adult Signature Required)  
 Large Item Delivery - White Glove (Adult Signature Required)

**Newegg Marketplace Direct Delivery Service** Important Shipping Information

Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600

1 IN STOCK \$712.16

CPU Socket Type: Dual LGA 2011  
Sold by PC Rush ⓘ

Protect Your Investment View Details

Subtotal: \$712.16

**Shipping Options**

Choose a delivery method

Standard Shipping (5-7 business days)  
 Expedited Shipping (3-5 business days)

1:09 AM 4/13/2016

## Switch and network Adapter

The screenshot shows a Windows desktop with a taskbar at the bottom. The taskbar icons are identical to the previous screenshot, including the Newegg shopping cart window. The desktop background is white.

**Newegg Marketplace Direct Delivery Service** Important Shipping Information

Dell Networking N2048 - 48 ports - managed switch - rack-mountable

1 IN STOCK \$1,975.31

Sold by DataVision ⓘ

Protect Your Investment View Details

Subtotal: \$1,975.31

**Shipping Options**

Choose a delivery method

Standard Shipping (5-7 business days)  
 Two-Day Shipping (2 business days)

**Newegg Marketplace Direct Delivery Service** Important Shipping Information

AddOn - Network Upgrades CN-GP1011-S3- AOK 1 Gbps PCI-Express Network Adapter

1 IN STOCK \$16.76

Sold by Limited Goods ⓘ

Protect Your Investment View Details

Subtotal: \$16.76

**Shipping Options**

Choose a delivery method

Standard Shipping (5-7 business days)

1:10 AM 4/13/2016

## Ram (Out of stock)

The screenshot shows a Newegg product page for Kingston 8GB (2 x 4GB) 240-Pin DDR3 SDRAM DDR3 1066 (PC3 8500) Desktop Memory Model KVR1066D3N7K2/8G. The item is marked as "Not available. See similar items below". A large "OUT OF STOCK" message is prominently displayed on the right. Below the main product image, there are smaller thumbnail images of related products. The Windows taskbar at the bottom shows various application icons.

## m3.2xlarge

### Chassis, Ram, SSD, CPU

The screenshot shows a Newegg shopping cart page with the following items:

Item	Price	Status
iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis	\$44.99	IN STOCK
Kingston 16GB 240-Pin DDR3 SDRAM ECC Registered DDR3 1600 Server Memory DR x4 Model KVR16R11D4/16	\$96.99	IN STOCK
Intel 320 Series 2.5" 80GB SATA II MLC Internal Solid State Drive (SSD) SSDSA2CW080G3B5	\$139.99	IN STOCK
Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz LGA 2011 115W BX80635E52670V2 Server Processor	\$1,559.99	IN STOCK

The subtotal for the items is \$1,841.96, and shipping is \$0.00. The Windows taskbar at the bottom shows various application icons.

## Rack and Motherboard

Screenshot of a Microsoft Edge browser window showing two shopping cart items from Newegg:

**Newegg Large Item Delivery Service**

- Tripp Lite SR2400 42U 42U SmartRack Value Series Rack Enclosure Cabinet (includes doors and side panels)**  
Subtotal: \$1,048.99  
Save: 9.80%
- Shipping Options**  
Choose a delivery method:
  - Large Item Delivery - Front Door (Adult Signature Required)
  - Large Item Delivery - White Glove (Adult Signature Required)

**Newegg Marketplace Direct Delivery Service**

- Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600**  
CPU Socket Type: Dual LGA 2011  
Sold by PC Rush  
Subtotal: \$712.16
- Shipping Options**  
Choose a delivery method:
  - Standard Shipping (5-7 business days)
  - Expedited Shipping (3-5 business days)
  - Two-Day Shipping (2 business days)

Windows taskbar at the bottom shows various pinned icons and the date/time: 1:17 AM 4/13/2016.

## Switch and Network Card

Screenshot of a Microsoft Edge browser window showing two shopping cart items from Newegg:

**Newegg Marketplace Direct Delivery Service**

- Dell Networking N2048 - 48 ports - managed switch - rack-mountable**  
Sold by DataVision  
Subtotal: \$1,975.31
- Shipping Options**  
Choose a delivery method:
  - Standard Shipping (5-7 business days)
  - Two-Day Shipping (2 business days)

**Newegg Marketplace Direct Delivery Service**

- AddOn - Network Upgrades CN-GP1011-53 AOK 1 Gbps PCI-Express Network Adapter**  
Sold by Limited Goods  
Subtotal: \$16.76
- Shipping Options**  
Choose a delivery method:
  - Standard Shipping (5-7 business days)

Windows taskbar at the bottom shows various pinned icons and the date/time: 1:18 AM 4/13/2016.

# c3.8xlarge

## Network Adapter, Chassis, RAM and CPU

Newegg Standard Shipping Service [Important Shipping Information](#)

<a href="#">Intel X540T2 100Mbps/1Gbps/10Gbps PCI Express 2.1 x8 Ethernet Converged Network Adapter</a>	1 <input type="button" value="IN STOCK"/>	\$599.99 <b>\$444.99</b> Save: 25.83%
<a href="#">iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis</a>	1 <input type="button" value="IN STOCK"/>	\$49.99 <b>\$44.99</b> Save: 10.00%
<a href="#">Kingston 32GB (4 x 8GB) 240-Pin DDR3 SDRAM Unbuffered DDR3 1333 Server Memory STD Height 30mm Model KVR1333D3N9HK4/32G</a>	1 <input type="button" value="IN STOCK"/>	<b>\$137.99</b> <b>Premier</b> <a href="#">JOIN TODAY</a>
<a href="#">Intel Xeon E5-2680 v2 Ivy Bridge-EP 2.8 GHz LGA 2011 115W BX80635E52680V2 Server Processor</a>	1 <input type="button" value="IN STOCK"/>	<b>\$1,769.99</b> <b>Premier</b> <a href="#">JOIN TODAY</a>
<b>Shipping Options</b>		Subtotal: \$2,397.96 Shipping: \$0.00
Zip/Postal Code <input type="text"/> <input type="button" value="Update"/>		

SECURITY SAFEGUARDS

Security is a top priority at Newegg. When you submit sensitive information via the website, your information is protected both online and offline.

OUR PRIVACY POLICY states that we will only share your information with third parties working on our behalf to complete your order such as UPS and FedEx.

1:00 AM 4/13/2016

## Rack and Motherboard

Newegg Large Item Delivery Service [Important Shipping Information](#)

<a href="#">Tripp Lite SR2400 42U 42U SmartRack Value Series Rack Enclosure Cabinet (includes doors and side panels)</a>	1 <input type="button" value="IN STOCK"/>	\$1,162.99 <b>\$1,048.99</b> Save: 9.80%
<b>Shipping Options</b>		Subtotal: \$1,048.99 Shipping: \$0.00
Choose a delivery method <a href="#">?</a> <input checked="" type="radio"/> Large Item Delivery - Front Door (Adult Signature Required) <input type="radio"/> Large Item Delivery - White Glove (Adult Signature Required)		

Newegg Marketplace Direct Delivery Service [Important Shipping Information](#)

<a href="#">Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600</a>	1 <input type="button" value="IN STOCK"/>	<b>\$712.16</b>
<b>Shipping Options</b>		Subtotal: \$712.16 Shipping: \$0.00
Choose a delivery method <a href="#">?</a> <input checked="" type="radio"/> Standard Shipping (5-7 business days) <input type="radio"/> Expedited Shipping (3-5 business days)		

1:21 AM 4/13/2016

## Switch and SSD

The screenshot shows a Windows desktop with a taskbar at the bottom. Two Newegg shopping cart windows are open in the center. The top window displays a Dell Networking N2048 - 48 ports - managed switch - rack-mountable for \$1,975.31. The bottom window displays an Intel 535 Series 2.5" 360GB SATA III MLC Internal Solid State Drive (SSD) for \$183.00. Both windows show standard shipping options.

## g2.2xlarge

### Chassis, RAM and SSD

The screenshot shows a Windows desktop with a taskbar at the bottom. A single Newegg shopping cart window is open in the center. It contains three items: an iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis (\$44.99), a Kingston 16GB 240-Pin DDR3 SDRAM ECC Registered DDR3 1600 Server Memory DRx4 Model KVR16R11D4/16 (\$96.99), and an Intel 320 Series 2.5" 80GB SATA II MLC Internal Solid State Drive (SSD) SSDSA2CW080G3B5 (\$139.99). The subtotal is \$281.97. Shipping is \$0.00. The window also includes a sidebar with privacy and security information.

## Rack and Motherboard

The screenshot shows a Microsoft Word document window with two tabs open. The active tab displays a Newegg shopping cart page. The cart contains two items:

- Tripp Lite SR2400 42U 42U SmartRack Value Series Rack Enclosure Cabinet (includes doors and side panels)**  
Subtotal: \$1,048.99  
Save: 9.80%
- Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600**  
Subtotal: \$712.16

Both items are marked as "IN STOCK". The "Shipping Options" section indicates "Shipping: \$0.00" for both. The "Choose a delivery method" dropdown shows "Standard Shipping (5-7 business days)" selected.

## Switch, Network Adapter and CPU

The screenshot shows a Microsoft Word document window with three tabs open. The active tab displays a Newegg shopping cart page. The cart contains three items:

- Dell Networking N2048 - 48 ports - managed switch - rack-mountable**  
Subtotal: \$1,975.31
- AddOn - Network Upgrades CN-GP1011-S3-AOK 1 Gbps PCI-Express Network Adapter**  
Subtotal: \$16.76
- Intel Xeon E5-2670 Sandy Bridge-EP 2.6GHz (3.3GHz Turbo Boost) LGA 2011 115W BX8061252670 Server Processor**  
Subtotal: \$575.00

All items are marked as "IN STOCK". The "Shipping Options" section indicates "Shipping: \$0.00" for all items. The "Choose a delivery method" dropdown shows "Standard Shipping (5-7 business days)" selected for each item.

## GPU

The screenshot shows a Newegg shopping cart page. At the top, there's a header bar with tabs for Microsoft Word and the Newegg Shopping Cart. The main content area displays a product item: "GIGABYTE GeForce GTX 960 4GB WINDFORCE 2X OC EDITION". The price is \$219.99, marked down from \$229.99. A "Protect Your Investment" button is visible. Below the product, shipping options are listed, including "FREE 2-Day Shipping". The subtotal is \$219.99 and shipping is \$0.00. The bottom section shows a "Newegg Digital Download Delivery Service" banner.

## r3.4xlarge

### Chassis, RAM and CPU

The screenshot shows a Newegg shopping cart page for a server build. The items listed are: 1) iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis, priced at \$44.99; 2) Kingston 32GB (4 x 8GB) 240-Pin DDR3 SDRAM Unbuffered DDR3 1333 Server Memory STD Height 30mm Model KVR1333D3N9HK4/32G, priced at \$137.99; and 3) Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz LGA 2011-115W BX80635E52670V2 Server Processor, priced at \$1,559.99. The subtotal for these items is \$1,742.97. The shipping is \$0.00. The bottom section shows a "Newegg Standard Shipping Service" banner.

## Rack and Mother Board

The screenshot shows a Microsoft Word document window with two Newegg shopping cart items listed:

- Tripp Lite SR2400 42U 42U SmartRack Value Series Rack Enclosure Cabinet (includes doors and side panels)**  
Subtotal: \$1,048.99  
Save: 9.80%
- Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600**  
Subtotal: \$712.16

Both items show "IN STOCK". Shipping options are listed for each item.

## Switch, Network Card and SSD

The screenshot shows a Microsoft Word document window with three Newegg shopping cart items listed:

- Dell Networking N2048 - 48 ports - managed switch - rack-mountable**  
Subtotal: \$1,975.31
- AddOn-Network Upgrades CLE-SP1011-53-AOK 1.6Gbps PCI-Express Network Adapter**  
Subtotal: \$16.76
- Intel 535 Series 2.5" 360GB SATA III MLC Internal Solid State Drive (SSD) SSDSC2BW300H61**  
Subtotal: \$183.00

Shipping options are listed for each item.

# i2.8xlarge

## Network Adapter, Chassis, RAM, SSD and CPU

Newegg Standard Shipping Service [Important Shipping Information](#)

Our Privacy Policy states that we will only share your personal information with third parties working on our behalf to complete your order such as UPS and FedEx.

**SECURITY SAFEGUARDS**

Security is top priority at Newegg. When you submit sensitive information through the website, your information is protected both online and offline.

**Intel X5-Opt2 100Mbps/1Gbps/10Gbps PCI Express 2.1 x8 Ethernet Converged Network Adapter**

Standard Return Policy [Send this item as a gift](#)

**iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis**

Standard Return Policy

**Kingston 32GB (4 x 8GB) 240-Pin DDR3 SDRAM Unbuffered DDR3 1333 Server Memory STD Height 30mm Model KVR1333D3N9H4/32G**

Standard Return Policy

**Intel DC S3610 2.5" 800GB SATA III MLC Internal Solid State Drive (SSD) SSDSC2BX80G0G401 - OEM**

Standard Return Policy [Recover Your Data](#) [View Details](#)

**Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5 GHz Processor LGA 2011 115W BX80635E52670V2 Server Processor**

Replacement Only Return Policy [Protect Your Investment](#) [View Details](#)

**Shipping Options**

Subtotal: \$2,825.95  
Shipping: \$0.00

Zip/Delivery Code [Update](#)

1:37 AM 4/13/2016

## Rack and switch

Newegg Large Item Delivery Service [Important Shipping Information](#)

APO/FPO/Military ONLY  
 Newegg 3 Business Days  
 Newegg 2 Business Days  
 Newegg Next Business Day  
 **FREE 2-Day Shipping** [Learn more](#) [Sign in](#)

**Tripp Lite SR2400 42U 42U SmartRack Value Series Rack Enclosure Cabinet (includes doors and side panels)**

IN STOCK [View Details](#)

**Dell Networking N2048 - 48 ports - managed switch - rack-mountable**

Sold by DataVision [View Details](#)

**Shipping Options**

Choose a delivery method  Large Item Delivery - Front Door (Adult Signature Required)  
 Large Item Delivery - White Glove (Adult Signature Required)

**Shipping Options**

Choose a delivery method  Standard Shipping (5-7 business days)  
 Two-Day Shipping (2 business days)

1:37 AM 4/13/2016

## Motherboard

Content - 28180.201620 Microsoft Word - proj.docx Newegg.com Shopping C Abhijeet

Newegg Inc. [US] https://secure.newegg.com/Shopping/ShoppingCart.aspx?submit=ChangeItem Home > My Shopping Cart

**SHOPPING SATISFACTION**  
Nearly all of Newegg.com's offerings are covered by a full 30-day refund policy.

**PRIVACY PROTECTED**  
Our Privacy Policy states that we do not share your personal information with third parties working on our behalf to complete your order such as UPS and FedEx.

**SECURITY SAFEGUARDS**  
Security is a top priority at Newegg. When you submit sensitive information via the website, your information is protected both online and offline.

**1 Item(s) in your shopping cart: \$712.16**

Select All Remove Selected Move Selected To... Update Qnts

**Newegg Marketplace Direct Delivery Service** Important Shipping Information

**Intel S2600GZ4 Custom Server Motherboard** Dual LGA 2011 DDR3 1600  
CPU Socket Type: Dual LGA 2011  
Sold by PC Rush  
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### CPU

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www.ebay.com/itm/Matched-PAIR-INTEL-XEON-E5-2676-V3-2-40GHz-SR1Y5-30Mb-12-Cores-24-Thread-E5-2670-/321956437206

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## Network adapter, Chassis, RAM and SSD

Newegg Standard Shipping Service [Important Shipping Information](#)

Product	Description	Quantity	Price	Subtotal
Intel X540T2 100Mbps/1Gbps/10Gbps PCI Express 2.1 x8 Ethernet Converged Network Adapter	IN STOCK	1	\$444.99	\$444.99
iStarUSA D-118V2-ITX Black Metal / Aluminum 1U Rackmount Compact Server Chassis	IN STOCK	2	\$87.98	\$175.96
Kingston 32GB (4 x 8GB) 240-Pin DDR3 SDRAM Unbuffered DDR3 1333 Server Memory STD Height: 30mm Model KVR1333D3N9HK4/32G	IN STOCK	1	\$137.99	\$137.99
SAMSUNG 850 EVO 2.5" 2 TB SATA III 3-D Vertical Internal Solid State Drive (SSD) MZ-75E2T0B/AM	IN STOCK LIMIT 3	1	\$602.73	\$602.73

Shipping Options  
Subtotal: \$1,273.69  
Shipping: \$0.00

Zip/Postal Code  Update

## Rack and Motherboard

Newegg Large Item Delivery Service [Important Shipping Information](#)

Product	Description	Quantity	Price	Subtotal
Tripp Lite SR2400 42U 42U SmartRack Value Series Rack Enclosure Cabinet (includes doors and side panels)	IN STOCK	1	\$1,048.99	\$1,048.99

Shipping Options  
Subtotal: \$1,048.99  
Shipping: \$0.00

Choose a delivery method  Large Item Delivery - Front Door (Adult Signature Required)  
 Large Item Delivery - White Glove (Adult Signature Required)

Newegg Marketplace Direct Delivery Service [Important Shipping Information](#)

Product	Description	Quantity	Price	Subtotal
Intel S2600GZ4 Custom Server Motherboard Dual LGA 2011 DDR3 1600	IN STOCK	1	\$712.16	\$712.16

Shipping Options  
Subtotal: \$712.16  
Shipping: \$0.00

Choose a delivery method  Standard Shipping (5-7 business days)  
 Expedited Shipping (3-5 business days)  
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## Switch

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Newegg Marketplace Direct Delivery Service [Important Shipping Information](#)

 Dell Networking N2048 - 48 ports - managed switch - rack-mountable 1 IN STOCK \$1,975.31

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