**Project on Understanding the Cost of Computing in the Cloud**

The report focus on a startup company who is considering to use cloud computing instead of building its own infrastructure. There is consensus that a cloud computing software stack at the layer of IaaS will be used, but its not clear whether the computing resources should be rented from a public cloud on-demand, or whether a private cloud should be purchased. Our job is to find the cost breakdown of a private cloud, and compare that to what Amazon would charge for the following instance types: t2.small, m3.large, c3.8xlarge, g2.2xlarge, r3.4xlarge, i2.8xlarge, and d2.8xlarge.

In this project we consider following factors for building own data center (private cloud) cooling, power, administration costs, network switches, ups, motherboard, case, power supply, disk, network card

For private cloud Assumption made

Electricity rate considered for Illinois 0.09 dollar per kwh

Admin Cost 70000 dollar per yr for 1000 servers

Taking double precision floating point operations

Flops Calculation for public instances=vcpu/2 \*clockrate\*ipc

Flops Calculation for private instances=no of cores \*clockrate\*ipc

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Instance | VCPU | Cost Per HR | Clock Rate | Processor | Memory | Storage | GFlops with Double Precision | Costper hr for gflops/sec |
| M410xlarge | 40 | 2.39 | 2.4 | Intel Xeon E5- 2676 v3 | 160 | Ebs | 2.4\*16\*20=768 GFLOPs/sec | =2.39/768  =0.003 |
| m3.large | 2 | 0.13 | 2.5 | Intel Xeon E5- 2670 v2 | 7.5 | 32 | 2.5\*8\*1=20 GFLOPS/sec | 0.13/20  =0.0065 |
| m3.2xlarge | 8 | 0.53 | 2.5 | Intel Xeon E5- 2670 v2 | 30 | 2 x 80 | 2.5\*8\*4=80 GLOPS/sec | 0.53/80  =0.006625 |
| c3.8xlarge | 32 | 1.68 | 2.8 | Intel Xeon E5- 2680 v2 | 60 | 2 x 320 | 16\*8\*2.8=358.4 GFLOPS/sec | 1.68/358.4  =0.00469 |
| g2.2xlarge | 8 | 0.65 | 2.6 | Intel Xeon E5- 2670 | 15 | 1 x 60 | 2.6\*4\*8=83.2  GFLOPS/sec  Adding Gpu flops=185.2  GigaFlops/sec | 0.65/185.2  =0.0035 |
| r3.4xlarge | 16 | 1.33 | 2.5 | Intel Xeon E5- 2670 v2 | 122 | 1 x 320 | 2.5\*8\*8=160 GFLOPS/sec | 1.33/160  =0.00831 |
| i2.8xlarge | 32 | 6.82 | 2.5 | Intel Xeon E5- 2670 v2 | 244 | 8 x 800 | 2.5\*8\*16=320 GFLOPS/sec | 6.82/320  =0.021 |
| d2.8xlarge | 36 | 5.52 | 2.4 | Intel Xeon E5- 2676 v3 | 244 | 24 x 2,000 | 2.4\*16\*16=691.2 GFLOPS/sec | 5.52/691.2  =0.0080 |

Amazon Cost

This table shows the value of cost per hour as given and GFLOPs/sec calculated for each EC2 instances.

Flops for g2 xlarge gpu

=noofcores\*2\*clockspeed/clockcyle= 24 clock cycle for kepler

=1536\*2\*0.797/24=102

Total g2.2xlarge=102+83.2=185.2 GigaFlops/sec

Public cloud we consider constant rate for 1 Gflop/sec by dividing cost/hr by Gflops/sec

No of racks and switches purchase 42u and 48 port switch

1. M4 10xlarge

|  |  |  |  |
| --- | --- | --- | --- |
| Equipment | Statistics | Device Name | Cost |
| Network card |  | Intel Ethernet Server Adapter X520-DA1 for Open Compute Project (OCP) | 140 |
| Chasis |  | Corsair Obsidian Series 450D Black Aluminum / Steel ATX Mid Tower Gaming Computer Case Compatible with ATX (not included) Power Supply | 120 |
| Network switch cost |  | NETGEAR ProSAFE FS750T2NA 48-Port Fast Ethernet Smart Switch w/ 2 Gigabit Ports 10/100 Mbps | 174 |
| Disk |  | Transcend mSATA 32GB SATA III MLC Internal Solid State Drive (SSD) MSA370 (TS32GMSA370) | 39 |
| Memory |  | [**Crucial 96GB (3 x 32GB) 240-Pin DDR3 SDRAM ECC DDR3 1866 (PC3 14900) Server Memory Model CT3K32G3ELSDQ4186D**](http://www.newegg.com/Product/Product.aspx?Item=N82E16820148907&cm_re=Crucial_96GB_%283_x_32GB%29_DDR3-1866_Memory-_-20-148-907-_-Product) | 1000\*2=2000 |
| Mother board |  | ASUS KGPE-D16 SSI EEB Server Motherboard Dual Socket G34 AMD SR5690 DDR3 1600/1333/1066/800 | 420 |
| Rack |  | StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks | 230 |
| Power | 1350 Watt |  | 1064.34 |
| Cooling | 90 Watt |  | 70.96 \*2=141.92 |
| Cpu |  | Intel Xeon E5-2640 V4 2.4 GHz 25MB L3 Cache LGA 2011 90W BX80660E52640V4 Server Processor | **990\*2= 1980** |
| Admin Costs |  |  | 70000 |
| UPS |  | APC BR1000G Back-UPS Pro 1000VA 8-outlet Uninterruptible Power Supply (UPS) | 123 |
| GFLOPS | Clock speed 2.4  IPC 8 | Per Processor 10\*16\*2.4=384 | 384.4\*2=768 GFlops/sec |
| Cost per year |  |  | 76432.26 |
| 5 yrs amortization cost |  |  | 382161.3 |

Cost Range

|  |  |  |  |
| --- | --- | --- | --- |
| Flops | No Of instances | Racks | Cost |
| 1 Giga Flop | 1 | 1 | =(382161.3/43800)/768  0.011361 |
| 10 Giga Flop | 1 | 1 | 0.011361 |
| 100 Giga Flop | 1 | 1 | 0.011361 |
| 1000 Giga Flop | 2 | 1 | 0.0061193 |
| 10000 Giga Flop | 14 | 1 | 0.00162655 |
| 100000 Giga Flop | 131 | 4 | 0.000959573 |
| 1000000 Giga Flop | 1303 | 32 | 0.00089565 |

1. M3 large

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| Network card |  | Intel Ethernet Server Adapter X520-DA1 for Open Compute Project (OCP) | 140 |
| Chasis |  | Corsair Obsidian Series 450D Black Aluminum / Steel ATX Mid Tower Gaming Computer Case Compatible with ATX (not included) Power Supply | 120 |
| Network switch cost |  | NETGEAR ProSAFE FS750T2NA 48-Port Fast Ethernet Smart Switch w/ 2 Gigabit Ports 10/100 Mbps | 174 |
| Disk |  | [**Crucial BX200 2.5" 480GB SATA III Internal Solid State Drive (SSD) CT480BX200SSD1**](http://www.newegg.com/Product/Product.aspx?Item=N82E16820156067&cm_re=Crucial_BX200_480GB_2.5%22_Solid_State_Drive-_-20-156-067-_-Product) | 118.2 |
| Memory |  | [Crucial 96GB (3 x 32GB) 240-Pin DDR3 SDRAM ECC DDR3 1866 (PC3 14900) Server Memory Model CT3K32G3ELSDQ4186D](http://www.newegg.com/Product/Product.aspx?Item=N82E16820148907&cm_re=Crucial_96GB_%283_x_32GB%29_DDR3-1866_Memory-_-20-148-907-_-Product) | 1000 |
| Mother board |  | ASRock EP2C602-4L/D16 SSI EEB Server Motherboard Dual LGA 2011 Intel C602 DDR3 1600/1333/1066 | 310 |
| Rack |  | StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks | 230 |
| Power | 1350 watt |  | 1064.34 |
| Cooling | 115 Watt |  | 90.67 |
| Cpu | Intel Xeon E5- 2670 v2 | Intel Xeon E5-2670 v2 Ivy Bridge-EP 2.5GHz 25MB L3 Cache LGA 2011 115W Server Processor CM8063501375000 – OEM | 1676 |
| Admin Costs |  |  | 70000 |
| UPS |  | APC BR1000G Back-UPS Pro 1000VA 8-outlet Uninterruptible Power Supply (UPS) | 123 |
| Gflops | Clock speed 2.5 | =2.5\*8\*10 | 200 Gflops/sec |
| Cost for 1 yr |  |  | 75045.2 |
| 5 yrs amortization cost |  |  | 375226.05 |

Cost per hr 8.56 dollar per hr for 200 GigaFlop/sec =0.0428 dollar per hr on rate of 1 Gigaflop/sec

Cost Range

|  |  |  |  |
| --- | --- | --- | --- |
| Flops | No Of Server | Racks | Cost |
| 1 Giga Flop | 1 | 1 | 0.0428 |
| 10 Giga Flop | 1 | 1 | 0.0428 |
| 100 Giga Flop | 1 | 1 | 0.0428 |
| 1000 Giga Flop | 5 | 1 | =  93123.05  =10.14/1000=0.0106 |
| 10000 Giga Flop | 50 | 2 | =297014.5  =33.9/10000=0.00339 |
| 100000 Giga Flop | 500 server | 12 | =2335929  =266.6586/100000  = 0.002667 |
| 1000000 Giga Flop | 5000 Server | 120 | =23009290  2626.63/1000000  0.002626631 |

3) m3.2xlarge

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| Network card |  | Intel Ethernet Server Adapter X520-DA1 for Open Compute Project (OCP) | 140 |
| Chasis |  | Corsair Obsidian Series 450D Black Aluminum / Steel ATX Mid Tower Gaming Computer Case Compatible with ATX (not included) Power Supply | 120 |
| Network switch cost |  | NETGEAR ProSAFE FS750T2NA 48-Port Fast Ethernet Smart Switch w/ 2 Gigabit Ports 10/100 Mbps | 174 |
| Disk |  | Corsair Force LS 2.5" 60GB SATA III MLC Internal Solid State Drive (SSD) CSSD-F60GBLSB | 35 |
| Memory |  | G.SKILL Ripjaws Z Series 32GB (4 x 8GB) 240-Pin DDR3 SDRAM DDR3 2133 (PC3 17000) Desktop Memory Model F3-17000CL11Q-32GBZLD | 120 |
| Mother board |  | ASUS Z9PE-D8 WS Dual LGA 2011 Intel C602 SATA 6Gb/s USB 3.0 SSI EEB Intel Motherboard | 531 |
| Rack |  | StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks | 230 |
| Power | 1350 Watt |  | 1064.34 |
| Cooling | 80 Watt |  | 63.07 |
| Cpu | Intel Xeon E5- 2670 v2 | IBM 00Y2851 - Intel Xeon E5-2609 v2 2.5GHz 10MB Cache 4-Core Processor – OEM | 431.95 |
| Admin Costs |  |  | 70000 |
| UPS |  | APC BR1000G Back-UPS Pro 1000VA 8-outlet Uninterruptible Power Supply (UPS) | 123 |
| Gflops |  | =8\*2.5\*4 | 80 Gflops/sec |
| Cost for 1 yr |  |  | 367537.1 |
| 5 yrs amortization cost |  |  | 367537.1\*5 |

|  |  |  |  |
| --- | --- | --- | --- |
| Flops | No Of Server | Rack | Cost |
| 1 Giga Flop | 1 | 1 | 0.104891 |
| 10 Giga Flop | 1 | 1 | 0.104891 |
| 100 Giga Flop | 2 | 1 | 382439.1  8.731486/160 =  0.054572 |
| 1000 Giga Flop | 13 | 1 | 546361.7  =12.47401/1040=0.011994 |
| 10000 Giga Flop | 125 | 3 | 2220661 =0.00507 |
| 100000 Giga Flop | 1250 | 30 | 19406613  =0.004431 |
| 1000000 Giga Flop | 12500 | 298 | 191610855  =0.0043747 |

4) C3 8xLarge

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| Network card |  | Intel Ethernet Server Adapter X520-DA1 for Open Compute Project (OCP) | 140 |
| Chasis |  | Corsair Obsidian Series 450D Black Aluminum / Steel ATX Mid Tower Gaming Computer Case Compatible with ATX (not included) Power Supply | 120 |
| Network switch cost |  | NETGEAR ProSAFE FS750T2NA 48-Port Fast Ethernet Smart Switch w/ 2 Gigabit Ports 10/100 Mbps | 174 |
| Disk |  | SAMSUNG 840 EVO MZ-7TE750BW 2.5" 750GB SATA III TLC Internal Solid State Drive (SSD) | 500 |
| Memory |  | [**G.SKILL Ripjaws Z Series 64GB (8 x 8GB) 240-Pin DDR3 SDRAM DDR3 1600 (PC3 12800) Desktop Memory Model F3-12800CL10Q2-64GBZL**](http://www.newegg.com/Product/Product.aspx?Item=N82E16820231508&cm_re=G.Skill_Ripjaws_Z_Series_64GB_%288_x_8GB%29_DDR3-1600_Memory-_-20-231-508-_-Product) | 250 |
| Mother board |  | ASUS Z9PE-D8 WS Dual LGA 2011 Intel C602 SATA 6Gb/s USB 3.0 SSI EEB Intel Motherboard | 531 |
| Rack |  | StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks | 230 |
| Power | 1350 Watt |  | 1064.34 |
| Cooling | 140 Watt |  | 110.38 |
| Cpu | Intel Xeon E5- 2680 v2 | IBM 00AM124 - AMD Opteron 6386SE 2.8 GHz 16MB Cache 16-Core Processor - OEM | 1647 |
| Admin Costs |  |  | 70000 |
| UPS |  | APC BR1000G Back-UPS Pro 1000VA 8-outlet Uninterruptible Power Supply (UPS) | 123 |
| Gflops |  | =2.8\*16\*8 | 358.4 |
| cost per year |  |  | 74889.72 |
| 5 yrs amortization cost |  |  | 374448.6 |
|  |  |  | 374448.6/4380  =8.549055 |

|  |  |  |  |
| --- | --- | --- | --- |
| Flops | No Of Server | Racks | Cost |
| 1 Giga Flop | 1 | 1 | 8.549055/358.4=0.023853 |
| 10 Giga Flop | 1 | 1 | 0.023853 |
| 100 Giga Flop | 1 | 1 | 0.023853 |
| 1000 Giga Flop | 3 | 1 | 0.0088775 |
| 10000 Giga Flop | 28 | 1 | 0.00219186 |
| 100000 Giga Flop | 280 | 3 | 0.00147341 |
| 1000000 Giga Flop | 2791 | 67 | 0.00141758 |

5) g2 2xlarge

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| Network card |  | Intel Ethernet Server Adapter X520-DA1 for Open Compute Project (OCP) | 140 |
| Chasis |  | Corsair Obsidian Series 450D Black Aluminum / Steel ATX Mid Tower Gaming Computer Case Compatible with ATX (not included) Power Supply | 120 |
| Network switch cost |  | NETGEAR ProSAFE FS750T2NA 48-Port Fast Ethernet Smart Switch w/ 2 Gigabit Ports 10/100 Mbps | 174 |
| Disk |  | Kingston SSDNow V300 Series SV300S3D7/120G 2.5" 120GB SATA III Internal Solid State Drive (SSD) Desktop Bundle Kit | 55 |
| Memory |  | CORSAIR Vengeance Pro 32GB (4 x 8GB) 240-Pin DDR3 SDRAM DDR3 2400 (PC3 19200) Desktop Memory Model CMY32GX3M4A2400C11R | 150 |
| Mother board |  | GIGABYTE GA-78LMT-USB3 (rev. 6.0) AM3+ AMD 760G + SB710 USB 3.0 HDMI Micro ATX AMD Motherboard | 55 |
| Rack |  | StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks | 230 |
| Power | 2000 Watt |  | 1576.8 |
| Cooling | 115 Watt |  | |  | | --- | | 90.67 | |
| Cpu | Intel Xeon E5- 2670 | Intel Xeon E5-2670 Sandy Bridge-EP 2.6GHz (3.3GHz Turbo Boost) 20MB L3 Cache LGA 2011 115W BX80621E52670 Server Processor | 354.76 |
| Gpu |  | NVIDIA Quadro K5000 for Mac VCQK5000MAC-PB 4GB 256-bit GDDR5 PCI Express 2.0 x16 SLI Supported Workstation Video Card | 1,836.78 |
| Admin Costs |  |  | 70000 |
| UPS |  | APC BR1000G Back-UPS Pro 1000VA 8-outlet Uninterruptible Power Supply (UPS) | 123 |
| Gflops |  | =8\*2.6\*8=166.4  Gpu Flops =90 Gflops/sec | =166.4+90  =256.4 |
| Cost for 1 year |  |  | 74906.01 |
| 5 yrs amortization cost |  |  | 374530.1 |

|  |  |  |  |
| --- | --- | --- | --- |
| Flops | No Of Server | No of Racks | Cost |
| 1 Giga Flop | 1 | 1 | 0.03335 |
| 10 Giga Flop | 1 | 1 | 0.03335 |
| 100 Giga Flop | 1 | 1 | 0.03335 |
| 1000 Giga Flop | 4 | 1 | 0.0098 |
| 10000 Giga Flop | 40 | 1 | 0.002735 |
| 100000 Giga Flop | 391 | 10 | 0.002035 |
| 1000000 Giga Flop | 3901 | 93 | 0.001987 |

6) R3 4xlarge

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| Network card |  | Intel Ethernet Server Adapter X520-DA1 for Open Compute Project (OCP) | 140 |
| Chasis |  | Corsair Obsidian Series 450D Black Aluminum / Steel ATX Mid Tower Gaming Computer Case Compatible with ATX (not included) Power Supply | 120 |
| Network switch cost |  | NETGEAR ProSAFE FS750T2NA 48-Port Fast Ethernet Smart Switch w/ 2 Gigabit Ports 10/100 Mbps | 174 |
| Disk |  | Intel 535 Series 2.5" 360GB SATA III MLC SSDSC2BW360H6R5 | 200 |
| Memory |  | NEMIX RAM 128GB (4X32GB) DDR3 1600MHz PC3-12800 ECC Regsitered Memory for APPLE Mac Pro 2013 6,1 | 1888 |
| Mother board |  | ASUS ROG RAMPAGE IV BLACK EDITION LGA 2011 Intel X79 SATA 6Gb/s USB 3.0 Extended ATX Intel Gaming Motherboard | 375 |
| Rack |  | StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks | 230 |
| Power | 1350 |  | 1064.34 |
| Cooling | 95 Watt |  | 74.90 |
| Cpu | Intel Xeon E5- 2670 v2 | Intel Xeon E5-2650 2.5 GHz 20MB L3 Cache LGA 2011 95W 69Y5329 Server Processor | 1868.35 |
| Admin Costs |  |  | 70000 |
| Ups |  | APC BR1000G Back-UPS Pro 1000VA 8-outlet Uninterruptible Power Supply (UPS) | 123 |
| Gflops |  | =2.5\*8\*8=160 | 160 Gflops/sec |
| Cost for 1 year |  |  | 76257.59 |
| 5 yrs amortization cost |  |  | =76257.59\*5 |

|  |  |  |  |
| --- | --- | --- | --- |
| Flops | No Of Server | Racks | Cost |
| 1 Giga Flop | 1 | 1 | 0.054408 |
| 10 Giga Flop | 1 | 1 | 0.054408 |
| 100 Giga Flop | 1 | 1 | 0.054408 |
| 1000 Giga Flop | 7 | 1 | 0.011277 |
| 10000 Giga Flop | 63 | 2 | 0.004893287 |
| 100000 Giga Flop | 625 | 15 | 0.004177539 |
| 1000000 Giga Flop | 6250 | 149 | 0.004153506 |

7) I2 8 xlarge

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| Network card |  | Intel Ethernet Server Adapter X520-DA1 for Open Compute Project (OCP) | 140 |
| Chasis |  | Corsair Obsidian Series 450D Black Aluminum / Steel ATX Mid Tower Gaming Computer Case Compatible with ATX (not included) Power Supply | 120 |
| Network switch cost |  | NETGEAR ProSAFE FS750T2NA 48-Port Fast Ethernet Smart Switch w/ 2 Gigabit Ports 10/100 Mbps | 174 |
| Disk |  | SAMSUNG 850 EVO 2.5" 1TB SATA III 3-D Vertical Internal Solid State Drive (SSD) MZ-75E1T0B/AM | 290\*7=2030 |
| Memory |  | NEMIX RAM 128GB (4X32GB) DDR3 1600MHz PC3-12800 ECC Regsitered Memory for APPLE Mac Pro 2013 6,1 | 1888\*2=3776 |
| Mother board |  | ASUS KGPE-D16 SSI EEB Server Motherboard Dual Socket G34 AMD SR5690 DDR3 1600/1333/1066/800 | 416 |
| Rack |  | StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks | 230 |
| Power | 1350 watt |  | 1064.34 |
| Cooling | 115 Watt |  | 90.67 |
| Cpu | Intel Xeon E5- 2670 v2 | IBM 2.5 GHz 16 MB L2 Cache 20MB L3 Cache Socket G34 115W 00AM123 Server Processor – OEM | 1587.55 |
| Admin Costs |  |  | 70000 |
| UPS |  | APC BR1000G Back-UPS Pro 1000VA 8-outlet Uninterruptible Power Supply (UPS) | 123 |
| Gflops |  | 2.5\*8\*16=320 | 320 GFLOPS/sec |
| Cost for 1 year |  |  | 79751.56 |
| 5 yrs amortization cost |  |  | 398757.8 |

|  |  |  |  |
| --- | --- | --- | --- |
| Flops | No Of Server | Racks | Cost |
| 1 Giga Flop | 1 | 1 | 0.02845 |
| 10 Giga Flop | 1 | 1 | 0.02845 |
| 100 Giga Flop | 1 | 1 | 0.02845 |
| 1000 Giga Flop | 4 | 1 | 0.009581 |
| 10000 Giga Flops | 32 | 1 | 0.00407696 |
| 100000 Giga Flops | 313 | 8 | 0.003375311 |
| 1000000 Giga Flops | 3125 | 75 | 0.0033272 |

8) D2 8x large

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| Network card |  | Intel Ethernet Server Adapter X520-DA1 for Open Compute Project (OCP) | 140 |
| Chasis |  | Corsair Obsidian Series 450D Black Aluminum / Steel ATX Mid Tower Gaming Computer Case Compatible with ATX (not included) Power Supply | 120 |
| Network switch cost |  | NETGEAR ProSAFE FS750T2NA 48-Port Fast Ethernet Smart Switch w/ 2 Gigabit Ports 10/100 Mbps | 174 |
| Disk |  | SAMSUNG 850 PRO 2.5" 2 TB SATA III 3-D Vertical Internal Solid State Drive (SSD) MZ-7KE2T0BW | 24\*949=22776 |
| Memory |  | NEMIX RAM 128GB (4X32GB) DDR3 1600MHz PC3-12800 ECC Regsitered Memory for APPLE Mac Pro 2013 6,1 | 1888\*2=3776 |
| Mother board |  | ASUS KGPE-D16 SSI EEB Server Motherboard Dual Socket G34 AMD SR5690 DDR3 1600/1333/1066/800 | 420 |
| Rack |  | StarTech.com 42U Adjustable Depth Open Frame 4 Post Server Rack Cabinet - Flat Pack w/ Casters, Levelers and Cable Management Hooks | 230 |
| Power | 1350 Watt |  | 1064.34 |
| Cooling | 90 Watt |  | 70.96 \*2=141.92 |
| Cpu | Intel Xeon E5- 2676 v3 | Intel Xeon E5-2640 V4 2.4 GHz 25MB L3 Cache LGA 2011 90W BX80660E52640V4 Server Processor | **990\*2= 1980** |
| Ups |  | APC BR1000G Back-UPS Pro 1000VA 8-outlet Uninterruptible Power Supply (UPS) | 123 |
| Admin Costs |  |  | 70000 |
| Gflops |  | 2.4\*16\*10\*2=768 | 768 Gflops /sec |
| Cost for 1 year |  |  | 100945.26 |
| 5 yrs amortization cost |  |  | 504726.3 |

|  |  |  |  |
| --- | --- | --- | --- |
| Flops | No Of Server | Racks | Cost |
| 1 Giga Flop | 1 | 1 | 0.0150 |
| 10 Giga Flop | 1 | 1 | 0.0150 |
| 100 Giga Flop | 1 | 1 | 0.0150 |
| 1000 Giga Flop | 2 | 1 | 0.00976291 |
| 10000 Giga Flop | 14 | 1 | 0.005270153 |
| 100000 Giga Flop | 131 | 4 | 0.004603177 |
| 1000000 Giga Flop | 1303 | 32 | 0.004539254 |

Comparison Of instances in Graphs

Graph1

This Graph shows that when we are moving from 1 GFLOPs to 1 PFLOPs, the cost of public cloud- Amazon EC2 remains constant for all instances, while for private cloud as we are moving to larger scale, the cost decreases exponentially.

Upto 100 GFlops private cloud costs higher than public cloud so it is better to rent resources. After 1000 GigaFlops the private cloud cost falls down and reach breakeven point and from this point it is better to own resource than rent from amazon

So, to perform large data calculation which require more flops private clouds are best as it costs less and gives the efficient output.

Graph2

Plot 2 depicts that for private cloud cost utilization remains constant up to 100 GFLOPs the utilization rate is less till 100 GFLops as we scale more resources are being utilized. From 10000 GFLOPS utilization cost of private cloud is upto same rate of amazon, From 10000 GFlops it is better to own resources than goto public cloud as utilization of is 100 percent to public cloud all the resources of instances are being used 100%.

Based on graphs and statistics on different instances we found that private clouds are best to scale for larger data Gflops, while public clouds are best for small amount of data.

SreenShots of shopping cart





