

# Cost of Computing in the Cloud

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Please refer to "costcalc.xls" for formulas, calculations and references

- Configuration 1: Hadoop/Spark Cluster with 32K-cores, 256TB memory, 50PB HDD, and 10Gb/s Ethernet Fat-Tree network (each VM should be equivalent to the d2.8xlarge instance); in addition to the compute resources, a 100PB distributed storage shared across the entire cloud should be procured, with enough capacity for 100GB/sec throughput (for pricing comparison, see S3)**

## Cost of Private Cloud

	Description	Price per Item	Quantity	Total Price(5Yrs)
Compute Servers	18 x 256KB L2 Cache 45MB L3 Cache LGA 2011-3 145W BX80660E52697V4 Server Processor	\$ 10,878.20	1778.00	\$ 19,341,439.60
Network Switches	(a) Mellanox Switch-IB 2 MSB7890 - switch - 36 ports - smart - rack-mountable(Qty 99) (b) Mellanox MSX6506-NR 108 port FDR capable modular chassis includes 4 fans and 2 (N+N) (Qty 18)	13959.99 , 21,435.00	99(36 Port), 18(108 port)	\$ 1,767,869.01
Network Cables	7m (23ft) Cisco ONS-SC+-10G-CU7 Compatible 10G SFP+ Passive Direct Attach Copper Twinax Cable	\$ 42.00	3560.00	\$149,520.00
Racks	Server Cabinet Enclosures, RACK-15, 42U,Adjustable mounting depth	\$ 1,133.98	43	\$ 48,761.14
Storage Servers	Dell 400-AJSC 600GB SAS Hard Drive Kit	\$ 252.00	166667	\$ 42,000,084.00
Electric Power	1400W High-efficiency AC power supply with Digital Switching Control & PMBus 1.2	9.47 cents/1kwh	1400 Watt	\$ 10,331,958.00
Cooling	A server package rated at 1400 watts running at maximum would theoretically generate 4480 BTU/hr.	9.47 cents/1kwh	(OperatingHour* BTU per hour*0.293)/1000	\$ 3,025,181.96
Administration	Data Center Administrator(Lead , 2 senior , Associate )	\$ 54,925.00	4	\$ 1,098,500.00
TOTAL	N/A	N/A	N/A	77.764 Million

## Cost of Public Cloud

	Description	Price per Item(Per month)	Quantity	Cost Per month	Total Price(5 Yrs)
<b>Compute Servers</b>	d2.8xlarge 36 244.0 HDD 24 x 2000 10 Gigabit	\$ 4,040.64	1050	\$ 4,242,672.00	\$ 254,560,320.00
<b>Network Switches</b>	N/A	N/A	N/A	N/A	N/A
<b>Network Cables</b>	N/A	N/A	N/A	N/A	N/A
<b>Racks</b>	N/A	N/A	N/A	N/A	N/A
<b>Storage Servers</b>	Amazon S3 Storage Classes	First 50 TB/ month \$0.023 / GB	100000000.00	\$ 2,100,563.20	\$ 126,033,792.000
<b>Electric Power</b>	N/A	N/A	N/A	N/A	N/A
<b>Cooling</b>	N/A	N/A	N/A	N/A	N/A
<b>Administration</b>	AWS Support Business			\$ 197,197.00	\$ 11,831,820.00
<b>TOTAL</b>	N/A	N/A	N/A		392.425932 Million

## AWS cost

Secure https://calculator.s3.amazonaws.com/index.html

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Services **Estimate of your Monthly Bill (\$ 6540432.14)**

**Estimate of Your Monthly Bill**

☒ Show First Month's Bill (include all one-time fees, if any)

Below you will see an estimate of your monthly bill. Expand each line item to see cost breakout of each service. To save this bill and input values, click on 'Save and Share' button. To remove the service from the estimate, jump back to the service and clear the specific service's form.

Export to CSV Save and Share

Amazon EC2	Amazon EC2 Service (US East (N. Virginia))	\$ 4242672.00
Amazon S3	Amazon S3 Service (US East (N. Virginia))	\$ 2100563.20
Amazon Route 53	AWS Support (Business)	\$ 197197.00
Amazon CloudFront	Support for all AWS services:	\$ 197197.00
Amazon RDS	Free Tier Discount:	-0.12
Amazon DynamoDB	<b>Total Monthly Payment:</b>	<b>\$ 6540432.14</b>
Amazon ElastiCache		
Amazon CloudWatch		
Amazon SES		

## CPU, Memory and Storage config

www.pogolinux.com/webaccount/main

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Shopping Cart

Qty	System	Description			
1	Iris 1161-2GPU	view components	\$10,878.21	\$10,878.21	<a href="#">Edit System</a> <a href="#">Delete System</a>
<p><b>CPU:</b> 1x Intel Xeon E5-2697v4 18C 2.3GHz 45MB Cache  <b>Memory:</b> 1x 128GB DDR4 ECC Reg 2133MHz (2 x 64GB)  <b>Hard Drives:</b> 2x HGST Ultrastar HE12 1TB 7200RPM SAS 12Gb/s  <b>GPU Options:</b> 1x Nvidia Tesla K10 8GB GDDR5 PCI-E Passive Cooling  <b>Operating System:</b> 1x No Operating System. Include testing and customer OS preference in notes.  <b>RAID Level:</b> 1x Custom RAID Configuration - Add instructions to system notes  <b>Warranty and Support:</b> 1x Return to Depot Warranty (3 Year Hardware Warranty with Standard Advance Parts Replacement)</p>					
Create Quote from Webcart Why create a quote?			Total	\$10,878.21	<a href="#">Checkout</a>

## Fat-Tree network Infiniband

Not Secure | www.mellanox.com/clusterconfig/

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Every attempt has been made to assure that the below configuration is the most optimum solution possible, however the configuration should be reviewed to assure this. Please contact your local sales representative to review the solution or for any further questions.

Select OEM

Mellanox

Enter Number of Nodes in Cluster

1944 (Max Nodes)

1778

CALCULATE

Select Level 1 Switch:

36-port Switch

Select Level 2 Switch:

108-port Switch

Select Blocking Configuration:

Non-blocking

Select Switch Configuration Data Rate

☒ FDR-10 40 Gb/s ☐ QDR 40 Gb/s

☐ FDR 56 Gb/s ☐ EDR 100 Gb/s

☐ HDR 200 Gb/s

Select Adapter Configuration Data Rate

☒ FDR-10 40 Gb/s ☐ QDR 40 Gb/s

☐ FDR 56 Gb/s ☐ EDR 100 Gb/s

☐ HDR100 100 Gb/s ☐ HDR 200 Gb/s

Select Host Adapter Type

☒ Dual Port ☐ Single Port

#### Non-blocking Cross Bisectonal Bandwidth (CBB) Configuration

Cluster Configuration To Use	Switch	Fully Configured	Partially Configured		
			Switch Count	Port Count per Switch	Line Cards per Switch
Level 1 Switches	36-port Switch	99			
Level 2 Switches	108-port Switch	18			

\* In some scenarios, the cluster could have Level 2 switches in which the number of ports required are different between the various switches. This optimization is accounted for here. If your configuration output has two groups of switches specified, then your cluster can have two groups of switch types, in which one of the groups has less port count than the other group.

Cables Required

Node to Level 1 Switch Cables	1778
Level 1 Switch to Level 2 Switch Cables	1782

Cable Media Type

☐ Copper ☐ Optical/Fiber ☒ Both

List Cable Lengths (in meters)

☒ All ☐ Selected

Please fill out the form below to receive complete cluster configuration and OEM-specific product part numbers (SKU's).

\* Note all fields are required.

First Name

Last Name

Title

Company Name

## Power usage

Home > Calculators > Electrical Calculators > Electricity bill calculator

## Electricity Bill Calculator

Electricity bill cost calculator. Electricity usage consumption calculator.

Select country: United States

Typical appliance: Desktop computer

Power consumption: 1400 watts (W)

Hours of use per day: 24 h/day

1 kilowatt-hour (kWh) cost: 9.47 cent

Calculate Reset

Electricity cost per day: \$3.18192

Electricity cost per month: \$96.8497

Electricity cost per year: \$1162.2

- 2 Configuration 2: Support 1 million virtual machines (VM) where each VM requires 2-core, 15GB RAM, 32GB SSD storage, and 1Gb/s Fat-Tree network (each VM should be equivalent to the r3.large instances); in addition to the compute resources, a 10PB distributed storage shared across the entire cloud should be procured, with enough capacity for 10GB/sec throughput (for pricing comparison, see S3)

#### Cost of Private Cloud

	Description	Price per Item	Quantity	Total Price(5Yrs)
<b>Compute Servers</b>	Intel Xeon E5-2600 v4 Series Processor • Up to 512GB DDR4 2400MHz ECC Registered Memory • Dual Port Gigabit Ethernet • Supports 2x Double Width GPU's	\$ 8,920.00	125000.00	\$ 1,115,000,000.00
<b>Network Switches</b>	(a) Mellanox Switch-IB 2 MSB7890 - switch - 36 ports - smart - rack-mountable (b) Mellanox MCS7500 130Tb/s 648-port EDR InfiniBand chassis switch includes 20 fans and 10 power supplies (N+N) RoHS R6	13959.99 , 108,335.00	556*12.5(36 Port), 18*12.5(648 port) ( Network can max support 10000 nodes	\$ 121,397,305.50
<b>Network Cables</b>	7m (23ft) Cisco ONS-SC+-10G-CU7 Compatible 10G SFP+ Passive Direct Attach Copper Twinax Cable	\$ 42.00	250100.00	\$10,504,200.00
<b>Racks</b>	Server Cabinet Enclosures, RACK-15, 42U,Adjustable mounting depth	\$ 1,133.98	2977	\$ 3,375,858.46
<b>Storage Servers</b>	Dell 400-AJSC 600GB SAS Hard Drive Kit	\$ 252.00	16667	\$ 4,200,084.00
<b>Electric Power</b>	1400W High-efficiency AC power supply with Digital Switching Control & PMBus 1.2	9.47 cents/1kwh	1400 Watt	\$ 726,375,000.00
<b>Cooling</b>	A server package rated at 1400 watts running at maximum would theoretically generate 4480 BTU/hr.	9.47 cents/1kwh	(OperatingHour*BTU per hour*0.293)/1000	\$ 212,681,521.50
<b>Administration</b>	Data Center Administrator(Lead , 2 senior , Associate )	\$ 54,925.00	125	\$ 34,328,125.00
<b>TOTAL</b>	N/A	N/A	N/A	2.228 Billions

#### Cost of Public Cloud

	Description	Price per Item(Per month)	Quantity	Cost Per month	Total Price(5 Yrs)
<b>Compute Servers</b>	r3.large 2 15.2 SSD 1 x 32 Moderate	\$ 121.52	1000000	\$ 121,520,000.00	\$ 7,291,200,000.00
<b>Network Switches</b>	N/A	N/A	N/A	N/A	N/A
<b>Network Cables</b>	N/A	N/A	N/A	N/A	N/A
<b>Racks</b>	N/A	N/A	N/A	N/A	N/A
<b>Storage Servers</b>	Amazon S3 Storage Classes	First 50 TB/ month \$0.023 / GB	10000000.00	\$ 220,764.16	\$ 13,245,849.600
<b>Electric Power</b>	N/A	N/A	N/A	N/A	N/A
<b>Cooling</b>	N/A	N/A	N/A	N/A	N/A
<b>Administration</b>	AWS Support Business			\$ 3,659,122.93	\$ 219,547,375.80
<b>TOTAL</b>	N/A	N/A	N/A		7.524 Billion

## AWS cost

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Reset All

**Services** **Estimate of your Monthly Bill (\$ 125399886.97)**

**Estimate of Your Monthly Bill**  
☒ Show First Month's Bill (include all one-time fees, if any)

Below you will see an estimate of your monthly bill. Expand each line item to see cost breakout of each service. To save this bill and input values, click on 'Save and Share' button. To remove the service from the estimate, jump back to the service and clear the specific service's form.

Export to CSV

Service	Unit	Amount	Save and Share
Amazon EC2 Service (US East (N. Virginia))		\$ 121520000.00	
Amazon S3 Service (US East (N. Virginia))		\$ 220764.16	
AWS Support (Business)		\$ 3659122.93	
<b>Free Tier Discount:</b>		\$ -0.12	
<b>Total Monthly Payment:</b>		\$ 125399886.97	

Amazon EC2  
**Amazon S3**  
 Amazon Route 53  
 Amazon CloudFront  
 Amazon RDS  
 Amazon DynamoDB  
 Amazon ElastiCache  
 Amazon CloudWatch

## CPU, Memory and Storage config

Qty	Description	Unit Amount	Extended Amount
1	Iris 1181-2GPU	\$8,920.00	\$8,920.00
	<ul style="list-style-type: none"> <li>Intel Xeon E5-2600 v4 Series Processor</li> <li>Up to 512GB DDR4 2400MHz ECC Registered Memory</li> <li>Dual Port Gigabit Ethernet</li> <li>Supports 2x Double Width GPU's</li> <li>3 x 3.5" Hot-swap Drive Trays</li> <li>Integrated IPMI 2.0+KVM with Dedicated LAN</li> <li>1400W High Efficiency Power Supply</li> </ul>		
1	Intel Xeon E5-2683v4 16C 2.1GHz 40MB Cache		
1	128GB DDR4 ECC Reg 2133MHz (2 x 64GB)		
1	Samsung 850 Pro 256GB 3D MLC SATA SSD 6Gb/s		
1	Nvidia Tesla K10 8GB GDDR5 PCI-E Passive Cooling		
1	No Operating System. Include testing and customer OS preference in notes.		
1	Custom RAID Configuration - Add instructions to system notes		
1	Return to Depot Warranty (3 Year Hardware Warranty with Standard Advance Parts Replacement)		
<b>Total</b>			
		<b>Subtotal:</b>	\$8,920.00
		<b>Tax:</b>	TBD
		<b>Shipping:</b>	TBD
		<b>Total:</b>	\$8,920.00

## Fat-Tree network Infiniband

Non-blocking Cross Bi-directional Bandwidth (CBB) Configuration			Partially Configured		
Cluster Configuration To Use	Switch	Fully Configured	Switch Count	Port Count per Switch	Line Cards per Switch
Level 1 Switches	36-port Switch	556			
Level 2 Switches	648-port Switch		18	556	31

\* In some scenarios, the cluster may have Level 2 switches in which the number of ports required are different between the various switches. This optimization is accounted for here. If your configuration has two groups of switches specified, then your cluster can have two groups of switch types, in which one of the groups has less port count than the other group.

### Cables Required

Note to Level 1 Switch Cables	10000
Level 1 Switch to Level 2 Switch Cables	10008

### Cable Media Type

☐ Copper   
 ☐ Optical/Fiber   
 ☒ Both

### List Cable Lengths (in meters)

☒ All   
 ☐ Selected

**Please fill out the form below to receive complete cluster configuration and OEM specific product part numbers (SKU's).**

\* Note all fields are required.

[Home](#) > [Calculators](#) > [Electrical Calculators](#) > [Electricity bill calculator](#)

Electricity bill cost calculator. Electricity usage consumption calculator.

- 3 Configuration 3: Support deep learning with 1 exaflop of mixed precision performance (hint: each VM should be equivalent to p3.16xlarge instances; you will want to use the NVIDIA V100 GPUs (8 GPUs per node), and allocate 8-cores per GPU (64-cores per node) with 8GB of memory per core (512GB per node); the network to use is at least 10Gb/s per GPU (100Gb/s should work), and should be organized in a Fat-Tree network; in addition to the compute resources, a 1PB distributed storage shared across the entire cloud should be procured, with enough capacity for 10GB/sec throughput (for pricing comparison, see S3)

#### *Cost of Private Cloud*

	Description	Price per Item	Quantity	Total Price(5Yrs)
<b>Compute Servers</b>	Twin Node Server (1U ) Each Node config (CPU: 2x Intel Xeon E5-2683v4 16C 2.1GHz 40MB Cache , Memory: 1x 256GB DDR4 ECC Reg 2133MHz (4 x 64GB)+Dell NVIDIA Tesla V100 GPU, Cust Kit)	\$ 174,315.87	999.00	\$ 174,141,554.13
<b>Network Switches</b>	(a) Mellanox Switch-IB 2 MSB7890 - switch - 36 ports - smart - rack-mountable(Qty 56) (b) Mellanox MSX6506-NR 108 port FDR capable modular chassis includes 4 fans and 2 (N+N) (Qty 18)	13959.99 , 21,435.00	56(36 Port), 18(108 port)	\$ 1,167,589.44
<b>Network Cables</b>	7m (23ft) Cisco ONS-SC+-10G-CU7 Compatible 10G SFP+ Passive Direct Attach Copper Twinax Cable	\$ 42.00	2008.00	\$84,336.00
<b>Racks</b>	Server Cabinet Enclosures, RACK-15, 42U,Adjustable mounting depth	\$ 1,133.98	48	\$ 54,431.04
<b>Storage Servers</b>	Dell 400-AJSC 600GB SAS Hard Drive Kit	\$ 252.00	1667	\$ 420,084.00
<b>Electric Power</b>	1400W High-efficiency AC power supply with Digital Switching Control & PMBus 1.2	9.47 cents/1kwh	1400+1400 Watt	\$ 11,610,328.05
<b>Cooling</b>	A server package rated at 1400 watts running at maximum would theoretically generate 4480 BTU/hr.	9.47 cents/1kwh	(OperatingHour* BTU per hour*0.293)/1000	\$ 3,399,501.44
<b>Administration</b>	Data Center Administrator(Lead , 2 senior , Associate )	\$ 54,925.00	4	\$ 1,098,500.00
<b>TOTAL</b>	N/A	N/A	N/A	191.977 Million

#### *Cost of Public Cloud*

	Description	Price per Item(Per month)	Quantity	Cost Per month	Total Price(5 Yrs)
Compute Servers	r3.large 2 15.2 SSD 1 x 32 Moderate	\$ 17,919.36	999	\$ 17,901,440.64	\$ 1,074,086,438.40
Network Switches	N/A	N/A	N/A	N/A	N/A
Network Cables	N/A	N/A	N/A	N/A	N/A
Racks	N/A	N/A	N/A	N/A	N/A
Storage Servers	Amazon S3 Storage Classes	First 50 TB/ month \$0.023 / GB	1000000.00	\$ 22,583.30	\$ 1,354,998.000
Electric Power	N/A	N/A	N/A	N/A	N/A
Cooling	N/A	N/A	N/A	N/A	N/A
Administration	AWS Support Business			\$ 544,620.72	\$ 32,677,243.20
TOTAL	N/A	N/A	N/A		1108.119 Million

*CPU, Memory and Storage config*

### Shopping Cart

Qty	System	Description			
1	Iris 1228	view components	\$18,250.59	\$18,250.59	<a href="#">Edit System</a> <a href="#">Delete System</a>
<p> <b>CPU:</b> 2x Intel Xeon E5-2683v4 16C 2.1GHz 40MB Cache  <b>Memory:</b> 1x 256GB DDR4 ECC Reg 2133MHz (4 x 64GB)  <b>HDD:</b> 1x Seagate Enterprise Capacity 1TB 6Gb/s 7200rpm 128MB SATA  <b>Operating System:</b> 1x No Operating System. Include testing and customer OS preference in notes.  <b>CPU:</b> 2x Intel Xeon E5-2683v4 16C 2.1GHz 40MB Cache  <b>Memory:</b> 1x 256GB DDR4 ECC Reg 2133MHz (4 x 64GB)  <b>Operating System:</b> 1x No Operating System. Include testing and customer OS preference in notes.  <b>Warranty and Support:</b> 1x Return to Depot Warranty (3 Year Hardware Warranty with Standard Advance Parts Replacement) </p>			close		
<a href="#">Create Quote from Webcart</a> <a href="#">Why create a quote?</a>			<b>Total</b>	\$18,250.59	<a href="#">Checkout</a>

www.dell.com/en-us/work/shop/accessories/apd/490-bedx?cid=302824&st=&gclid=CjwKCAjwwuvWBRBZEIwALXqjwx813-QRjhaybuNrvUr0aOc

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## Dell NVIDIA Tesla V100 GPU, Cust Kit

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Dell Part 490-BEDX

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★ Get up to \$585 back in rewards

Ship Date 5/11/2018   Order Code 490-bedx



*Fat-Tree network Infiniband*



Select OEM

Mellanox

Enter Number of Nodes in Cluster

1944 (Max Nodes)

1000

CALCULATE

Select Level 1 Switch:

36-port Switch

Select Level 2 Switch:

108-port Switch

Select Blocking Configuration:

Non-blocking

Select Switch Configuration Data Rate

☒ FDR-10 40 Gb/s

☐ QDR 40 Gb/s

☐ FDR 56 Gb/s

☐ EDR 100 Gb/s

☐ HDR 200 Gb/s

Select Adapter Configuration Data Rate

☒ FDR-10 40 Gb/s

☐ QDR 40 Gb/s

☐ FDR 56 Gb/s

☐ EDR 100 Gb/s

☐ HDR100 100 Gb/s

☐ HDR 200 Gb/s

Select Host Adapter Type

☐ Dual Port

☒ Single Port

Non-blocking Cross Bisectional Bandwidth (CBB) Configuration

Cluster Configuration To Use	Switch	Fully Configured	Partially Configured		
			Switch Count	Port Count per Switch	Line Cards per Switch
Level 1 Switches	36-port Switch	56			
Level 2 Switches	108-port Switch		18	56	4

\* In some scenarios, the cluster could have Level 2 switches in which the number of ports required are different between the various switches. This optimization is accounted for here. If your configuration output has two groups of switches specified, then your cluster can have two groups of switch types, in which one of the groups has less port count than the other group.

Cables Required

Node to Level 1 Switch Cables	1000
Level 1 Switch to Level 2 Switch Cables	1008

Cable Media Type

☐ Copper

☐ Optical/Fiber

☒ Both

List Cable Lengths (in meters)

☒ All

☐ Selected

Please fill out the form below to receive complete cluster configuration and OEM-specific product part numbers (SKUs).

\* Note all fields are required.

First Name

Last Name

Title

Company Name

Power usage

Electricity bill cost calculator. Electricity usage consumption calculator.

Select country:

United States

Typical appliance:

Desktop computer

Power consumption:

2800

watts (W)

Hours of use per day:

24

h/day

1 kilowatt-hour (kWh) cost:

9.47

cent

Calculate

Reset

Electricity cost per day:

\$6.36384

Electricity cost per month:

\$193.699

Electricity cost per year:

\$2324.39

Summary

	Configuration 1(Million)	Configuration 2 (Billion)	Configuration 3 (Million)
<b>Public Cloud (including EC2 and S3) Cost over 5 years, 24/7 operation, with 100% usage.</b>	\$ 392.43	7.524	1108.119
<b>Private Cloud cost over 5 years, 24/7 operation, with 100% usage</b>	\$ 77.76	2.228	191.977
<b>What utilization must be achieved with the private cloud to make the private cloud option more attractive than the public cloud?</b>	19.82%	29.61%	17.32%
<b>Summary</b>	Private cloud only costs 19.82% of AWS, Or if we need the resources for small projects less than 11.9 months	Private cloud only costs 29.62% of AWS, Or if we need the resources for small projects less than 17.8 months	Private cloud only costs 17.33% of AWS, Or if we need the resources for small projects less than 10.4 months