



What is the real cost of Commercial Cloud provisioning?



SouthGrid in numbers



CPU [cores]	RAM [TB]	Disk [TB]	Manpower [FTE]	Power [kW]
5100	10.2	3000	7	1.5 x 319 (478*)
Cost per month			58,333 GBP	30,000 (45000) GBP
Cost per year			700,000 GBP	360,000 (540,000) GBP
One off	1,530,000.00 GBP			

Used for estimates:

* Estimate for old hardware

- Average box (based on our Intel Hadoop workers):
 - 12 cores, 24 GB RAM, 24 TB HDD
 - 500 W max
 - 3,600 GBP
- Price per kWh: 0.13 GBP
- Costs per FTE: 100,000 GBP per year (not the salary)
- Factor for old hardware: 1.5 (8 core machines)
- Factor for cooling: 1.5



SouthGrid in numbers



- Hardware
 - 5100 cores
 - 10.2 TB RAM
 - 3 PB of storage
- Network
 - 420 TB incoming transfers per month
 - 130 TB outgoing transfers per month
 - Peak rates for SGrid around 340 MB/s



Commercial Cloud Providers





Amazon



- Many instance types
 - General purpose (from 1 vCPU, 1.7 GB RAM to 8 vCPU 30 GB RAM, 160 to 4 x 420 GB HDD)
 - Compute optimised (from 2 vCPU, 1.7 GB RAM to 32 vCPU 60.5 GB RAM, 10 Gbit network, up to 4 x 840 GB)
 - Memory optimised (2-32 vCPU, 17.1-244 GB RAM, 2 x 840 GB or 2x 120 GB SSD)
 - Storage optimised (16 vCPU, 60.7-117 GB RAM, 2 x 1024 GB SSD to 24 x 2048 GB SSD)
 - Micro and GPU instances



Rackspace



- Both cloud and dedicated servers
 - 4 vCPU, 8 GB RAM, 320 GB HDD, \$0.48/h, \$350/month
 - managed cloud + \$100 per month (<http://www.rackspace.com/cloud/servers/>)
 - Dedicated servers: 4 cores, 8GB RAM, 2 x 146 GB 15k SAS RAID, \$789/month + 2 TB free bandwidth



Softlayer



- Many configuration options
 - 2 x Intel Xeon 2620: 6 Core @ 2 GHz, 32 GB RAM,
 - Unlimited bandwidth option (\$2000 per machine though)
 - Storage server option (\$3600 for above machines with 36 x 4 TB HDD = 144 TB)
 - Cloud: 16 cores @ 2 GHz, 32 GB RAM, 100 GB HDD, \$1.52/h or \$1042/month



Joyent



- Again, many options (
<http://www.joyent.com/products/compute-service/pricing>)
- Cheapest (per CPU with \geq 2GB RAM): 1vCPU, 3.75 GB RAM, 56 GB HDD, 1 Gbit/s (10 Gbit/s) with Linux (SmartOS), \$0.12/h
- Only provider with offers for large storage: 3 PB = \$84,707 per month



Windows Azure



- Has a Linux option (even cheaper than windows)
- Not many options
 - 1 vCPU, 1.75 GB RAM, \$0.06/h, \$45/month (cheaper for longer periods)
 - Same ratio for 2, 4 and 8 vCPU



Costs from webpage



Provider	Per hour	Per month	Network in	Network out	Total per month
Amazon	\$0.065 – \$0.13(not enough RAM though)	---	\$0	\$0.05	\$245180
Rackspace	\$0.48	\$350	\$0	\$0.12	\$461850
Rackspace D		\$789	\$0	\$0.12	\$1021335
Softlayer	\$1.52	\$1042	\$0	\$0.10	\$345138
Softlayer D		\$639	\$0	\$0.10	\$284575
Joyent	\$0.12		?	?	\$440640
Windows Azure	\$0.06 (not enough RAM though)	\$45	\$0	\$0.08	\$239900



Openstack (Infrastructure as a service)



- Common between the providers (to some extent)
- Makes it easy to rent resources on the fly
- [http://www.cio.com/article/735131/
CERN Modernizes IT Infrastructure with Openstack
and Puppet](http://www.cio.com/article/735131/CERN_Modernizes_IT_Infrastructure_with_Openstack_and_Puppet)
- And London-Grid as well (HLT cloud)
- From Redhat summit:
[http://rhsummit.files.wordpress.com/2013/06/
bryant t 0340 openstack architecture1.pdf](http://rhsummit.files.wordpress.com/2013/06/bryant_t_0340_openstack_architecture1.pdf)



Focus: Rackspace



- CERN is using them:
 - <http://openlab.web.cern.ch/news/rackspace-joins-cern-openlab-contributor>
 - http://www.theregister.co.uk/2013/07/01/rackspace_cern_openstack_partnership/
- Two pricing scenarios:
 - Managed cloud on our hardware
 - Cost of renting hardware
 - Both with 0.5 MGBP per year in mind



Managed cloud on our hardware



- 109 nodes (running Ubuntu 12.04):
 - 2 control nodes
 - 2 neutron nodes (network as a service)
 - 105 compute nodes (1260 cores)
- Total of 297,900 GBP per year
- More details in backup slides



Renting a data centre



- 0.5 MGBP
 - Cisco ASA 5520 Firewall – 184.81 GBP per month
 - 2 controllers (12 core + HT @2.5 GHz, 128 GB RAM, 8 x 600 GB 15k SAS in RAID 10, 100Mbps network)
 - 62 nodes (same as controllers)
 - 2 neutron nodes (same as controllers)
 - **494,802.12 GBP per year** for effective 744 cores



Summary Rackspace



- Managed SouthGrid by Rackspace:
 - 1,205,785.71 GBP per year
 - Hardware + electricity on us
- Renting SouthGrid from Rackspace:
 - 3,391,788.73 per year (2,150,412 less than renting VMs from them or 8,864,232 less than real HW)
 - 1 PB of storage on nodes
 - 100 Mbps per node



Summary



- Estimated current cost of SouthGrid:
 - 1,560,000 GBP per year (FTEs, power, new hardware => lower estimate)
- Cloud solutions
 - 3,414,900 GBP per year (Softlayer without reductions)
 - 3,391,788.73 per year from Rackspace
- Renting VMs or real hardware still quite expensive
 - Network transfer costs went down in the past years
 - Maybe the rest will follow



Backup slides





Managed cloud on our hardware



Controllers

Role	Nodes	Tier Price/Month/Node	Monthly Recurring Fee	Annual Recurring Fee
Controllers	2	£ 250	£ 500	£ 6,000

Compute & Neutron Nodes Tiered Pricing Model

Tier	Nodes	Tier Price/Month/Node	Monthly Recurring Fee	Annual Recurring Fee
First	56	£ 200	£ 11,200	£ 134,400
Next	180	£ 75	£ 13,500	£ 162,000
Next	240	£ 30	£ 7,200	£ 86,400

Below are the fees using the above tiered pricing for compute and neutron nodes

Bristol Environment of 105 Compute & 2 Neutron Nodes = Total of 107 Nodes

Compute Nodes	Tier Price/Month/Node	Monthly Recurring Fee	Annual Recurring Fee
1-56	£ 200	£ 21,000	£ 252,000
57-107	£ 75	£ 3,825	£ 45,900
Total		£ 24,825	£ 297,900



Renting from Rackspace - 1



Center: Kubik (LON3)

Cisco ASA 5520 Firewall Int'l

Quantity	One Time Per Unit	Total One Time	Monthly Per Unit	Total Monthly
1	£75.00 GBP	£75.00 GBP	£184.81 GBP	£184.81 GBP

- Single Device
- 450 Mbps Aggregate and 280,000 Concurrent Connections
- Stateful packet inspection
- Cisco VPN Access - Client to Site: Five (5) included [SKU: 106239]
- Managed Colocation - One Hour Hardware Replacement Guarantee

A - Controllers

Performance One - Gold

Quantity	Setup Per Unit	Total Setup	Monthly Per Unit	Total Monthly
2	£0.00 GBP	£0.00 GBP	£621.95 GBP	£1,243.90 GBP

- **Operating System:**OpenStack on Ubuntu 12.04
- **Processor:**Dual Processor, Hex Core Intel 2.50GHz (Std.)
- **Memory:**128 GB (Std.)
- **Drive and RAID Configuration:**
 - RAID 10 [SKU: 102694]
 - 600 GB (15K SAS 3.5") - Qty: 8
- **Network:**100 Mbps
- **Additional Network Connection(s):**Intel I350 Quad Port (Std.) - Qty: 1
- **Managed Backup:**No Backup
- **Drive Partitioning:**Rackspace Suggested Partitioning
- **Rackspace Private Cloud - OpenStack:**
 - Environment Support Level: Core Software Support (Requires Hosted Private Cloud Server Support)
 - Server Role: Nova Controller



Renting from Rackspace - 2



Int'l - Performance One - Gold				
Quantity	Setup Per Unit	Total Setup	Monthly Per Unit	Total Monthly
62	£0.00 GBP	£0.00 GBP	£621.95 GBP	£38,560.90 GBP
<ul style="list-style-type: none"> • Operating System:OpenStack on Ubuntu 12.04 • Processor:Dual Processor, Hex Core Intel 2.50GHz (Std.) • Memory:128 GB (Std.) • Drive and RAID Configuration: <ul style="list-style-type: none"> ◦ RAID 10 [SKU: 102694] ◦ 600 GB (15K SAS 3.5") - Qty: 8 • Network:100 Mbps • Additional Network Connection(s):Intel I350 Quad Port (Std.) - Qty: 1 • Managed Backup:No Backup • Drive Partitioning:Rackspace Suggested Partitioning • Rackspace Private Cloud - OpenStack: <ul style="list-style-type: none"> ◦ Environment Support Level: Core Software Support (Requires Hosted Private Cloud Server Support) ◦ Server Role: Nova Compute 				

Neturon Int'l - Performance One - Gold				
Quantity	Setup Per Unit	Total Setup	Monthly Per Unit	Total Monthly
2	£0.00 GBP	£0.00 GBP	£621.95 GBP	£1,243.90 GBP
<ul style="list-style-type: none"> • Operating System:OpenStack on Ubuntu 12.04 • Processor:Dual Processor, Hex Core Intel 2.50GHz (Std.) • Memory:128 GB (Std.) • Drive and RAID Configuration: <ul style="list-style-type: none"> ◦ RAID 10 [SKU: 102694] ◦ 600 GB (15K SAS 3.5") - Qty: 8 • Network:100 Mbps • Additional Network Connection(s):Intel I350 Quad Port (Std.) - Qty: 1 • Managed Backup:No Backup • Drive Partitioning:Rackspace Suggested Partitioning • Rackspace Private Cloud - OpenStack: 				