

Cloud computing to do more

W. Trimble

2014Argonne Soils Workshop

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Saturday afternoon—really, guys?

What problems does this solve?

- “The classroom problem” everyone clicks “submit at the same time-> crashes servers
- Data too big to process on your laptop.
- Campus cluster is down for maintenance
- Data analysis takes too long on one computer.

What is cloud computing?

(for scientists)

- You can “rent” access to computers and disk space from a commercial provider of same.
- This provides you with a way to scale your computation for “burst” periods, without investing in hardware.
- Or you can just use a bigger, faster computer.

Why “cloud”?!



...because the diagram that CS people use to represent abstract compute resources looks like a cloud.

Amazon is a major cloud computing provider

- Did you know they rent computers!?
- Rumors are that it's more lucrative than their book selling division...



Terms

EC2 – Elastic Cloud Computing, computer rental from Amazon.

EBS – Elastic Block Storage, virtual hard drive rental from Amazon.

Some quick calculations:

1 small machine, / yr:

1.7gb of RAM, a ~1.0 GHz single-core CPU, 160gb of local disk.

\$.06 / hr

8760 hrs / year

=> ~\$525/ year.



~a somewhat effective server replacement.

1 high-memory quadruple extra-large instance / yr:

68.4 gb of RAM, 8 core @ ~3.2 GHz, 1.7tb of local disk.

\$1.64 / hr

8760 hrs / year

=> \$14,400 / year



20 high-CPU extra large machines, for a day:

7gb of RAM, 8 x 2.5 GHz CPUs, 1.7tb of local disk.

\$0.58 / hr

24 hrs / day

20 machines

=> ~\$278/ day.



Why is EC2 so expensive??

- They cover *all* hardware, power, air conditioning and network costs.
- That's actually way more expensive than you think. (Talk to your sysadmin or HPC person...)
- They do not operate at 100% capacity,
- They want to make \$\$.



What are **we** using it for?

- Teaching workshops and classes.
- Running MG-RAST, RAST, and assembly rast with kBase backends.
- Scientific computing workhorses without the sysadmins
- Automated testing on clean machines with known software install.

Today's tutorials

1. Log in to a new (blank) machine from Amazon. (We have provided these for you).
2. Install NCBI BLAST
3. Download & format some databases
4. Run BLAST
5. Produce an excel spreadsheet of best hits
- ...
1. Run 2-way BLAST (ecoli x ecoli strains)
2. Calculate reciprocal best hits
3. Produce an excel spreadsheet of putative orthologs

Today's tutorials

1. Get some short-read data onto our instance
2. Download a reference sequence
3. Run short-read aligner BWA
4. Visualize the result

This is a tool for when your data is bigger than your laptop, or for when your campus cluster is down.