Outline:
- Cloud computing on Amazon Web Services
- Timing Fortran codes

Reading:
- class notes: AWS section
- class notes: Timing code section

Cloud Computing
- Computing resources as a “utility”.
- Rent computer time by the hour as needed.
- Avoid buying computers that will sit idle most of the time.

- Provide a computing platform with necessary software pre-installed.

Amazon Web Services (AWS)
- Elastic Cloud Computing (ECC)
- Scalable Storage (S3)
- Many other services: aws.amazon.com

Several instance types are available.
- Free usage tier: Can run one “micro-instance” free for a year. (1 EC2 compute unit, 613 MiB memory)
- C1, High CPU medium instance: 2 cores with 5 EC2 units, 1.7 GiB memory.
- See the Price list
Amazon Machine Images (AMIs)

Choice of virtual machines to use when launching an instance.

See the List of basic AMIs

For this class, and AMI is available with much of the software needed.

https://console.aws.amazon.com/ec2/home?region=us-west-2#launchAmi=ami-b47feb84

AWS demo

See the instructions in the class notes: AWS section

Note:

• You will need to create an account
• and create a key-pair
• and a security group
• On a Mac, for X-window forwarding you need to install Xcode
• On Windows, you need an ssh client such as putty
  For X-window forwarding you also need xming

AMath 483/583 — Lecture 15

Outline:

• Timing Fortran codes

Reading:

• class notes: Timing code section
• $UWHPSC/codes/fortran/timings.f90
• $UWHPSC/codes/openmp/timings.f90
Determining CPU and execution time

Unix `time` command, e.g.

```
$ time ./a.out
<output from code>
```

```
real 0m5.279s
user 0m1.915s
sys 0m0.006s
```

Means the elapsed (wall clock) time was 5.279 seconds,
CPU time dedicated to your code was \( \approx 1.915 \) seconds.
System time \( \approx 0.006 \) seconds.

Doesn't allow examining parts of code, not always very accurate.

**Note that timing small codes can be deceptive**

Fortran timing utilities

- `system_clock`: elapsed time between 2 calls.
- `cpu_time`: CPU time used between 2 calls.

See class notes: Timing code