Cloud Computing: Lab Exercise 1

1. Log into your AWS account and begin the setup. Go to the `EC2` service.

   - Create a key pair.
   - `chmod 400 /path/my-key-pair.pem`

2. Launch an instance a t2.micro instance of "RedHat 7.5" and connect to it.

   ```
   ssh -i /path/my-key-pair.pem ec2-user@[Instance's Public DNS]
   ```

   A helpful reference is `http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/concepts.html`. Make sure to set up security rules such that you can connect via `ssh`, `http` and `https`.

3. Install `gcc-gfortran gcc cmake wget` and other packages as needed using

   ```
   sudo yum install [packageName]
   ```

4. Download LAPACK 3.8 from `http://www.netlib.org/lapack/lapack-3.8.0.tar.gz` using `wget`, then install and execute the tests.

   ```
   tar -xvzf lapack-3.8.0.tgz
   mkdir bld-lapack
   cd bld-lapack
   export CMAKE_Fortran_COMPILER=gfortran
   cmake ../lapack-3.8.0   \
     -DCMAKE_INSTALL_PREFIX=${HOME}/LIB \
     -DCMAKE_BUILD_TYPE=Release \
     -DBUILD_TESTING=ON -DBUILD_DEPRECATED=ON
   make
   make test
   make install
   ```

5. Try out performance with the `LINPACK` Benchmark rules:

   - Read about LINPACK Benchmark at `https://www.top500.org/project/linpack/`
   - Download `lapack-timing-lab.tgz` from blackboard;
   - Create a `benchmark` directory under your `$HOME`, then `cd` to it, and unpack the tar file, then build and test with the default NETLIB library:

     ```
     cd $HOME
     mkdir benchmark
     cd benchmark
     tar xzf ../lapack-timing-lab.tgz
     cd TIMING
     make
     mv xlintimd xlintimd.netlib
     ./xlintimd.netlib < dtime.in | tee dtime-netlib.out
     ./xlintimd.netlib < hpc.in | tee hpc-netlib.out
     ```

   - Look up the performance you get from `DGETRF`, and use it as an approximation of the LINPACK values.

6. Install the ATLAS library using

   ```
   sudo yum-config-manager --enable rhui-REGION-rhel-server-extras rhui-REGION-rhel-server-optional
   sudo yum install atlas atlas-devel
   ```

7. Repeat the LINPACK exercise with ATLAS, by doing:

```
cd $HOME/benchmark
cp make.inc.atlas make.inc
cd TIMING
make
mv xlintimd xlintimd.atlas
./xlintimd.atlas < dtime.in | tee dtime-atlas.out
./xlintimd.atlas < hpc.in | tee hpc-atlas.out
```

8. Look up the complete history of the TOP500 list from `https://www.top500.org/lists/top500/`; what is the latest time at which your virtual machine would have made it into the TOP500?

9. Assuming (for the sake of the argument) that you can achieve perfect speedup, how many virtual machines would you need to make it into the current TOP500?

Remember to terminate your instances at the end of the week.