Mobile Cloud Computing

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Project Description

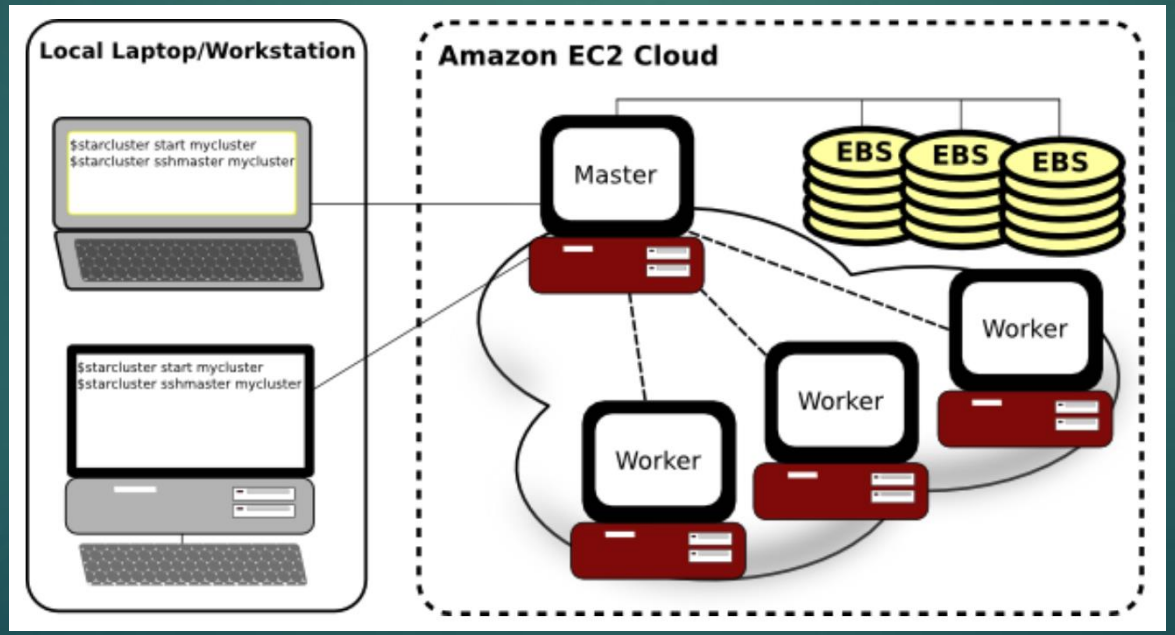
- Our goal is to simulate computational offloading of a compute-intensive task on an android application to a cloud server.
  - Server will complete the task via distributed computation.
  - Data will be an array of at least 100,000 elements conceptualizing a large data set--data that is too large to store on an android device.
  - Program on the cloud server will be performing an exhaustive search and comparison to simulate the computational offloading.
  - In order to create a compute-intensive environment, the algorithm is going to search and compare the 100,000-element-sized array with itself. Forcing the algorithm to perform with a time complexity of O(n^2). A slower time run will allow us to see a difference in computational performance.

Project Environment

- Amazon Web Services(AWS) EC2
  - Starcluster AMIs
- Android OS
- Linux OS
- StarCluster
- Message passing interface(MPI)
  - mpi4py for Python

StarCluster

- StarCluster- Is a tool kit that manages computer clusters hosted on Amazon's EC2 Cloud. It is designed to automate and simplify the process of building, configuring, and managing clusters of virtual machines.

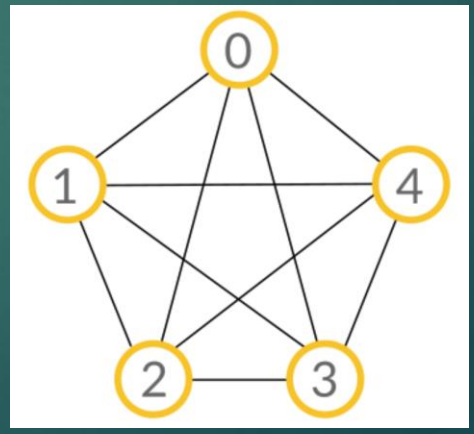


StarCluster

- Security Groups- The starcluster configures a security group for our cluster allowing us to control network access to the cluster.
- Password-less SSH: The star cluster configures the cluster in order for the SSH to be used from any node within the cluster without having to login using a password.
- Network File System (NFS)- able to attach Elastic Block Storage (EBS) volumes on the cluster in order to obtain persistent storage.
- Within in the star cluster we can dynamically resize clusters in order to make it scalable.

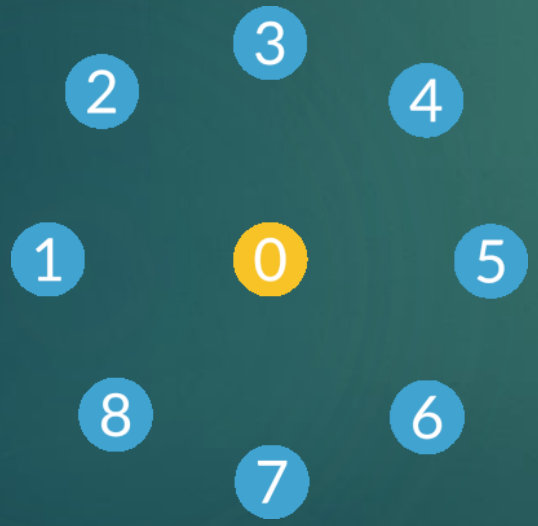
Message Passing Interface(MPI)

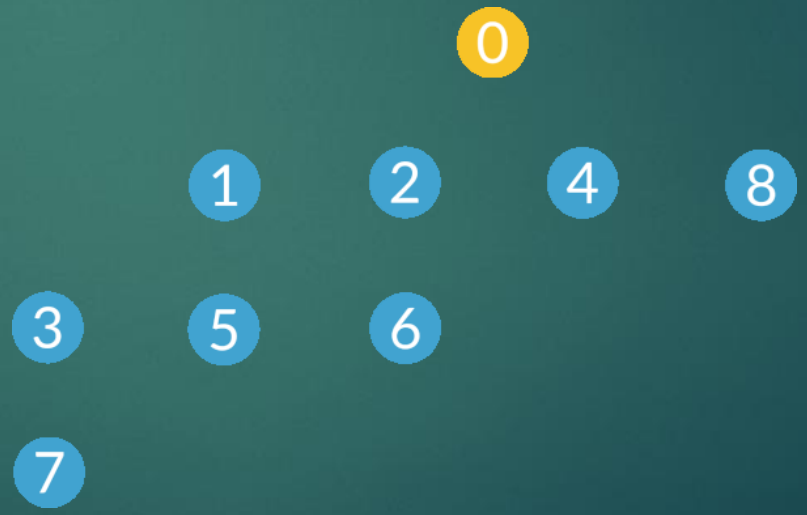
- MPI- Standardized message passing library interface that can be used in different languages (ex. C, C++, python).
- MPI is good for high performance computing and parallelism because it handles the passing of messages between different processes.
- Distributed computing- Takes a single task and distributes it among computers in order to complete a task.
- Point to point communications- MPI uses point to point communications to communicate from one process to another.
  - Blocking/Non-blocking communication
  - Race conditions



Message Passing Interface(MPI)

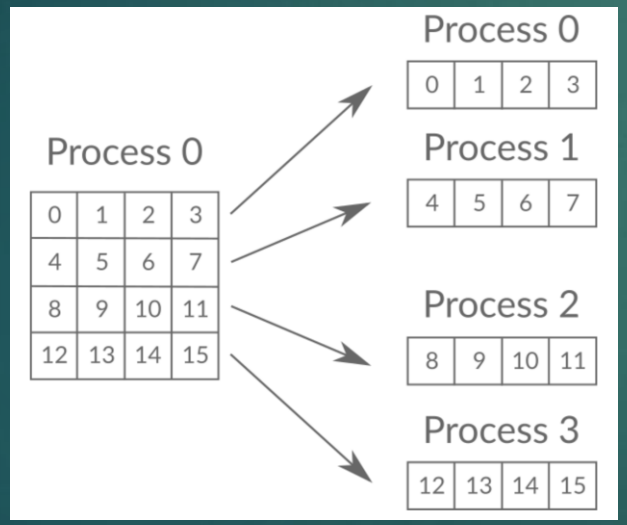
- Collective communication- There are two types: Broadcasting and Scattering/Gathering.
  - Broadcasting: One process broadcasts the same information to every process.

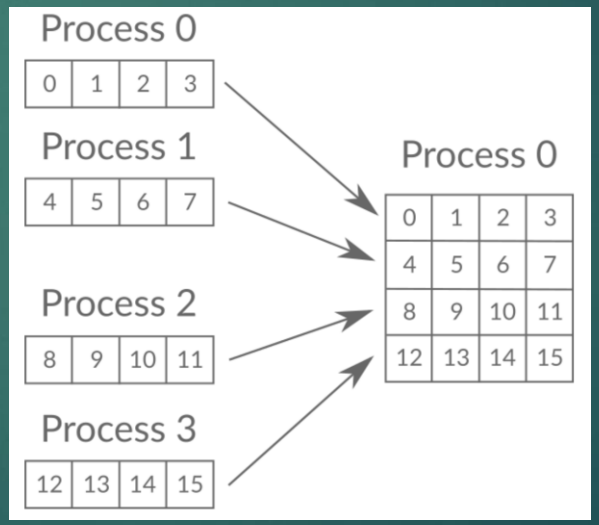




Message Passing Interface(MPI)

- Collective communication- There are two types: Broadcasting and Scattering/Gathering.
  - Scattering/ Gathering: Are used in order to distribute and gather data.





Demonstration

To be continued...

- Still a work in progress we need to create the android application
  - User interface
- Have communication between application and cloud server
  - Socket programming (Java/Python)
- Testing/Debugging

References

- StarCluster
  - http://star.mit.edu/cluster
- Distributed computing with MPI
  - https://www.codingame.com/playgrounds/349
- Open MPI
  - https://www.open-mpi.org
- mpi4py
  - https://mpi4py.readthedocs.io

Questions?