MPI Clusters within a LAN

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Running a code in multiple system is easier with MPI cluster within a LAN. I am assuming all are using Linux systems. I tried testing it with Ubuntu and running it on 4 system having 1 as master and rest as client systems.

Note: Check that all the system have same version of OpenMPI or MPICH2

Step 1: Install MPICH2 or OpenMPI

Install MPICH2 in all the system i.e,

$ sudo apt install -y mpich

In case the above command is not running, download the tar file from here and follow the following steps.

$ tar -xzf mpich2–1.4.tar.gz
$ cd mpich2–1.4
$ ./configure — disable-fortran
$ make; sudo make install

or

Install OpenMPI in all the systems i.e,

$ sudo apt-get install libopenmpi-dev openmpi-bin openmpi-doc

Step 2: Configure the Host file

Over here we will map the IP addresses to the host names so that we don't have to type the ip addresses again and again

Master:

$ sudo nano /etc/hosts
127.0.0.1 localhost
#MPI SETUP
100.96.100.1 master
100.96.100.2 client1
100.96.100.2 client2
100.96.100.2 client3

Client1:

$ sudo nano /etc/hosts

127.0.0.1 localhost
#MPI SETUP
100.96.100.1 master
100.96.100.2 client1

Client 2:

$ sudo nano /etc/hosts
127.0.0.1 localhost
#MPI SETUP
100.96.100.1 master
100.96.100.2 client2

Client 3:

$ sudo nano /etc/hosts
127.0.0.1 localhost
#MPI SETUP
100.96.100.1 master
100.96.100.2 client3

Save all the files and exit.

Step 3: Create a new user

I will advice to create a new user with same name in all devices

$ sudo adduser mpiuser

Set a password for each machine.

Step 4: Setting up SSH

The systems will be communicating via ssh and sharing data over nfs. Install
the openssh in all the system

$ sudo apt install openssh-server

Change User:

$ su -mpiuser

#key generation

$ ssh-keygen -t rsa

#create .ssh directory on client

$ ssh mpiuser@client1 mkdir -p .ssh

type yes when promted

then type the password of client1

#Upload generated public keys to client

$ cat .ssh/id_rsa.pub | ssh mpiuser@client1 'cat >> .ssh/authorized_keys'

Enter the password of client1 when prompted

#Set permission on in client

$ ssh mpiuser@client1 “chmod 700 .ssh; chmod 640 .ssh/authorized_keys”

#Login to client without password

$ ssh mpiuser@client1

Note: Do the same for other clients from master

Note: Do the same for master from all clients

Step 5: Setting up NFS

NFS is used to share the object file among all the systems and the shareable datas.

Master:

Install the server nfs in the master to mount the shared folder

#nfs for server installation

$ sudo apt install nfs-kernel-server

 # Create a sharable folder

$ mkdir storage

 # Create an entry in /etc/exports

$ cat /etc/exports
/home/mpiuser/storage *(rw,sync,no_root_squash,no_subtree_check)

 # run the command after any change to /etc/exports

$ exportfs -a

 # Restart the nfs server

$ sudo service nfs-kernel-server restart

Client:

 # Install nfs for client

$ sudo apt-get install nfs-common

#Create a shareable folder with the same name as master

$ mkdir storage

#mount the master folder to client

$ sudo mount -t nfs master:/home/mpiuser/storage ~/storage

#check if the mount is successful

$ df -h

#Reboot your client system.

 # Add the entry to the file system table

$ cat /etc/fstab
#MPI CLUSTER SETUP
master:/home/mpiuser/storage /home/mpiuser/storage nfs

Step 6: Run a program

change directory in master node

$ cd storage/
$ pwd
/home/mpiuser/storage

Create a Hello World MPI program in C with name helloworld_MPI.c

#compile the code

$ mpicc helloworld_MPI.c

#run the code

$ mpirun -np 4 -hosts master,client1,client2,client3 ./a.out

Hopefully it will work out for you all when you try to make a MPI Cluster

Mpi Cluster Ssh Hello World Parallel Computing

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