

# OpenMPI – Distributed Computing

## How to use OpenMPI

After restart any slave , you should enter this command in restarted machine:

- Sudo mount master:/home/mpi/Desktop/sharedfolder /home/mpi/Desktop/sharedfolder

With this command , all sharedfolder in Desktop will sync with master sharedfolder

For run any MPI application in cluster , you should run it in master :

- At the first compile application
  - Go to this directory : `cd /home/mpi/Desktop/sharedfolder` and open terminal
  - `Mpicc <mpi-file> -o ./outputfile`
- After compile, you can run compiled program with 6 slots in 3 machine (one master and two slave)
  - `Mpirun -hostfile /etc/hostfile1 -np 6 ./outputfile`

If you run “top” command in any machine, you will see “outputfile” in top of list

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# How to add a slave to OpenMPI cluster

### STEP1: Install SSH on new slave and exchange public keys

#### On new slave enter this command

- Sudo apt-get update
- Sudo apt-get upgrade
- Sudo apt-get install net-tools
  - Set a IP static for machine and remember that
- Sudo apt-get install openssh-server
- mkdir ~/.ssh
- chmod 700 ~/.ssh
- ssh-keygen -t rsa
  - press enter button or enter yourself directory
  - set password(optional)
- ssh-copy-id -p 22 -I ~/.ssh/id\_rsa.pub < master-username >@<master-ip>
  - this file should be added in authorized-keys file in ~/.ssh directory of master
- sudo nano /etc/ssh/sshd\_config
  - uncomment PubkeyAuthentication yes
  - enter at next line: RSAAuthentication yes
- sudo nano /etc/hosts
  - enter this line in file: <master-ip> master

#### On master enter this command

- ssh-copy-id -p 22 -I ~/.ssh/id\_rsa.pub < newslave-username >@<newslave-ip>
  - this file should be added in authorized-keys file in ~/.ssh directory of newslave
- sudo nano /etc/hosts
  - enter this line in file: <newslave-ip> <slave-name>

#### At end of Step1 you can

- Enter this line in master: ssh <newslave-name>
  - You will connect to <newslave-name> via ssh without password
- Enter this line in <newslave-name>: ssh <master>
  - You will connect to master with via without password

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## Step2: configure NFS as a file sharing service in new slave and sync with master

### On master enter this command

- Sudo nano /etc/exports
  - Insert this line in file: /home/mpi/Desktop/sharedfolder <newslave-ip>(rw,sync,no\_subtree\_check)
- Sudo exportfs -a
- Sudo systemctl restart nfs-kernel-server

### On new slave enter this command

- Sudo apt-get install nfs-common
- Sudo mkdir -p /home/mpi/Desktop/sharedfolder
- Sudo mount <master-ip>:/home/mpi/Desktop/sharedfolder /home/mpi/Desktop/sharedfolder

### At end of Step2 you can

- Every change in sharedfolder directory will appear for all machine in sharedfolder directory

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## Step3: install OpenMPI for new slave

### On new slave enter this command

- Sudo apt-get install gcc
- Sudo apt-get install openmpi-bin openmpi-common libopenmpi-dev libgtk2.0-dev
- Download OpenMPI: version 4.0.0 then copy it in Desktop
- Run terminal in Desktop and enter this command: `tar -xvf /home/mpi/Desktop/openmpi-4.0.0`
- Go to openmpi-4.0.0 file extracted in Desktop and enter this command in terminal
  - `./configure --prefix="/home/mpi/.openmpi"`
  - Make
  - Sudo make install
  - `export PATH="$PATH:/home/mpi/.openmpi/bin"`
  - `export LD_LIBRARY_PATH="$LD_LIBRARY_PATH:/home/mpi/.openmpi/lib"`

### On new slave enter this command

- `sudo nano /etc/hostfile1`
  - define number of slots for new slave
    - add this command to this file: `<newslave-name> slots=2`
    - save and exit

### At end of Step3 you can

For test, run command “`mpirun`” or “`mpicc`”, it should show error about couldn't find anything to do.

When you see this error is meaning, configure is finished correctly.

And a new slave added to cluster.