Raspberry Pi Cluster Setup

1. Install OS onto microSD card
   a. Master node options
      i. Raspbian
      ii. Raspbian Lite
   b. Slave nodes → Raspbian Lite
   c. Raspberry Pi Imager makes this easy

2. Setup geographic info
   a. $ sudo raspi-config
   b. “5. Localization Options”
      i. “L1. Locale”
         1. Deselect “en_GB.UTF-8 UTF-8”
         2. Select “en_US.UTF-8 UTF-8”
         3. Select “en_US.UTF-8” as default
      ii. “L2. Timezone”
         1. “US”
         2. “Central”
      iii. “L3. Keyboard”
         1. Select “HP Pavilion ZT1100” or “Generic 104-key PC”
         2. Select “Other”
         3. Select “English (US)”
         4. Select “English (US)”
         5. Select “No AltGr key”
         6. Select “No compose key”

3. Setup Wi-Fi connection
   a. $ sudo raspi-config
   b. “1. System Options”
   c. “S1 Wireless LAN”
   d. Select “US United States”
   e. Enter Wi-Fi information
   f. Exit raspi-config

4. Change hostname
   a. $ sudo raspi-config
   b. “1. System Options”
   c. “S4. Hostname”
   d. <node name><node #>
      i. Ex: node0, node1,…

5. Change default password for pi account
   a. $ sudo raspi-config
   b. “1. System Options”
   c. “S3. Password”
   d. Enter new password

6. Increase amount of RAM available
   a. $ sudo raspi-config
   b. “4. Performance Options”
   c. “P2. GPU Memory”
   d. Set to either 16 or 32 (probably 16)

7. Enable SSH
   a. $ sudo raspi-config
   b. “3. Interface Options”
   c. “P2. SSH”
   d. Select “Enable” or “Yes”

8. Add “raspberry_pi_cluster” repo
   a. $ git clone
      https://github.com/TheOGChips/raspberry_pi_cluster.git
      ~/raspberry_pi_cluster

9. Setup Ethernet connection
   a. $ cd raspberry_pi_cluster
   b. $ sudo su
   c. # bash eth_static_ip_setup.sh <node #>

10. Setup VNC (master node only)
   a. $ cd raspberry_pi_cluster
   b. $ sudo su
   c. # bash vnc_setup.sh
   d. # exit
   e. $ source ~/.bash_aliases
   f. $ start-vnc
   g. $ bash vnc_config.sh
   h. Note: Optional. Only useful if Raspbian (not Raspbian Lite)
      image is running on master node.

11. Reboot the Raspberry Pi
   a. Test SSH connectivity
      i. $ ssh pi@<IP address created in step 9>
   b. Test Wi-Fi connectivity
      i. $ sudo apt update
         1. Note: if no errors → working

12. Repeat steps 1 through 11 for each node in the cluster

13. On main computer (the one you’ll be managing and accessing
   the cluster from), install and configure ClusterSSH
   a. $ bash clusterssh_setup.sh

14. Using ClusterSSH: install OpenMPI and mpi4py, create
   aliases for their commands, create and mount an NFS (network file
   system), and setup trusted SSH communication amongst all nodes
   in the cluster
   a. $ cssh
      i. Note: This will open all IP addresses automatically under
         default (no need to specify IP addresses). There will be
         one terminal window for each Pi.
      ii. On master node
         1. $ bash comm_setup.sh master
      iii. On slave nodes
         1. $ bash comm_setup.sh slave

15. Setup SLURM
    a. On master node
        i. $ bash slurm_setup/slurm_setup.sh master
        ii. Reboot
            1. # reboot
    b. On each slave node
        i. $ bash slurm_setup/slurm_setup.sh slave
        ii. Testing Munge
            1. If you see an error message…
                1. Double-check that munge.key is identical across all nodes
                2. Reboot all nodes
                3. Try "$ ssh pi@node01 munge -n | unmunge" again
                4. If there's still an error, try replicating munge.key across all nodes and retry again
        iii. Testing SLURM
            1. If you see another error message…
                1. Reboot all Pis
                2. Try the following again:
                    1. sinfo
                    2. srun --nodes=<# slave nodes> hostname

16. Sources:
    a. Primary
        i. Part 1: https://glmdev.medium.com/building-a-raspberry-pi-cluster-784f0df9afbd
        ii. Part 2: https://glmdev.medium.com/building-a-raspberry-pi-cluster-aaa8d1f3d2ca
        iii. Part 3: https://glmdev.medium.com/building-a-raspberry-pi-cluster-f5f2446702e8
    b. Secondary
        i. https://magpi.raspberrypi.org/articles/build-a-raspberry-pi-cluster-computer