Raspberry Pi Cluster Computer

10/18/16

* Supplies arrive!
* Parts received:
  + Samsung 32GB Evo Plus UHS-1 microSDHC x 9
  + Sabrent 60W 10-port USB Fast Charger x 1
  + Netgear ProSAFE 16-Port 10/100 Desktop Switch (Model no. FS116) x1
  + Sabrent USB 2.0 A Male to Micro B Cables (6 pack) x 2
  + Raspberry Pi 3, Model B, 1GB RAM x 9
* All microSD cards are formatted in FAT32 file format upon arrival
* We will be loading Raspbarian Jessie Lite onto one, setting up a pi with it and then cloning that image onto the other SD cards
* Hooked up first raspberry pi, ran *sudo raspi-config*
  + Ran expand filesystem
  + Boot options set to boot to command line, automatically logged in as “pi” user
  + Wait for network at boot set to false
  + Internationalization options:
    - Local: en\_US.UTF-8 UTF-8
      * Default local for the system environment: none
    - Timezone: America > Chicago
    - Keyboard: English (US)
    - Wifi country: US
  + Enable camera: no
  + Advanced options > hostname changed to ubXX (based on IP address)
  + Advanced options > SSH enabled
* Reboot
* We will be assigning static IPs to the pis. Our IP addresses to use are: 141.224.33.111, .112, .113, .114, .115, .116, .117, .119, .120
  + The head node will use 141.224.33.120
* Having trouble getting network connection with switch working, finally got connected to internet with Alan’s computer through switch in server case. No luck with ports on wall, seem not to work. Also had difficulty with old, faulty Ethernet cables.
* Finally got online! Ran *sudo apt-get update* and *sudo* *apt-get upgrade*
* Setup ssh-key:
  + Type: ssh-keygen -t rsa -C pi@ub<pi number>
  + When prompted for a location, press enter to save to the default (/home/pi/.ssh/id\_rsa)
  + When prompted for a passphrase press enter twice
* On the head pi, setup /etc/hosts file, should look as follows:
* 127.0.0.1 localhost
* ::1 localhost ip6-localhost ip6-loopback
* fe00::0 ip6-localnet
* ff00::0 ip6-mcastprefix
* ff02::1 ip6-allnodes
* ff02::2 ip6-allrouters
* 127.0.1.1 rpi0
* 192.168.1.173 rpi0 rpi0.local rpi0.lan
* 192.168.1.177 rpi1 rpi1.local rpi1.lan
* 192.168.1.178 rpi2 rpi2.local rpi2.lan
* 192.168.1.180 rpi3 rpi3.local rpi3.lan
* Replace rpi# with pi name, replace ip with ip from the corresponding pi.
* Setup ssh connection with key (allows passwordless access to the cluster):
  + On the head pi, enter the following command in the terminal: cat ~/.ssh/id\_rsa.pub | pi@<pi name> ‘cat >> .ssh/authorized\_keys’
  + Answer yes to the question.
  + Password: raspberry
  + This needs to be done for each pi.

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HEAD NODE

* Reflashed head node
  + Expanded filesystem
  + Changed default password of “pi” user to headnode
  + Set internationalization options
    - Locale: would only set to en-GB utf-8 for some reason, even when en-US utf-8 was selected, seems like raspi-config for setting locale doesn’t work
      * Was able to successfully change locale to US through GUI settings, editing /etc/locale.gen did not work for some reason
    - Timezone: central
    - Keyboard layout: US
    - Wi-Fi country: US
  + Wait for network at boot: no
  + Advanced settings:
    - Hostname: ub00
    - Enabled SSH
* Reboot head node
* Ran sudo apt-get update and sudo apt-get upgrade
* Saved a copy of the default setup image of head node
* Had a TON of trouble getting wifi to work on head node, finally concluded the wifi interfaces on two of the pis do not work. Changed head node to a different pi with working wifi. Pi was not recognizing the wlan0 interface
  + Followed this tutorial to connect to school’s wifi: <https://www.raspberrypi.org/forums/viewtopic.php?f=36&t=111100>
* Assigned head node the static IP of 141.224.33.120 for wlan0 (wifi) by doing the following:
  + cd /etc/network
  + sudo cp interfaces interfaces.old
  + sudo nano interfaces
  + below the line “allow-hotplug wlan0” I added the following:
    - iface wlan0 inet static (changed manual to static on this line)
    - address 141.224.33.120
    - netmask 255.255.0.0
    - gateway 141.224.207.254
    - dns-nameservers 8.8.8.8
  + Reboot the pi
* Configured eth0 (Ethernet) for head node to have static IP 192.168.0.100 by adding the following to the file /etc/network/interfaces
  + iface eth0 inet static
  + address 192.168.0.100
  + netmask 255.255.255.0
  + gateway 0.0.0.0

CLUSTER NODE

* Reflashed one of the cluster nodes
  + Expanded filesystem
  + Set boot options for auto login to console
  + Wait for network at boot false
  + Set internationalization options
    - Locale: would only set to en-GB utf-8 for some reason, even when en-US utf-8 was selected, seems like raspi-config for setting locale doesn’t work
      * Had to manually go in and change /etc/locale.gen, uncommended the line with en-US utf-8 and commented out en-GB utf-8 then ran sudo ran-gen
    - Timezone: central
    - Keyboard layout: US
    - Wi-Fi country: US
  + Set hostname to ub01Changed memory split to a
  + llocate 16 memories to GPU
  + Enabled SSH
* Reboot cluster node
* Ran sudo apt-get update and sudo apt-get upgrade
* Saved a copy of the default setup image of cluster node
* Re-imaged all cluster node SD cards
* Cluster nodes will not be able to reach the internet, they will only be able to communicate with the head node
* Configured node ub01 to have static IP by adding the following to /etc/network/interfaces:
  + auto eth0
  + iface eth0 inet static
  + address 192.168.0.101
  + netmask 255.255.255.0
  + gateway 192.168.0.100
* Changed hostname of ub01 using sudo raspi-config and navigating to advanced options
  + wifi doesn’t work
* Configured node ub02
  + Wifi doesn’t work
* Configured node ub03
* Configured node ub04
* Configured node ub05
* Configured node ub06
* Configured node ub07

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* Verified I could SSH into head node from my computer, IP address is currently 141.224.204.114
  + Need to request IT to assign static IP to MAC b8:27:eb:0b:30:6d
* Verified I could SSH into each of the cluster nodes from the head node
* Generated an RSA key on the head node by using *ssh-keygen -t rsa -C “pi@ub00”*, pressing enter for the default directory and pressing enter twice for no passphrase
* Then added public key to authorized key list by running *cat /home/pi/.ssh/id\_rsa.pub >> /home/pi/.ssh/authorized\_keys*
* Proceeded to copy the public key of the head node to each worker node by remotely creating a .ssh directory in the home directory by running *ssh pi@192.168.0.10X ‘mkdir .ssh’* and then from the master node running *cat ~/.ssh/id\_rsa.pub | ssh pi@192.168.0.10X “cat >> .ssh/authorized\_keys”*