

GBEA 2023

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RASPBERRY PI SERVER STACKS

Build Your Own Internet

THE PROBLEM

- Arbitrary or Fear-Based Rules Incompatible with CS Education
- Weak Curriculum that does not cover industry needs
- Few valid End of Pathway Assessments
- Everyone is Dumbing Things Down
- The College Board is Too Far Behind
- Baby Sitting Tools Produce Script Kiddies

THE GOAL

Ability to teach full-stack IP-Based programming

- Graphical User Interfaces
- MySQL/SQL/NOSQL Databases
- Internet (IP) Based Programming (transcending localhost)

Curriculum that actually trains real-world coding Forward progress towards industry entrance exams

- Java
- .NET Core (Non-existent in curriculum)

High School Students *can* Program Across-the-Stack



OVERVIEW

Each Stack

Raspberry Pi 4s with 8GB RAM (4) SSD External Drives (4) Case with two internal cooling fans

Per Stack

Switch KVM USB Switches (multiple stacks) Wireless Access Point



CAPABILITIES

Each Stack

File Server

Database Server

Web Server

BUYING THE GEAR

https://tinyurl.com/piServers









THE GEAR

BIG STEPS

Each Pi

- 1. Install/Configure Pi
- 2. Tether to hotspot, Upgrade network manager
- 3. Upgrade/Update Pi
- 4. Partition and Mount SSD
- 5. Install LAMP Stack
 - 1. Linux (Done)
 - 2. Apache
 - 3. MySQL (Maria Db)
 - 4. Php (localhost)

BIG STEPS

Each Pi

- 6. Mount Pi in Chassis (2 units each power a chassis fan)
- 7. Connect each pi to switch and switch to WAP
- 8. Connect KVM
- 9. Test KVM and Operations of each Pi



Linux Steps

- 1. Setup Pi
 - I. Follow On Screen Instructions
- 2. Tether to Phone for unblocked Internet
- 3. Upgrade to Network Manager
 - 1. sudo apt install network-manager network-manager-gnome
 - 2. Sudo raspi-config

aspberry Pi 4 Model B Rev 1.2				
Raspberry Pi Software Configuration Tool (raspi-config)	Raspberry Pi Software Configuration Tool (raspi-config)	Select the network configuration to use		
1 System Options Configure system settings 2 Display Options Configure display settings 3 Interface Options Configure connections to peripherals 4 Performance Options Configure performance settings 5 Localisation Options Configure advanced settings 8 Update Update 9 About raspi-config Information about this configuration tool	Al Expand Filesystem Ensures that all of the SD card is available AS compositor Enable/disable xcompmgr composition manager AA Network Interface Names Enable/disable predictable network if names AS Network Proxy Settings AB Boot Order Choose network or USB device boot A7 Bootloader Version Select Latest or default boot ROM software A9 Wayland Enable experimental Wayland backend AA Network Config Sat network configuration tool	1 dheped 2 NetworkHanager		
<select> <finish></finish></select>	<select> <back></back></select>	<0k> <cancel></cancel>		

https://thepihut.com/blogs/raspberry-pi-tutorials/how-to-set-up-an-ssd-with-the-raspberry-pi

4. Install GParted

CHECKLIST

Linux Steps (2)



Create Partition Table (Device->Create Partition Table)

		/dev	//sda - GParted			~ ^ X			/de	ev/sda - GParted			~ ^ X
Parted Edit View D	Device Partition Help				ſ		GParted Edit	View Device Partition	Help			r	
1 ₽ ← ⊗ 2	6 G 🖌			 	/dev/sda	(223.57 GiB) 👻		Create Partition Attempt Data R	Table escue		 	/dev/sda	(223.57 GiB) 👻
		:	unallocated 223.57 GiB							unallocated 223.57 GiB			
artition File S	System S	Size	Used	Unused		Flags	Partition	File System	Size	Used	Unused		Flags
							unallocated 🤞	unallocated					
operations pending							0 operations pen	ding					





4. Partitioning SSD (cont)

		/dev/	sda - GParted		
GParted Edit View De	evice Partition H	elp		/dev/sda	(223.57 GiB)
		/0 2	dev/sda1 23.57 GiB		
Partition File System	n Label	Size	Used	Unused	Flags

Linux Steps (4)

				Ba 8 8			•
							~ ^ ×
Parted Edi	it View De	evice Partitio	n Help				
3 ⊗ -	3 G K	61			<u></u> /c	lev/sda (223	3.57 GiB) 👻
				/dev/sda1 223.57 GiB			
artition	File System	Label	Size	Used	Unused	Flag	s
/dev/sda1	ext4	WDSSD	223.57 GiB	1.94 GiB	221.63 G	iВ	

4. Finding the SSD's UUID (ID Number)

sudo lsblk -o UUID,NAME,FSTYPE,SIZE,MOUNTPOINT,LABEL,MODEL

Linux Steps (5)

NO SPACES

		pi@	Draspberrypi:			^	ं×
File Edit Tabs Help							
pi@raspberrypi:~ \$ sudo lsblk -o UUID	, NAME, FSTYP	E, SIZE, M	OUNTPOINT, LA	ABEL, MODEL			-
JUID	NAME	FSTYPE	SIZE MOUNT	TPOINT LABEL	MODEL		
	sda		223.6G		WDC_WDS240G2G0A-00JH30		
b27ae581-8943-4d25-8f89-7b1cc6b46f3a	Lsda1	ext4	223.6G	WDSSD			
	mmcblk0		28.9G				
4A63-80DB	-mmcblk0p1	vfat	2.4G	RECOVE	RY		
	-mmcblk0p2		512B				
417e81cc-87fb-4ca2-8814-217dd55b40aa	-mmcblk0p5	ext4	32M	SETTIN	GS		
0574-5063	_mmcblk0p6	vfat	256M /boot	t boot			
7104395a-e85e-432e-9b36-bcaa33af439e pi@raspberrypi:~ \$	└_mmcblk0p7	ext4	26.3G /	root			

Linux Steps (6) 4. Creating a mounting directory

mkdir *directoryName*

Set Permissions

- sudo chown pi:pi -R /home/pi/directoryName/
- sudo chmod a+rwx /home/pi/directoryName/

Create Automatic Mounting

		pi@	raspbe	errypi: ~	~ ^ X
File Edit Tabs Help					
GNU nano 3.2			/etc/	fstab	Modified
proc /proc	proc	defaults			
/dev/mmcblk0p6 /boot	vfat	defaults		2	
/dev/mmcblk0p7 /	ext4	defaults, noatime		1	
<pre># a swapfile is not a swap</pre>	partition, r	no line here			
# use dphys-swapfile swa	ap[on off] f	for that			
UUID=b27ae581-8943-4d25-8f8	39-7b1cc6b46f	f3a /home/pi/myssd/	ext4	defaults 0	

Add this line to the end of this file



https://randomnerdtutorials.com/raspberry-pi-apache-mysql-php-lamp-server/

Linux Steps (8)

5. Install LAMP Stack

The LAMP stack is a combination of Linux, Apache, MySQL, and PHP.

Linux: Already Done Apache:

sudo apt-get update sudo apt-get upgrade sudo apt install apache2 –y

sudo usermod -a -G www-data pi (Assuming user is pi)(You may choose a different user to install)

sudo chown -R -f www-data:www-data /var/www/html

sudo nano /var/www/html/index.html

PHP: (Do this before MySQL)

pi@raspberrypi:/var/www/html \$ sudo apt install php –y pi@raspberrypi:/var/www/html \$ sudo rm index.html pi@raspberrypi:/var/www/html \$ sudo nano index.php

Add this to the file if you want a php home page vs index.html <?php echo "hello world"; ?>



CHECKLIST

Linux Steps (9) Install LAMP Stack (cont)

5.

pi@raspberrypi:/var/www/html \$ sudo service apache2 restart

S 192.168.1.86	× +	- 🗆 X
$\leftrightarrow \ \ \rightarrow \ \ G$	(i) Not secure 192.168.1.86	@ ☆ 🔮 :
hello worl	d	



Install LAMP Stack (cont)

5.

Install MariaDB Server (MySQL for Pi)

pi@raspberrypi:/var/www/html \$ sudo apt install mariadb-server php-mysql -y
pi@raspberrypi:/var/www/html \$ sudo service apache2 restart

Linux Steps (10)

pi@raspberrypi:/var/www/html \$ sudo mysql_secure_installation

You will be asked Enter current password for root (type a secure password): press Enter Type in Y and press Enter to Set root password Type in a password at the New password: prompt, and press Enter. Important: remember this root password, as you will need it later Type in Y to Remove anonymous users Type in Y to Disallow root login remotely Type in Y to Remove test database and access to it

Type in Y to Reload privilege tables now

Linux Steps (11)

5. Install LAMP Stack (cont)

Install phpMyAdmin

pi@raspberrypi:/var/www/html \$ sudo apt install phpmyadmin -y

- Select Apache2 when prompted and press the Enter key
- Configuring phpmyadmin? OK
- Configure database for phpmyadmin with dbconfig-common? Yes
- Type your **password** and press **OK**



pi@raspberrypi:/var/www/html \$ sudo phpenmod mysqli
pi@raspberrypi:/var/www/html \$ sudo service apache2 restart



-				-	
404 Not Found	×	+			
$\leftrightarrow \rightarrow C$	D Not secure 192	.168.1.86/phpmyadmin		Q	\$ \$
Net Fee					
Not Fot	ina				
The connected I	PI (obcorredovie	may not found on this a	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.		
The requested C	RL / pupinyadim	was not found on uns s	civel.		
Apache/2.4.38 (Rasphian) Server	at 192 168 1.86 Port 80			
<i>ipuene 2.4.00</i> (.	asporany server	a 172.100.1.001 0/1 00			

pi@raspberrypi:/var/www/html \$ sudo ln -s /usr/share/phpmyadmin /var/www/html/phpMyAdmin

Linux Steps (12)

pi@raspberrypi:/var/www/html \$ ls
phpmyadmin

When you go to localhost/phpmyadmin (or your Pi's IP Address), you might see:

If so (common), move phpMyAdmin folder

Install LAMP Stack (cont)

5.

🛃 pi@raspberrypi: /var/www/html	-	- 🗆	×
pi@raspberrypi:/var/www/html \$ ls			\sim
phpmyadmin			
pi@raspberrypi:/var/www/html \$			

Linux Steps (13)

5. Install LAMP Stack (cont)

Reload admin page <u>http://localhost/phpmyadmin</u> (or your pi's ip address)

Finally, set permissions for your web pages:

pi@raspberrypi:~ \$ ls -lh /var/www/ pi@raspberrypi:~ \$ sudo chown -R pi:www-data /var/www/html/ pi@raspberrypi:~ \$ sudo chmod -R 770 /var/www/html/ pi@raspberrypi:~ \$ ls -lh /var/www/



RESULTS

First Year Results! 2022-2023 AP CSP/APCS-A Classes

1. Airline Reservation Systems

- a) AP Principles Python/SQL
- b) APCS-A Java/SQL

2. Requirements

- a) Crew (Captain/FO/FA)
- b) Passengers
- c) Aircraft
- d) Flight Schedule



First Year Results! 2022-2023 AP CSP/APCS-A Classes

RESULTS





First Year Results! 2022-2023 AP CSP/APCS-A Classes

🔛 IntelliAir - actual	Iflightedit		×		RES	ULTS
Back	Actual Flight: E	Edit				
ID	Distance	Crew List	v			- 🗆 X
Pushback	Passenger List	Takeoff		Actual Fligh	nt: View	
Aircraft	Departure	Destination	ure	Destination	Airline	More Info
Divert Code	Approach	Cancelled				And Mary
Departure Location	Departure Locatic Landing	International				
	Save			No content in table		Edit
						Delete
AN A						

First Year Results! 2022-2023 AP CSP/APCS-A Classes

