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

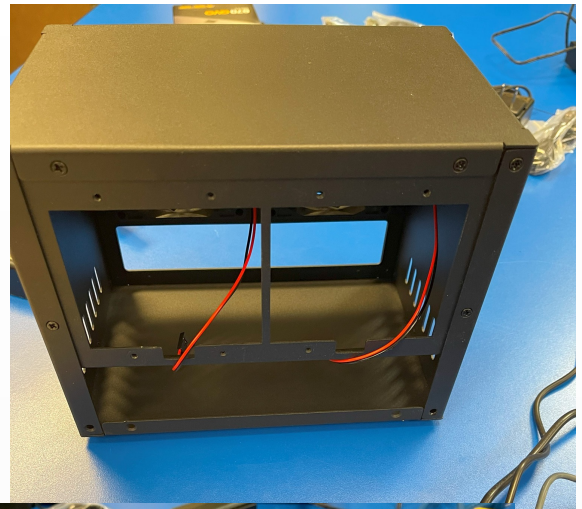
Database Server

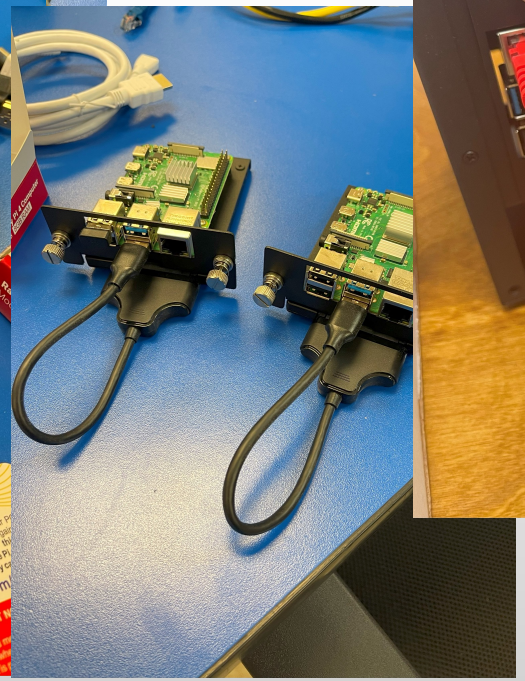
Web Server

BUYING THE GEAR

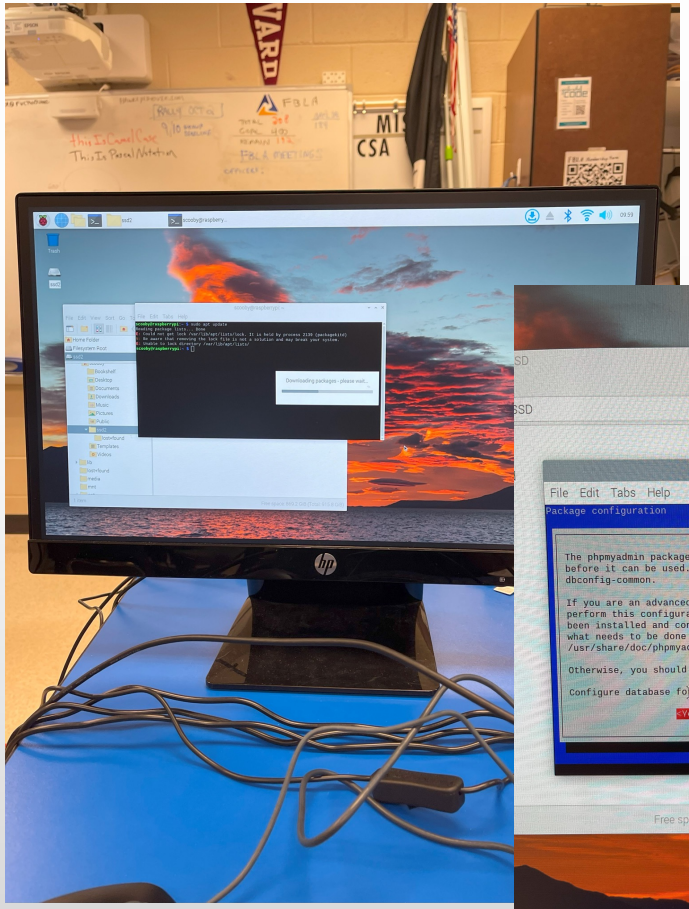
https://tinyurl.com/**piServers**

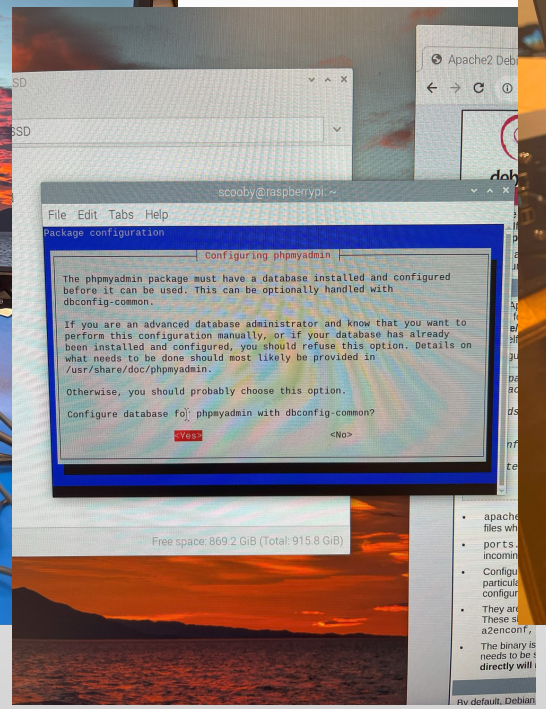
THE GEAR

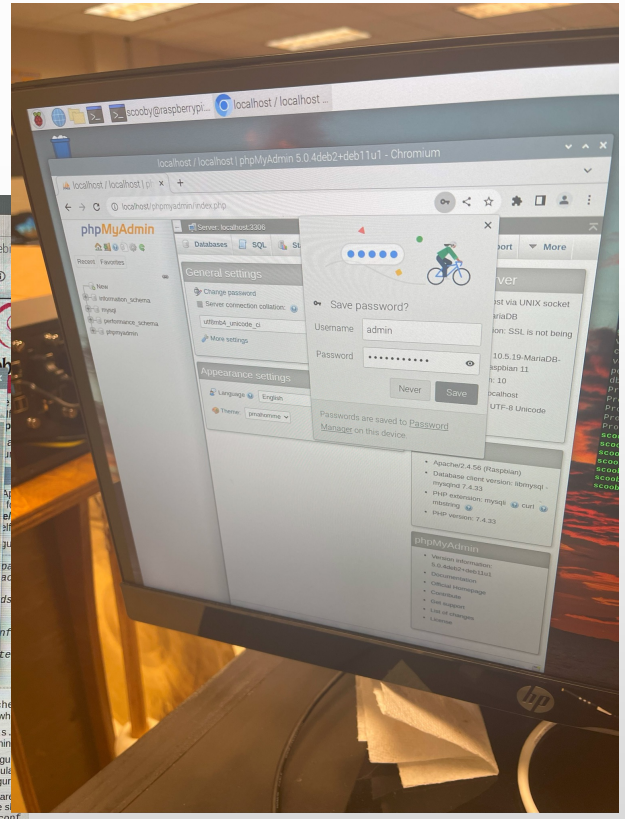




THE GEAR




scooby@raspberrypi: ~
File Edit Tabs Help
Package configuration
Configuring phpmyadmin
The phpmyadmin package must have a database installed and configured before it can be used. This can be optionally handled with dbconfig-common.
If you are an advanced database administrator and know that you want to perform this configuration manually, or if your database has already been installed and configured, you should refuse this option. Details on what needs to be done should most likely be provided in /usr/share/doc/phpmyadmin.
Otherwise, you should probably choose this option.
Configure database for phpmyadmin with dbconfig-common?
<Yes>
<No>
Free space: 869.2 GiB (Total: 915.8 GiB)


localhost / localhost | phpMyAdmin 5.0.4deb2+deb11u1 - Chromium
phpMyAdmin
General settings
Save password?
Username
admin
Password
Never
Save
Appearance settings

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. **L**inux (Done)
    2. **A**pache
    3. **M**ySQL (Maria Db)
    4. **P**hp (localhost)

BIG STEPS

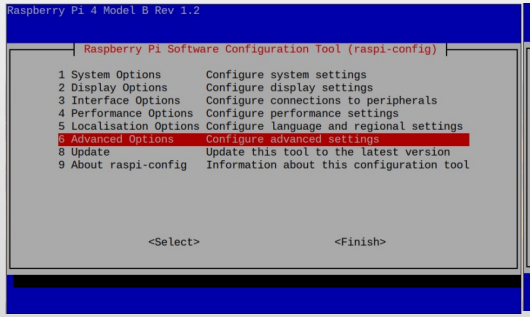
Each Pi

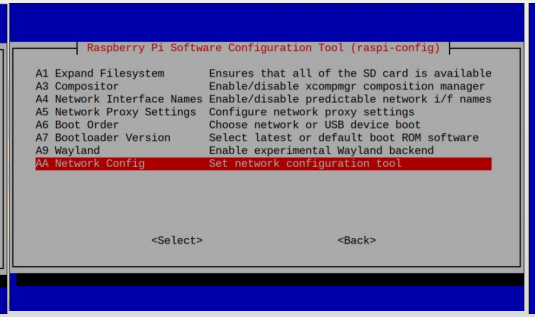
6. Mount Pi in Chassis (2 units each power a chassis fan)
7. Connect each pi to switch and switch to WAP
8. Connect KVM
9. Test KVM and Operations of each Pi

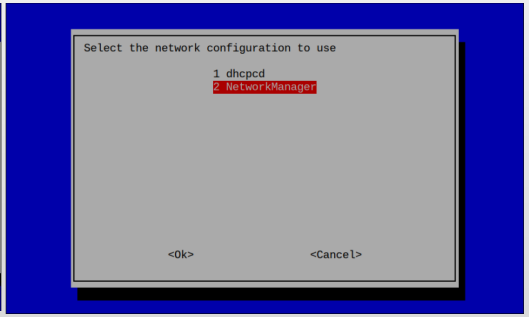
CHECKLIST

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**







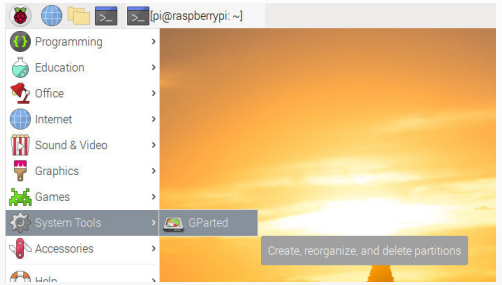
https://thepihut.com/blogs/raspberry-pi-tutorials/how-to-set-up-an-ssd-with-the-raspberry-pi

CHECKLIST

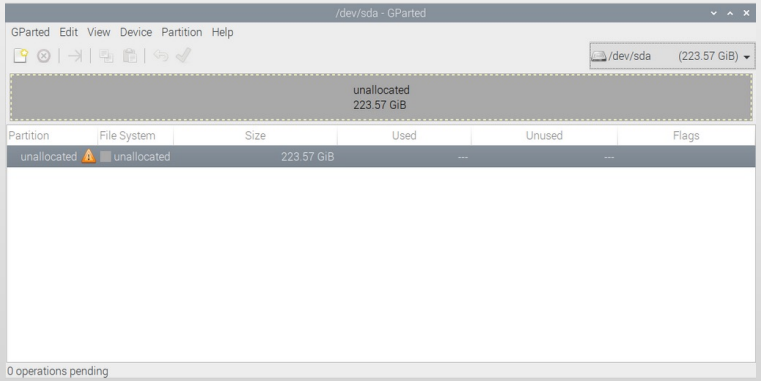
Linux Steps (2)

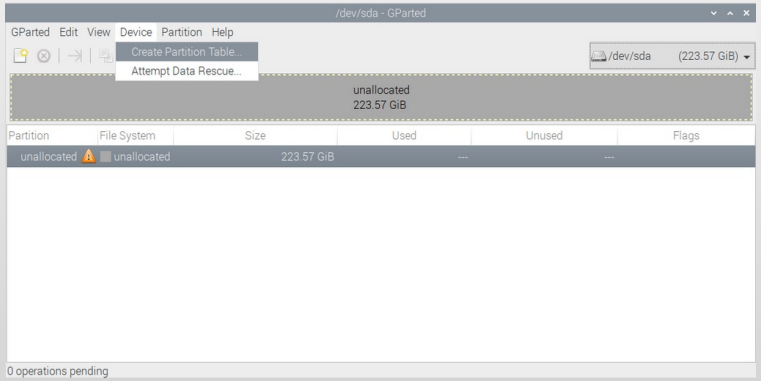
4. **Install GParted**

   sudo apt-get install gparted



Create Partition Table (Device->Create Partition Table)



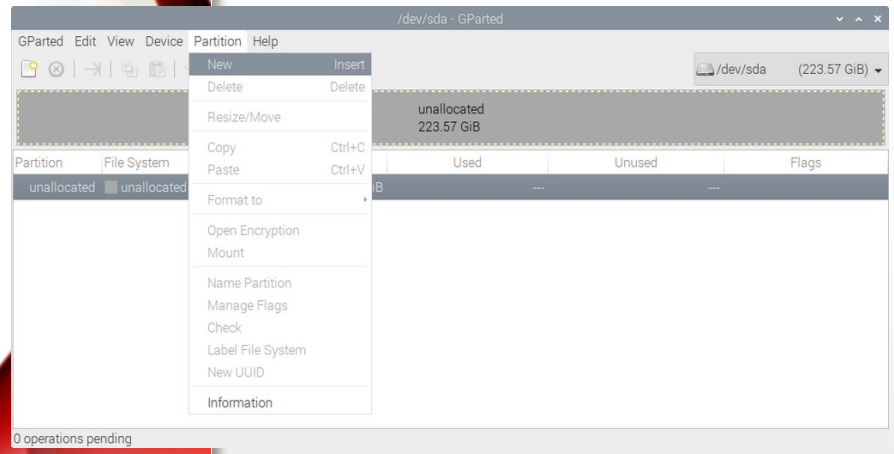


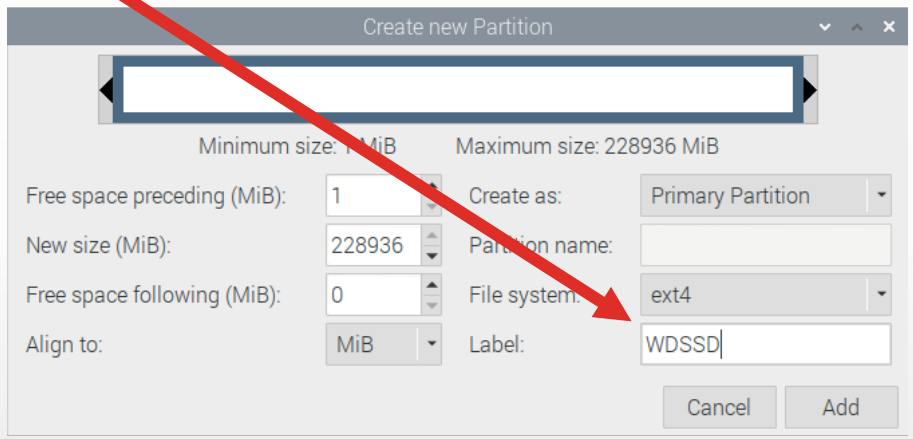
Name is Important!

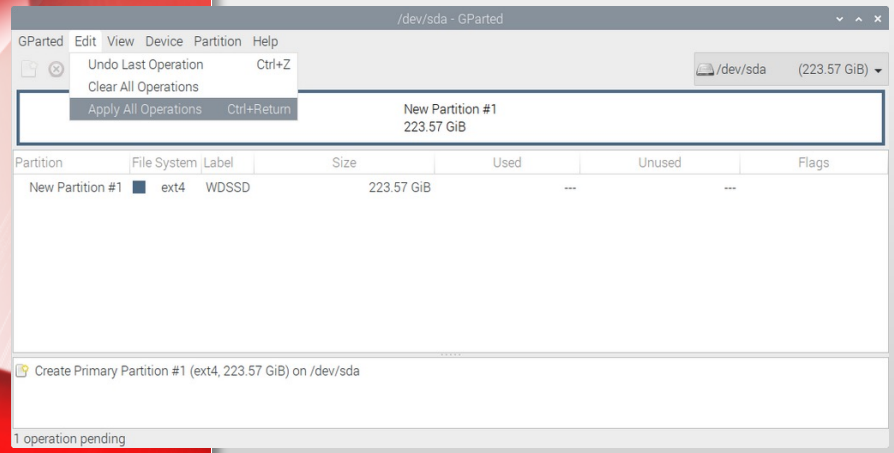
CHECKLIST

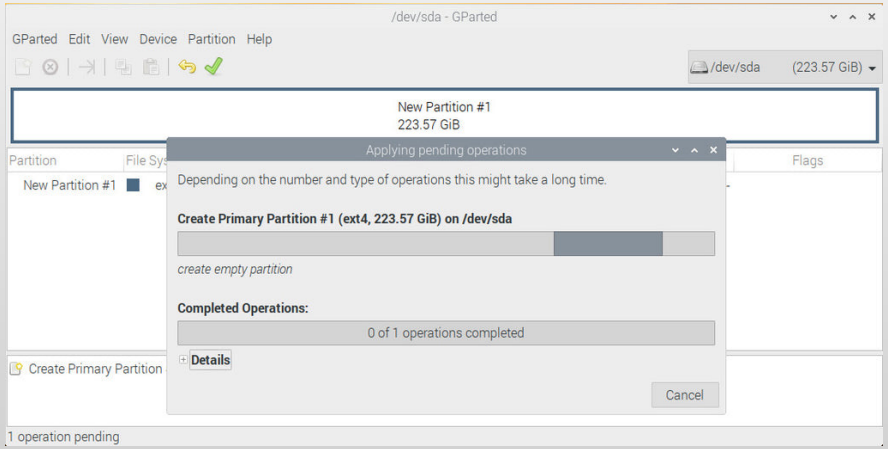
Linux Steps (3)

4. Partitioning SSD (cont)





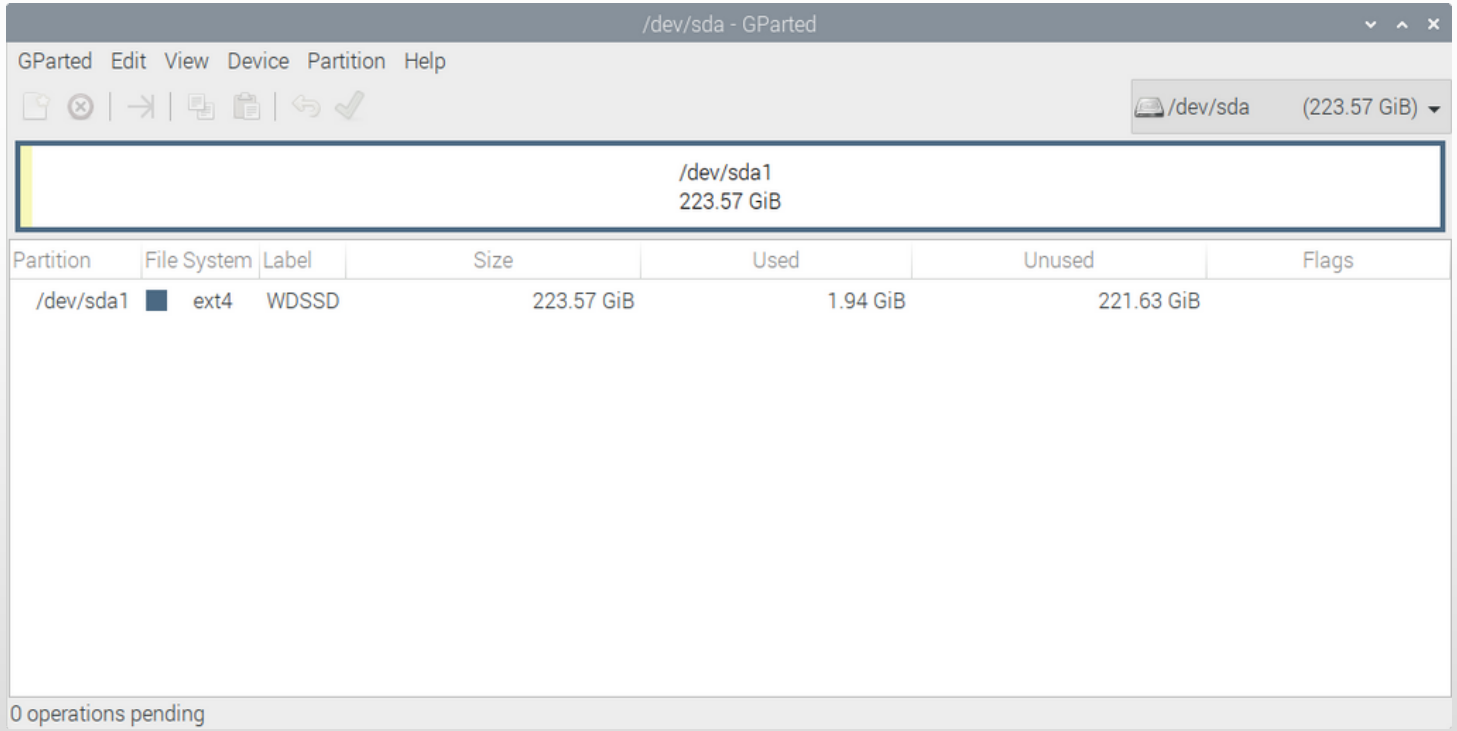




CHECKLIST

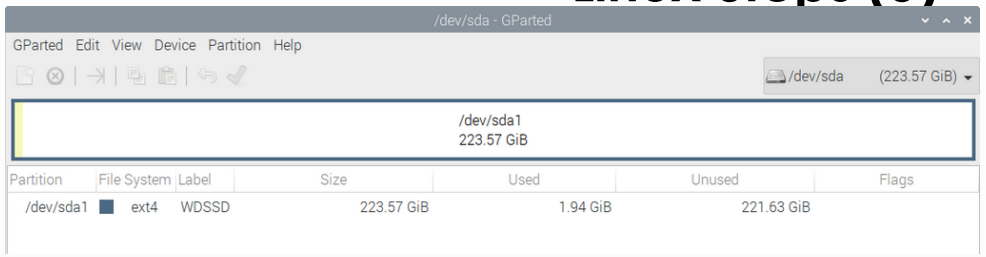
Linux Steps (4)

4. **Partitioning SSD (cont)**



CHECKLIST

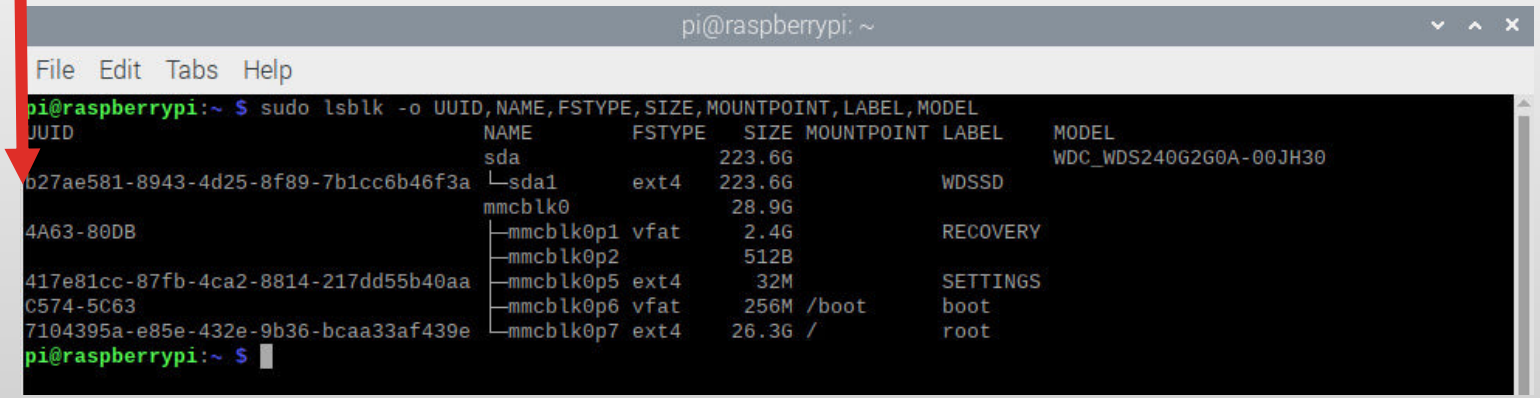
Linux Steps (5)



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

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

NO SPACES



CHECKLIST

Linux Steps (6)

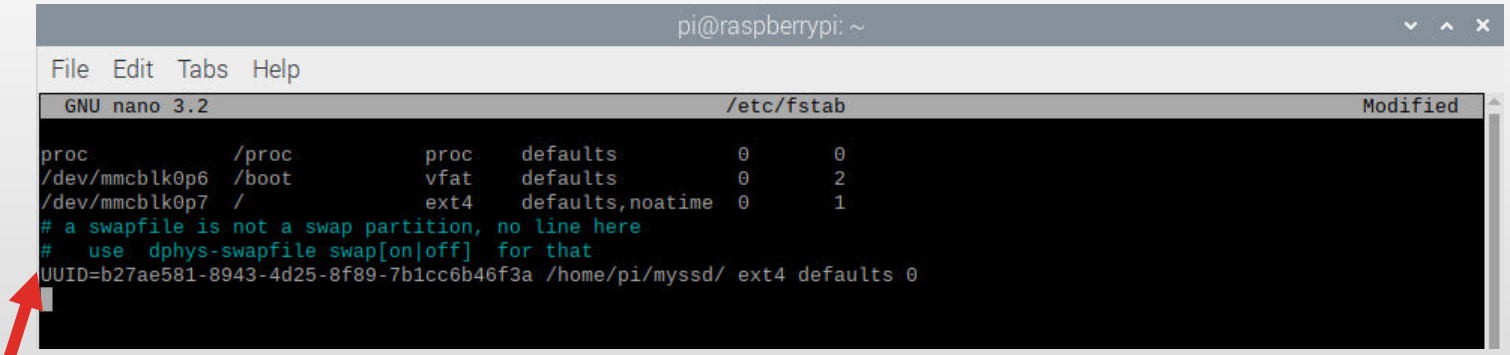
4. Creating a mounting directory

mkdir *directoryName*

Set Permissions

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

Create Automatic Mounting



Add this line to the end of this file

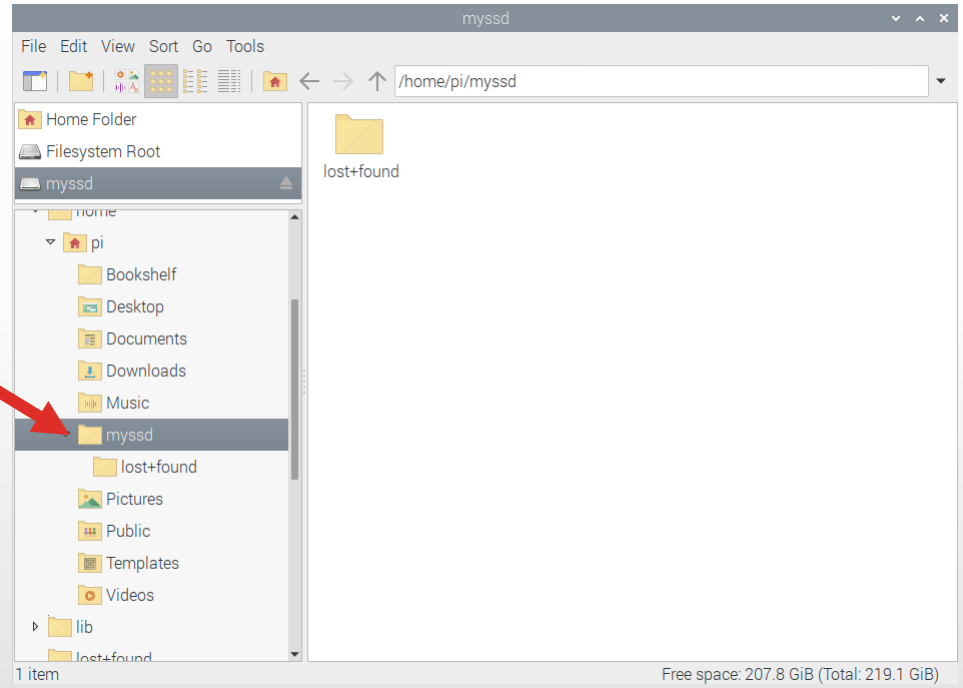
UUID=xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx /home/pi/directoryName/ ext4 defaults,auto,users,rw,nofail 0 0

CHECKLIST

Linux Steps (7)

4. **Mount Drive**

   sudo mount -a



Reboot & Test

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

CHECKLIST

Linux Steps (8)

5. Install LAMP Stack

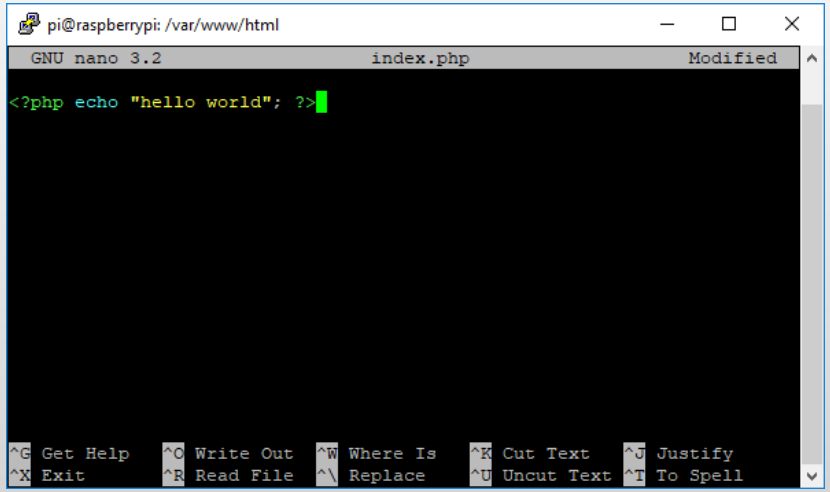
The LAMP stack is a combination of Linux, Apache, MySQL, and PHP.

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

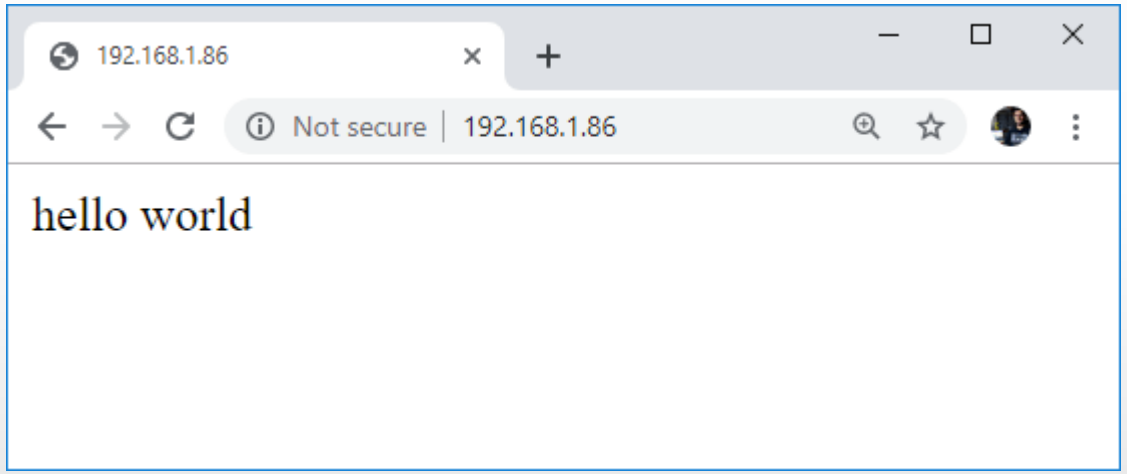
Add this to the file if you want a php home page vs index.html
<?php echo "hello world"; ?>

CHECKLIST

Linux Steps (9)

5. Install LAMP Stack (cont)

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



CHECKLIST

Linux Steps (10)

5. Install LAMP Stack (cont)

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

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
```

CHECKLIST

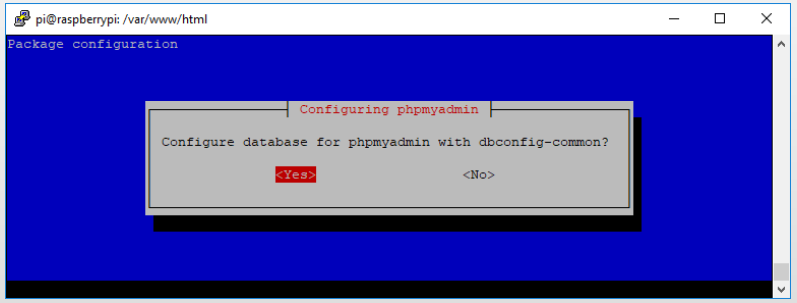
Linux Steps (11)

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**



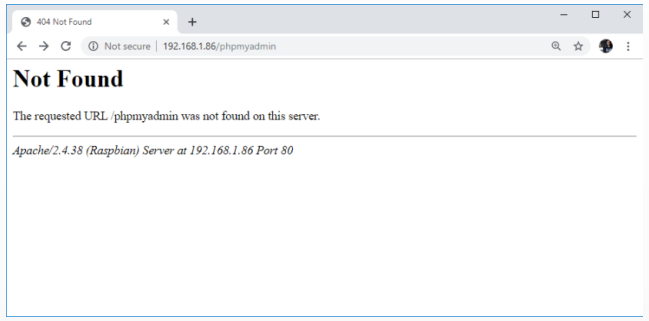

```
pi@raspberrypi:/var/www/html $ sudo phpenmod mysqli
pi@raspberrypi:/var/www/html $ sudo service apache2 restart
```

CHECKLIST

Linux Steps (12)

5. Install LAMP Stack (cont)

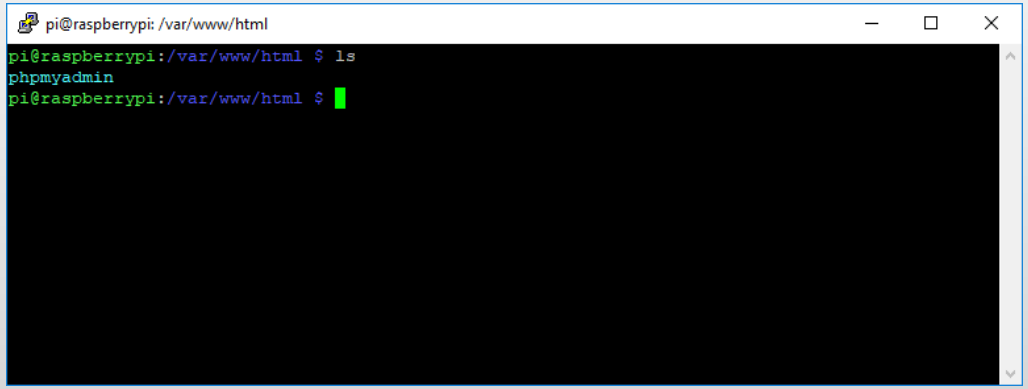
When you go to localhost/phpmyadmin (or your Pi's IP Address), you might see:



If so (common), move phpMyAdmin folder

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

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



CHECKLIST

Linux Steps (13)

5. Install LAMP Stack (cont)

Reload admin page

http://localhost/phpmyadmin (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/
```

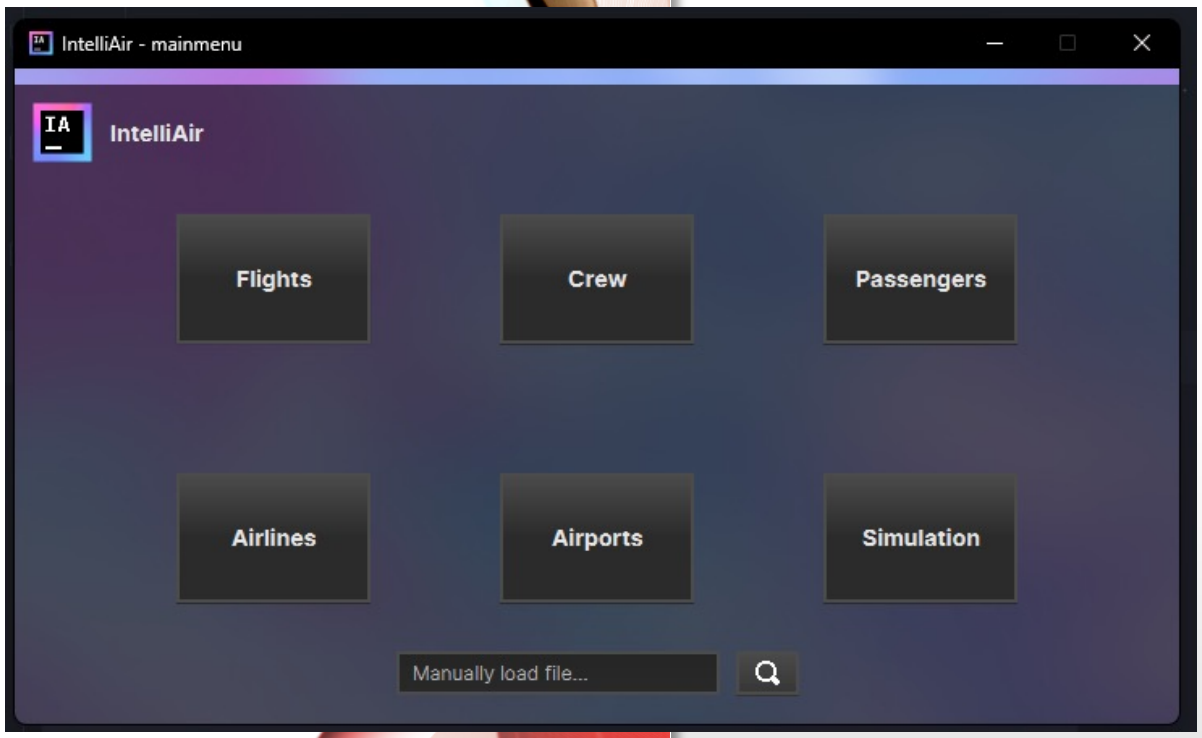
RESULTS

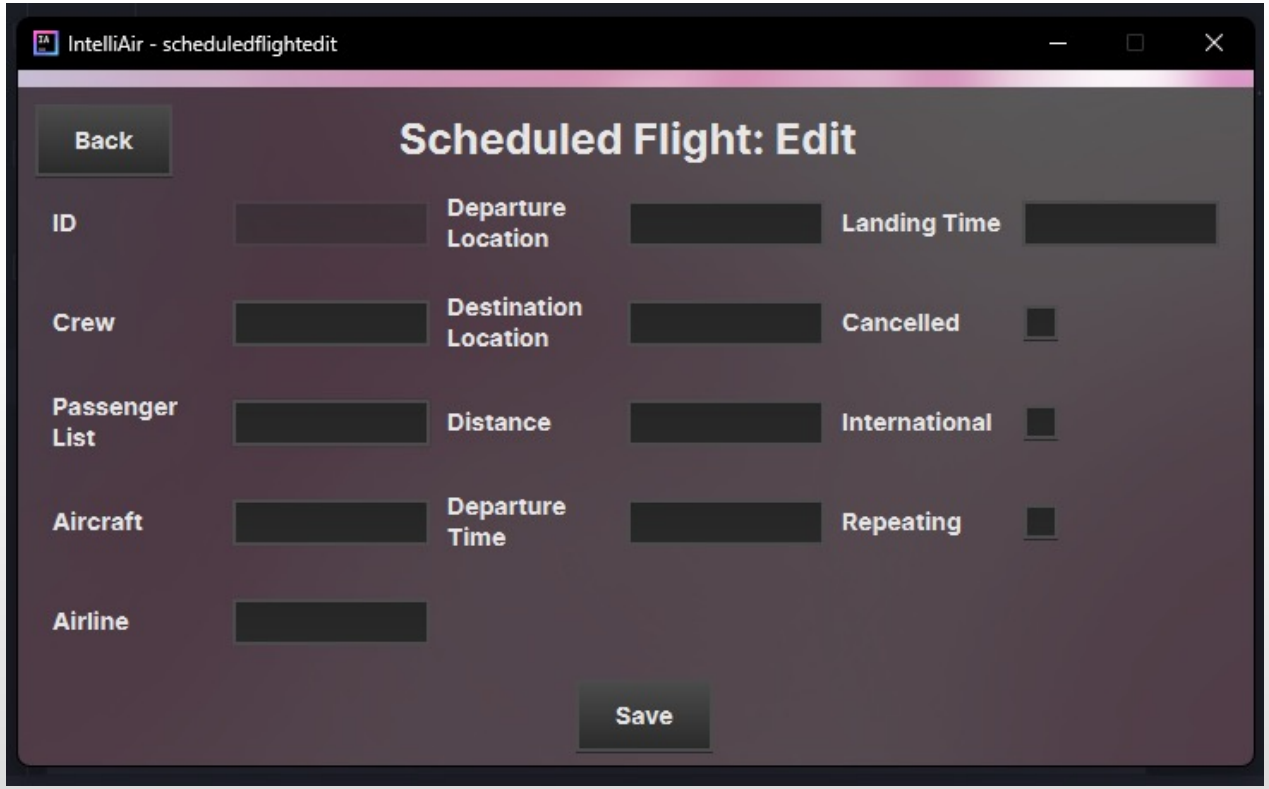
First Year Results!
2022-2023 AP CSP/APCS-A Classes

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

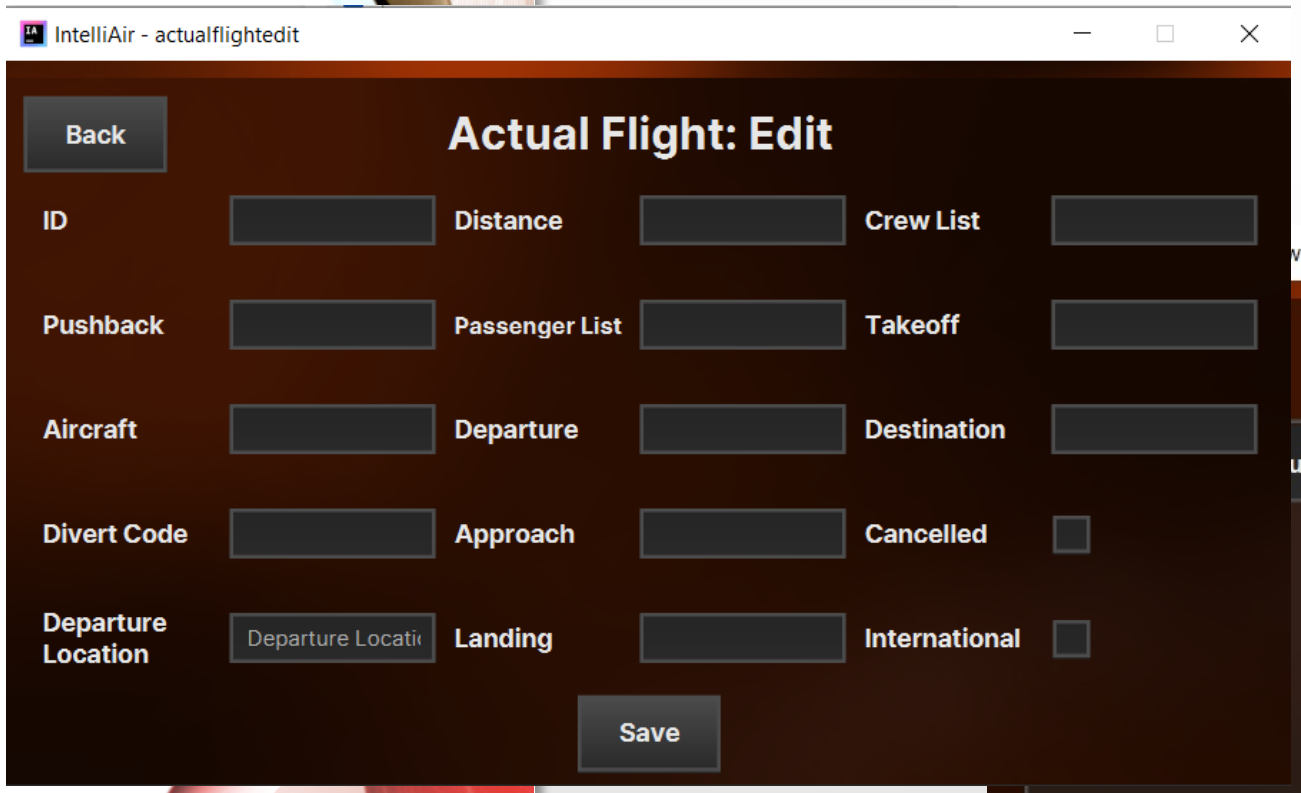
RESULTS

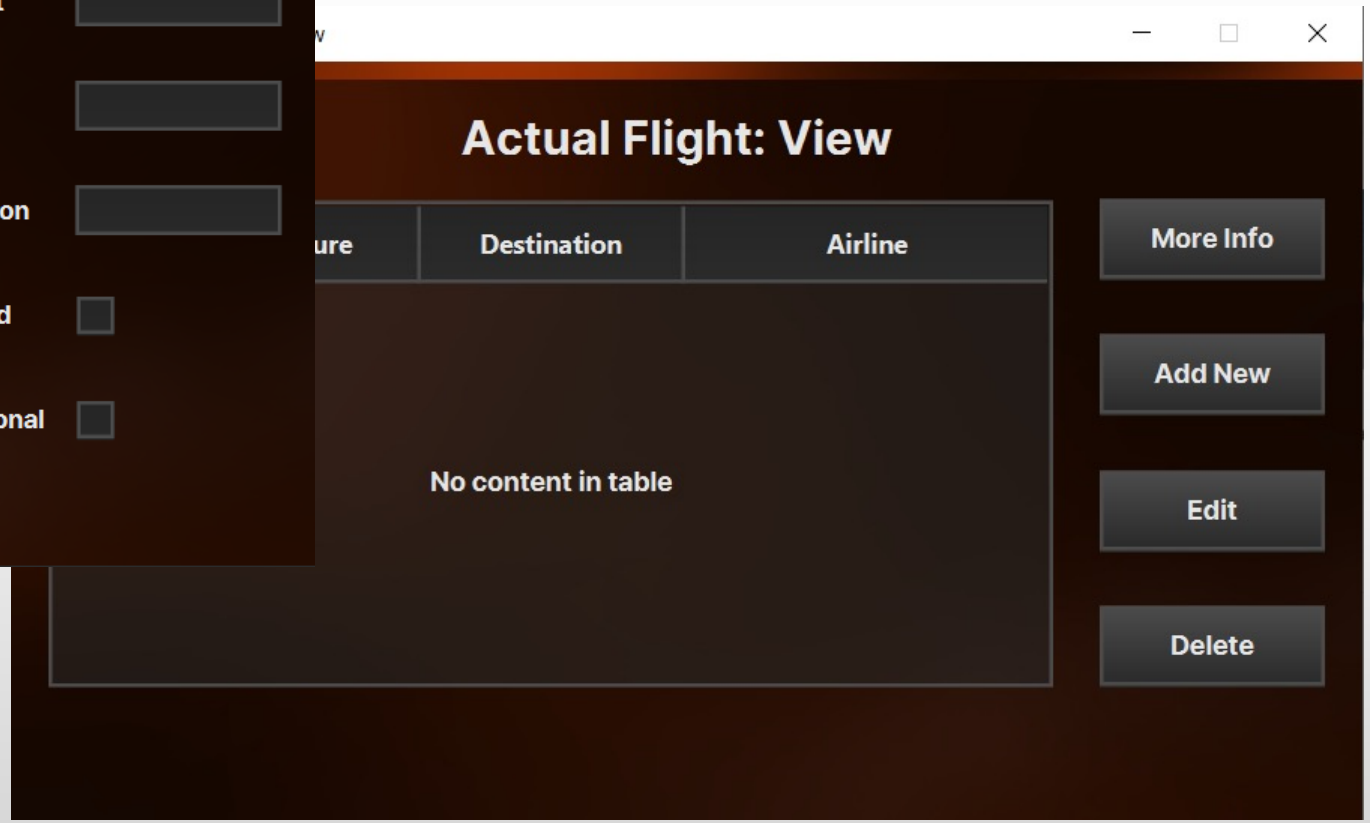




First Year Results!
2022-2023 AP CSP/APCS-A Classes

RESULTS





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

RESULTS