# For Raspberry PI On-Premise IoT / Apache Kafka / TML Deployments:

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*Below are suggested configurations – some fields may differ or may not apply*

## MAIN SITE: https://github.com/smaurice101/raspberrypi

1. **Install Java**

   a. `sudo apt-get update`
   b. `sudo apt install default-jdk`
      i. `If you run into issue uninstall: sudo apt-get autoremove openjdk-11-jre`
      ii. `And reinstall`

2. **install TMUX: https://linuxhint.com/install-tmux-ubuntu/**

   a. `sudo apt update`
   b. `sudo apt-get install tmux`
   c. `pkill -f tmux  (kills all tmux sessions)`
   d. `tmux a -t <session name>`

3. `Cpu monitoring:`

   a. `sudo apt update`
   b. `sudo apt install -y htop`

4. **Install MySQL:**

   a. `Sudo apt update`
   b. `Sudo apt upgrade`
   c. `sudo apt install mariadb-server`
   d. `sudo mysql_secure_installation`
   e. `enter: sudo mysql -u root`
   f. `SET PASSWORD FOR 'root'@'localhost' = PASSWORD('new_password');`
      i. `Replace 'new_password' with raspberry`
      ii. `GRANT ALL PRIVILEGES on *.* to 'root'@'localhost' IDENTIFIED BY 'raspberry';`
      iii. `FLUSH PRIVILEGES;`
      iv. `If ERROR run: sudo systemctl status mariadb.service`
      v. `sudo rm -rf /var/lib/mysql/*`
      vi. `sudo mysql_install_db -u mysql`
      vii. `sudo service mysql restart`
      viii. `MAKE SURE TO re-run SET PASSWORD, and GRANT ALL PRIVILEDGES…`

5. Install Python (follow steps a-j)

    a. sudo apt-get install -y build-essential tk-dev libncurses5-dev libncursesw5-dev libreadline6-dev libdb5.3-dev libgdbm-dev libsqlite3-dev libssl-dev libbz2-dev libexpat1-dev liblzma-dev zlib1g-dev libffi-dev tar wget vim

    b. sudo mkdir Python
    c. sudo apt-get install libatlas-base-dev
    d. sudo chown pi:pi /home/pi/Python
    e. cd Python
    f. wget https://www.python.org/ftp/python/3.9.15/Python-3.9.15.tgz
    g. sudo tar -zxvf Python-3.9.15.tgz
    h. cd Python-3.9.15/
    i. ./configure --enable-optimizations
    j. sudo make altinstall
    k. confirm install:
        i. python —version
       ii. IF WANT TO REMOVE PYTHON:
            1. sudo apt-get clean
            2. sudo apt-get autoremove --purge
            3. sudo apt-get remove python3.9
            4. sudo apt-get autoremove

6. IF REPOSITORY does not install:
    a. Use: sudo apt-get install software-properties-common
    b. Sudo apt-get update
7. install MAADSTML python library and other libraries
    a. pip install maadstml
    b. pip install requests
    c. pip install nest_asyncio
    d. pip install joblib
    e. pip install asyncio

8. Install TML Technologies for ARM chipset If using Pi 3+, for PI 4 using ARM64 binaries:YOU KEEP ALL THESE IN USB stick
    a. https://github.com/smaurice101/raspberrypi
        i. Download TML binaries
       ii. Put each unzipped files in their folders:
            1. Sudo mkdir viper
            2. Sudo mkdir hpde
            3. Sudo mkdir viperviz
    b. Copy viper-env-file from https://github.com/smaurice101/raspberrypi/tree/main/viper-env-file
        i. Replace viper.env file with one above
            1. Copy/replace to Viper and Viperviz folder

  c. IotSolution – copy all Python scripts from Github:
   [https://drive.google.com/drive/folders/1wJEufLVtOzu8R-yYh6ybMASAaKkvMaTw?usp=sharing](https://drive.google.com/drive/folders/1wJEufLVtOzu8R-yYh6ybMASAaKkvMaTw?usp=sharing)
    i. Sudo mkdir IotSolution
      1. produce-iot-customdata.py
      2. preprocess-iot-monitor-customdata.py
      3. preprocess2-iot-monitor-customdata.py
      4. Raw IoT Device Data: IoTData.zip and unzip data
      5. IoT Lat/Longs: downlaofdsntmlidmain.csv

9. Start Apache Kafka: ZOOKEEPER (Store on USB stick)
  a. Sudo mkdir Kafka
  b. Sudo chown pi:pi Kafka
  c. Cd kafka_2.13-3.0.0
  d. Download Kafka: wget [https://archive.apache.org/dist/kafka/3.0.0/kafka_2.13-3.0.0.tgz](https://archive.apache.org/dist/kafka/3.0.0/kafka_2.13-3.0.0.tgz)
  e. tar xzf kafka_2.13-3.0.0.tgz
  f. export KAFKA_HEAP_OPTS="-Xmx512M -Xms512M"
  g. PATH="$PATH:/home/pi/Kafka/kafka_2.13-3.0.0/bin"
  h. cd bin
  i. Enter: zookeeper-server-start.sh /home/pi/Kafka/kafka_2.13-3.0.0/config/zookeeper.properties <enter>
    i. Make sure to change zookeeper.properties: dataDir=/home/pi/zoodata

10. Start Kafka in another terminal
  a. Kill port: sudo kill -9 $(sudo lsof -t -i:3000)
  b. export KAFKA_HEAP_OPTS="-Xmx512M -Xms512M"
  c. ./kafka-server-start.sh ../config/server.properties
    i. Make sure to change: log.dirs=/mnt/usb/kafka-logs

11. To SSH in to raspberry pi
  a. Use Raspberry Pi imager and flash OS
    i. [https://www.raspberrypi.com/software/](https://www.raspberrypi.com/software/)
  b. Click setting and enable SSH and Wifi
  c. To manually enable wifi/ssh follow blog here:
    i. [https://roboticsbackend.com/enable-ssh-on-raspberry-pi-raspbian/](https://roboticsbackend.com/enable-ssh-on-raspberry-pi-raspbian/)

12. Mount USB
  a. ***Make sure to put USB 3.0 in the right USB port (Raspberry pi has BLUE port for USB 3.0, and black for USB 2.0)***
  b. Type: `sudo ls -l /dev/disk/by-uuid/`
  C. Capture uuid i.e. 61AA-D040 (for /sda1 which is usb)

```
total 0
lrwxrwxrwx 1 root root 15 Feb 20 23:08 37CA-39EC -> ../../mmcblk0p1
lrwxrwxrwx 1 root root 10 Feb 20 23:08 61AA-D040 -> ../../sda1
lrwxrwxrwx 1 root root 15 Feb 20 23:08 a4af13c6-d165-4cbd-a9f6-c961fef8255d -> .
```

d. ./../mmcblk0p2

e. Create mount folder: `sudo mkdir /mnt/usb`

f. Auto mount usb:

g. `Open file: sudo nano /etc/fstab`

h. Add line at the end of /etc/fstab:

    i. `UUID=61AA-D040 /mnt/usb vfat uid=pi,gid=pi 0 0`

    ii. `Save and exit`

    iii. `Reboot: sudo reboot`

# To Execute the IoT Solution

13.     `Cd to /mnt/usb/tmux`
14.     `Run: ./tmux.sh`
    a. `Note you may need to edit`

15. **VISUALIZATION URL: <u>Make sure to change IP address</u> to the one given to your Raspberry PI:**
    a. http://192.168.2.29:9005/iot-failure-seneca.html?topic=iot-preprocess2,iot-preprocess&offset=-1&groupid=&rollbackoffset=500&topictype=prediction&append=0&secure=1
    b. You should see a dashboard similar to this:
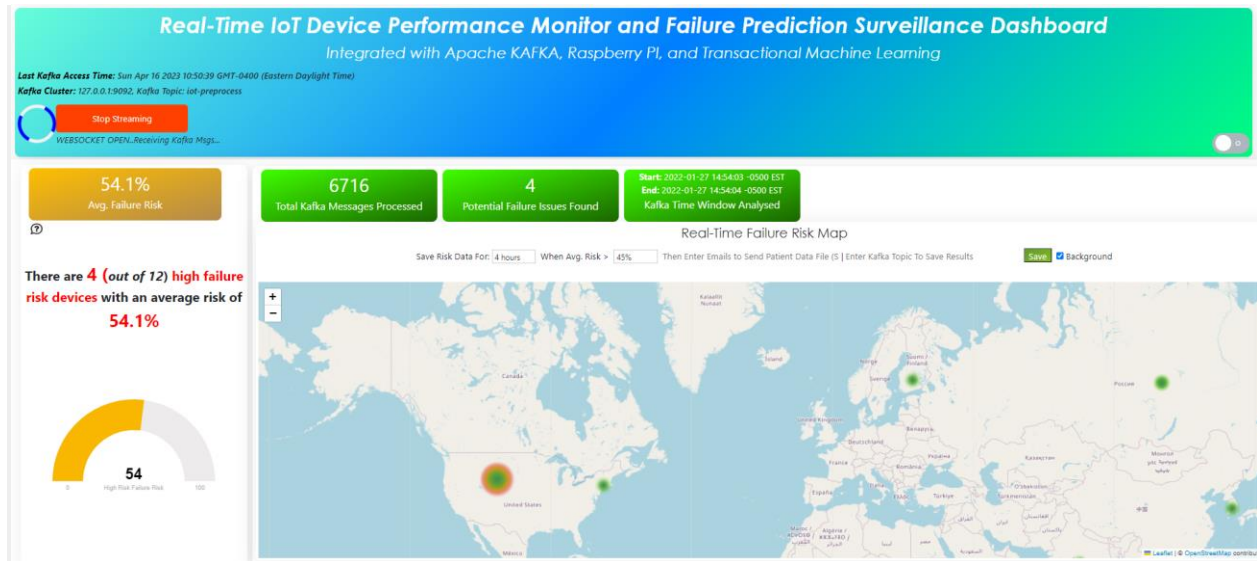
```
16. Increase swap file
    a. sudo nano /etc/dphys-swapfile
    b. CONF_SWAPSIZE=2000
    c. sudo reboot
    d. free -m
```

# ISSUES

# If you run in to issues if the solution does not start do the following to re-start solution:

1. Enter reboot pi: sudo reboot
2. Then restart and run:
   a. cd to tmux folder
   b. run: ./tmux.sh <enter>
   c. check solution is running by checking the tmux windows:
      i. list window – run: tmux ls
      ii. attach to window: tmux a -t preprocess2-data-python-8002
      iii. attach to window: tmux a -t preprocess2-data-viper-8002