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

Server environment:zookeeper.version=3.6.1--104dcb3e3fb464b30c5186d229e00af9f332524b, built on 04/21/2020 15:01 GMT
Server environment:java.version=1.8.0_144

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

1. **Install Java**

   a. `sudo apt-get update`
   b. `sudo apt install default-jdk`

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.

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
           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
   e. tar xzf kafka_2.13-3.0.0.tgz
   f. export KAFKA_HEAP_OPTS="-Xmx512M -Xms512M"
   g. Edit zookeeper/conf/zoo.cfg
      i. tickTime=2000
         initLimit=10
         syncLimit=5
         dataDir=/media/pi/sebusb/zookeeper # change to your /mnt/usb
         clientPort=2181
   h. PATH="$PATH:/home/pi/Kafka/kafka_2.13-3.0.0/bin"
   i. cd bin
   j. 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=/mnt/usb/zoodata (or wherever the usb is mounted to)

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/
    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/

12. Mount USB
    a. Type: sudo ls -l /dev/disk/by-uuid/
    b. 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 -> .
```
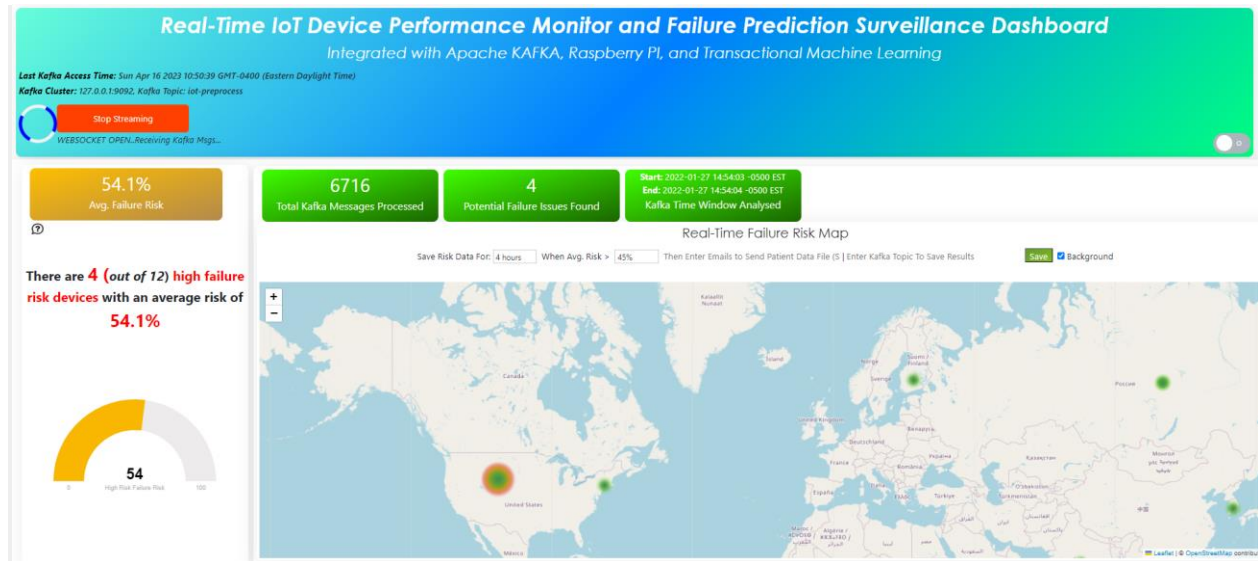
c. `./../mmcblk0p2`

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

e. Auto mount usb:

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

g. 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: Make sure to change IP address 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:

Real-Time IoT Device Performance Monitor and Failure Prediction Surveillance Dashboard
Integrated with Apache KAFKA, Raspberry PI, and Transactional Machine Learning

16. Increase swap file
    a. sudo nano /etc/dphys-swapfile
    b. CONF_SWAPSIZE=2000
    c. sudo reboot
    d. free -m