Sentinel 2 Cloud Detector – Experiment Instructions

Image Generation Experiment – One Pi Configuration

- Requirements
  - Pi Hat Profiler has been compiled by running the "**make all**" command at the top-level directory of the project.
  - Sentinel 2 Cloud Detector and its dependencies have been installed according to the "**docs/sentinel2_CloudDetectorInstallationInstructions.pdf**" document.
  - FTP server has been setup on the host or remote (may require port-forwarding) machine according to the "**docs/FTP_Server_Tutorial.pdf**" document.
- Description
  - The Image Generation Experiment performs the following tasks on separate hardware threads:
    1. Runs Pi Hat Profiler Executable (Records power measurements from the Raspberry Pi) and suspends program execution for 5 minutes (Idle Time).
    2. Performs cloud classification and cloud masking on the Sentinel 2 data files contained in the "**examples/**" directory
    3. Encrypts each data file.
    4. Compresses each encrypted file.
    5. Transmits the compressed data file if the pixel ratio of the image is acceptable.
    6. Once the experiment is terminated, Pi Hat Profiler power measurement results will be output to a time-stamped CSV file in the "**powerMeasurements/**" directory.
- Instructions
  1. Run "**sh runImageGenerationExperiment_OnePiConfiguration.sh <ftpServerIpAddress_Required> <ftpServerPort_Required> <compressionDataClientIpAddress_Optional> <imageDataClientIpAddress_Optional> <encryptionDataClientIpAddress_Optional>**"
  2. To terminate the experiment, run "**sh killImageGenerationProcesses.sh**"
- **NOTE:**
  - Once the experiment has concluded, the following command should be executed: "**sh killImageGenerationProcesses.sh**".
  - This script ensures that all processes have been successfully terminated and ensures that the Pi Hat Profiler CSV file is no longer being written to.

Image Generation Experiment – Four Pi Configuration

- Requirements
  - Four Raspberry Pi 4 nodes and an FTP Server node have been setup as previously described in the "**Requirements**" section of the "**Image Generation Experiment – One Pi Configuration**".
  - All Raspberry Pi 4 nodes and the FTP Server node are connected to a VPN or LAN.
- Description
  - This version of the Image Generation Experiment performs the same functions as the "**Image Generation Experiment – One Pi Configuration**" but uses three Raspberry Pi Nodes to spawn the Python Processes. Additionally, one Raspberry Pi Node is used to run a Simulink Satellite Model.
- Instructions
  - Raspberry Pi Node 1:
    - Run Simulink Satellite Model.
  - Raspberry Pi Node 2:
    - Run "**sh runImageEncryptor_FourPiConfiguration.sh <ftpServerIpAddress_Required> <ftpServerPort_Required>**"
  - Raspberry Pi Node 3:
    - Run "**sh runFileCompressor_FourPiConfiguration.sh <raspberryPiNode2_IpAddress_Required>**"
  - Raspberry Pi Node 4:
    - Run "**sh runCloudDiscriminator_FourPiConfiguration.sh <raspberryPiNode3_IpAddress_Required>**"
- **NOTE:**
  - Once the experiment has concluded, the following command should be executed by each Raspberry Pi Node: "**sh killImageGenerationProcesses.sh**".
  - This script ensures that all processes have been successfully terminated and ensures that the Pi Hat Profiler CSV file is no longer being written to.