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# What is the developed simulator?

The developed code simulates real-time monitor and control for west area of IEEE 118-bus system. Fig. 1 and Fig. 2 depict the network topology of the entire system and the west area, respectively.

A computer screen capture

Description automatically generated with low confidence

Fig. Topology of IEEE 118-bus system.

A computer screen capture

Description automatically generated with medium confidence

Fig. Topology of the West Area.

The 24-hour load profile for each bus is derived by scaling the system’s rated load in the PSSE sav file according to the California Independent System Operator’s Day-ahead load forecast for May 1, 2024.

This simulator performs several critical functions:

* Calculating time-series power flow every 4 seconds
* Updating and dispatching AGC signals every minute
* Conducting N-1 contingency analysis every 5 minutes.

Additionally, the simulator can trip lines and subsequently update and dispatch AGC signals, running power flow analysis after each tripping event. Fig. 3 illustrates the schematic diagram of the simulator architecture.

Graphical user interface, text

Description automatically generated

Fig. 3 Schematic diagram of the simulator architecture

# How to use the developed simulator

**Input requirements:**

1. Timeseries PSSE ‘.sav’ files:
   1. These files are essential for power flow analysis. They contain critical power system data, including time series load profiles, generator setpoints, comprehensive information on buses, branches, and capacitors.
2. mon, sub, con, dfx, acc, and thr files:

These files are used for AC contingency analysis report.

**Output categories:**

1. N-1 Contingency Analysis Reports:
   * The code generates contingency files named in the format acc\_report(118)\_hourX.txt, where X ranges from 1 to 1439. Each file corresponds to an hourly contingency analysis report.
2. Number of Diverged Cases:
   * The code outputs the count of all instances where the power flow calculation did not converge.
3. Number of Cases with AGC Failure:
   * The code prints the number of instances where Automatic Generation Control (AGC) fails during the simulation.

**Steps to run the simulator:**

1. Install PSSE
2. Install visual studio and select the Python interpreter which was installed by PSSE
3. Update paths in PowerFlowAGCFreq\_comments.py:
   1. Update paths in the code for the entire ‘code’ folder, input files (base load ‘IEEE118(3A).sav’ file, time series ‘.sav’ file, mon, sub, con, dfx, acc, and thr), and output files (N-1 contingency analysis report)
4. Insert PSSE license
5. Execute PowerFlowAGCFreq\_comments.py