**Problem Area** :- Monitoring, Measurement & Analytics in a Smartgrid

**Problem Definition** :- Monitor voltage/current charachterictics using the TCS RIPSAC platform

**Methodology** :- The RIPSAC platform lends itself to sensor integration. In case of the smartgrid, the sensors are primarily PMUs. We will use iPDC/PMUSIM to simulate these PMUs. The simulated PMUs will send volatage/current data to our application which will be running on top of RIPSAC. The application will do the following tasks.

1. Push the voltage/current information into a database.
2. Plot the voltage/current charachteristics in realtime.
3. Present an interface to the user to query the data.

**Value added** :- By adopting the above methodology we seek to be able to achieve the following

1. Monitoring voltage quality as per a custom standard. This custom standard would basically be ANSI C84.1 scaled upto our Indian Voltage levels.
2. Monitoring load patterns of the simulated PMU topology. Depending upon the current and voltage charachteristics, we can determine the load at a particular PMU. The PDCs can aggregate this load information. The state of a system can be defined as an ordered set of the load values at all the top-tier PDCs. Based upon these sets, one can come up with a notion of dangerous and safe states. For eg, the system can be said to be in a dangerous state if the North Zone PDC is indicating that the north zone has 70% of the system load. The software is supposed to quickly flag such dangerous states and suggest alternatives like dropping certain loads.

**Deliverable** :- A software running on top of RIPSAC which does the above.

**Challenges** :-

1. Integration of iPDC/PMUSIM and RIPSAC :- The output generated by the simulated PMUs should be converted into an SensorML which can be read by our software which runs on top of RIPSAC. It is envisaged that one can start up a process which listens to all incoming traffic at the PDC server port and then converts the data in the frames to a sensorML. As of now, we do not know if this is a prudent approach or even whether it can be done in real-time. A cleaner way would be to pump the PDC data into a seperate database and directly construct the sensorMLs from it.
2. The plotting of the voltage charachteristics graph can be done by quering the database at regular intervals. For example is the simulation duration is 6 hours and we intend to find out which nodes showed voltage charachteristics deviating from our ANSI C84.1-like standard over a period of 15 mins, we can query the database every 15 mins and identify the offending points and simultaneously plot them on the graph.
3. The database schema must be designed such that it is intuitive enough for the administrator to query and obtain the relevant results. For example the administrator might want to know which node had the maximum load for the maximum amount of time in the simulation run. The database schema must not be too complicated and must easily lend itself to such queries.
4. Choosing an underlying a network topology for the PDCs and justifying this choice is indeed difficult. After this choice is made, we need to enlist all the dangerous states according to some arbitrary thresholds. Again justifying the values of these thresholds is a challenge.
5. (Administrative)** :- Obtain the login and documentation for RIPSAC. As of date the site mentioned in the presentation (https://ripsac.web2labs.net/) has all dead links except home and login.

**Timeline** :-

1. Obtain RIPSAC license and documentation :- 25-march-2013
2. Go through the RIPSAC API. Identify the functions which will be needed in our application. :- 1-april-2013
3. Design the database schema :- 3-april-2013
4. Design the test configuration. This is crucial as we need to create an environment which has enough pertubations which we can measure. :- 10-april-2013
5. Convert PMU/PDC data into sensorML :- 17-april-2013
6. Plot the real-time voltage graph :- 22-april-2013
7. Identify the nodes which are pushing the system towards an unstable state. :- 29-april-2013
8. Final delivery :- 3-May-2013

**Group Members** :-

1. Ashokkumar 124050006
2. Durgesh Samant 124050007