



IIT HYDERABAD

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INDEPENDENT PROJECT GROUP-4

Self healing grid

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1 Introduction to Grids

Delivering electrical power from the generating station to consumption loads is the classical task for the power grid. However, a power grid and any other network's infrastructure share some difficulties in operation, control, efficiency, and reliability mainly:

- Numerous interconnected distributed components.
- Any component/operation failure can easily affect other components/operations instantaneously.
- Several interconnections and dependencies between the network variables. Thus, network mathematical modelling is a difficult challenge.

It is expected that the consumption rate of electricity will be twice the overall consumption rate of all other energy resources next decade. Thus, using the electric power efficiently and reliably are crucial. This raises the need of autonomous power grid operation by deploying hardware and software all over the power grid. Hence, the grid response to disturbances and malfunctions can be improved while obtaining efficient electrical power operation. Doing so, the smart grid is obtained

2 What is Self Healing Grid?

The Self Healing Grid is a system comprised of sensors, automated controls, and advanced software that utilizes real-time distribution data to detect and isolate faults and to reconfigure the distribution network to minimize the customers impacted.

3 History of Self Healing Grid

The self-healing algorithm was originally designed for the very common scenario of two feeders connected in an open ring arrangement. As shown in the Figure 1, often the two feeders are supplied from the same primary substation. The algorithm works equally if the two feeders are supplied from different primary substations.

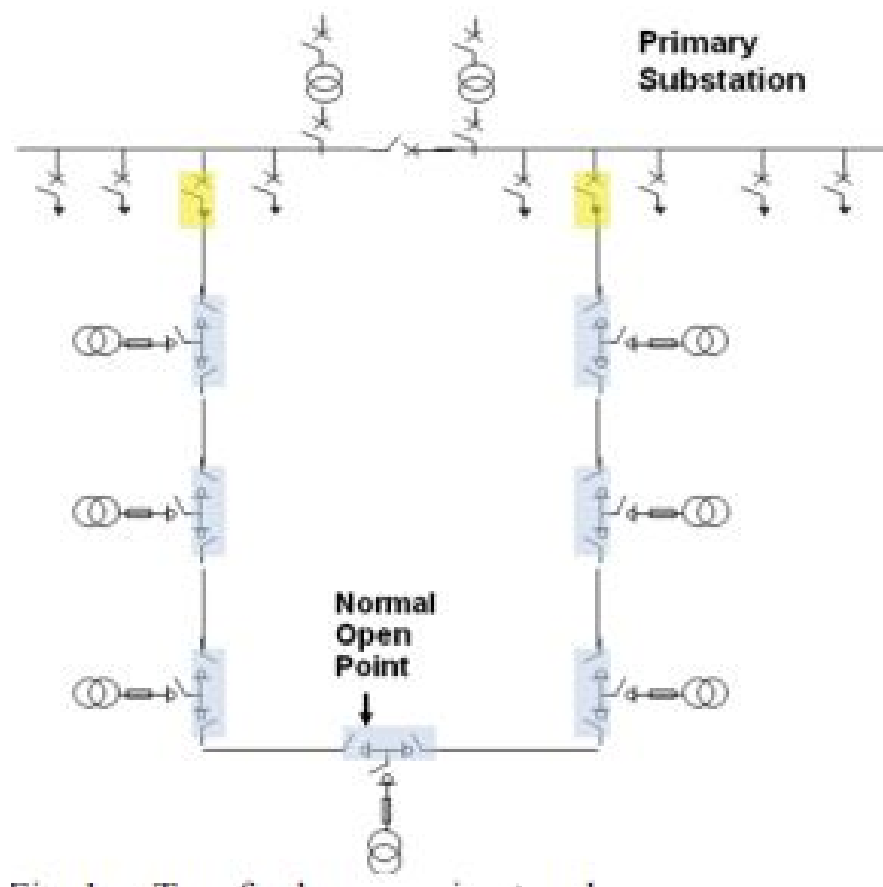


Figure 1: Two feeder open ring topology

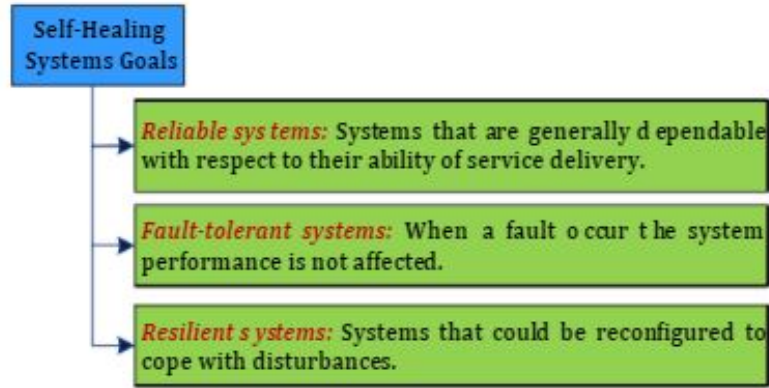


Fig. 4. Goals of self-healing system.

Figure 2: goals of self healing grid

4 Functions and Applications of Self Healing Grid

self-healing function is the ability of a system to distinguish automatically between operating properly or not, then it can apply the required settings in order to retain its normal case of operation. Thus, the desired goals of self-healing systems can be summarized as shown in figure2 .

- Fast and proper detection of grid disturbances.
- Redistribution of grid resources to avoid adversative impacts.
- Assuring the continuity of service under any conditions.
- Minimization of service restoration time.

5 Main Goal of our Project

1. By reconfiguring the switches and reclosers installed on the distribution feeder to quickly isolate the faulted section of the feeder and re-establish service to as many customers as possible from alternate sources/feeders.

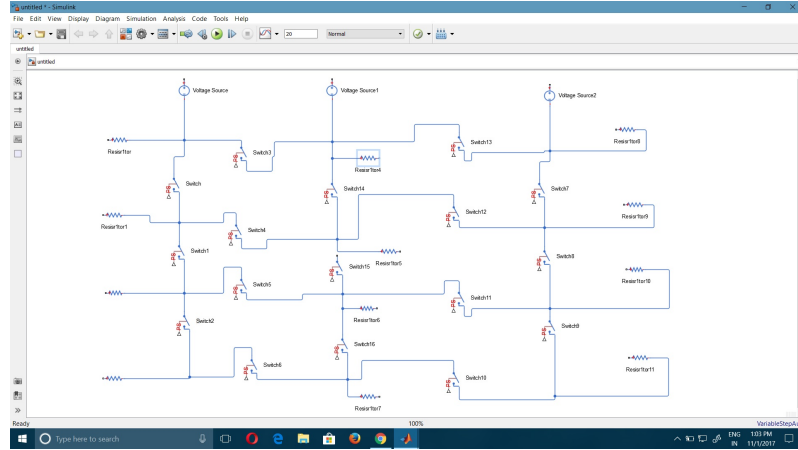


Figure 3: example of 3 feeder network

6 Operation of Self Healing Grid

1. When the fault location is given to the software, first it checks whether it can supply power to the fault locations, by keeping current in limits.
2. Then it checks whether the power can be supplied from the same feeder using alternate routes so that the load of these fault locations only falls on some buses but not on others.
3. Then it is programmed to supply power to maximum number of loads it can and the others cannot be supplied power.

This is done by checking all possible ways of supplying power to fault locations and then getting the combination which can supply power to maximum number of loads.

6.1 solving of example 3 and limitations

- The power will be restored to the loads (LOAD 3,2 ,LOAD 4,2) by closing a side switch between the feeders
- The switch through which we are feeding the load from the other substation should follow some conditions
 1. Max current limit

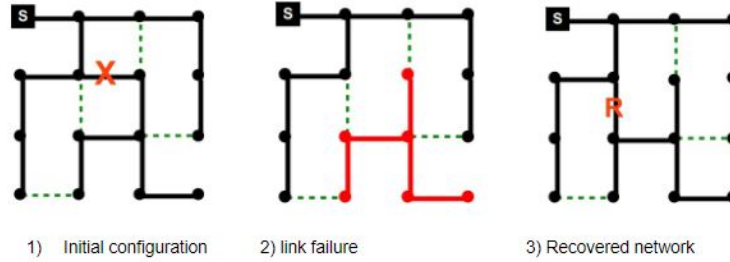


Figure 4: operation of self healing grid with one substation

2. Total power of the loads should be less than substation supply
3. Current should flow in one direction
4. There should not be any closed loops in the network

7 Communication in Self Healing Grid

The self healing requires communication between the intelligent controllers. A common choice is to use a “Star” topology where one node is a local master which communicates with all the others. This means the “leaf” nodes are fairly simple but the local controller has to handle many communication channels.

8 Financial Feasibility

- Framework is broad
- Includes all time scales milliseconds to hour
- Too many cost factors research and development ,SW, devices
- Too narrow - not of interest

9 Cost Model Ananlysis of Self Healing grid

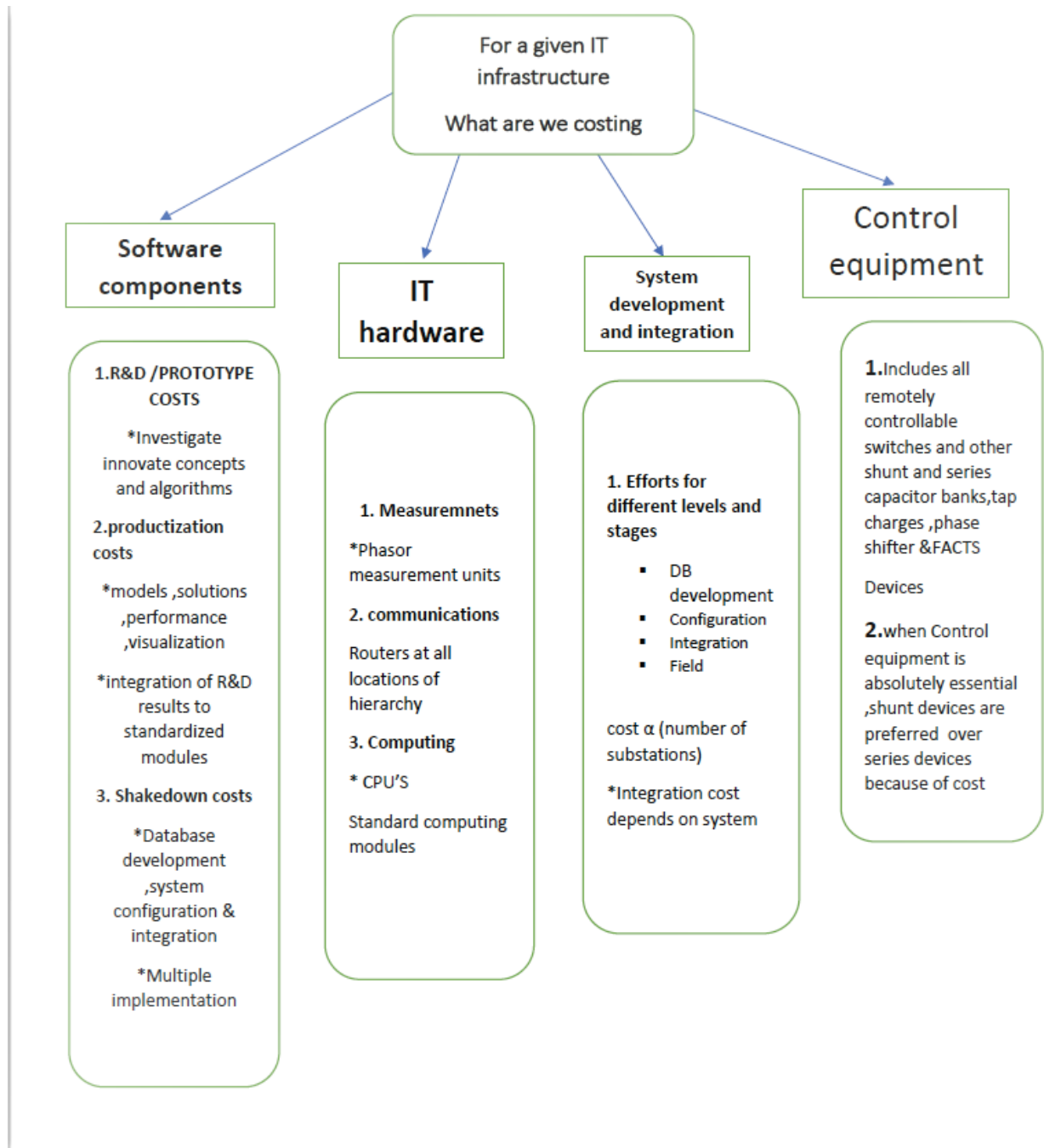


Figure 5: cost model ananlysis of self healing grid