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# Reducing Fault Response Time of Power supply Distribution in Developing Nation

Ajibodu F.A[1], Adaramola O.J[2]
[1](*Department, Of Electrical/Electronic engineering, The Federal Polytechnic Ilaro Ogun State Nigeria)*
[2](*Department, Of Computer Engineering, The Federal Polytechnic Ilaro Ogun State Nigeria)*

***Abstract:*** *Power supply is an important factor in the development of a nation and its economic activities. Hence the need to distribute Electricity effectively becomes very important. Companies depend on power to run machinery and power is a factor that determines the cost of production. When a fault occurs, the time taken to restore normal supply is very important. In developing nation, when a fault occurs it sometimes takes up to months before the local office comes to the rescue to resolve the fault, this is due to remote location of a client. It sometimes requires the quick intervention of occupant to notify the local office of the fault. In some instance out of three phases only a single phase will be operational and clients in the other phase will be denied service. To this end a model was developed that can provide real time status of power distribution over a power line at a particular location. This model provides voltage and current status per phase which in turn will allow the local office to determine if a fault has occurred and expectedly quicken their response time to restore power. This in effect will improve technological innovation and productivity.*

***Keyword:*** *Power, Model, Fault, Real time, simulation.*

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## I. INTRODUCTION

Power supply is an important factor in the development of a nation and its economic activities. Hence availability is important. Power supply commonly known as electricity supply are been generated from the power station and then transmitted to its various client by the distribution unit[1]. In order to provide quick response in a situation of fault a local office is saddled with the responsibility of providing technical backup and monitoring. In developing nation[2], a case study of Nigeria, in Africa. Response time to fault is sometimes too long to be acceptable. For instance,[5]. A faulty line or transformer might not receive attention for restoration from the local office due to fact that the office is not aware of the fault. Monitoring [6] becomes a factor to improve the time of response to fault and necessary power restoration. This is not acceptable for the growth and development of medium and large-scale enterprise which might resolve to alternatives of generating power local through diesel or petrol Generator. Which by extension will increase the cost of running and cost of living at large. In order to forestall this, remote monitoring can be employed using intelligent system [7]which can be connected over a long distance given real time status of lines Mohamed, [8] and transformer under the purview of the local office. This will improve response time, for the local office can monitor in real time status of each lines and hence effect repairs as quickly as possible.

A model was developed to handle this task at each transformer station a module containing and a reconfigurable system was employed that monitors the line voltage and connected through a 2.4Ghz wireless radioto the remote local office where it can be monitored in real time for fault[9]. In the same other every other station is connected to the local office wirelessly.

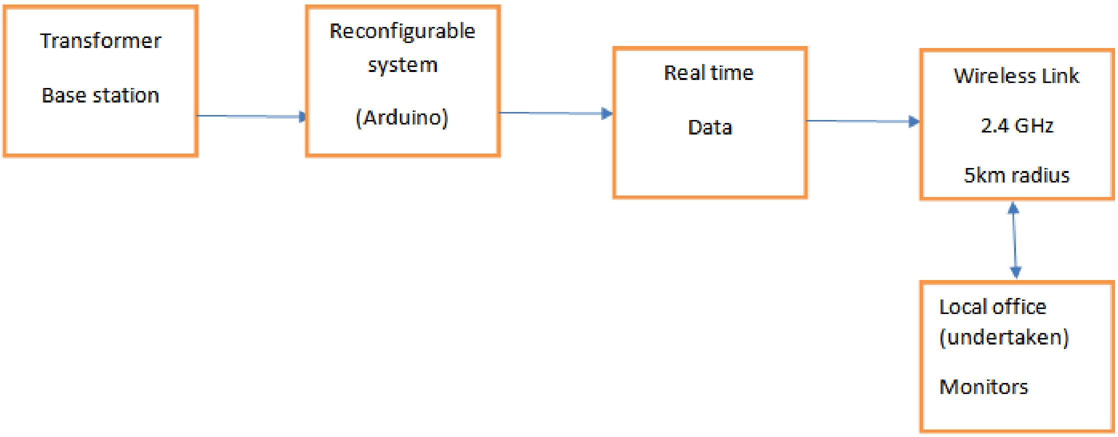


**Figure 1:** Remote Monitoring model

From figure 1 above, the local office will be receiving real time data from the remote station alerting in real time line voltage at each transformer station. This will enable the local office to response to fault in real time and improve on down time [10]. The components required for this process are briefly explained below.

i. **Transformer station:** This station houses the transformer that steps down the 11kV to 415V which is distributed per phase at 240V (Red, Yellow, Blue phase). The monitoring system is introduced at this stage to monitor each line and acquired the data.

ii. **Reconfigurable system:** This system uses a microcontroller board such as Arduino board to acquire the real time data which can be remotely accessed through it Ethernet port, for remote access.

iii. **Wireless link:** This is the point to point network link establish between the base station and the local office in this model a 2.4 GHz is used.

iv. **The Local office:** This is the office in charge running and monitoring power distribution at the undertaken. Also repair of fault occur to provide continuous supply. This is where the live data will be monitored

**Model and simulation**

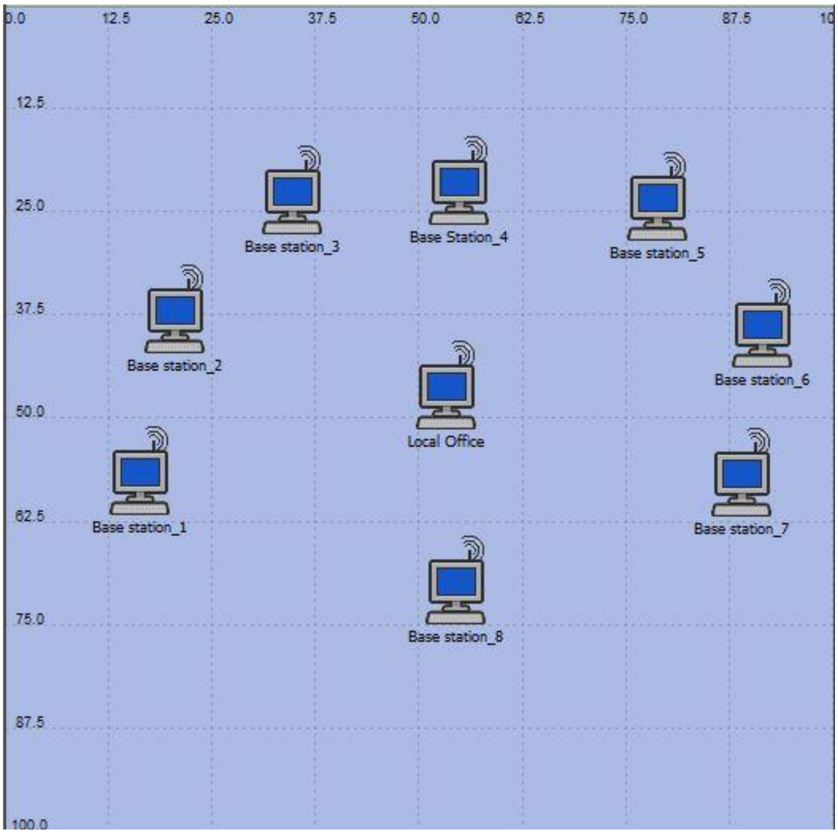


**Figure 2:** Substation Connected to the Local Office

The local office is linked remotely to the base station in other to obtain real time status of line voltage at a particular base station. Each base station is equipped with an embedded system that acquires data from each lines (Blue, Yellow and Red phase) and transmit data to the local office. The simulation software used in the development of this model is OPNET Modeler.

**Simulation and Result**

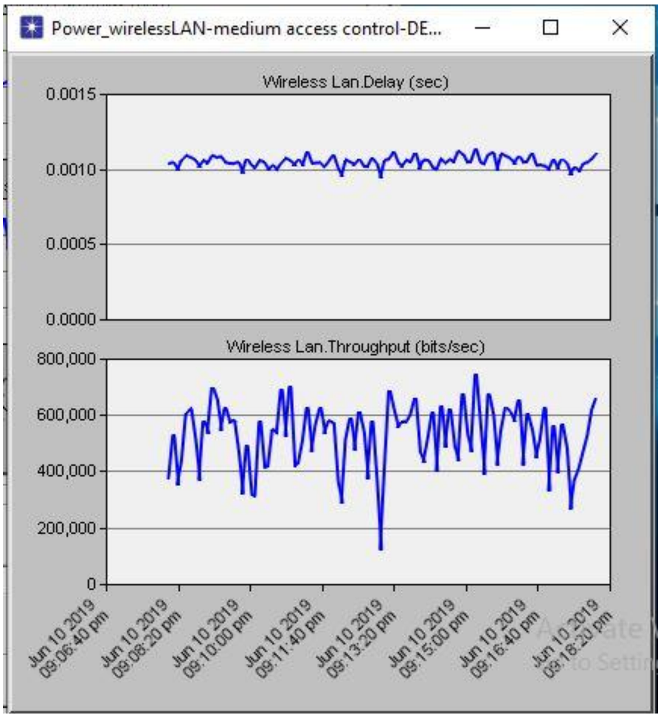


**Figure 3:** Real Time Traffic at the Local Office from Remote Base Station

The result obtained in figure 3 shows the traffic and information flowing from the remote base station to the local office which enable real time monitoring of live data on the base station.

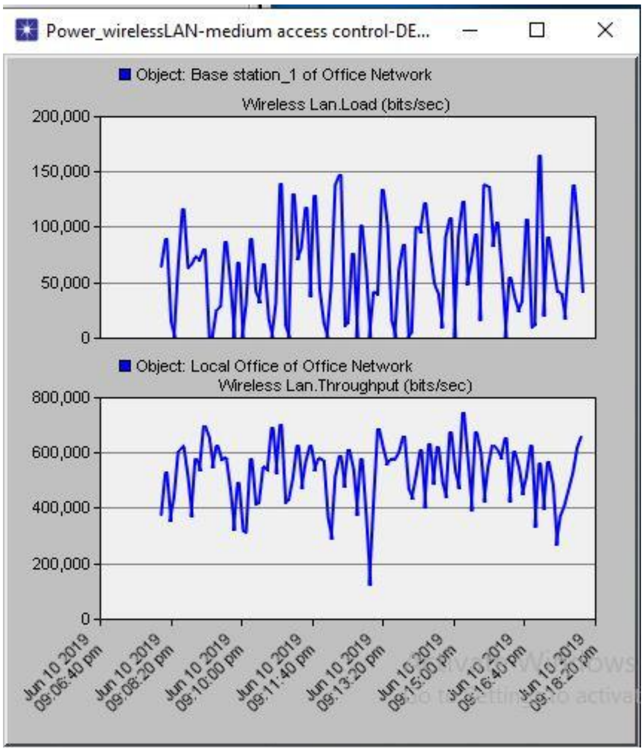


**Figure 4:** Base Station Acquiring Information from the Power Lines

Figure 4 shows the live information been acquired from the lines at the remote base station which is then transferred to the local office.

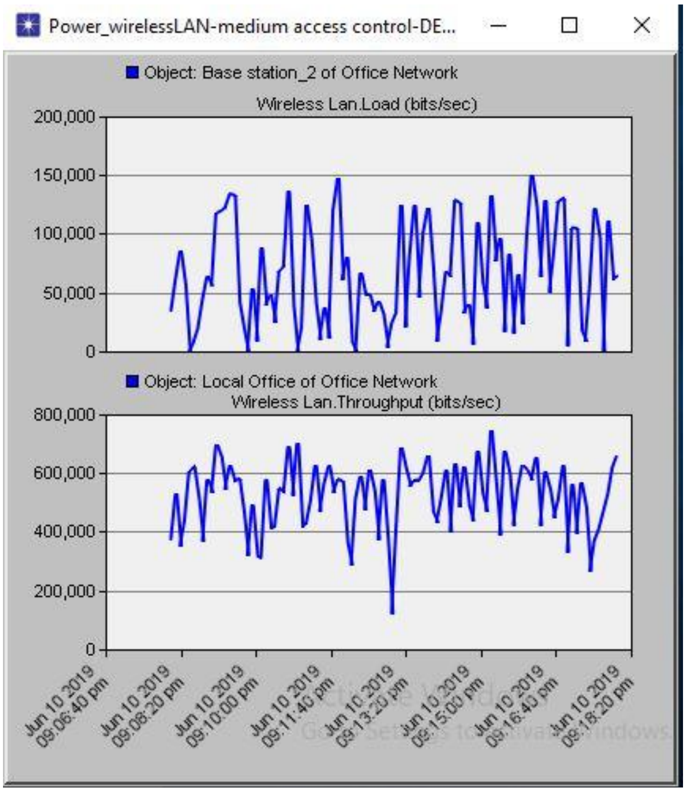


**Figure 5:** Live Data from Base Station 2

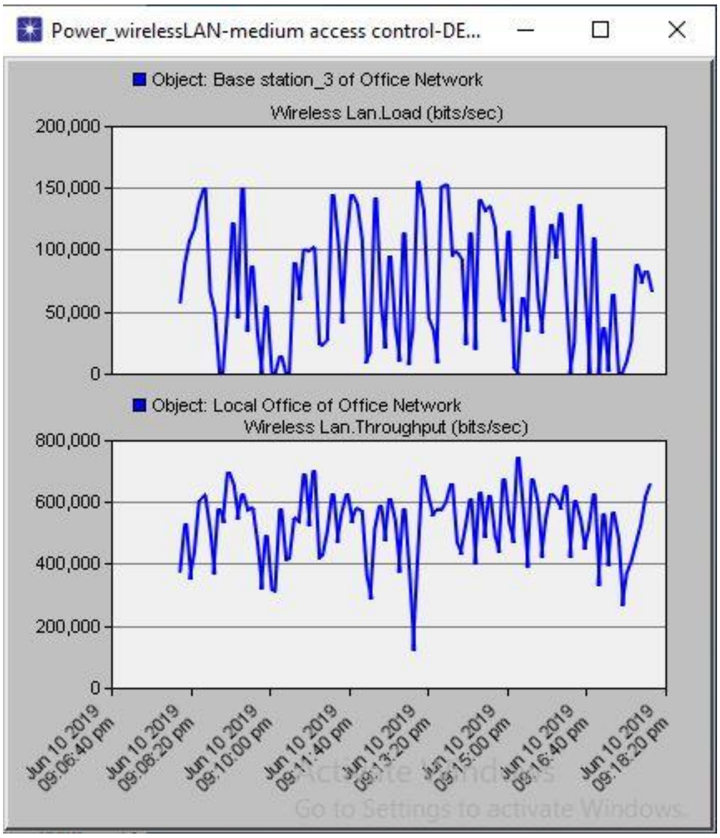


**Figure 6:** Live Data from Base Station 3

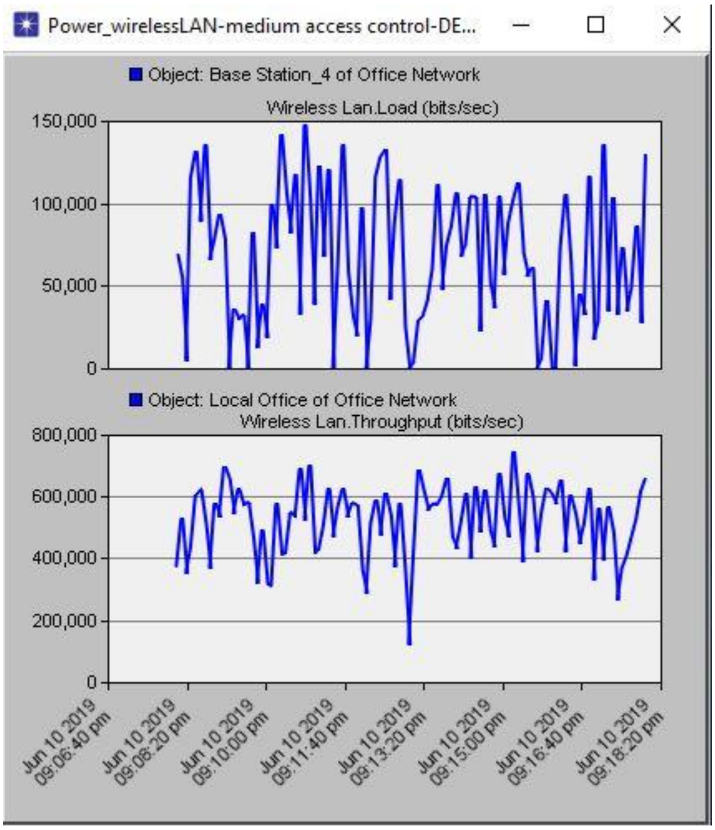


**Figure 7:** Live Data from Base Station 4

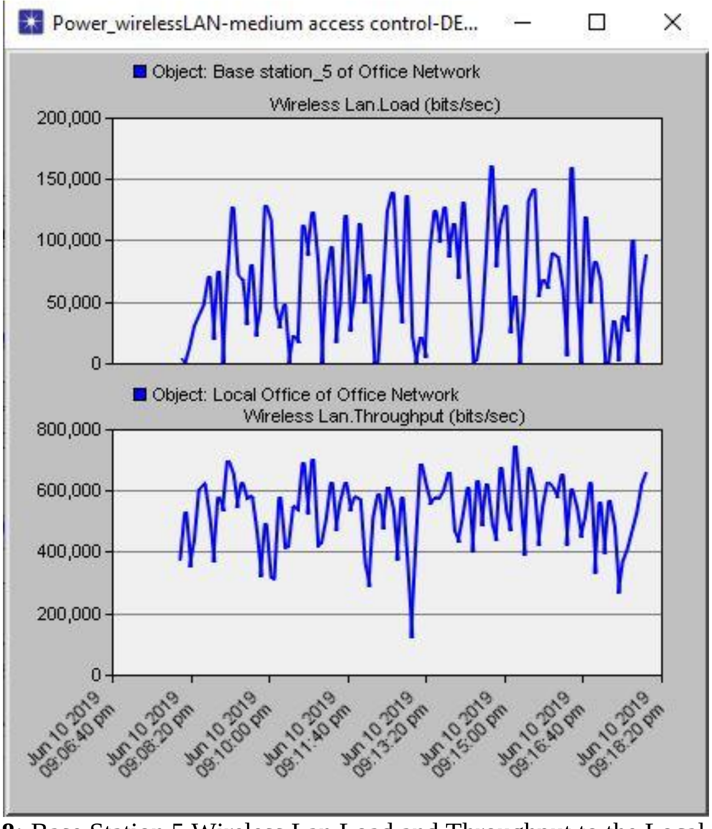


**Figure 8:** Base Station 5 Wireless Lan Load and Throughput to the Local Office.

From figure 2 to 8 we can infer that data acquired from the remote base station are transferred to the local office where the remote base station can be monitored. Quick response can be done when a fault occur.

## II. CONCLUSION

This model will go a long way to improve response time and by extension lower cost of production due to availability of supply. At the remote base station the embedded system can also be used to store data for future references. The live data can also be used to determine failure rate of a base station.

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