International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 6 Issue 3, March-April 2022 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Implementation of Automation for the Seamless Identification of Fault in Modern Smart Grids

Abdul Wahied Khan, Yuvraj Singh Ranawat, Deepak Kumar Joshi

Department of Electrical Engineering, Mewar University, Chittorgarh, Rajasthan, India

ABSTRACT

Every machine in the world runs on electricity so we cannot even imagine the world without electric power. Electricity has a pivotal role in our lives. Electricity is one of the aspect that leads to the development of the country and help people to live their life comfortably. Like power generation electric power distribution is also a challenging aspect. The existing Indian distribution network is also facing so many challenges such as the annual load growth is increasing, the distribution network power losses are high, distribution equipment failure due to over loading, poor voltage profile of the system and the number of breakdowns and frequent interruptions on distribution feeders are high. So there is a need for electric utilities to make their distribution system a modern one, a smart one and an agile one. These things necessitate the automation of a distribution system to overcome the prevailing difficulties. The paper presents a the distribution system Automation for a smart grid that is analyzed and implemented using Multi Agent System (MAS) for four significant issues of power system such as Fault identification, isolation and restoration (FIIR) using Multiagent system for a smart grid application.

How to cite this paper: Abdul Wahied Khan | Yuvraj Singh Ranawat | Deepak Kumar Joshi "Implementation of Automation for the Seamless Identification of Fault in Modern Smart Grids" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-6 | Issue-3, April 2022, pp.1885-1888, URL: www.ijtsrd.com/papers/ijtsrd49856.pdf

IJTSRD49856

Copyright © 2022 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (http://creativecommons.org/licenses/by/4.0)

INTRODUCTION

An electrical grid is an interconnected system for delivering electricity from supplier to consumers. It consists of generating stations that produce electrical power, high-voltage transmission lines used to carry power from distant sources to the demand center, and distribution lines that connect individual consumers. It is an indisputable reality that electric power is one of the major and most important factors that led to the rapid industrialization and globalization in the twentieth century. In India, 15–20% of transmitting power is lost in the transmission and distribution network while 10 to 20% is lost to theft across the utilities. As these losses have been decreasing slowly over the recent years, But still there is a long way for the utilities to achieve the desired state of operations. India has also been lacking its generation infrastructure expansion plans for the last few decades. The smart grid delivers electricity to consumers using two-way digital technology to enable the more efficient management of consumers/end users of electricity as well as to identify and correct supply–demand imbalances of the grid more efficiently and also instantaneously detect faults in a "self-healing" process that increases service quality, improves reliability, and reduces costs. The significant vision of the smart grid includes a wide set of applications includes software, hardware, and technologies that enable utilities to integrate, interface with, and intelligently control innovations. The traditional power grids are generally used to carry power from a few central generators to a large number of consumers. In contrast, the smart grid can use a two-way flow of electrical energy and information to create an automated and distributed advanced energy delivery network**.**

Literature Survey:

Various computing algorithms were used for solving different power system applications. But all those algorithms such as genetic algorithm, particle swarm optimization, artificial neural networks etc; needs a powerful central controller to handle a large amount of data and transmission of global information with the network. These centralized schemes are costly and

easy to suffer from single-point failures. Furthermore, centralized control scheme lacks additivity to structure changes of power networks. When new generators and loads are installed, the centralized control scheme may need to be redesigned. Considering the uncertainty of intermittent renewable energy resources, generation fluctuation may result in unintentional structure changes, which will further increase the burden to centralized schemes. Since distributed control scheme can overcome the above mentioned shortcomings, distributed control scheme looks like a better solution for the reliable operation of power systems. Andreas Nader linger et al. (2011) Proposed that the MATLAB presented an interface, which is based exclusively on documented and portable mechanisms supplied by Java and MATLAB. The approach is based on asynchronous communication between Java threads and MATLAB and follows the producer/ consumer pattern. The author also presented the performance measurements and discussed the impact of an optimization for calling MATLAB functions that return a result value back to Java. Takeshi Nagata et al. (2004) Proposed a multi-agent approach for a decentralized power system restoration for a local distribution network. The proposed method consists of agents such as Bus Agents (BAGs) and Junction Agents (JCTs). The proposed multi-agent system is a promising approach to more large-scale power system networks. un Yan et al. (2016) proposed a Q-learning based approach to identify critical attack sequences with consideration of physical system behaviors. Q-learning, improve the damage of sequential topology attack towards system failures with the least attack efforts. Case studies based on three IEEE test systems have demonstrated the learning ability and effectiveness of Q-learning based vulnerability analysis. Yinliang Xu and Wenxin Liu (2011) proposed the centralized schemes followed by other soft computing algorithms which suffer single point failures and lacks adaptability to structure changes of power networks. Thus, the proposed algorithm for distributed control scheme overcomes the shortcoming of the centralized control. Hongwei DU et al. (2012) given an important feature of smart distribution different from the traditional distribution network. It is used to support a large number of distributed generation (DG) access. Effect of DG on distribution network is analyzed first and also given a DG access requirement for the distribution automation system. Paulo Leitao et al. (2013) given that the multi-agent technology and its usage in the active power distribution system were briefly explained with its use cases. Hosny Abbas et al. (2015) proposed that the Multi-agent systems (MAS) appeared as a new architectural style for engineering complex and highly dynamic applications such as SCADA systems. An approach for simply developing flexible and interoperable SCADA systems based on the integration of MAS and OPC process protocol. Syrine Ben Meskina et al. (2016) proposed that the failure propagation in smart grids (SGs) complicates and prolongs the recovery time as the faults to be resolved increase. The design and implementation of a framework for SGs modeling, simulation, and recovery. The proposed approach is based on a multiagent system composed of static and mobile agents to ensure local and remote resolutions. The deployment of local distributed databases updated at run-time ensure the effectiveness of the proposed fault recovery strategy

METHODOLOGY:

The occurrence of a fault in a distribution system is quite a common issue and it is unavoidable. When a fault occurs in a system, the protection devices like relays and circuit breakers are used to isolate the faulty section from the healthy section.

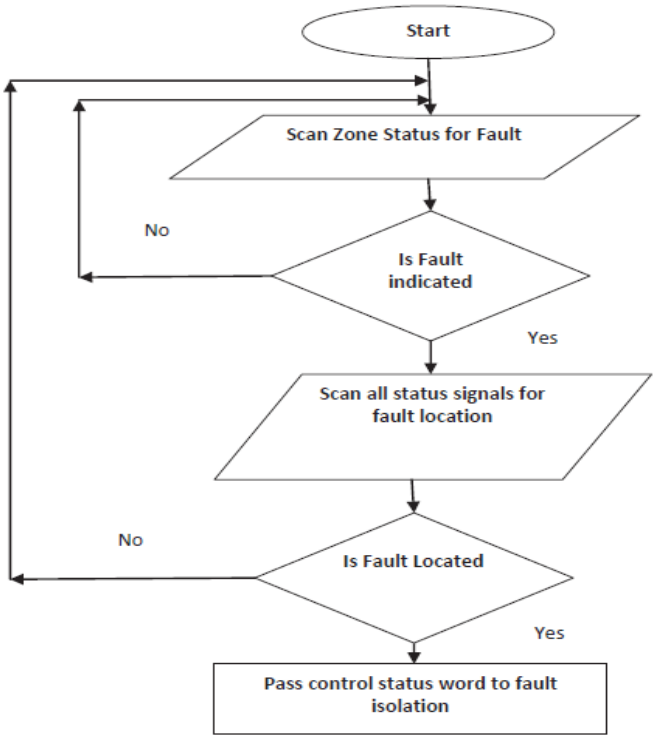

Figure 1 Fault identification Algorithm

But, during this operation, some of the unfaulted loads were also disconnected. Thus, it is necessary to restore the unfaulted loads as early as possible to restore the supply to the consumers and it is also required to maintain the continuity of the supply. The main objective of this paper is to create agents in JADE and interface it with the distribution network developed in MATLAB/Simulink.

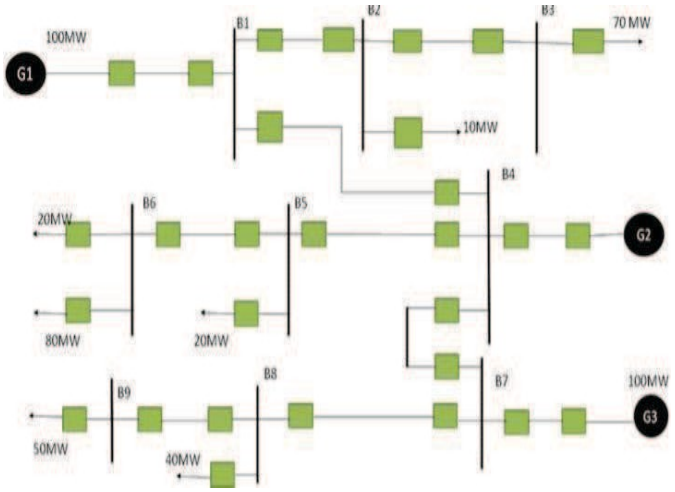

Figure 2 Proposed 9-bus systems

Result:

The results were carried in Matlab. MATLAB/SIMULINK software is used to add the modeling and simulation features .Fig 3:- Simulation of 9bus distribution system.

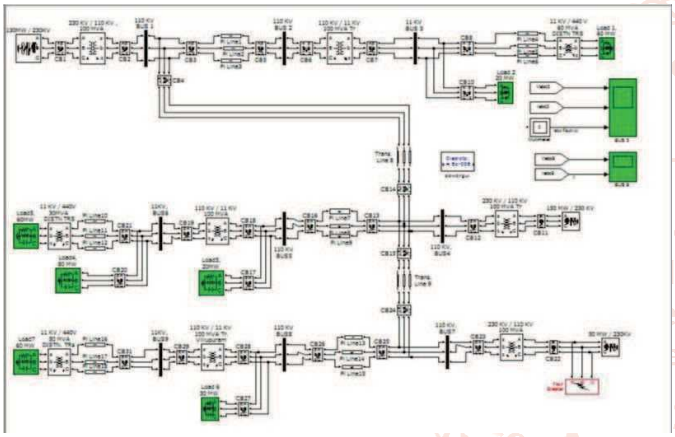

Fig 3 shows the simulation results.

The specific protective relaying concepts that go beyond the level of detail originally provided by the software. The MATLAB software package with SIMULINK support and Power System Block set (PSB) is utilized to develop customized model libraries for teaching protective relaying concepts

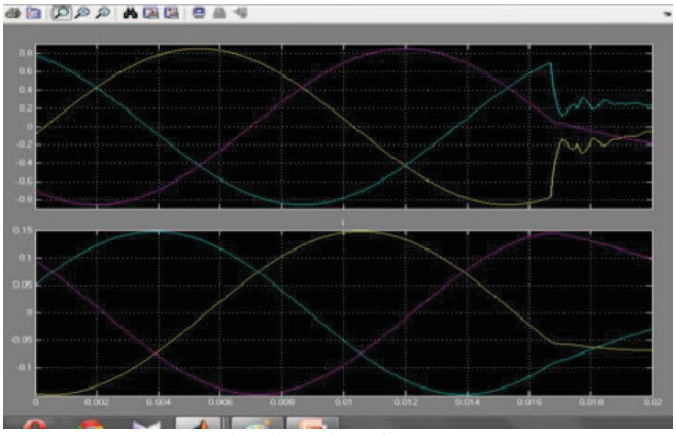

Fig 4:- Line faultss

Conclusion:- The proposed power issue for power distribution automation process for Fault identification, isolation and restoration (FIIR) for distribution automation for a smart grid using Multivalent system is carried and analysis in simulation results. In this analysis of FIIR for a distribution system for distribution automation, a practical 9-bus system was taken. Average consensus algorithm and mean metropolis methods were used to arrive the restoration strategy. This proves to be a faster algorithm for the restoration process.

References

[1] Aboelsood Zidan, and Ehab F. El-Saadany, (2012) "A Cooperative Multiagent Framework for Self-Healing Mechanisms in Distribution Systems" IEEE Transactions on Smart grid, Vol. 3, pp. no. 1525-1539

[2] Ameya K. Saonerkar, B. Y. Bagde and B. S. Amour (2014), "DG Placement in the distribution network for power loss minimization using Genetic Algorithm", International Journal of Research in Engineering and Science, Vol. 02, pp. no. 41-47

[3] Amirhossein Sajadi et. al. (2012), " Distributed Control Scheme for Voltage Regulation inSmart Grids, International Journal of Smart Grid and Energy, vol. no. 3, pp. np0. 53-59

[4] An D. T. Le, Muttaqi K. M, Negnevitsky. M and Ledwich. G (2007), "Response coordination of distributed generation and tap changers for voltage support", IEEE, Proceeding Australasian Universities Power Engineering Conference, pages pp. 705-711

[5] Anastasia S. Safigianni and George J. Salis(2000), Optimum Voltage Regulator Placement in a Radial power distribution network, IEEE transactions on power systems, Vol. 15, pp. no. 2

[6] Andreas Naderlinger, Josef Templ, Stefan Resmerita, Wolfgang Pree(2011) "An Asynchronous Java Interface to MATLAB", IEEE XPLORE

[7] Arup Singh, S. Neogi et. al (2011)" Smart grid initiative for power distribution utility in India", IEEE, Power and Energy Society General Meeting

[8] Bakshideh Zad. B, Lobry. J, Vallee. F and Durieux. O (2013)" Improvement of on-load tap changer performance in voltage regulation of MV distribution systems with DG units using D-STATCOM", 22nd international conference on electricity distribution, CIRED,

[9] Baran M. E and Wu F. F (1989) "Network reconfiguration in distribution systems for loss reduction and load balancing", IEEE Trans. Power, pp. no. 1401 1407.

[10] Caire, G., Developing Multi-Agent Systems with JADE, Wiley & Sons, 2007.

[11] Carreno. E, Romero. R and Padilha-Feltrin. A (2008) "An efficient codification to solve distribution network reconfiguration for loss reduction roblem", IEEE Transactions on Power Systems, Vol. 23, No. 4, pp. 1542- 1551,

[12] Chandan Kumar and Mahesh K. Mishra (2014), "A Voltage-Controlled DSTATCOM for Power-Quality Improvement", IEEE Trans. Power Delivery', Vol. 29, pp. no. 3,

[13] Charles R. Robinson, Peter Mendham, and Tim Clarke (2010), "MACSimJX: A Tool for Enabling Agent Modelling with Simulink Using JADE", Journal of Physical Agents, Vol. 4, pp. no. 3

[14] Chia-Hung Lin et. al, (2009) Fault Detection, Isolation and Restoration using a Multi agent based Distribution Automation System, IEEE conference publications, ICIEA. vol. no. 3. pp. no. 45-49

[15] Chumno KY, LAK Sivcheng, LEOM Lefong, L Y Senghuo(2014), report on Distribution Automation, Institute of Technology of Cambodia,

[16] Chun-Lien Su, Cong-Kai Lan, Tso-Chu Chou, and Ching-Jin Chen (2015)" Performance Evaluation of Multiagent Systems for Navy Shipboard Power System Restoration", IEEE Transactions on industry applications, Vol. 51, pp. no. 4

[17] Civanlar. S, Grainger J. J, Yin. H and Lee S. S. H (1988) "Distribution feeder reconfiguration for loss reduction" IEEE Trans. Power Deliver)', vol. no. 1, pp. no. 1217-1223

[18] David Camacho, Ricardo Alev, Cesar castro, Jose M. molue (2002), "Performance evaluation of Zeus, JADE and Skeleton agent frame works, IEEE SMCTA2N3,

[19] De Oliveira M. E, Ochoa L. F, Padilha-Feltrin. A and Mantovani J. R. S (2004) "Network Reconfiguration and Loss Allocation for Distribution Systems with Distributed generation" IEEUPES, Transmission & Distribution Conference

[20] Department of Energy [online]available at https://energy.gov/oe/services/technologydevelopment/smart-grid Systems,

[21] Dinesh. J, Yogesh. M, Hemachandran. M, Uvaraj. G (2013), " Application of Multi Agent system", International Journal of Computer Application, vol. 66. no. 1

[22] Ettehadi. M, Ghasemi. H and Vaez-Zadeh. S (2013) "Voltage Stability-Based DG Placement in Distribution Networks", IEEE Transactions on Power delivery, Vol. 28, No. 1

[23] Euan M. Davidson, Stephen D. J. McArthur, Cherry Yuen (2008)" AuRANMS: Towards the Delivery of Smarter Distribution Networks through the Application of Multiagent Systems Technology" IEEE XPLORE