A Gateway For Synchrophasor Technology With Security

Linta John[1], Bibin Varghese[2], Smita C Thomas[3]

[1, 2, 3] Mount Zion College of Engineering, Kadamanitta, Pathanamthitta

Abstract- *Synchrophasor technology has a large no of applications. This application is ranging from simple grid monitor- ing/visualization to real-time protection and also control. Synchrophasors are numbers which has both magnitude and phase angle. The devices which is used for measuring the synchrophasor numbers are phasor measurement units (PMUs) and phasor data concentrators (PDCs). For the working of these devices, support the IEEE C37.118.2 communication framework, but this framework is vulnerable to cyber attacks, due security mechanisms. The recently emerge framework IEC 61850-90-5, support security features. The gateway concept is very good because it provide security. Here addresses the security issues in synchrophasor technology through the design of a security gateway. The security gateway is implemented with the concept of providing username and password. Also the data is encrypted using the AES algorithm. The security gateway is very compact in size.*

Keywords- Synchrophasor technology, AES, Frameworks.

I. INTRODUCTION

Synchrophasor technology include the measurement of synchrophasor numbers which has both magnitude and phase angle of the sine waves which is present in the electrical quantities. The Phasor Measurement Units (PMUs) are devices which is used to measure the synchrophasors. And also PMU's at different locations will be the data to the control center. The PMUs are incorporated with a GPS antenna,which helps to get an accurate data. Only with the accurate data the control center can able to precisely process them. An efficient and secure communication framework is neede in Synchrophasor technology to transfer the data. IEEE C37.118.2 and IEC 61850-90-5 are the two synchrophasor communication frameworks. IEEE C37.118.2 comes from IEEE C37.118. And has been widely used in PMUs and Phasor Data Concentrators (PDCs). However, IEEE C37.118.2 has no inherent security mechanism. With the emerging of IEC 61850 , which addresses all the security problems of IEEE C37.118.2. IEC 61850-90-5 was introduced in 2012. In synchrophasor technology the data also need to encrypt, so AES algorithm ius a good choice. AES is developed by Vincent Rijmen and Joan Daemen.

From the figure 1 we can see that, the gateway is a thing which can be seen in both substations and the central stations. The substations contains a set of PMU's. The gateway which is in the substation accept the packet which is either secure ore insecure, and accept that and convert it in to IEC 61850-90-5 and passes through the central station. The gateway in the central station accept the data and convert it in to its original form. The data is transmitted from base station to central station via network
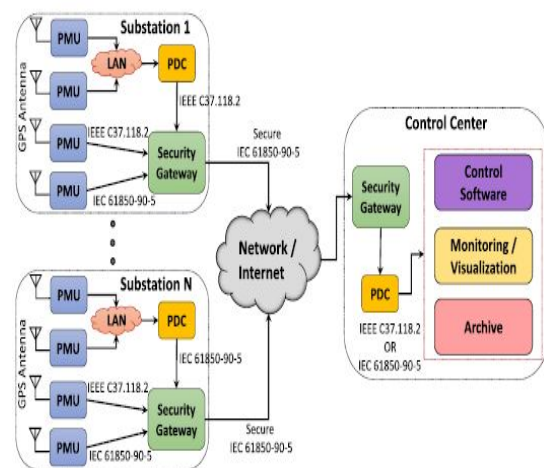

Fig :1 Synchrophasor technology system

II. RELATED WORK

Synchrophasor technology has great application in WAMPAC applications. It consists of two important components: PMUs and PDCs. PMUs measure electrical quantities and transmit them to the control center. PDCs collect data from multiple PMUs and make them in to single data. Most of the framework contains four messages: data, configuration, command, header.
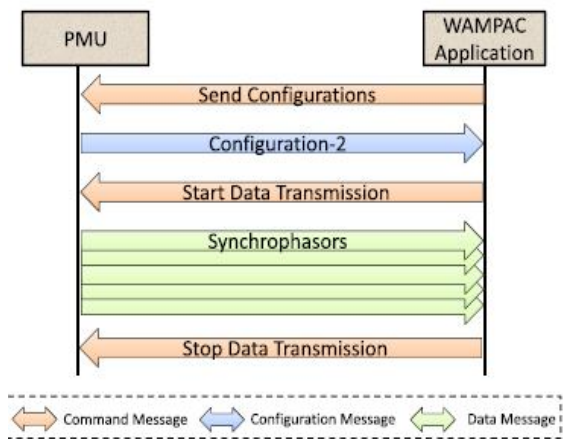
IEEE C37.118.2 and IEC 61850-90-5 without any security mechanism are highly vulnerable to cyber attacks

.

III. PROPOSED METHOD

In Synchrophasor system both base station and central station have security gateways, which accepts and transmit the packets over the network. For the protection of the data, security is needed. Here the gateway is work as group members. The proposed method consists of group members and Key server. The key server is responsible for providing the username and password for the group member. Here the group member will get authenticated by the server. After the successful authentication, the group members can also communicate with each other. So only the authenticated ones can participate in the communication, by this security can be achieved.

At first the member sends a request for getting username and password from the server. After get the password and username the member can communicate. And also the server provides the key for the encryption of the data, AES is used.
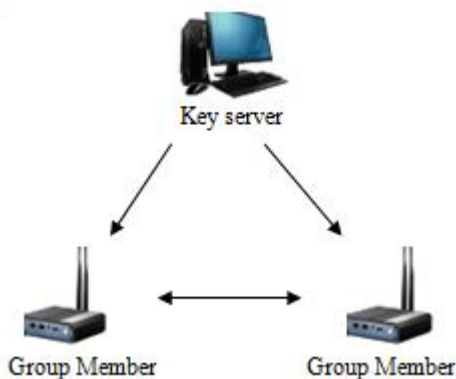
IV. CONCLUSION

Synchrophasor technology has a great applications in power industry. The data produced is Accurate so it increases the application. Most synchrophasor measuring devices like phasor devices use IEEE C37.118.2 which is highly vulnerable to cyber attacks. So need to use a security mechanism. The security gateway supports two way conversion features between IEEE C37.118.2 and IEC 61850-90-5 communication frameworks. Here the security is provided by using the username and the password , also the the data isencrypted by using the AES algorithm

V. ACKNOWLEDGMENT

REFERENCES

[1] R. Khan, K. McLaughlin, D. Laverty, and S. Sezer, ``Analysis of IEEE C37.118 and IEC 61850-90-5 synchrophasor communication frame- works,'' in Proc. IEEE Power Energy Soc. General Meet. (PESGM), Jul. 2016, pp. 1-5.

[2] I. M. Dragomir and S. S. Iliescu, ``Synchrophasors applications in power system monitoring, protection and control,'' in Proc. 20th Int. Conf. Control Syst. Comput. Sci., May 2015, pp. 978-983.

[3] R. Khan, K. McLaughlin, D. Laverty, and S. Sezer, ``IEEE C37.118-2 synchrophasor communication framework: Overview, cyber vulnerabilities analysis and performance evaluation,'' in Proc. 2nd Int. Conf. Inf. Syst. Secur. Privacy (ICISSP), 2016, pp. 1-10.