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Smart Grid based on Edge Cloud Computing

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Abstract: *Grid means power or energy supply. An electric grid with the information and communication technology (ICT) is called smart grid. To use smart grid, smart meters are installed, and helps to do two way communications i.e consumers to suppliers and then again to consumers. Smart grid with edge computing is the smart solution where the consumers can track the high power voltage and because of that there will be no loss of energy. All the data gets transmitted using wireless communication. In tradition method consumers had only access of paying electricity bills but Smart grid overcomes the drawback of traditional method by providing two way communication. The consumers can also find out the graph of power supply at home, company, etc using smart grid. In future the cost of smart grid will get reduced and AI implementation will be activated and it will reduce the need for grid storage, and the consumers will able to operate the smart meters, so that the loss of electricity will be in control.*

Keywords: Smart Grid, Edge Computing, Smart meter, Sensors, PMU placement, Electricity

I. INTRODUCTION

Smart Grid: An electric grid with the information and communication technology (ICT) is called smart grid. It is an electrical grid with Automation, Communication and IT systems that can monitor power flows from points of generation to points of consumption (even down to appliances level) and control the power flow or curtail the load to match generation in real time or near real time. Smart grids use cloud computing for multi-directional movement of electricity and data. The smart grid helps to detect and respond to changes in supply, demand and functioning in real time.
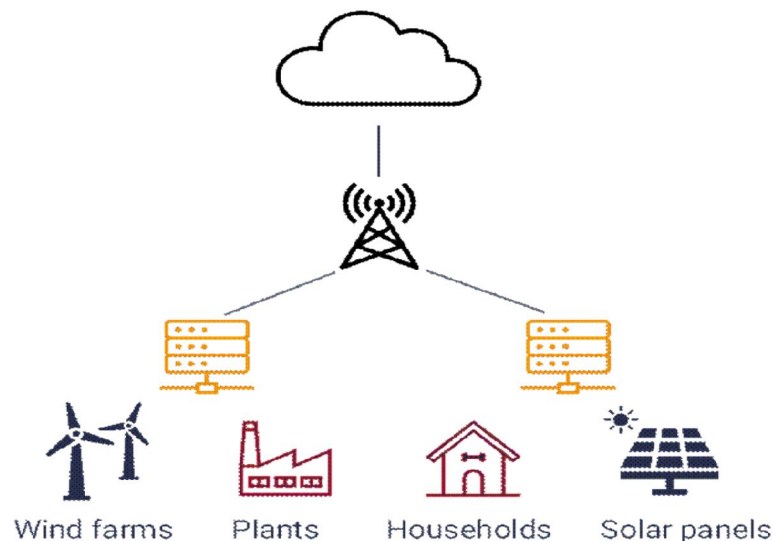

II. RELATED WORK

Cloud Computing: Clouding computing is the process of managing, processing, storing data using internet. It performs all the operations on cloud. over the Internet ("the cloud") to offer faster innovation, flexible resources, and economies of scale. Examples of cloud computing are Dropbox, a file storage and sharing system. Microsoft Azure, which offers

backup and disaster recovery services, hosting, and more. Rackspace, which offers data, security, and infrastructure services.


2.1 Edge Computing

Edge computing is the extension or additional part of the cloud computing. It allows to perform the operations on the local disk means on the user's computer, on an IOT device or on any other local device. There is no need to communicate with cloud servers while processing. Edge computing is used to record and detect the action. It reduce the usage of cloud computing. Edge computing provides with no communication gap. It is faster and has real time response. But the drawback is , additional resources are required.
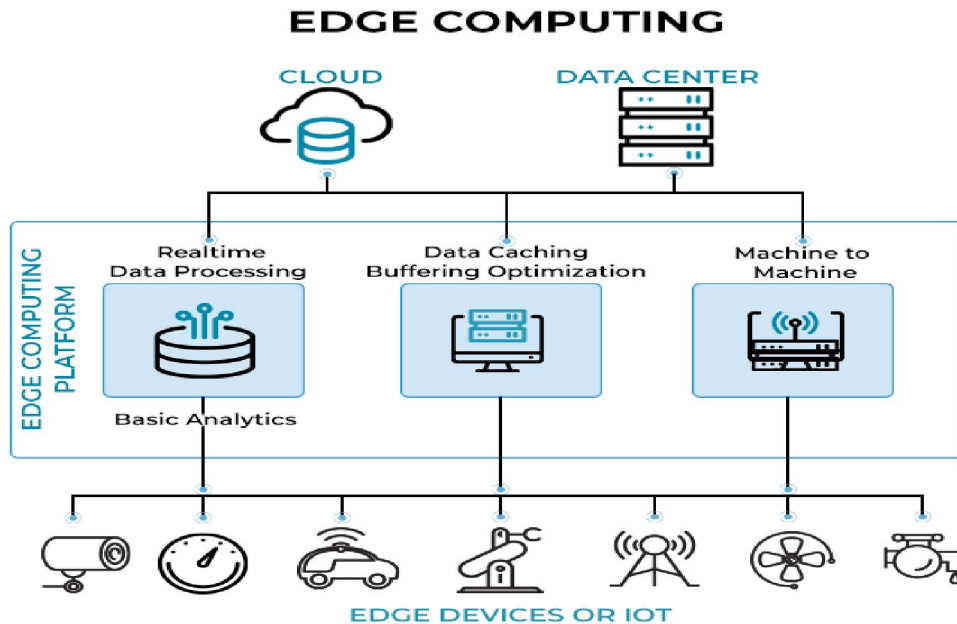
III. SMART METERS

Smart meters are installed at homes and business places. It monitors the energy consumption. Smart meters transmits the information back to energy providers. It helps to do two may communication means from consumer to supplier and then again to consumer. Smart meters tracks the area of high use and it is self monitor. Advanced sensors are used in smart meters to identify possible outage and to provide proper service. Smart meter is a smart solution.
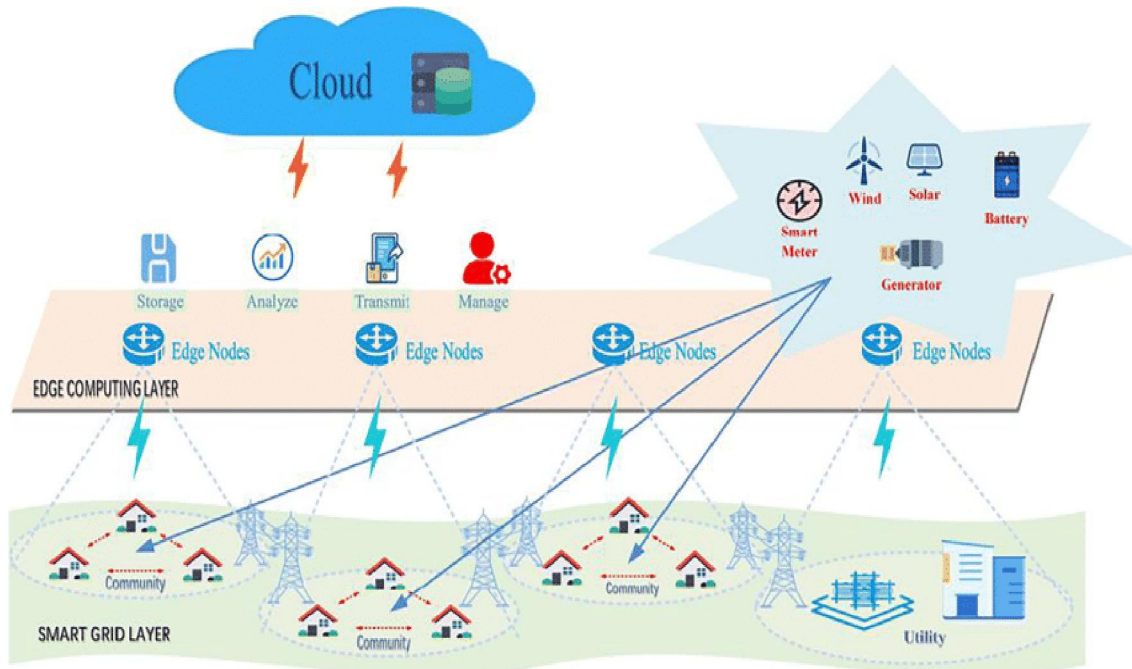
Who are using Smart Grid?

Individual consumers, corporate participation, government regulators are using smart grid mostly. It has become a many customer choices because is works as a transmit and receiver.

IV. ENERGY PROVIDERS

It tracks energy consumption and automatically throttle down energy consumption on a granular level when demands get too high. Energy is transferred from energy company to distribution center to destination point. Tracks the area of high and low voltage power supply so there is low wastage of power. All the data is get transmitted using wireless communication and because of that there is no loss of energy.


(a)   (b)
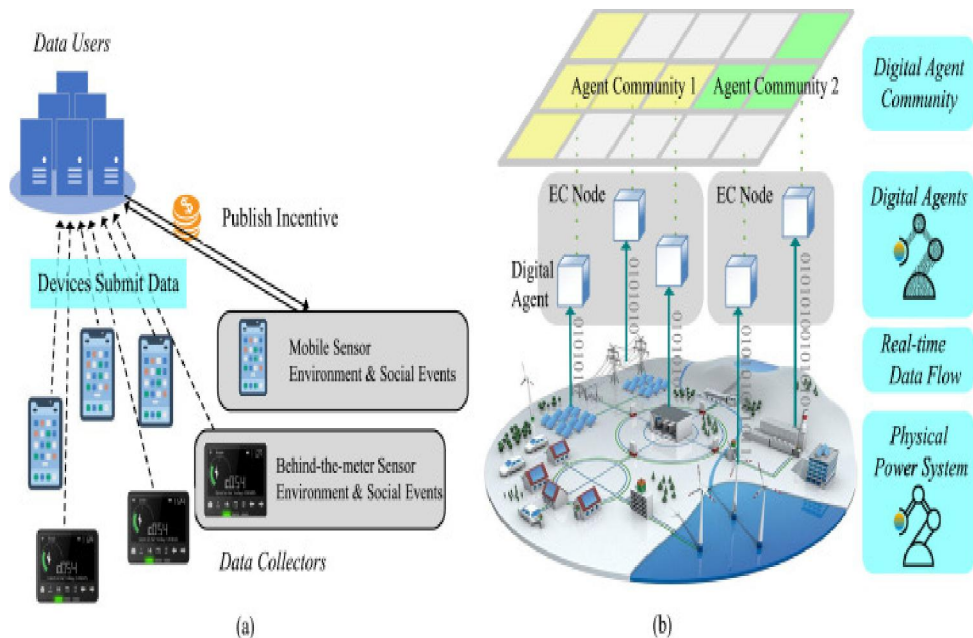
VI. SENSOR USED

Voltage, amphere, frequency, humidity, temperature sensors will collect all these things to transmit and it will help to collect data and computer will display in a graph. To know the voltage, current and frequency Phasor Measurement Unit (PMU) is get used. The smart grid based on on-board computing consists of a large number of sensors and data sources that continually collect high-resolution data.

VII. PHASOR MEASUREMENT UNIT (PMU)
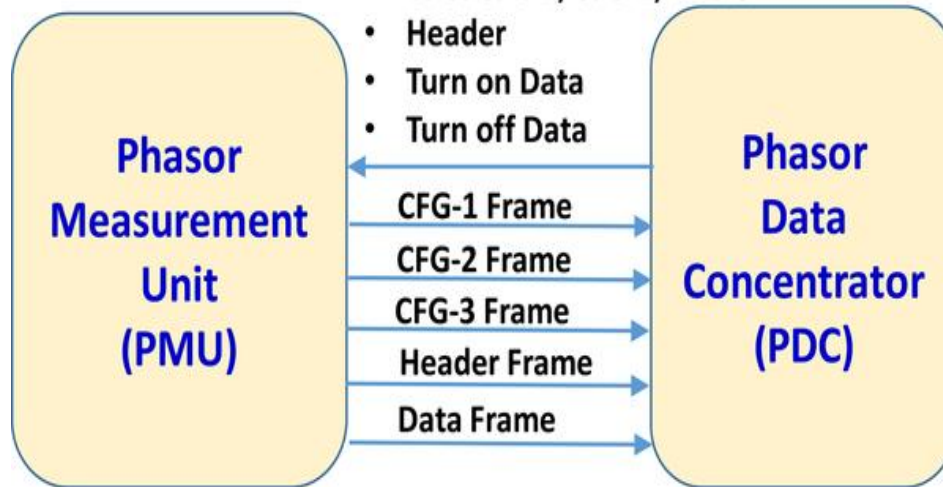
PMUs provide a detailed and accurate view of power quality across a wide geographic grid. It tells accuracy of voltage, current and frequency.

The capability is used in multiple ways: To improve the accuracy of modelling system conditions.

SSs and Interface Standard Protocols

Smart Sensors	Interface Standards	Network connection	
PMU-based SSs	IEEE 1344	**Wired**	**Wireless**
		TCP/IP	3G/4G/LTE Cellular
	IEEEC37.118.2	UDP/IP	WiFi
	IEC 61850–90-5	RS232	WiMAX
		Optical	

VIII. APPLICATIONS, ADVANTAGES AND DISADVANTAGES OF SMART GRID

Applications	Advantages	Disadvantages
Demand Response	Low latency	Expensive technology
Electric Vehicles (EVs)	Data privacy	Time consuming
Wide-Area Situational Awareness	Reduce bandwidth = collect more data	Threat of cyber attacks
Distributed Energy Resources and Storage	No communication gap	Electricity transmission losses
Distribution Grid Management	Reduced usage of cloud resources	
	Faster	

VIIII. CONCLUSION

An intelligent network with a wide range of sensors and data sources continuously collects high-resolution data based on edge computing. The management of this large amount of data is identified as one of the major challenges, particularly where real-time and latency sensitive services are present. Smart grid is expensive method but in future the cost of this technology will get reduce. As it provides two way communications i.e consumers to suppliers and then again to consumers, the loss of energy is get reduced and it is in control of consumer. So basically, Smart grid is not a solution it just a smart management.

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