Object Oriented Power Distribution System Using Unified Modelling Language

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Abstract- *The power distribution system is effectively carried out by the object oriented method using unified modelling language (UML). The UML is a standard tool used in object oriented languages to produce an efficient solution. The reusability, extensibility and modularity can be efficiently accessed by object oriented model and UML. The power that is distributed from the generating station to the consumers is shown by the class diagram and sequence diagram. Finally the total amount of power distributed for twenty four hours is evaluated by the object oriented language and the result is shown by the mat lab software.*

Keywords*- UML, Objects, Use cases, Power Distribution System.*

I. INTRODUCTION

The power distribution system involves large amount of data. This data is carried out by the object oriented concepts. The UML is used to represent the data by various modelling diagrams. UML offers a broad notation for the entire lifecycle of object oriented development process. It is a successful proven language for modelling huge and complex systems. The UML provides set of rules and notations for the designing purpose. Literature concentrates various applications of object oriented concepts using UML for power systems. The UML diagrams hold the properties of structural and behavioural features of architecture[3]. The UML represents how to identify and describe the class, object, use cases, sequence association, interface etc[6]. It produces a pattern to visualize the architectural form of object oriented principles by different elements such as actors, activities, processes, components, databases, object oriented programming language statements and reusable software components[7]. This paper focuses on the object orientation of power distribution system using UML. The main aim of UML is to provide an easy, simple and clear documented software model for the users. Extensibility and modularity of the object oriented design through UML for power distribution system and its equivalents provides the advantages of reusability.

II. THE NEED FOR UML

The UML is a standard tool to represent the software system's design and structure by various diagrams. Each diagram concentrates its own principles to show the design, development and implementation of software systems[5]. The UML diagrams are helpful to generate the source code for any object related languages and to produce reports.

Due to the huge development of software products in their size and complexity the need of architectural design has been raised. The architecture designed using object oriented software systems provide the system for various properties in a greater level of abstraction. The UML is the best choice and is used to signify and develop the architecture of software system by its different model diagrams[4].

A. Benefits of UML

To overcome the complex situations in software or application programs the UML models are used[3]. The modeling diagrams reduce the difficulty stages and situations that arise during the development phase as well as the interaction between the customers. The modelling diagrams show the exact concept of system what is to be done and how it should be developed[2]. The UML is standardized modeling languages in the area of object oriented concepts. It includes a set of graphical notations to develop the visual models of object oriented environments[1].

B. The Development Stages of UML

The UML was developed by Grady Booch, Ivar Jacobson and Jim Rumbaugh at Rational Software in the year 1990. It was taken off by Object Management Group(OMG) in the year 1997 .The International Standards Organization (ISO) has accepted the UML as an industrial standard for modelling the systems in the year 2000[7]. The UML can also be used for business modelling, enterprise architecture and object oriented analysis and design. The UML is considered as the standard modelling language in the industrial area. This modelling language consists of high level graphical notations and various set of diagrams.

III. POWER DISTRIBUTION SYSTEM IN UNIFIED MODELLING LANGUAGE

The power distribution system is effectively shown by the UML diagrams such as Class diagram and Sequence diagram. The class diagram explains the entire concepts of power distribution system by its class name, attributes and operations it required[6]. The sequence diagram explains the brief content of power distribution system for the various timing sequence it acquired.

A. Class Diagram

The class diagram is partitioned into three divisions. The first part mentions the class name, the second part lists the attributes, used for the class and finally last part identifies the operations that are perform the functional activities of the object oriented concepts. Fig 1 explains the entire concepts of power distribution system by showing the each component as a separate class diagram. The figure shows the *Generating Station, Receiving Station, Substation, Primary Distribution, Secondary Distribution* and *Consumers* as the class name. The *Volt* and *Powe*r are the attributes of *Generating Station* and *voltage, power, current* are the attributes of *Receiving Station*. *Transmit (), Accept ()* and *Distribute ()* are the operations of *Generating* and *Distributing Stations*.
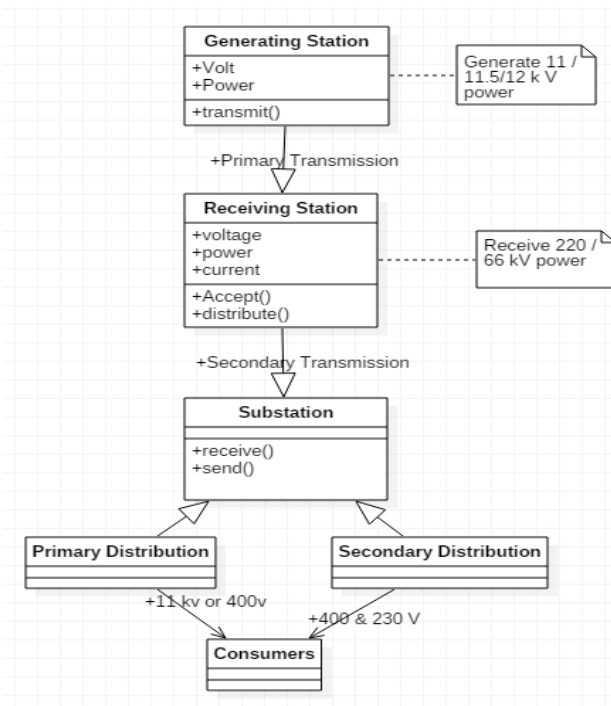

Figure: 1. Class Diagram showing the Overview of Power Distribution System

The *Generating Station, Receiving Station, Substation* and *Consumers* are the list of use cases. The lines

connecting each usecases represent the lifeline that holds the use cases. The *Primary Transmission* object can distribute 220/132V power from *Generating Station* to *Receiving Station*. The *Primary Transmission* object lifeline will be activated only within this region. When the object transmitted to the *Secondary Transmission* the *Primary Transmission* object will be disabled. The *Secondary Transmission* object distributes 132/11kv of power to the *Substation* object. From here the power can be distributed to the *Consumers* by either *Primary Distribution (11kv/400v)* or *Secondary Distribution (400 & 230 V)* methods. In this stage, the amount of power distributed for each time intervals will be evaluated. Figure .3 Shows the total power received from the *Substation* and consumed by the *Consumers* by either *Primary Distribution* or *Secondary Distribution* method.
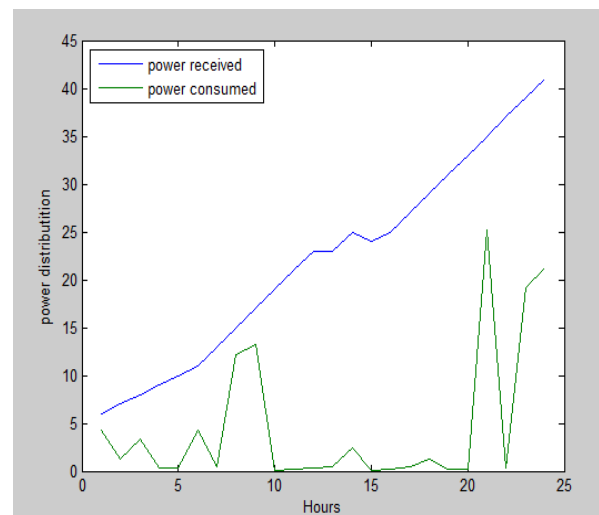

Figure: 2. Total Power Received and Consumed in 24 hours

IV. CONCLUSIONS

The object oriented method has been proposed for the evaluation of power that is distributed from the substation to the consumers. The UML diagrams are used to show the static nature and timing sequence of power distribution. This produces the reusability, extensibility and modularity. The total amount of power that is distributed from the substation and consumed by the consumers is verified by the object oriented language and mat lab software. This method shows the amount of power received and consumed for twenty four hours. The same can be extended to find the power distribution status in various distribution network systems.

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