Project Design Phase-II

Technology Stack (Architecture & Stack)

Date	21 October 2022
Team ID	PNT2022TMID34159
Project Name	Predicting the energy output of wind farm based on weather conditions

Technical Architecture
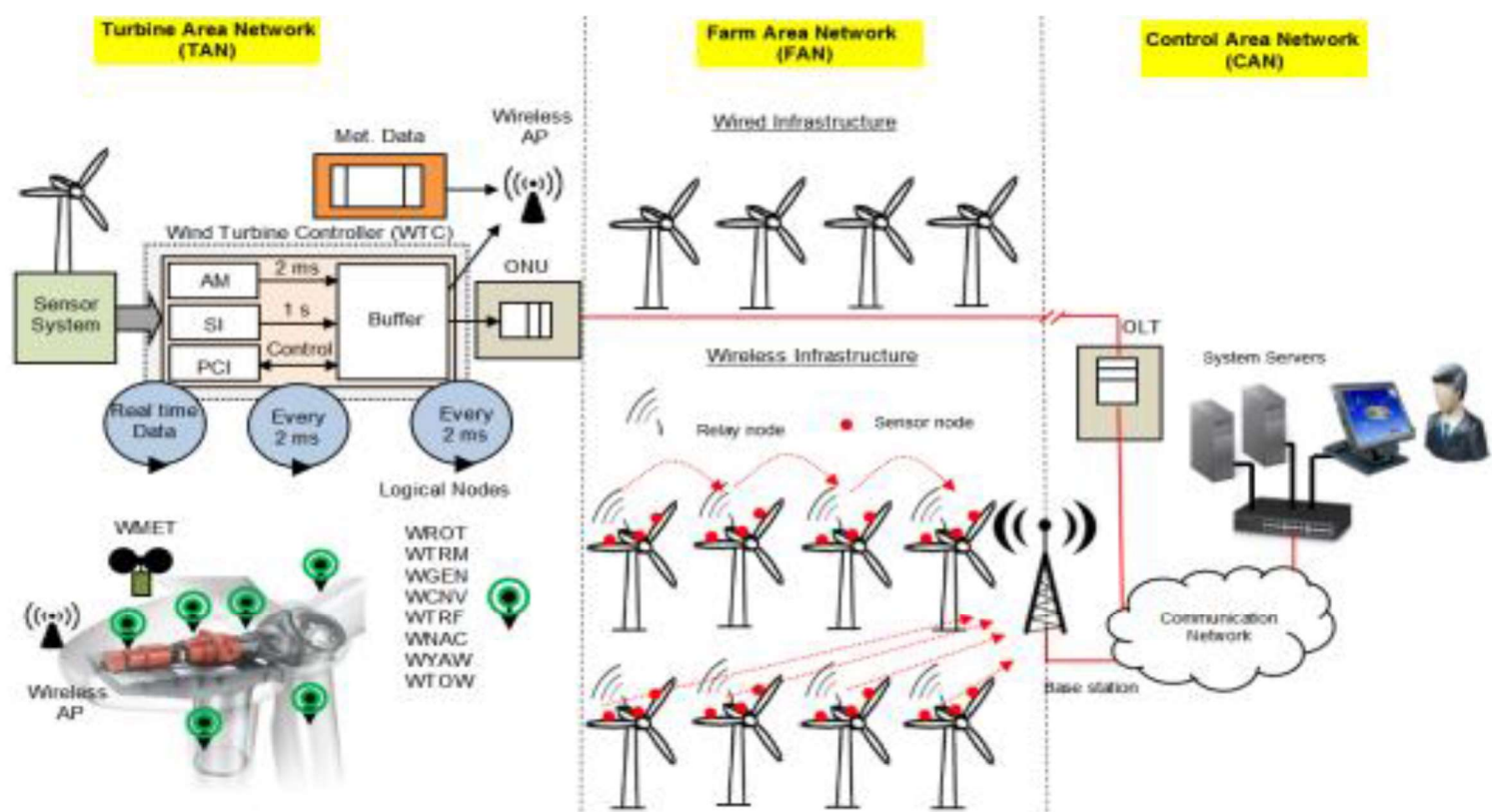
Guidelines:

The proposed communication network architecture for the Smart-WPF consists of three networks: the turbine area network (TAN), the farm area network (FAN), and the control area network (CAN). It consists of hierarchical architectures where Level 1 is a sensor network in a single wind turbine, Level 2 is the wind turbine-to-wind turbine interaction in the WPF, Level 3 is the local control center to wind turbine interaction, and Level 4 is the farm-to-farm interaction to optimize grid operation. In order to implement hierarchical network architectures, a hybrid communication solution is considered. EPON-based architecture represents a wired solution, while ZigBee-Pro is considered for the wireless solution. In this work, Levels 1 and 2 are explained in more detail, while Levels 3 and 4 are out the scope of this work.

Table 1 – Components and Technologies:

S.No	Component	Description	Technology
1	User Interface	This is used by the user for interacting with the system to know about the services provided by system.	HTML, CSS, Angular Js.
2	Weather Data collector	This weather data collector is used to collect the real time weather data in the environment.	Sensors, wired and wireless network
3	Symbolic Regression (Machine Learning Model)	To deal with interaction of the different parameters.	Genetic Programming Data Modeler.
4	Database	Used to store the collected and examine weather condition and energy output.	MySQL, NoSQL, etc.
5	File Storage	To store the data files in the databases for future references.	Local or Global File System or IBM Storage.
6	External API	This application programming interfaces is used to know about the energy output based on every weather condition.	Weather conditions obtained and their energy output.
7	Infrastructure (Server/Cloud)	The whole system is applied and stored in server for easy access and retrieved.	Data Storage Server or IBM Cloud Servers

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1	Open-Source Frameworks	The open source framework used in this system is flexible and it includes R, python etc..	IBM Open source Tools and databases.
2	Security Implementations	The data stored in the database when shared with industries are encrypted and shared as encrypted data to avoid the access of data by third party people.	SHA-256, Encryptions, IAM Controls, OWASP etc.
3	Scalable Architecture	The architecture used here is a 3tier architecture where a middleware is present to carry out the communication between client and server.	3tier architecture.
4	Availability	The system is designed in a way that It can handle traffic in a better way and thus helps the system available for users at any time.	Network traffic analysis tools.
5	Performance	The system can efficiently handle a higher number of request and can also uses catch buffer to store and retrieve the data in a easier way.	Methods like Confusion Matrix F1 score, Precision – Recall curve etc.