High Level Design Document

Introduction

This High Level Design (HLD) document outlines the architecture and core components for the **EcoWatt - Energy Consumption Dashboard** project. The purpose of EcoWatt is to provide a Tableau-based dashboard for utility providers to monitor energy usage, analyze peak demand periods, and review cost breakdowns using interactive charts and time filters.

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1. System Architecture Overview

Architecture Description:
EcoWatt consists of three main layers: Data Source, Data Processing, and Visualization. Data is extracted from utility databases, processed and transformed, then visualized in Tableau dashboards for end-users.

Module/Component	Role/Responsibility
Data Source	Stores raw energy usage and cost data
Data Processing Layer	Extracts, transforms, and loads (ETL) data for Tableau
Tableau Dashboard	Visualizes data with interactive charts and filters
User Interface	Allows users to interact with dashboard and filters

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2. Component Interactions

Step	Source Component	Target Component	Interaction Description
1	Data Source	Data Processing Layer	Data extraction (scheduled or on-demand)
2	Data Processing Layer	Tableau Dashboard	Load processed data into Tableau data models
3	Tableau Dashboard	User Interface	Render interactive charts and filters for user analysis
4	User Interface	Tableau Dashboard	User applies filters; dashboard updates visualizations

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3. Data Flow Overview

Data Flow Step	Description
Raw Data Ingestion	Energy usage and cost data ingested from utility DB
ETL Processing	Data cleaned, aggregated, and formatted for Tableau

Data Load to Tableau	Processed data published to Tableau data source
Visualization & Access	Users access dashboard, apply filters, view analytics

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4. Technology Stack

Layer/Component	Technology/Framework
Data Source	Utility Provider Database (SQL/CSV/Cloud)
Data Processing	Tableau Prep / ETL Scripts
Visualization	Tableau Desktop / Tableau Server
User Interface	Tableau Interactive Dashboards

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5. Scalability & Reliability

- **Scalability:**
  - Tableau Server supports multiple concurrent users and large datasets.
  - ETL processes can be scheduled and parallelized as data volume grows.
- **Reliability:**
  - Data refresh schedules ensure up-to-date analytics.
  - Tableau’s built-in user authentication and access controls secure sensitive data.

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