**Project Design Phase**

**Solution Architecture**

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| Date | 28 June 2025 |
| Team ID | LTVIP2025TMID37691 |
| Project Name | Sustainable Smart City Assistant using IBM Granite LLM |
| Maximum Marks | 4 Marks |

**Solution Architecture:**

The solution architecture for the Sustainable Smart City Assistant using IBM Granite LLM includes a user-friendly interface (Streamlit/Gradio), a FastAPI backend connected to Granite for chat and summarization, real-time IoT data integration, a vector database for semantic search, and secure cloud deployment with monitoring tools. It’s modular, scalable, and designed for responsive, AI-driven urban services.

1. User Interface Layer

* 1. Built with **Streamlit** or **Gradio** for web/mobile access

○ Supports multilingual chat, dashboards, and feedback forms

1. Application Layer

* 1. **FastAPI** handles routing, authentication, and API orchestration

○ Connects to IBM Granite LLM for chat, summarization, and eco-tip generation

○ Integrates forecasting and anomaly detection modules (e.g., LSTM, Isolation Forest)

1. AI & NLP Layer

* 1. **IBM Granite LLM** for natural language understanding and generation

○ **Prompt templates** for summarization, eco-advice, and citizen query handling

○ **Vector database** (Pinecone or FAISS) for semantic search and memory

1. Data Layer

* 1. **IoT data ingestion** from sensors (pollution, traffic, energy) via APIs

○ **Cloud storage** (AWS S3, GCP) for structured/unstructured data ○ **Relational DB** (PostgreSQL) for user and feedback data

1. Security & Governance Layer

* 1. TLS encryption, RBAC, audit logging

○ Compliance with GDPR and India’s Data Protection Bill

1. Deployment Layer

* 1. Containerized with **Docker**, orchestrated via **Kubernetes**

○ Hosted on **cloud platforms** (AWS, Azure, or GCP)

○ Monitored using **Prometheus** and **Grafana**

**Solution Architecture Diagram:**

