**Project Design Phase : Solution Architecture**

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| Date | 14 jun 2025 |
| Team ID | LTVIP2025TMID32673 |
| Project Name | Sustainable Smart City Assistant AI by using IBM granite LLM |
| Maximum Marks | 4 Marks |

**Solution Architecture Description**

The Sustainable Smart City Assistant AI is designed to provide a centralized, intelligent platform that connects urban infrastructure systems with residents and administrators. It enables personalized sustainability insights, operational efficiency, and proactive urban management.

**Architecture Overview**

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| --- | --- |
| Component | Description |
| User Interfaces | Web, mobile apps, WhatsApp chatbot, and city dashboards. |
| Data Sources | IoT sensors (air quality, water flow, waste bins, traffic), GIS mapping systems, utility usage data (electricity, water), citizen feedback systems. |
| AI/ML Engine | - Predictive analytics for energy, water, and waste usage. - Pattern recognition in citizen behavior. - Personalized eco-friendly suggestions using NLP. |
| Data Integration Layer | granite LLM and middleware that integrate with existing municipal systems (ERP, SCADA, CRM) to unify data across departments. |
| Backend Services | Microservices for alert generation, recommendation engines, user management, real-time analytics, and reporting. |
| Cloud Infrastructure | Scalable deployment on streamlit using containerized services (Docker, Kubernetes), real-time databases, and secured storage systems. |
| Security & Compliance | Role-based access control, data encryption, GDPR compliance, government digital governance standards, and periodic auditing. |

**Solution Features**

- Unified conversational interface for all citizen needs

- Real-time alerts on traffic, pollution, outages, etc.

- Eco tips dashboards with AI-based insights

- Feedback loop between citizens and government bodies

- Predictive weather reports

- Multilingual and inclusive AI interfaces

-documents or file purification

-KPI forcast estimation

**Development Phases**

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| --- | --- |
| Phase | Description |
| Phase 1 | Requirement analysis, stakeholder consultation, and prototype of AI assistant |
| Phase 2 | Backend integration with smart city data sources and GIS/IoT APIs |
| Phase 3 | AI/ML training using collected data, development of personalized insight engine |
| Phase 4 | Front-end interfaces (apps, dashboards, kiosks), testing, and feedback loops with pilot communities |
| Phase 5 | Final deployment, scale-up to additional cities, and continuous monitoring/improvement |

**Solution Requirements**

- IBM granite model

- google colab cloud

- Secure IoT data pipelines

- github for project automation

- Municipal cooperation for API/data access

- Citizen onboarding and education initiatives

**Solution Architecture Diagram**

Citizens / Planners   
   
 |  
   
 Conversational UI <--- (straemlit)  
   
 |  
   
 AI & Personalization   
 (Granite Models, Analytics)   
   
 |  
   
 Data Integration   
 (FastAPI, Utilities)   
   
 |  
   
 Cloud Infrastructure   
 (Sql Storage, Compute, API)