

Multi-Agent System for City-Wide Public Governance: Budgeting, Resource Allocation, and Project Execution

Objective

To design and deploy a Multi-Agent System (MAS) that connects departments across city levels for collaborative budgeting, manpower allocation, and resource planning. The goal is to ensure efficient public service delivery with minimal public disturbance, optimal use of resources, and timely project completion.

Core Functions & Capabilities

1. **Cross-Department Budget Coordination**
 2. Departments propose budgets for joint or overlapping projects.
 3. Agents negotiate funding splits using cost-benefit and need analysis.
4. **Resource & Workforce Sharing**
 5. Staff agents maintain current load, skills, availability.
 6. Resource agents (equipment, fleet, venues) negotiate usage slots.
7. **Project Timeline Arbitration**
 8. Timeline agents evaluate dependencies, traffic impact, and feasibility.
 9. Coordination ensures zero-overlap on critical public infrastructure.
10. **Live Progress Tracking & Predictive Replanning**
 11. Department agents feed live telemetry (progress, delays).
 12. MAS can auto-adjust schedules and resource assignment if work falls behind.
13. **Public Nuisance Minimization**
 14. Environmental agents simulate traffic, noise, accessibility disruptions.
 15. Proposals triggering major nuisance require override approvals.
16. **Unified Audit and Compliance Layer**
 17. Every resource reallocation, budget transfer, and timeline change is logged.
 18. Governance agents ensure legal, regulatory, and union policy compliance.
19. **Emergency Backoff Mechanism**

20. In case of disaster/emergency events, CrisisCoordinatorAgent can override normal rules and dynamically reassign staff/resources.

Types of Agents

Agent	Role
DepartmentAgent	Manages department-level priorities, schedules, and requests
StaffAgent	Represents each worker with availability, skills, policies
ResourceAgent	Manages shared city-wide equipment and vehicles
BudgetAgent	Proposes and negotiates departmental funding allocations
TimelineAgent	Proposes start/end dates while managing inter-agency constraints
NuisanceAgent	Simulates public impact (noise, roadblocks, disruption)
PolicyAgent	Ensures union, legal, and inter-agency compliance
CrisisCoordinatorAgent	Central override control in emergencies
AuditAgent	Maintains tamper-proof event log for all changes

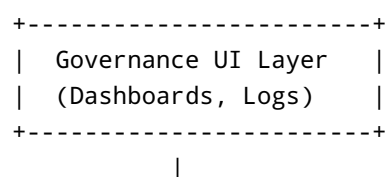
Data Sources

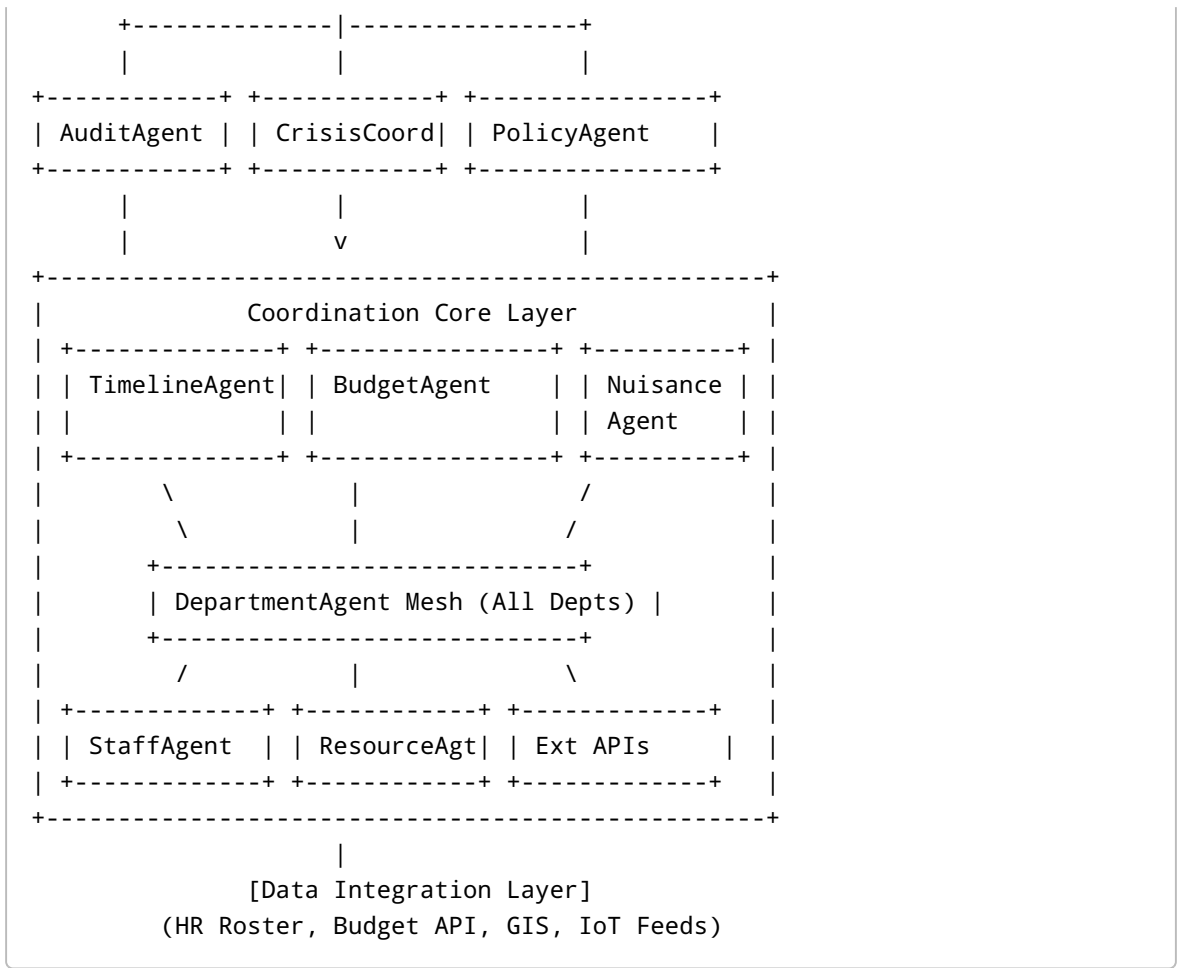
- Real-time project data feeds (IoT sensors, progress reports)
- Historical execution times for similar projects
- GIS/Traffic data for nuisance modeling
- Budget allocation APIs from municipal finance systems
- HR/roster data (through anonymized summaries)

Tools & Frameworks (Suggested)

- MAS Framework: [Spade \(Python\)](#), JADE (Java)
- Rule Engine: Open Policy Agent (OPA) for legal/policy encoding
- Coordination Protocols: Contract Net, Auction-based task allocation
- Communication: JSON over WebSocket or message queues (Kafka/RabbitMQ)
- Visualization/UI: React + D3 for planners & audit visualization

High-Level Architecture Diagram





Let me know if you want this architecture turned into an interactive prototype, simulation plan, or PDF tech spec.