Skyf City

SKYF MERCHANTS

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GitHub Repo: https://github.com/COS214-Project-2024/Team-24

Functional Requirements

Buildings System

Core Functions:
Construction/Demolition
Resource consumption (power, water, waste)
State management (operational, under construction, etc.)
Resident management
Maintenance tracking
Interactions:
With Citizens: Housing and employment
With Resources: Consumption and production
With Zones: Placement and type restrictions

Utilities System

Core Functions:
Resource distribution (Power, Water, Sewage)
Capacity management
Infrastructure maintenance
Interactions:
With Buildings: Supply resources
With ResourceManager: Track consumption/capacity
With Government: Infrastructure funding

Citizens System

Core Functions:
Population management
Satisfaction tracking
Tax payment.
Resource consumption
Interactions:
With Buildings: Housing and employment
With Government: Tax payments
With Resources: Consumption
With Zones: Movement and preferences

Government System

Core Functions:
Policy management

Tax collection.
Budget allocation
Infrastructure development
Interactions:
With Citizens: Tax collection and services
With Buildings: Regulations and inspections
With Resources: Infrastructure funding
With Zones: Zoning policies

Zone System

Core Functions:
Area designation (residential, commercial, industrial)
Building placement rules
Density management
Interactions:
With Buildings: Placement validation
With Government: Zoning policies
With Citizens: Living/working spaces.

DESIGN PATTERNS

Singleton Pattern
Participants:
ResourceManager
CitizenManager
CityManager
TimeManager
ZoneManager
Purpose: Ensure single instance of core management systems

Command Pattern
Participants:
Abstract Command: Command
Concrete Commands:
BuildCommand
DemolishCommand
ChangePolicyCommand
UpdateResourcesCommand
SimulationCommands

Purpose: Encapsulate operations as objects

State Pattern
Participants:
Context: Building
Abstract State: BuildingState
Concrete States:
Abandoned
Operational
UnderConstruction
UnderMaintenance
Purpose: Manage building lifecycle states

Observer Pattern
Participants:
Abstract Subject: Observable
Abstract Observer: Observer
Concrete Subjects:
Building
Zone
Government
Concrete Observers:
Citizen
Statistics
Purpose: Notification system for changes

Visitor Pattern
Participants:
Abstract Visitor: BuildingVisitor
Concrete Visitors:
InspectionVisitor

MaintenanceVisitor
Elements:
Building
Commercial
Industrial
Residential
Landmark
Purpose: Separate algorithms from object structure

Strategy Pattern
Participants:
Strategy Interface: TaxStrategy
Concrete Strategies:
HighIncomeTaxStrategy
LowIncomeTaxStrategy
Context: TaxPolicy
Purpose: Define family of algorithms

Factory Pattern
Participants:
Factory: BuildingAttributeFactory
Product: BuildingAttributes
Purpose: Create building attributes

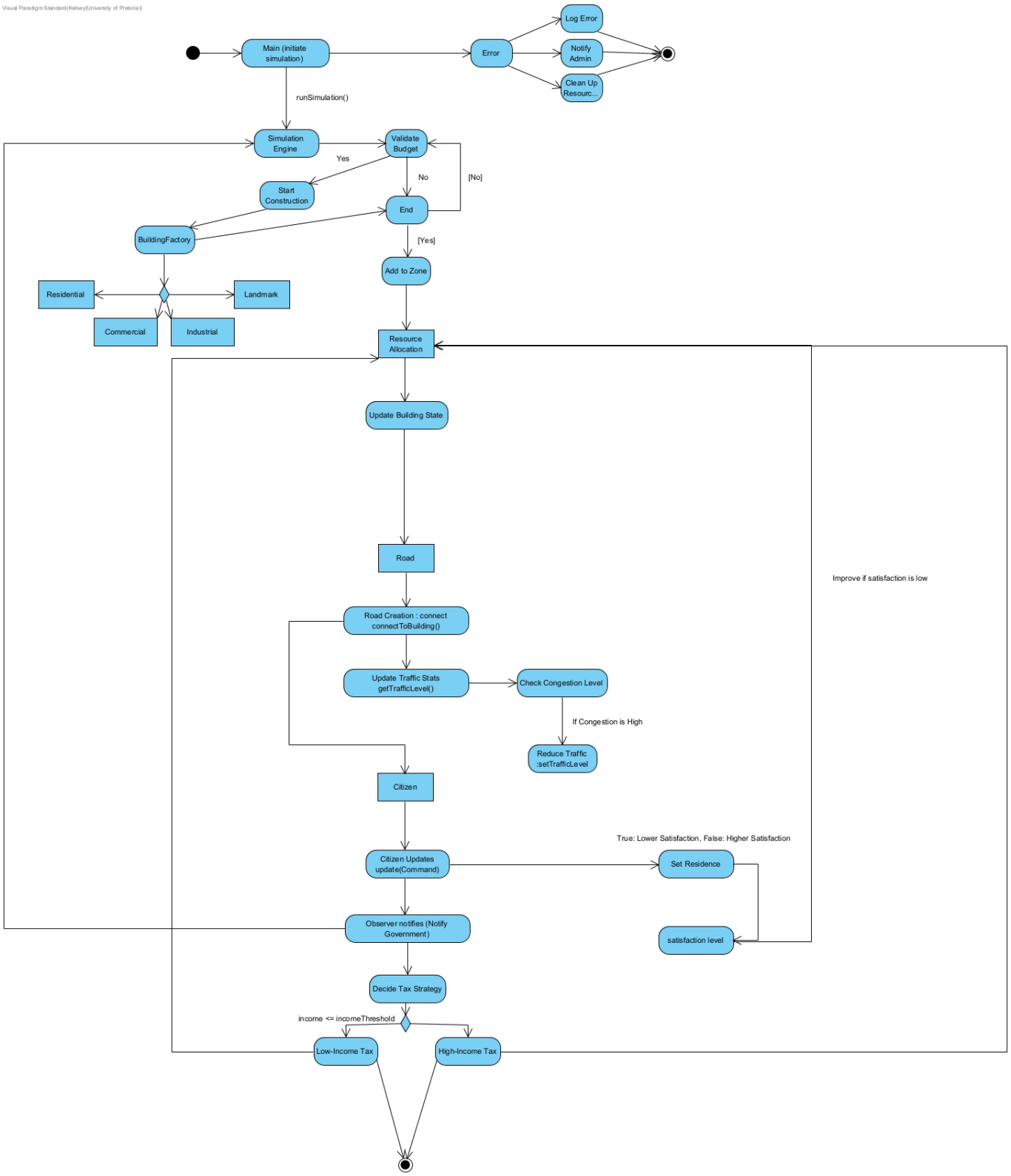
Memento Pattern
Participants:
Originator: Policy
Memento: PolicyMemento
Caretaker: Government
Purpose: Capture and restore policy states

Facade Pattern
Participants:
Facade: SimulationFacade

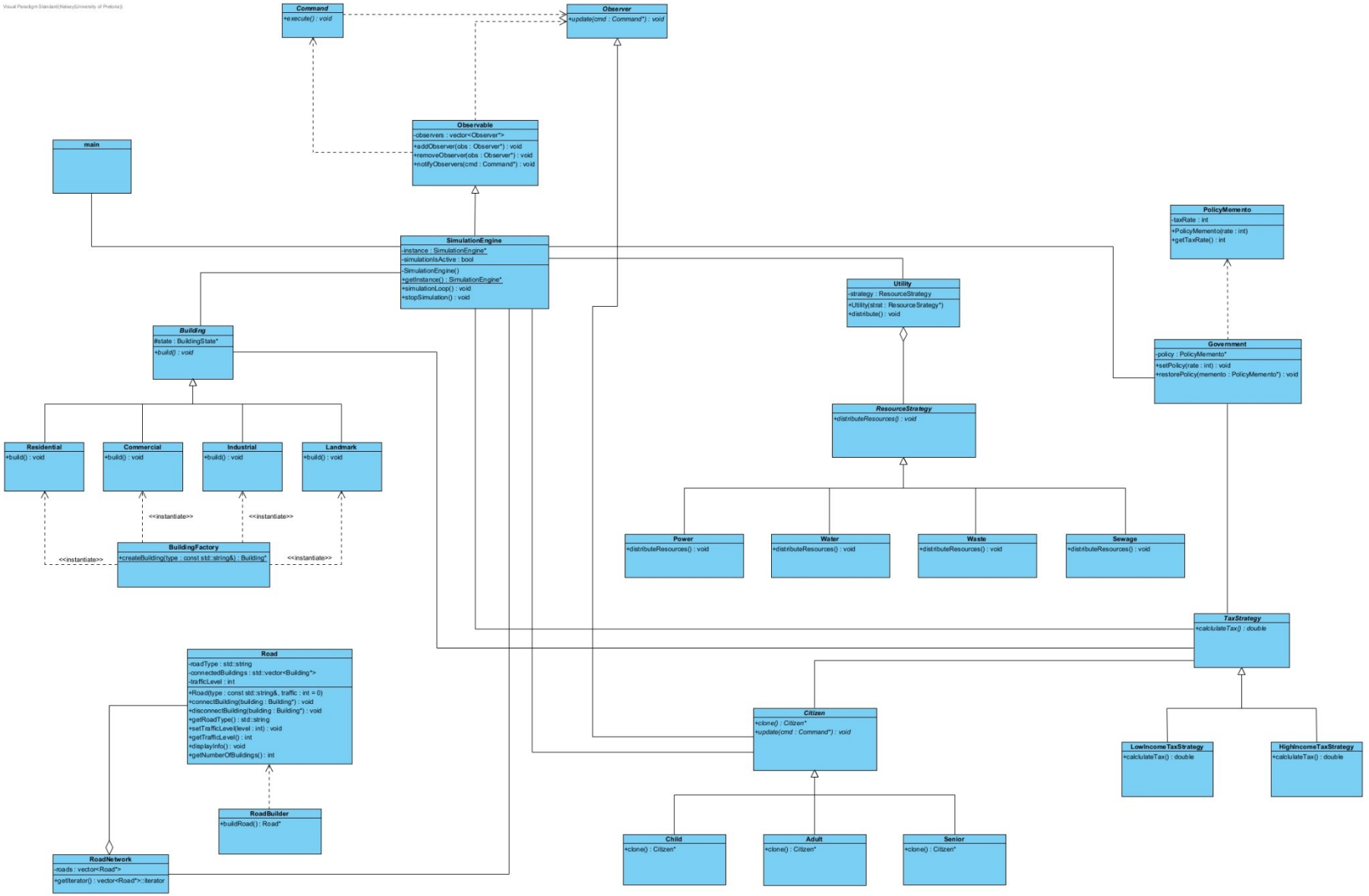
Subsystems:
SimulationEngine
Various Managers
Purpose: Provide unified interface

Composite Pattern
Participants:
Component: Zone
Composite: ZoneManager
Leaf: Individual zones
Purpose: Treat collections of zones uniformly
Builder Pattern
Participants:
Builder: RoadBuilder
Product: Road
Complex Part: RoadNetwork
Purpose: Construct complex road networks

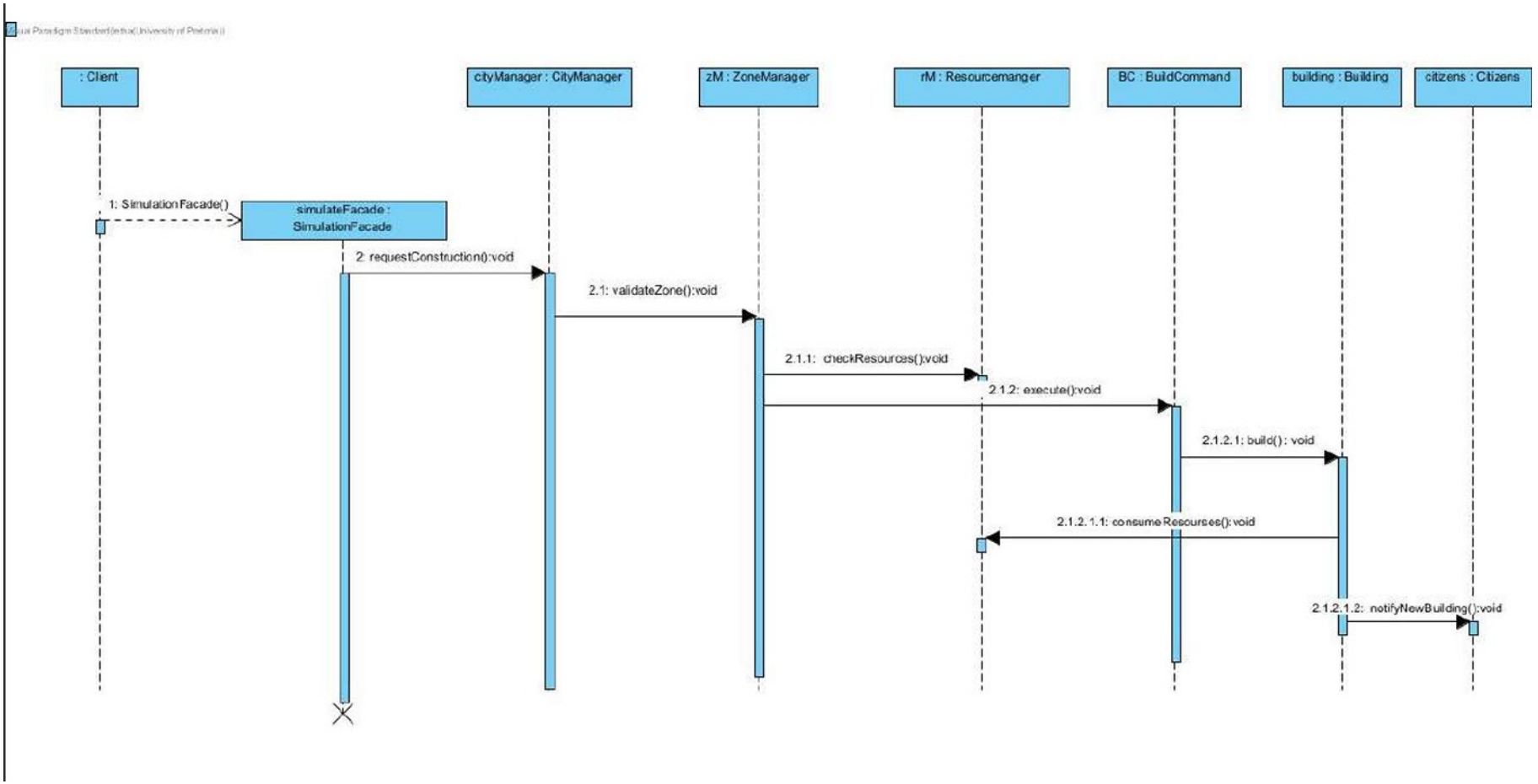
Activity Diagram

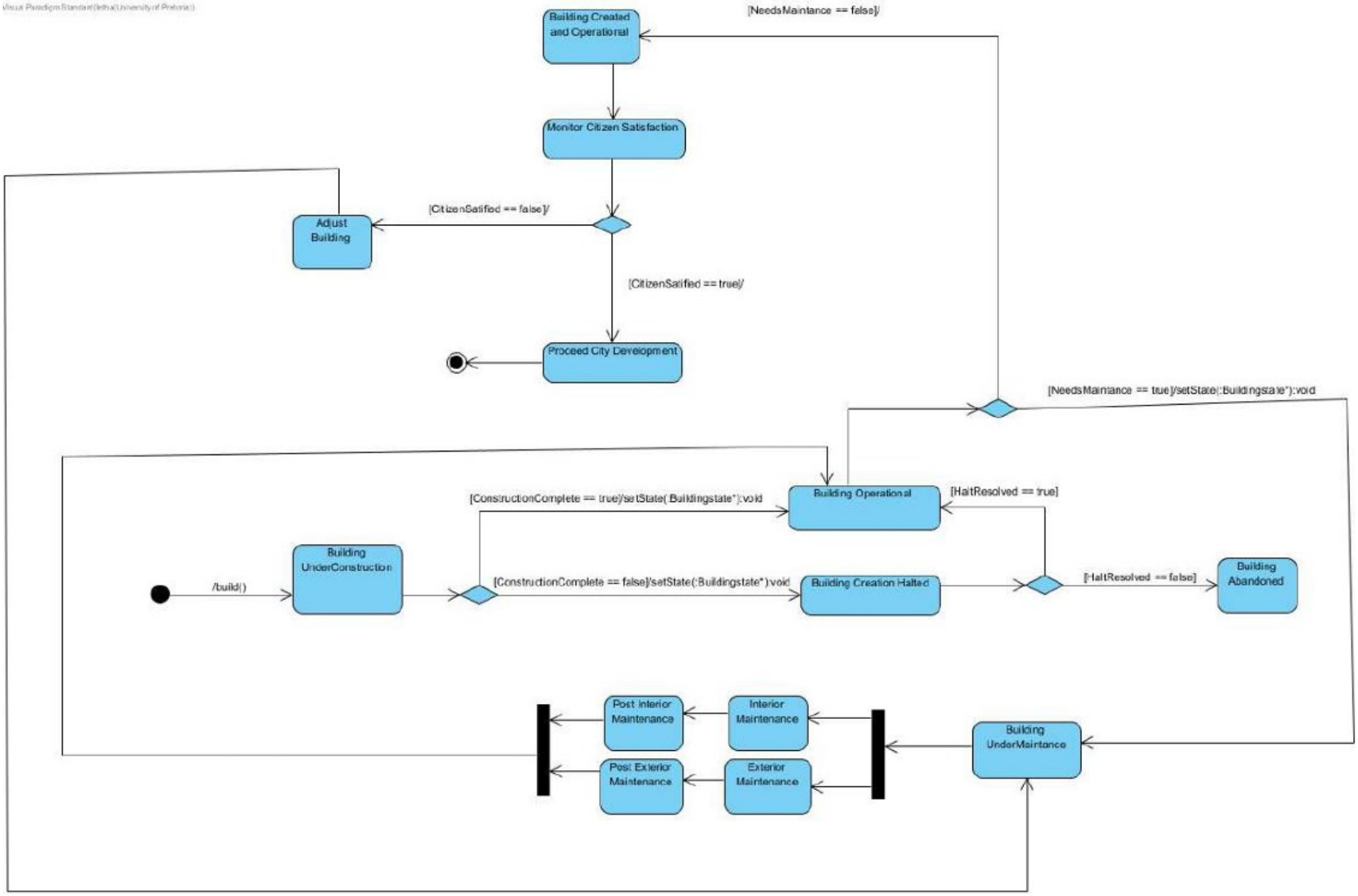


Class Diagram

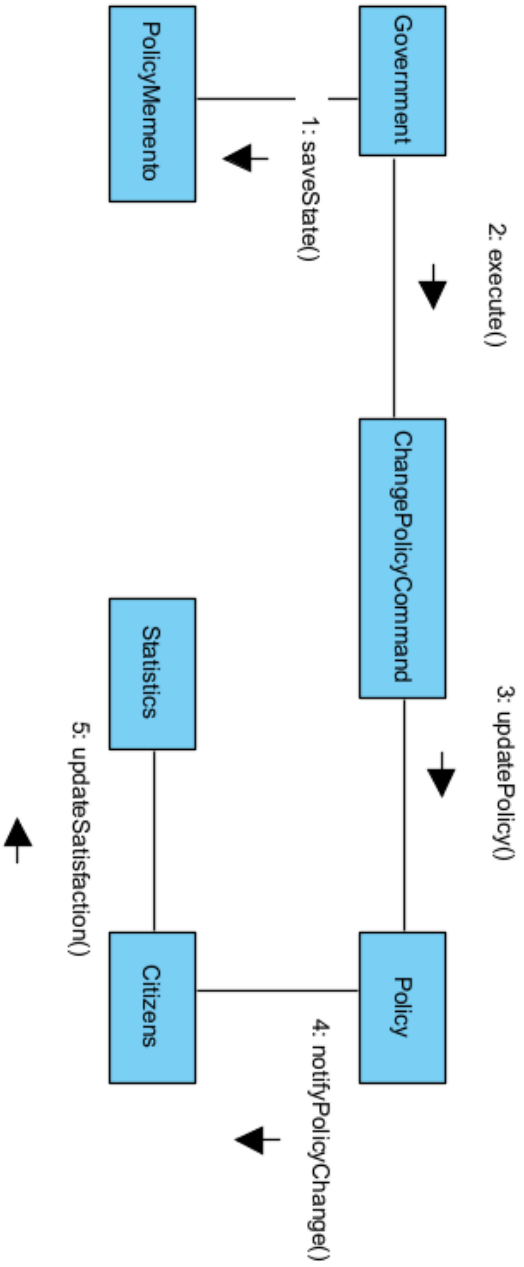


State and Sequence


: Client
cityManager : CityManager
zM : ZoneManager
rM : Resourcemanger
BC : BuildCommand
building : Building
citizens : Citizens
1: SimulationFacade()
simulateFacade : SimulationFacade
2: requestConstruction():void
2.1: validateZone():void
2.1.1: checkResources():void
2.1.2: execute():void
2.1.2.1: build() : void
2.1.2.1.1: consumeResourses():void
2.1.2.1.2: notifyNewBuilding():void



Communication



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