

# Skyf City

*SKYF MERCHANTS*

**COS 214 – Project**

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# 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:

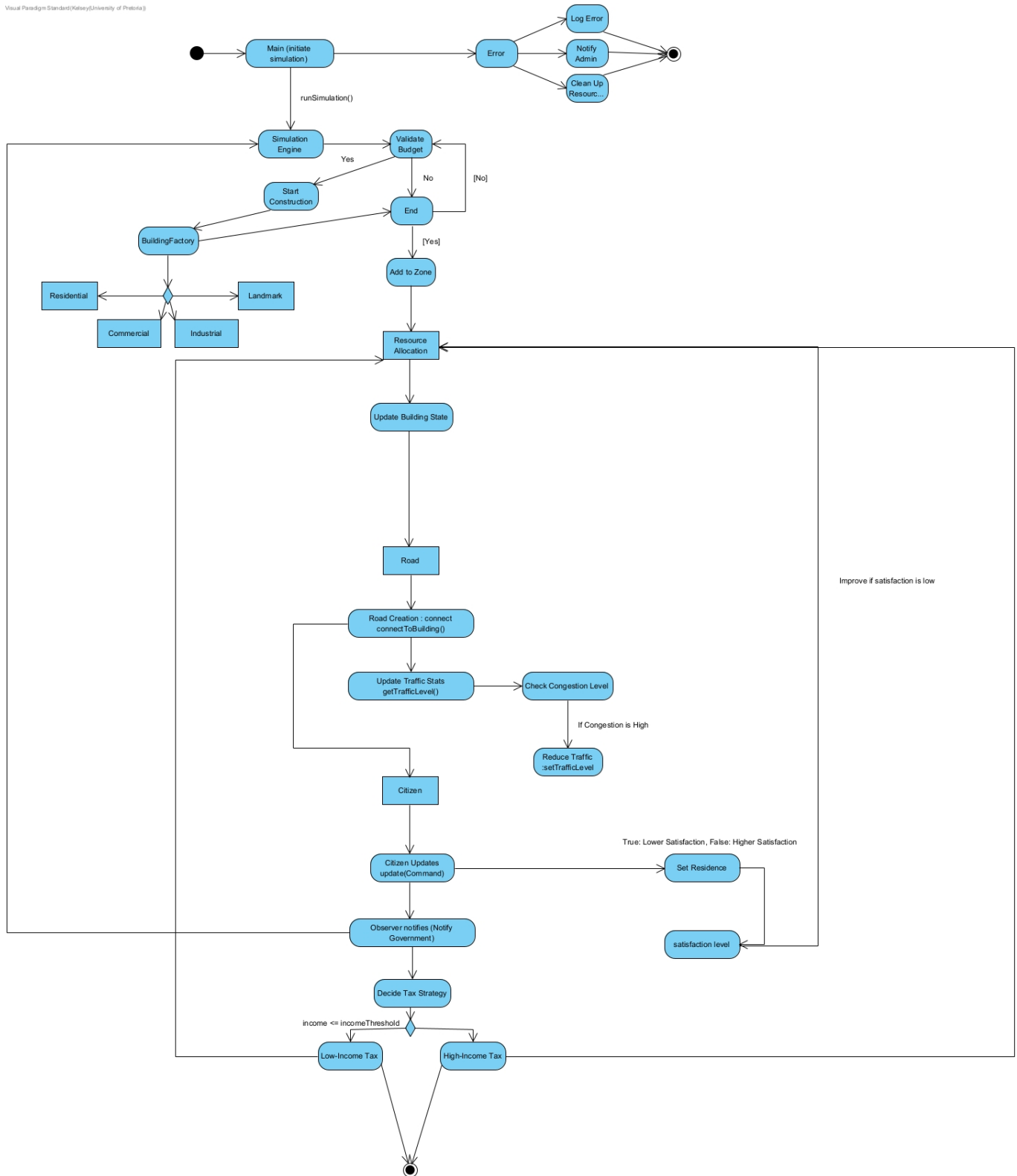
Builder: RoadBuilder

Product: Road

Complex Part: RoadNetwork

Purpose: Construct complex road networks

## **Activity Diagram**

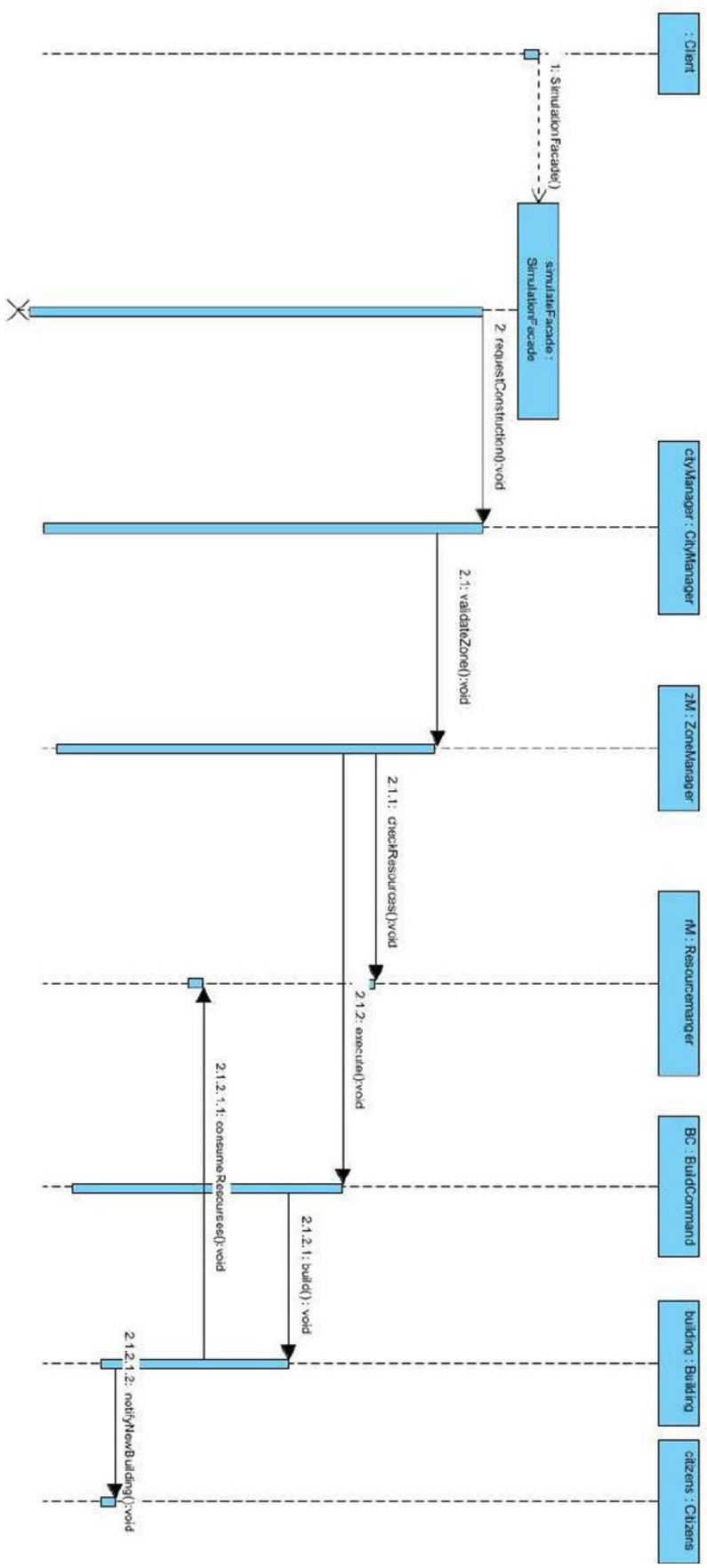


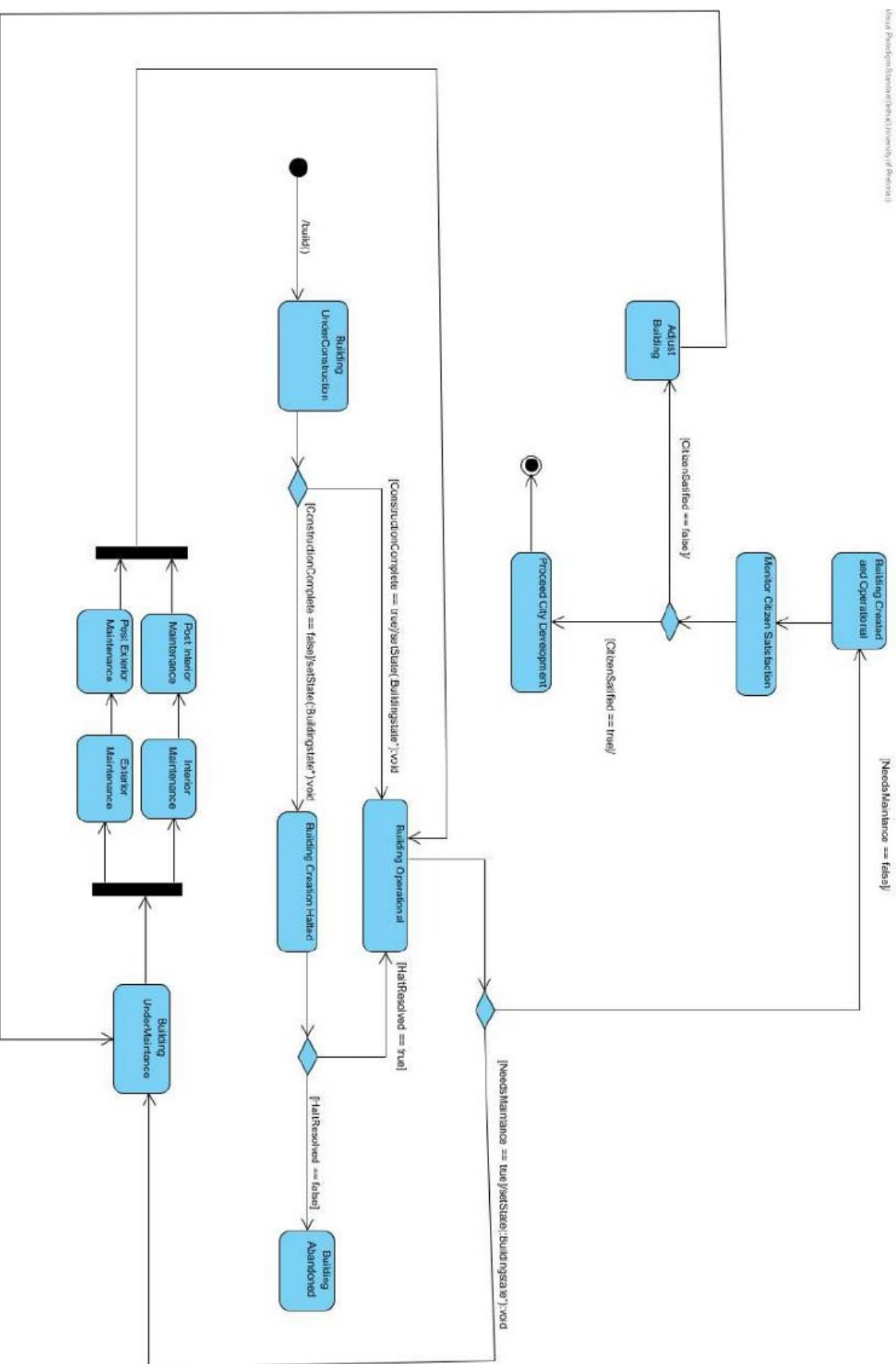
Class Diagram



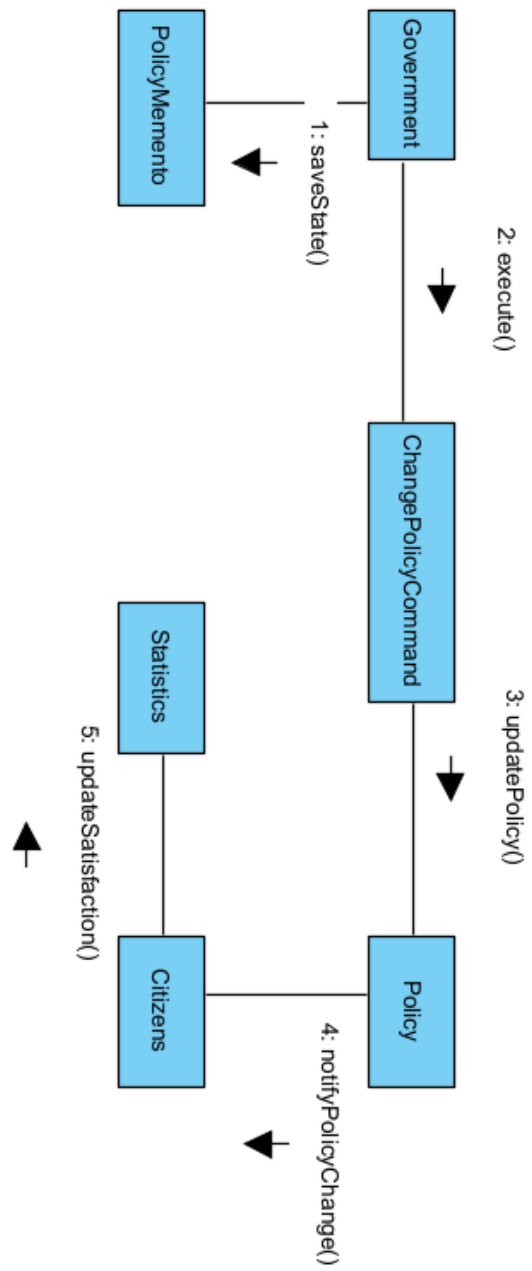


## State and Sequence





## Communication



## Object Diagram

