smartTRANSIT

Initial Design

TEAM MAGENTA

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1.0 Introduction

1.1 Goals and Objectives

SmartTransit is a private transportation network utilized in an urban setting. Individual vehicles able to connect to the network can be controlled automatically by the system within the city limits. This creates a safe automated system for users that can also be manually controlled when needed.
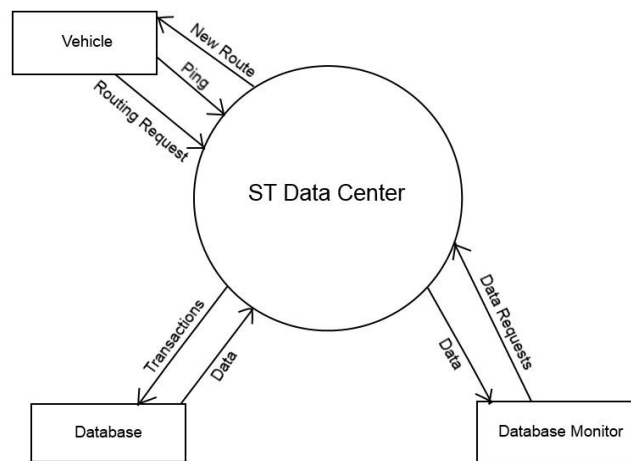
1.2 Statement of Scope

This design is limited to describing the development of the data center and contained systems including the network communication and security system for an individual city within the United States of America.
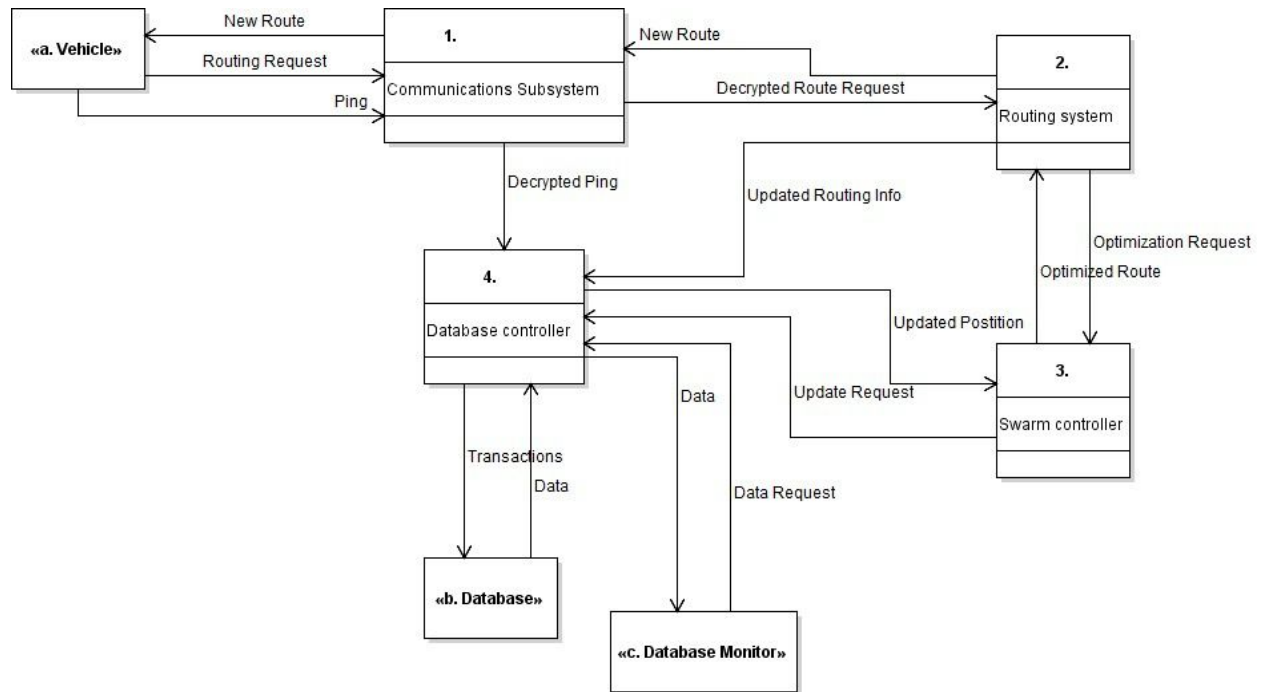
2.0 Data Model Description
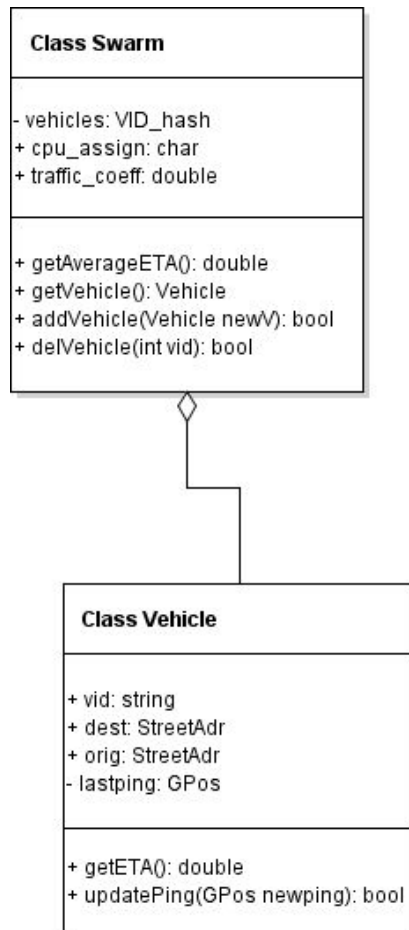
2.1 System Context Diagrams
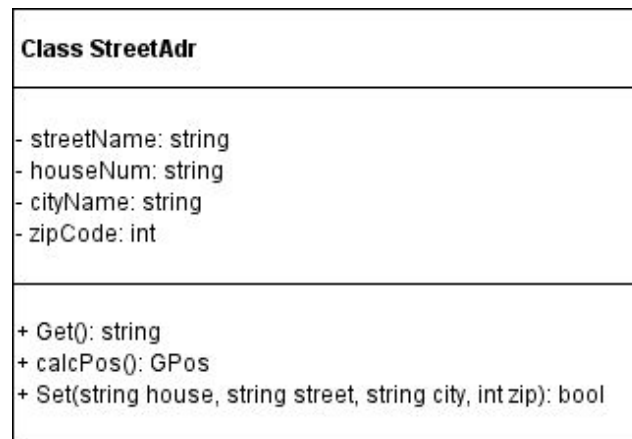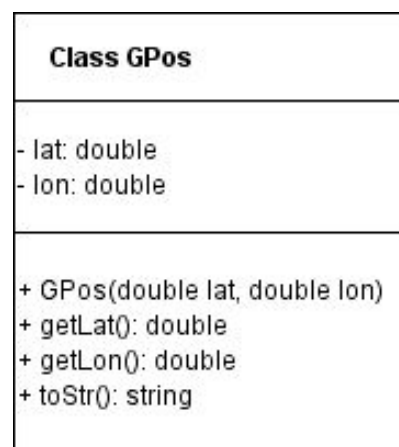
Level 0 Context Diagram

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Level 1 Diagram

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2.2 Class Diagrams

Swarm Class Diagram

Class Swarm

- vehicles: VID_hash
+ cpu_assign: char
+ traffic_coeff: double

+ getAverageETA(): double
+ getVehicle(): Vehicle
+ addVehicle(Vehicle newV): bool
+ delVehicle(int vid): bool

Class Vehicle

+ vid: string
+ dest: StreetAdr
+ orig: StreetAdr
- lastping: GPos

+ getETA(): double
+ updatePing(GPos newping): bool

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StreetAdr Class Diagram

Class StreetAdr

- streetName: string
- houseNum: string
- cityName: string
- zipCode: int

+ Get(): string
+ calcPos(): GPos
+ Set(string house, string street, string city, int zip): bool

GPos Class Diagram

Class GPos

- lat: double
- lon: double

+ GPos(double lat, double lon)
+ getLat(): double
+ getLon(): double
+ toStr(): string
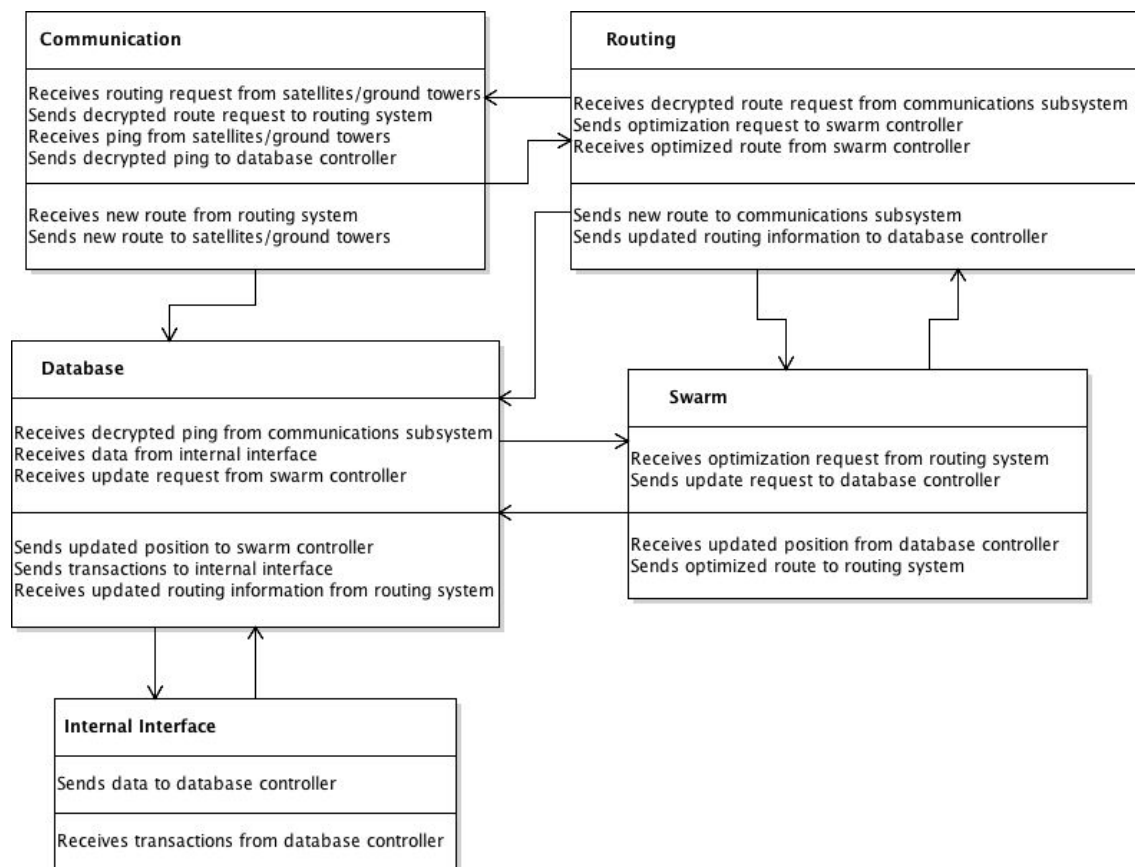
2.3 Use Case Diagrams and Descriptions

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| Use Case Name	External Communications Use Case
Actors	In-car device, routing system, database system, communications system
Description	The in-car device sends one of three possible message types to the SmartTransit server through encrypted transmission, receiving a response in return.
Assumptions	SSL connection between car and communications server has been established, in-car device uses proper encryption.
Basic Flow	1. The in-car device sends an initial route request 2. The ST routing system sends back a confirmation message 3. The ST routing system sends back the corrected route to the in-car device 4. The in-car device sends regular location pings 5. The ST database system returns a confirmation message for each ping
Alternative Flow	4a. If at any point the route is finished or the device does not respond for a long period of time, the active connection is stopped.

3.0 Architectural Design: Hierarchy Diagram
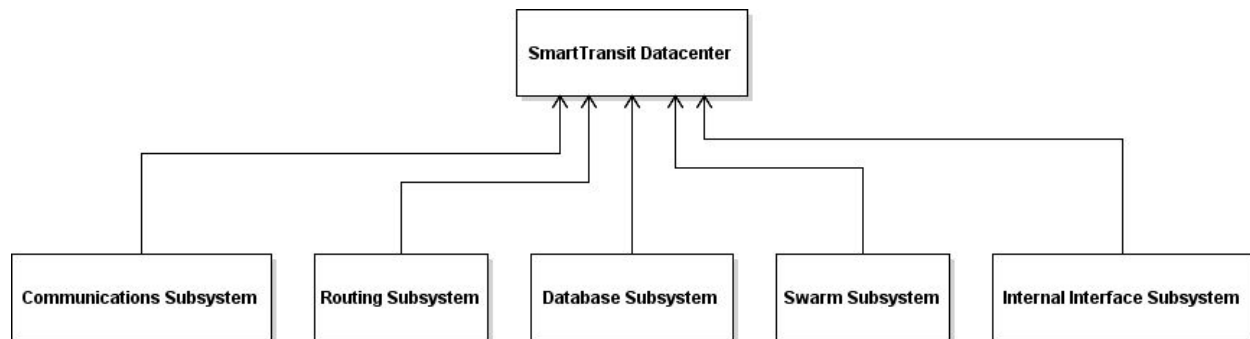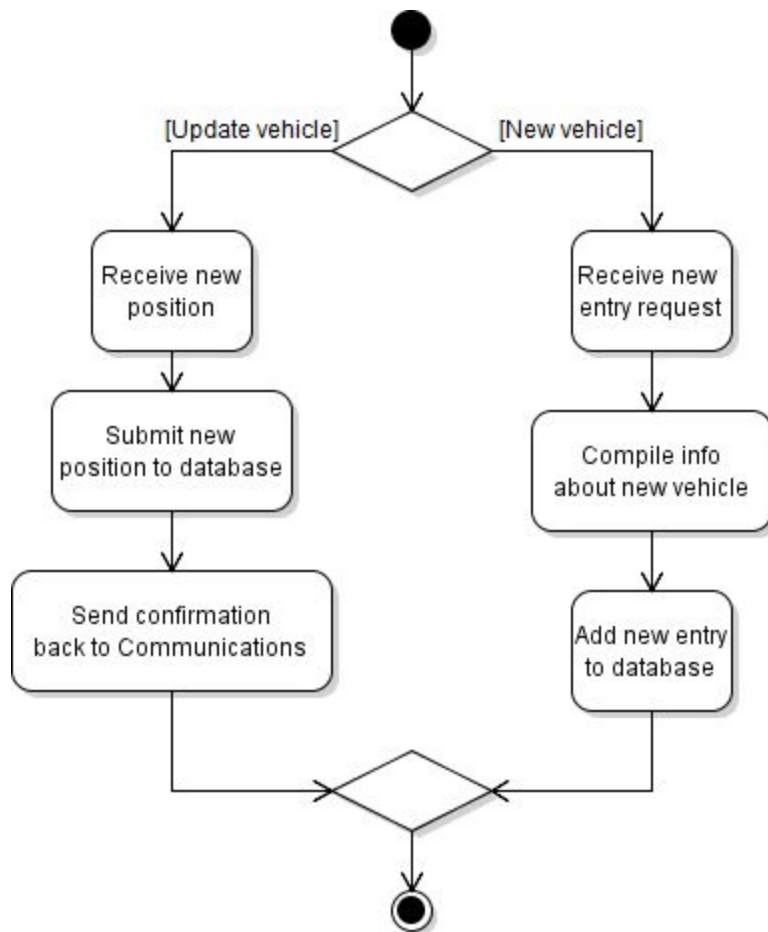

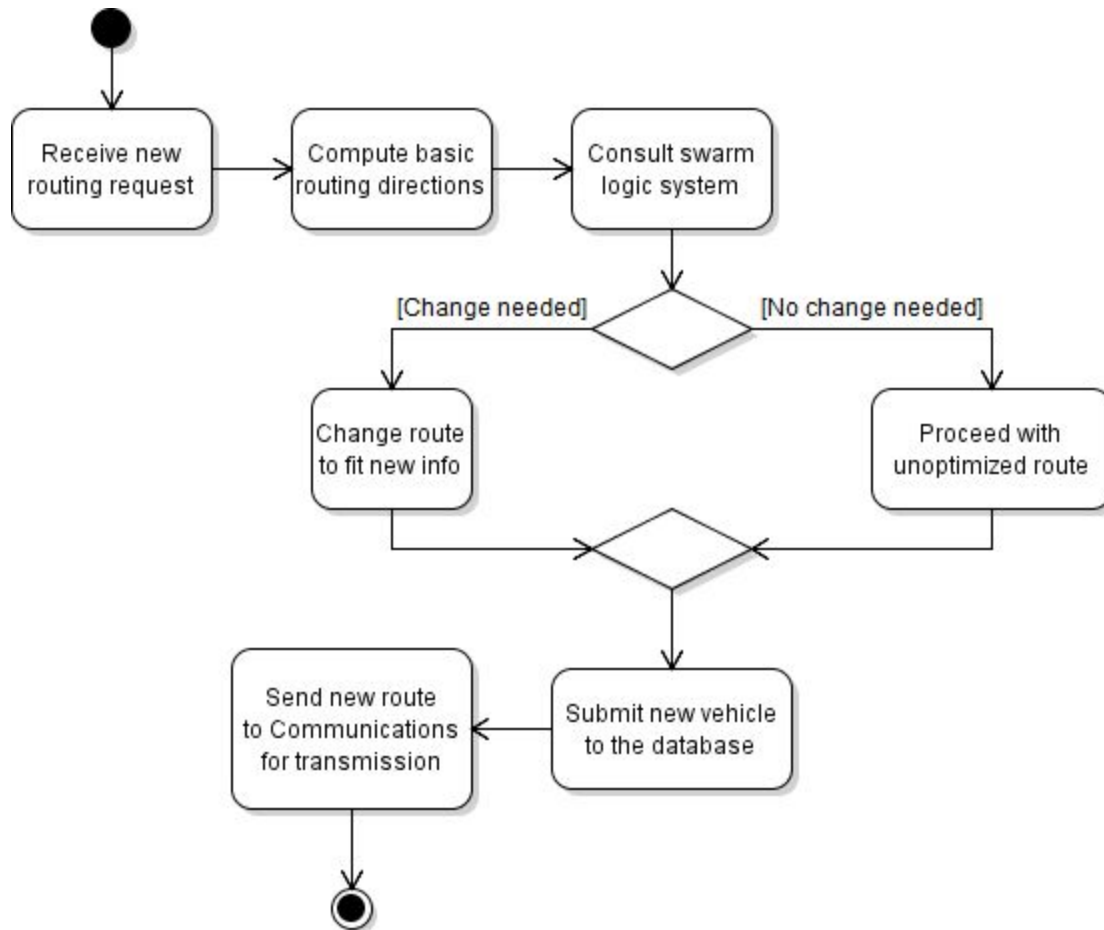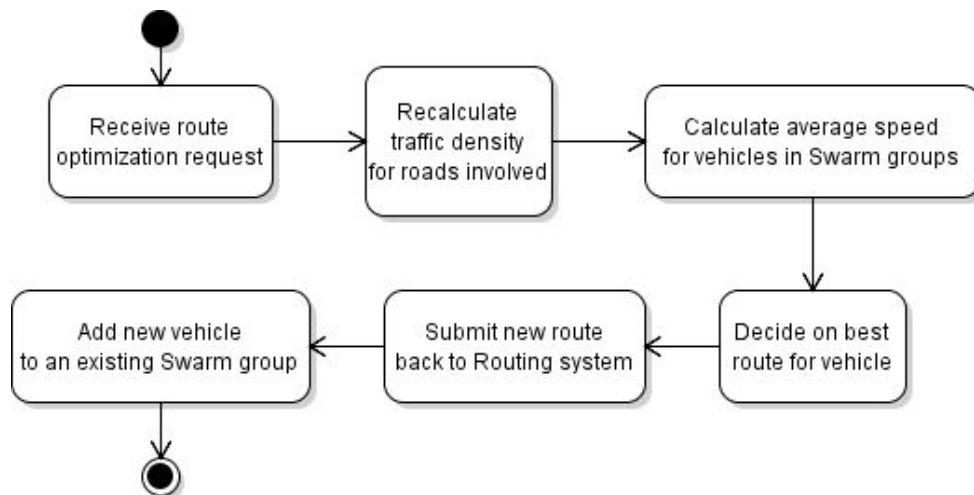# 4.0 Component-Level Design

5.0 Dynamic Design Model: Activity Diagrams

Communications system activity diagram
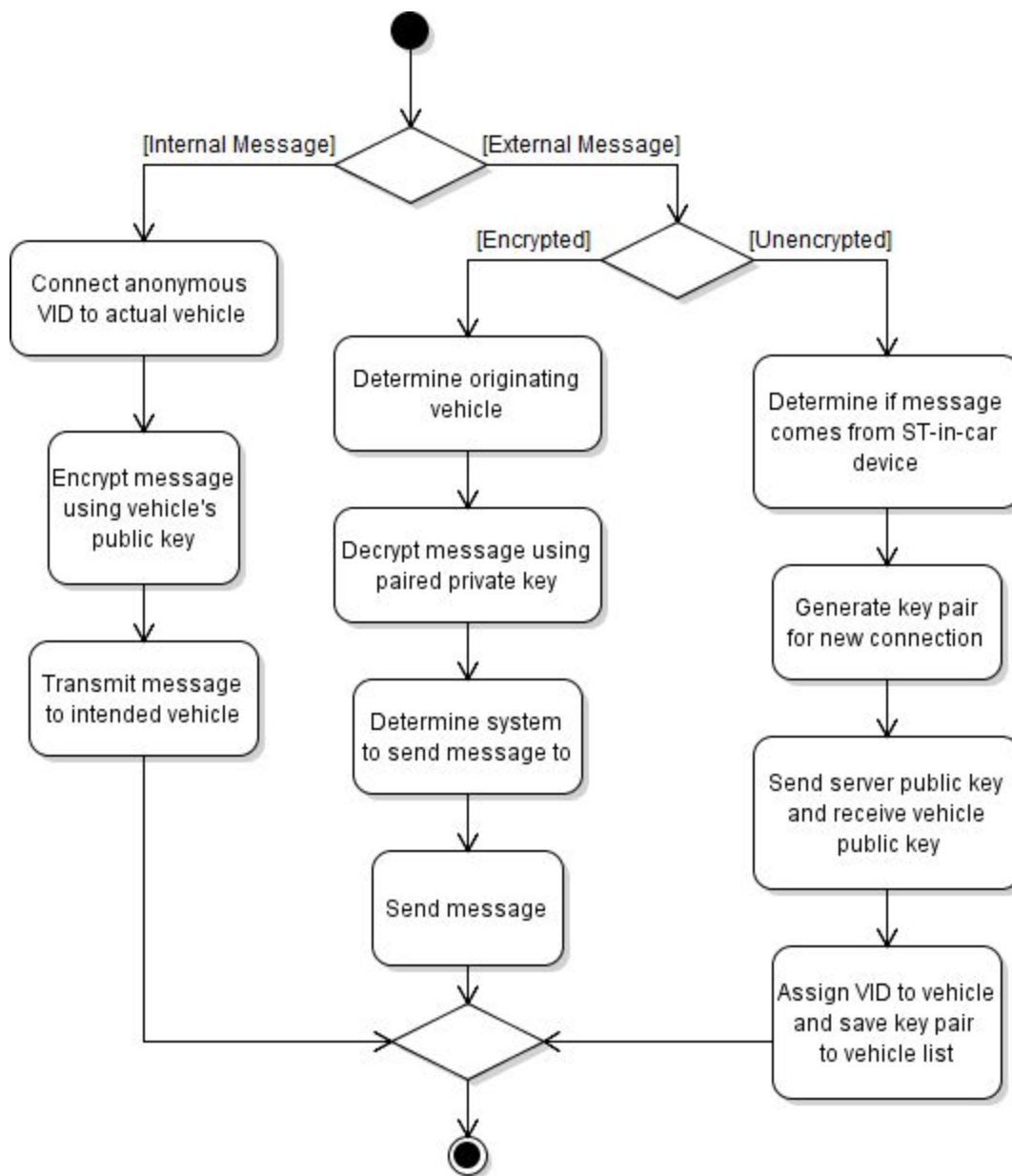
Design

Database system activity diagram

Design

Routing system activity diagram

Swarm system activity diagram

6.0 Restrictions, Limitations, and Constraints

6.1 Design Restrictions and Limitations

Requirements specification

- Vehicle laws

- Security standards

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- Tower or satellite connection from server to vehicle is needed for routing

Implementation of the software

- Server space

- Server maintenance

- Tower maintenance

- Hosting connections to the vehicles

6.2 Design and Implementation Constraints

SmartTransit must perform within the constraints of federal, state, and local

transportation laws and regulations. The database infrastructure and signal transmission

structures need time to set up. The database also requires multiple storages and central hubs in

order for easier data manipulation through database management system in the datacenter. The

artificial intelligence system will handle the majority of the connection between applications.

The datacenter will use oracle database as the base technology and tools. The database will also

use massive parallel processing or parallel database management system, for this system

parallelizes the query execution of a database management system, splits queries and allocates

them to multiple database management system nodes in order to process massive amounts of

data concurrently. There will be multiple interface language options available to users.

Communication protocol and security will be handled during the information transmission

through the network. In the database and system designs, the main navigation system will also

show clear naming and functionality of the software; visualized hierarchy will appear as priority

for the explanation and guidance for the functionality of the software.