Software Engineering, Department of Computer Engineering

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TRAFFIC LIGHTS FOR SAFETY AND EFFICIENCY

REQUIREMENT SPECIFICATION DOCUMENT

Contents

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1. INTRODUCTION

This document specifies the requirements for making traffic flow safe and efficient in a conjunction by using Axel's goal-oriented requirement engineering model. In this section, I will depict you system-as-is and system-to-be to you.

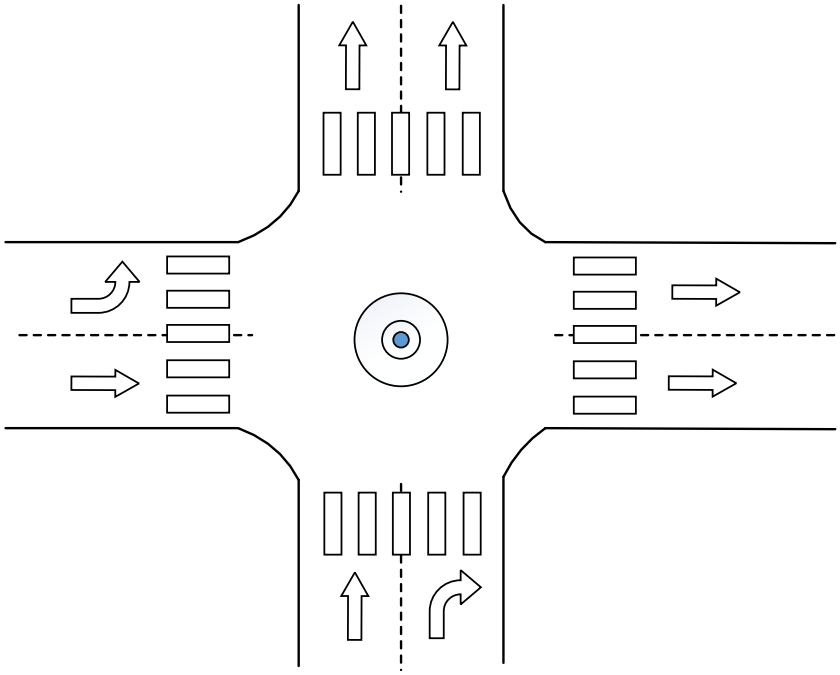


Figure 1 System-as-is

We have a system-as-is like that is depicted above.

The system that we are going to design in this document will be based on the Goal-Oriented Modeling.

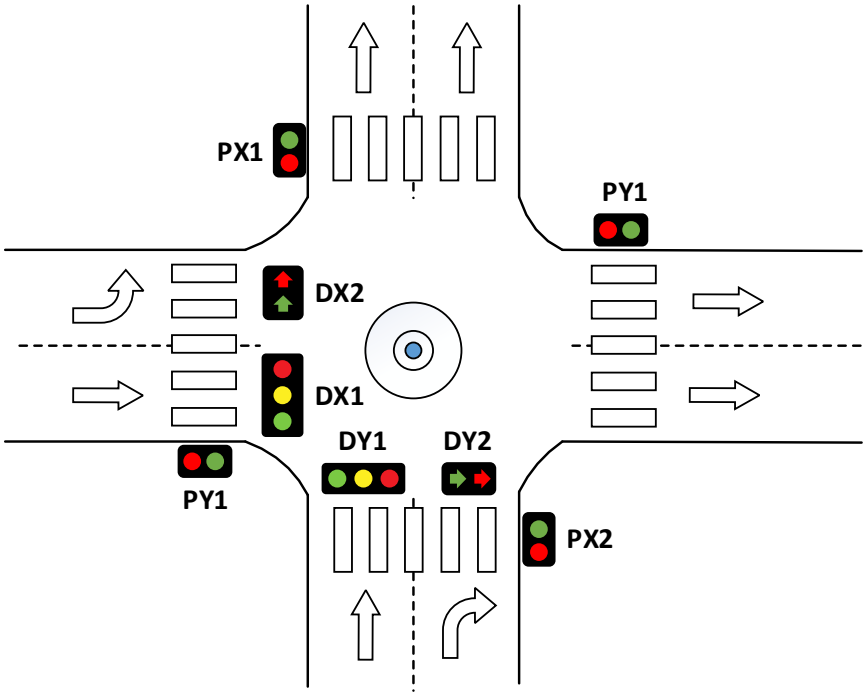


Figure 2 System-to-be

The document will constitute of seven sections with the introduction. After the introduction section, you will find the section Goal Model that will give you details of the system goals from business ones to technical ones. In the third section, I will address the obstructions of the system together with the solutions for some of them. In the fourth section, you will find the agents and relationships of them each other. Fifth and sixth sections will identify conceptual and operation models that are necessary to carry out the system requirements. The seventh and last section is the conclusion part of the document that gives you a summary of what you read.

2. GOAL MODEL

We are going to address each sub goal separately because it is not possible to fit all of the goals into a single page. Annotations will be interleaved.

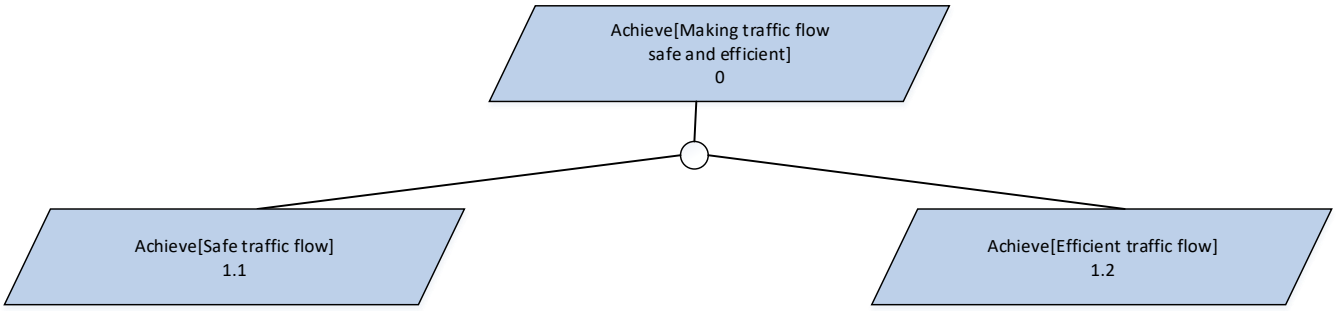


Figure 3 Main Goal - Making traffic flow safe and efficient

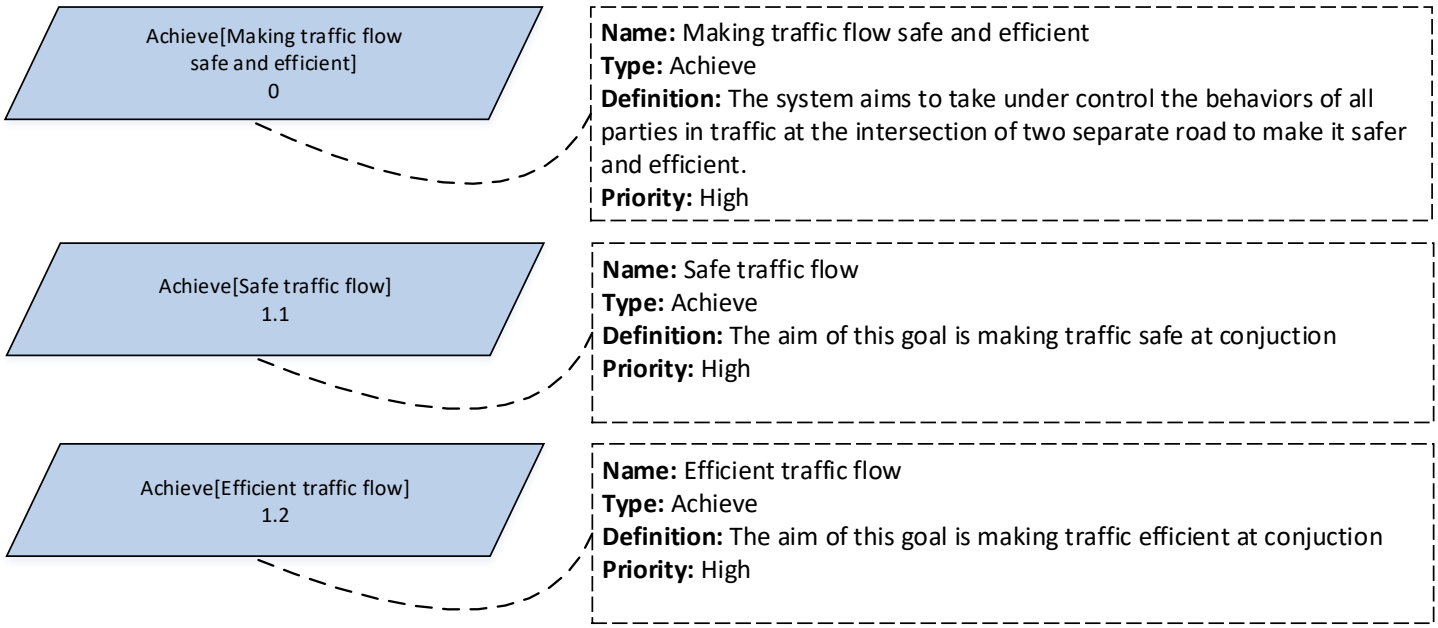


Figure 4 Annotation of Main Goal - Making traffic flow safe and efficient

2.1 Sub goals of safe traffic flow

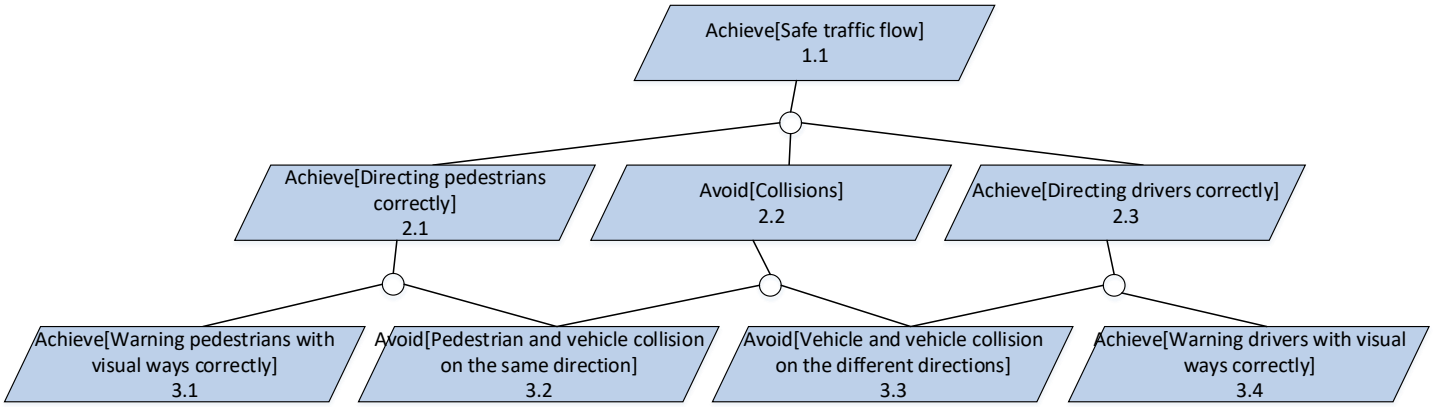


Figure 5 Sub goals of safe traffic flow

Achieve[Directing pedestrians correctly]
2.1

Name: Directing pedestrians correctly
Type: Achieve
Definition: The aim of this goal is directing pedestrians correctly.
Priority: High

Avoid[Collisions]
2.2

Name: Collisions
Type: Avoid
Definition: The aim of this goal is avoiding collision of pedestrians and vehicles.
Priority: High

Achieve[Directing drivers correctly]
2.3

Name: Directing drivers correctly
Type: Achieve
Definition: The aim of this goal is directing drivers correctly.
Priority: High

Achieve[Warning pedestrians with visual ways correctly]
3.1

Name: Warning pedestrians with visual ways correctly
Type: Achieve
Definition: The aim of this goal is warning pedestrians with visual ways to allow them to know whether they may cross or not.
Priority: High

Avoid[Pedestrian and vehicle collision on the same direction]
3.2

Name: Pedestrian and vehicle collision on the same direction
Type: Avoid
Definition: The aim of this goal is avoiding collision of pedestrians and vehicles on the same road.
Priority: High

Avoid[Vehicle and vehicle collision on the different directions]
3.3

Name: Vehicle and vehicle collision on the different directions
Type: Avoid
Definition: The aim of this goal is avoiding collision of vehicle and vehicles on going to different directions.
Priority: High

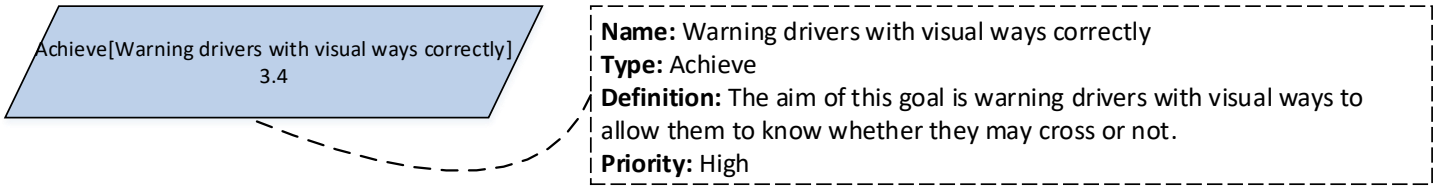


Figure 6 Annotations of sub goals of safe traffic flow

2.1.1 Sub goals of warning pedestrians with visual ways correctly

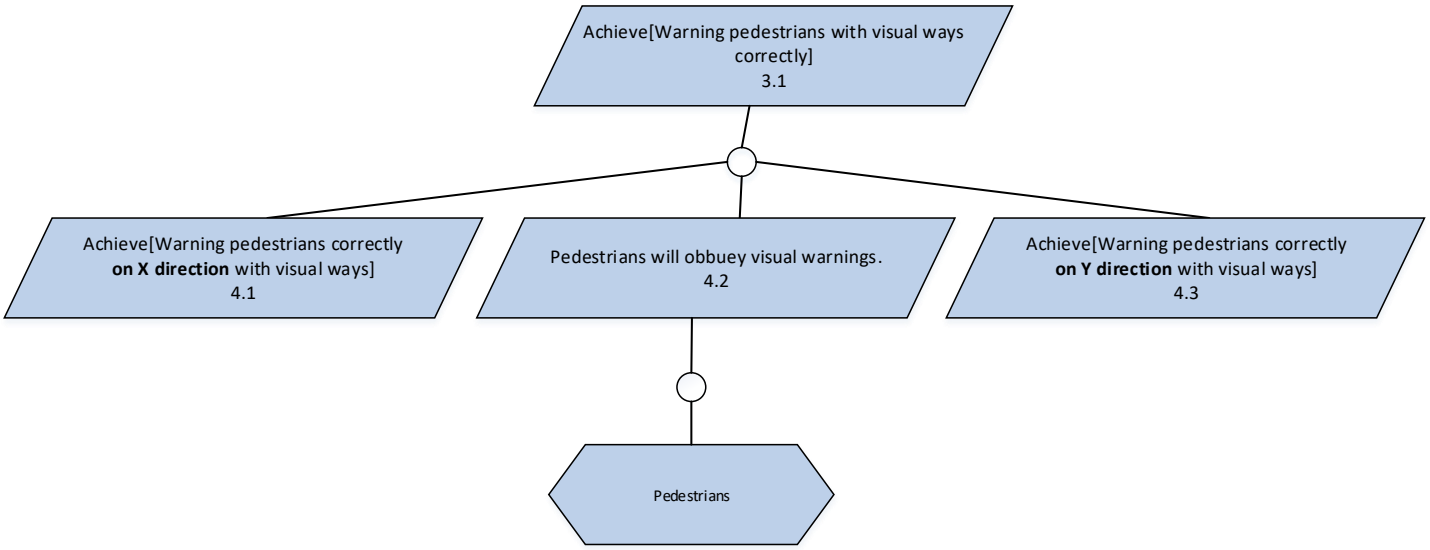


Figure 7 Sub goals of warning pedestrians with visual ways correctly

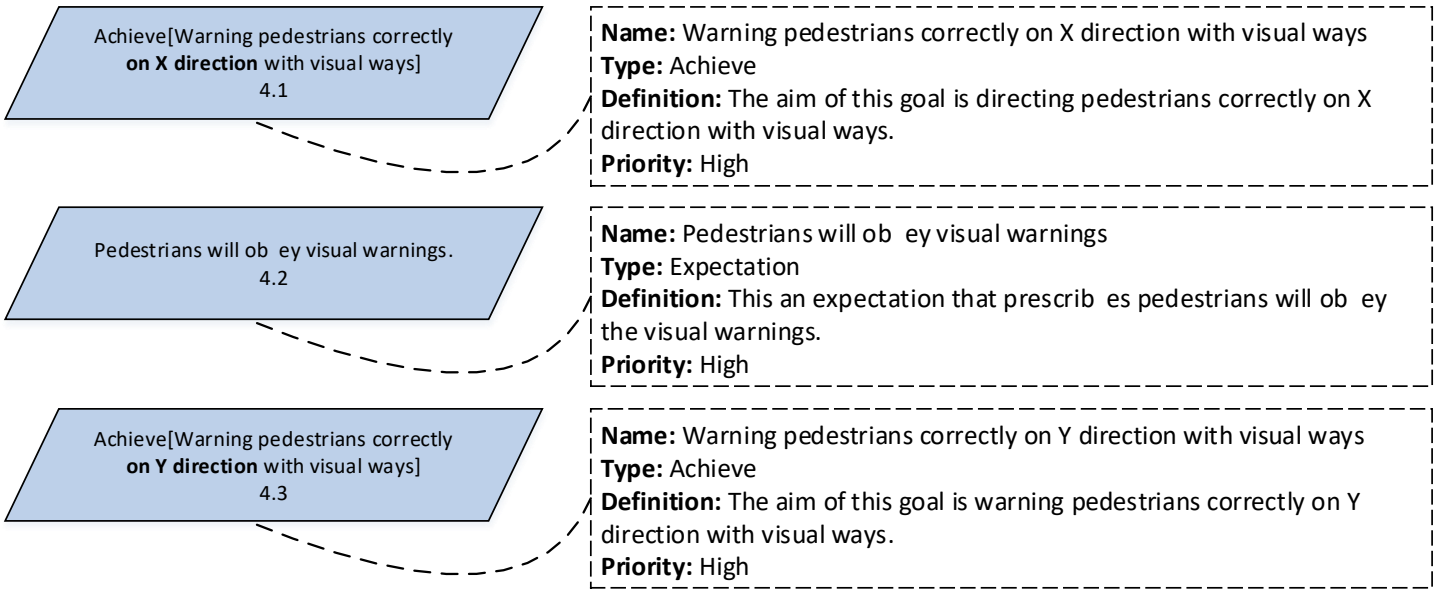


Figure 8 Annotations of sub goals of warning pedestrians with visual ways correctly

2.1.1.1 Sub goals of warning pedestrians correctly on X direction with visual ways

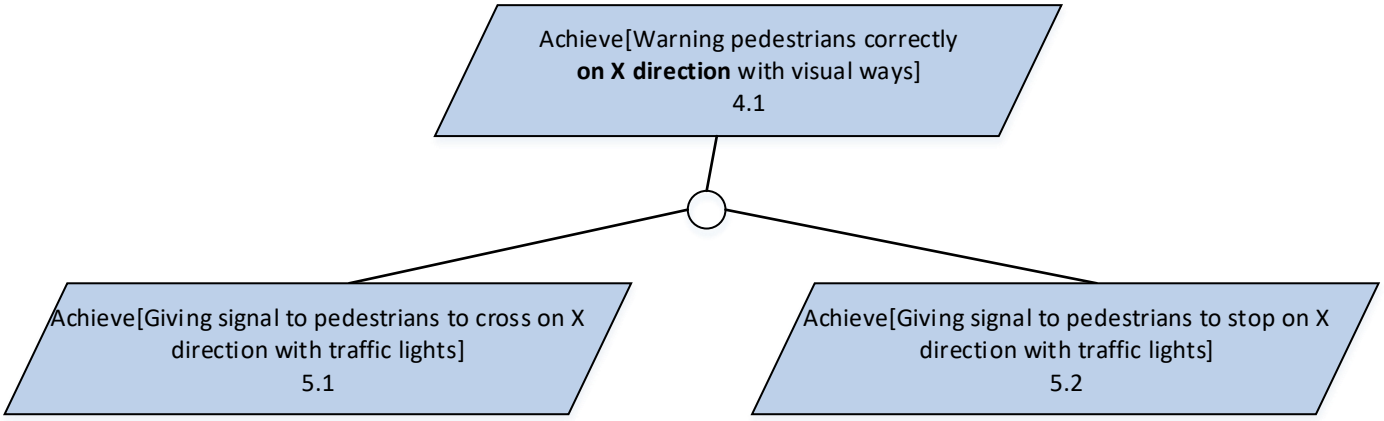


Figure 9 Sub goals of warning pedestrians correctly on X direction with visual ways

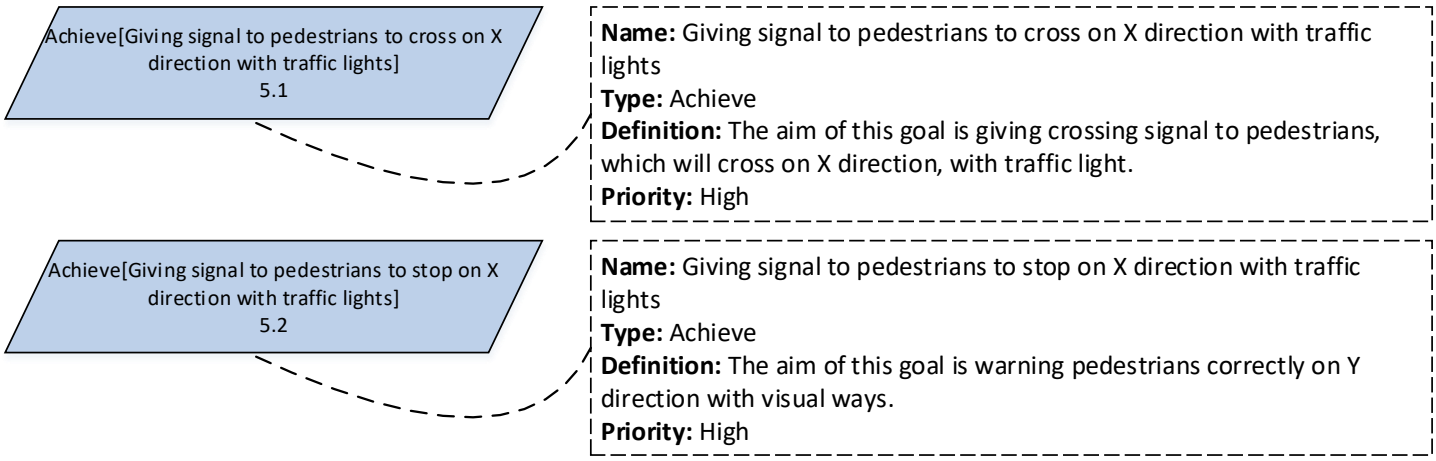


Figure 10 Annotations of sub goals of warning pedestrians correctly on X direction with visual ways

2.1.1.1.1 Sub goals of giving signal to pedestrians to cross on X direction with traffic lights

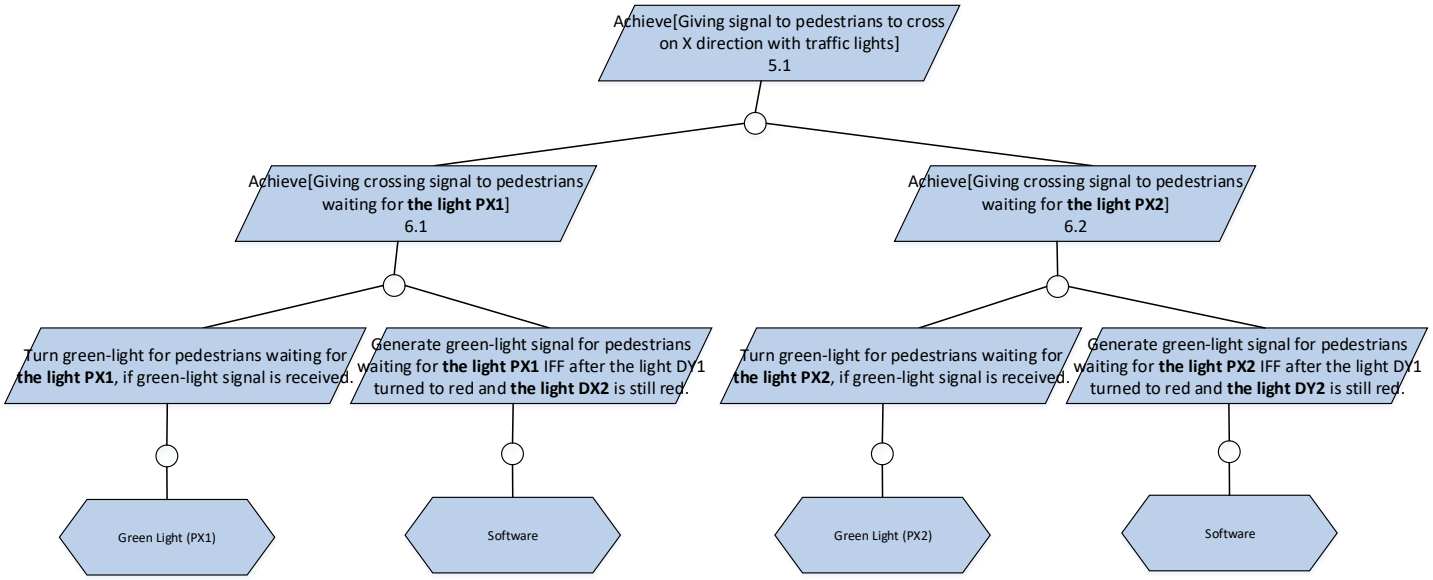


Figure 11 Sub goals of giving signal to pedestrians to cross on X direction with traffic lights

Achieve[Giving crossing signal to pedestrians waiting for **the light PX1**]
6.1

Name: Giving crossing signal to pedestrians waiting for the light PX1
Type: Achieve
Definition: The aim of this goal is giving crossing signal to pedestrians waiting for the light PX1.
Priority: High

Achieve[Giving crossing signal to pedestrians waiting for **the light PX2**]
6.2

Name: Giving crossing signal to pedestrians waiting for the light PX2
Type: Achieve
Definition: The aim of this goal is giving crossing signal to pedestrians waiting for the light PX2
Priority: High

Turn green-light for pedestrians waiting for **the light PX1**, if green-light signal is received.

Name: Turn green-light for pedestrians waiting for the light PX1, if green-light signal is received
Type: Requirement
Definition: This is a requirement that is going to show pedestrians waiting for the light PX1 that crossing is availab le for them.
Priority: High

Generate green-light signal for pedestrians waiting for **the light PX1** IFF after the light DY1 turned to red and **the light DX2** is still red.

Name: Generate green-light signal for pedestrians waiting for the light PX1 IFF after the light DY1 turned to red and the light DX2 is still red.
Type: Requirement
Definition: This is a requirement that is prescrib ing the conditions of when the light PX1 is turned to green.
Priority: High

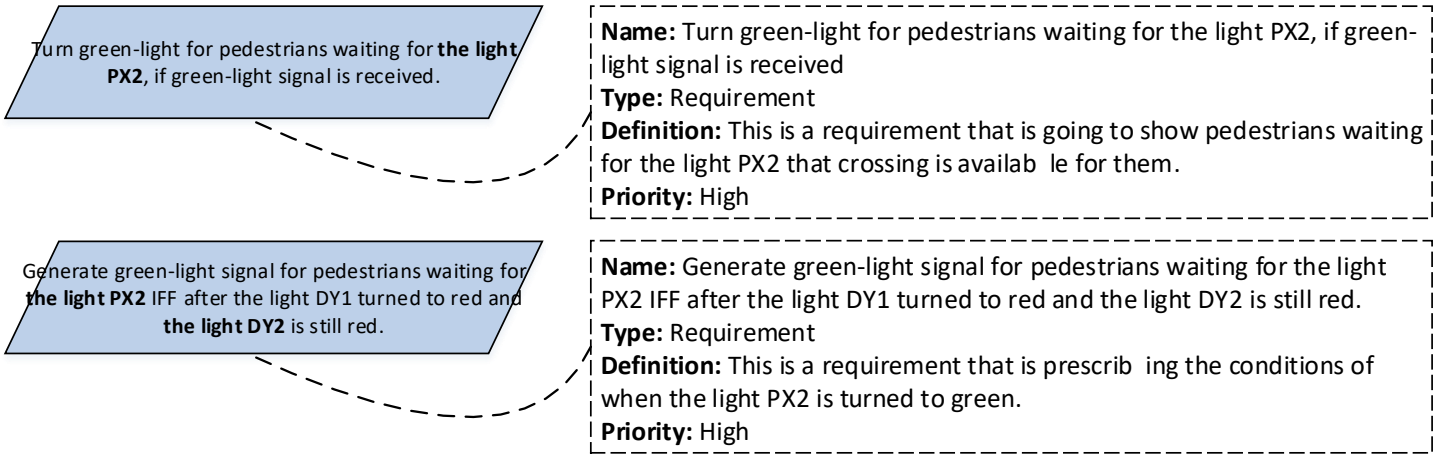


Figure 12 Annotations of sub goals of giving signal to pedestrians to cross on X direction with traffic lights

2.1.1.1.2 Sub goals of giving signal to pedestrians to stop on X direction with traffic lights

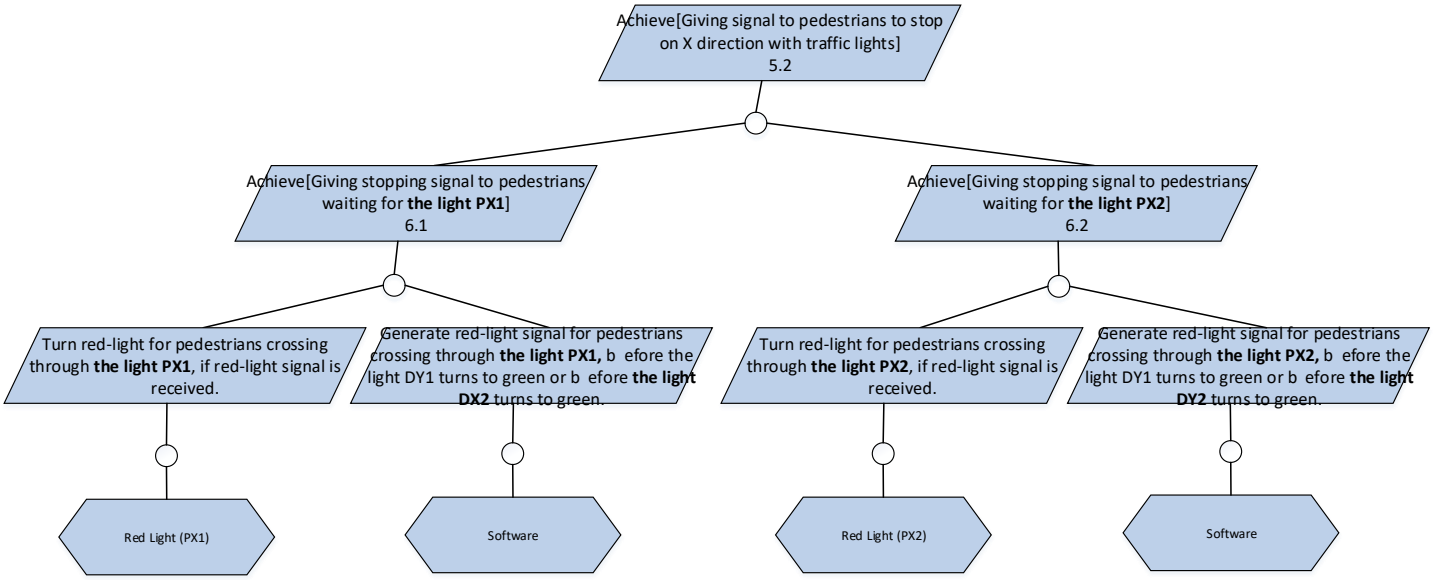
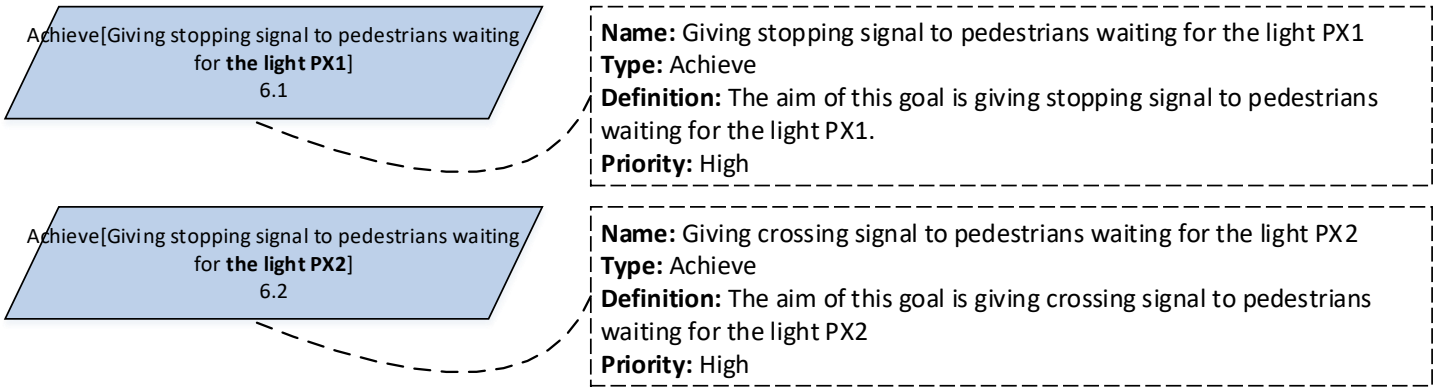


Figure 13 Sub goals of giving signal to pedestrians to stop on X direction with traffic lights



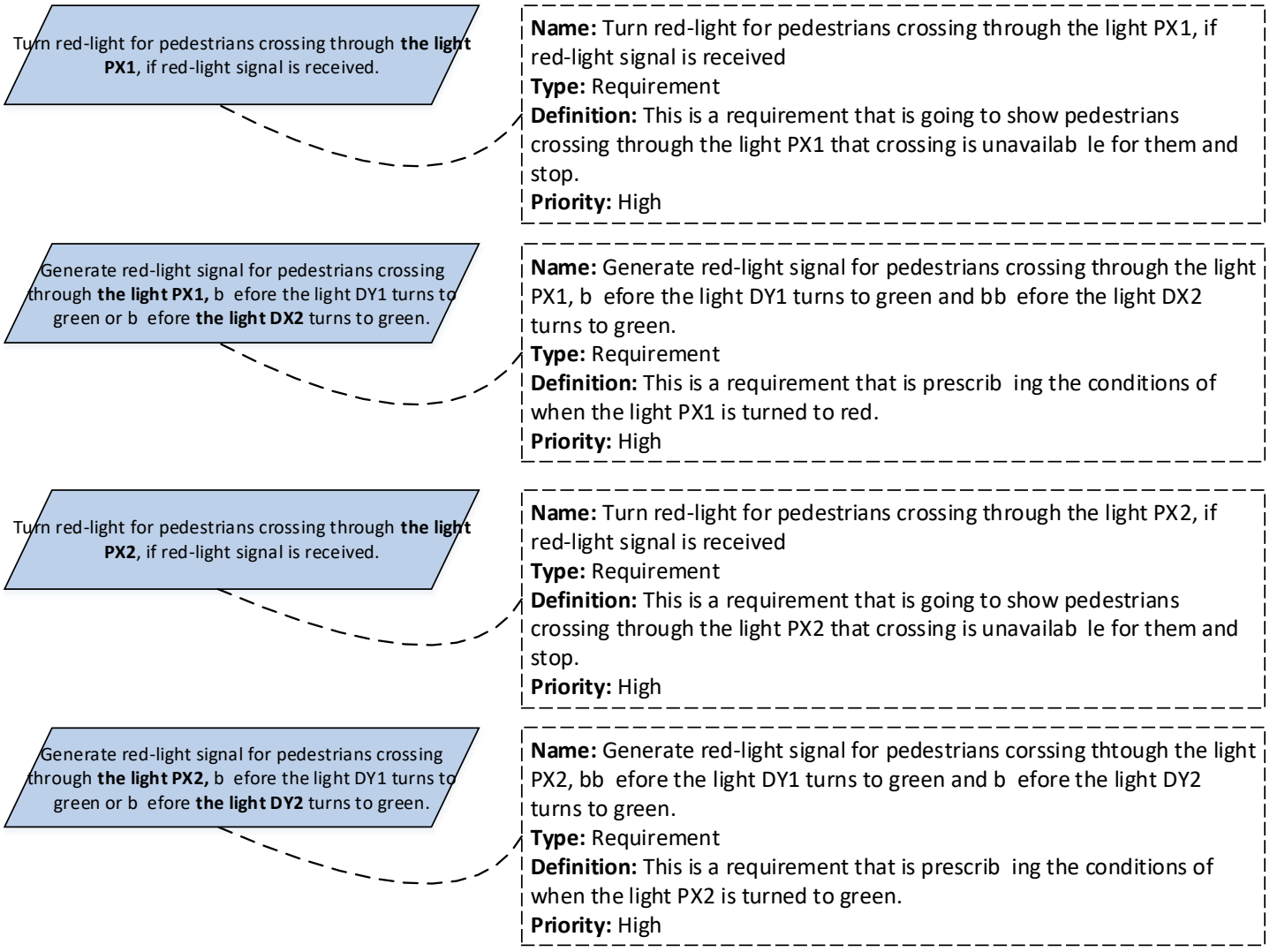


Figure 14 Annotations of sub goals of giving signal to pedestrians to stop on X direction with traffic lights

2.1.1.2 Sub goals of warning pedestrians correctly on Y direction with visual ways

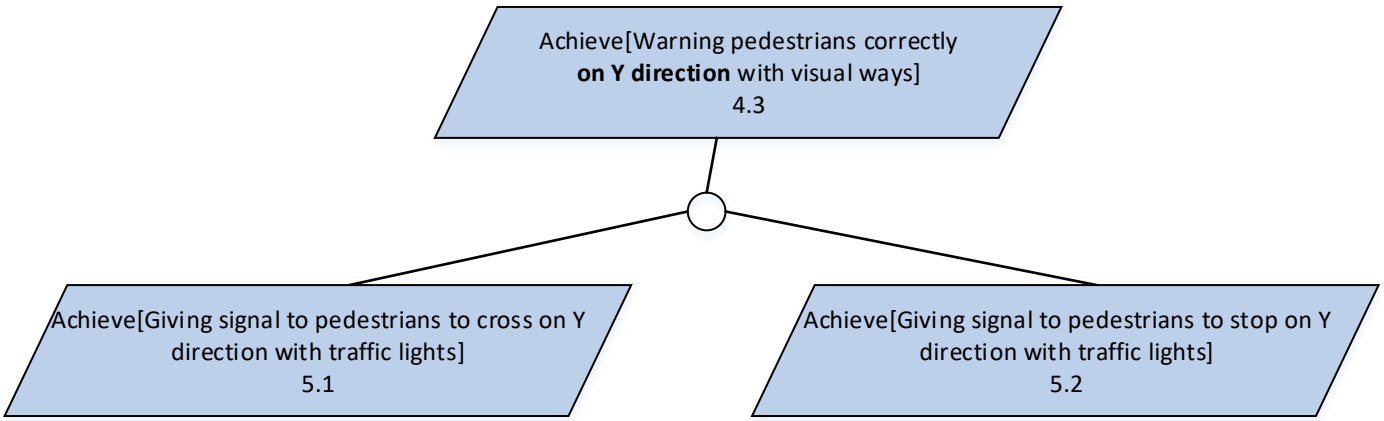


Figure 15 Sub goals of warning pedestrians correctly on Y direction with visual ways

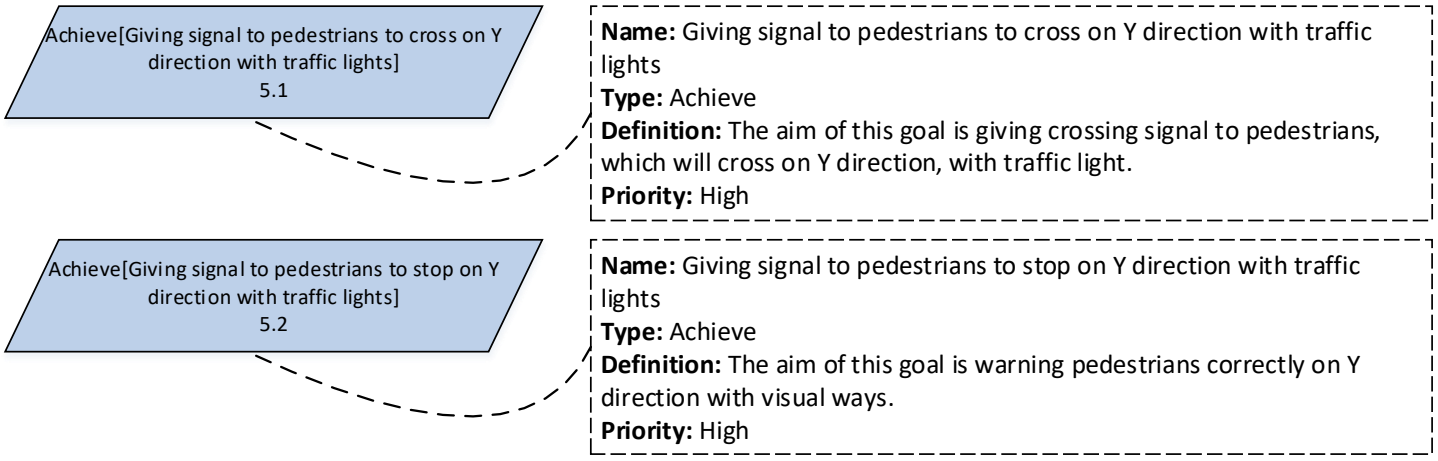


Figure 16 Annotations of sub goals of warning pedestrians correctly on Y direction with visual ways

2.1.1.2.1 Sub goals of giving signal to pedestrians to cross on Y direction with traffic lights

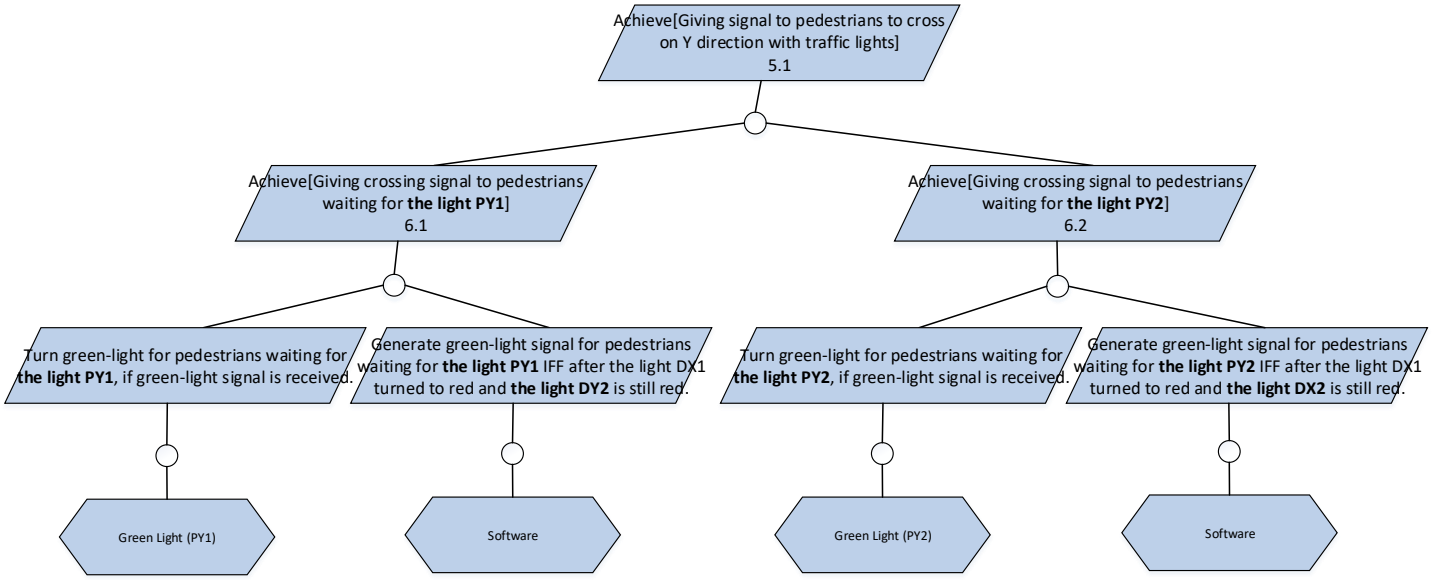
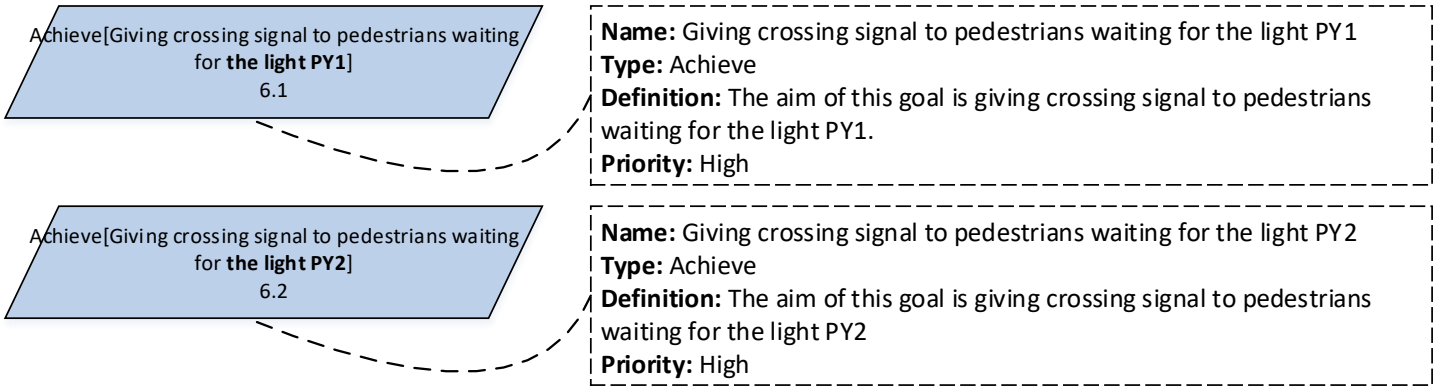


Figure 17 Sub goals of giving signal to pedestrians to cross on Y direction with traffic lights



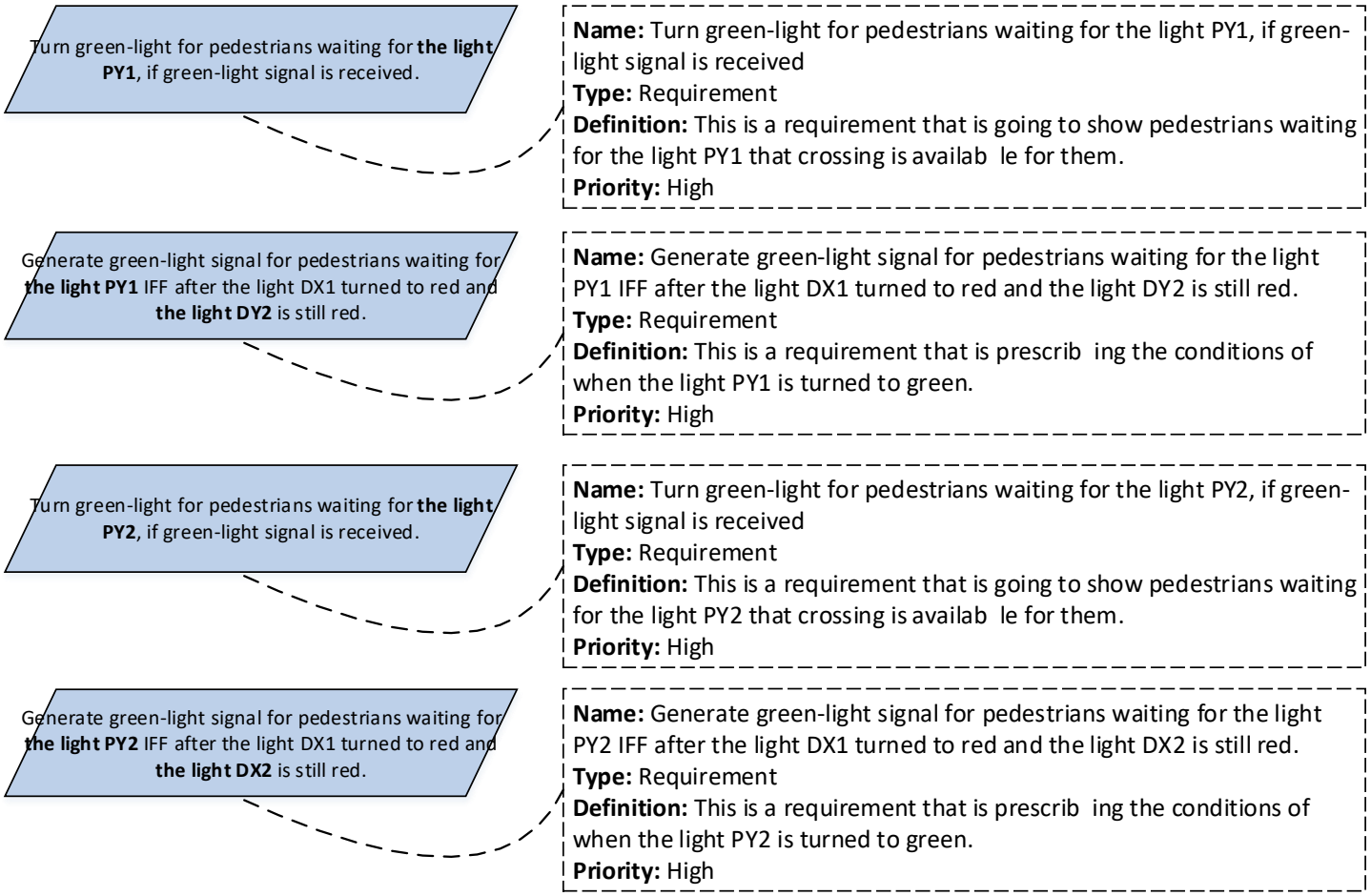


Figure 18 Annotations of sub goals of giving signal to pedestrians to cross on Y direction with traffic lights

2.1.1.2.2 Sub goals of giving signal to pedestrians to stop on Y direction with traffic lights

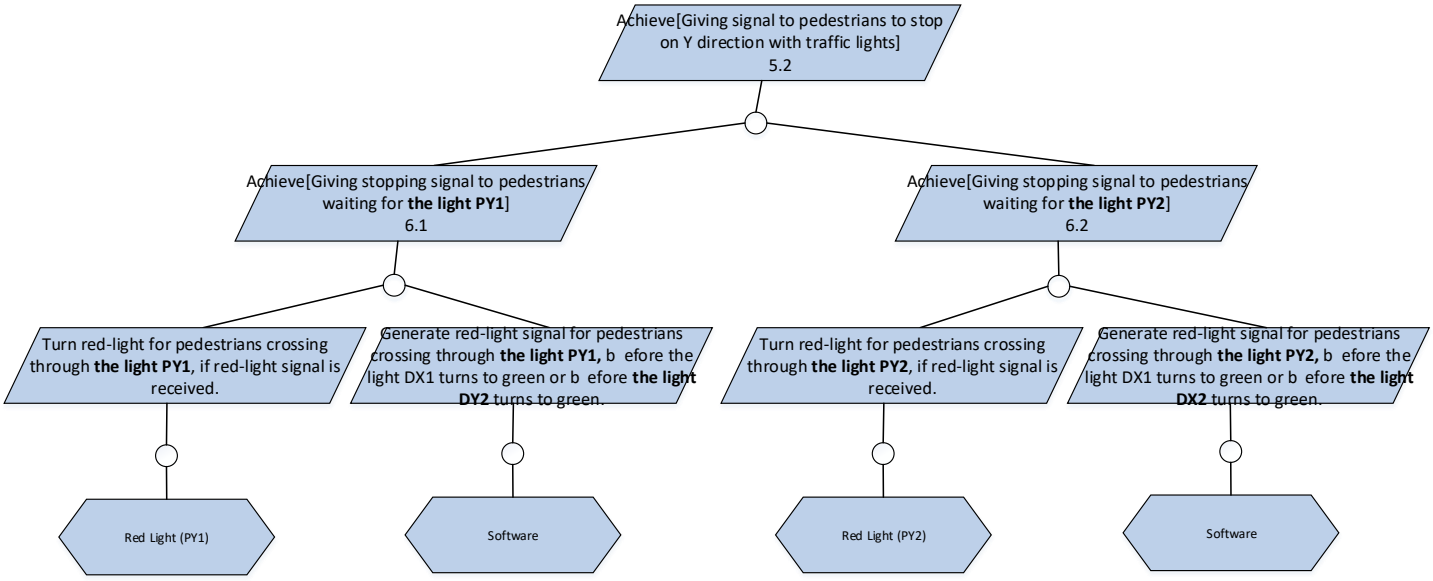


Figure 19 Sub goals of giving signal to pedestrians to stop on Y direction with traffic lights

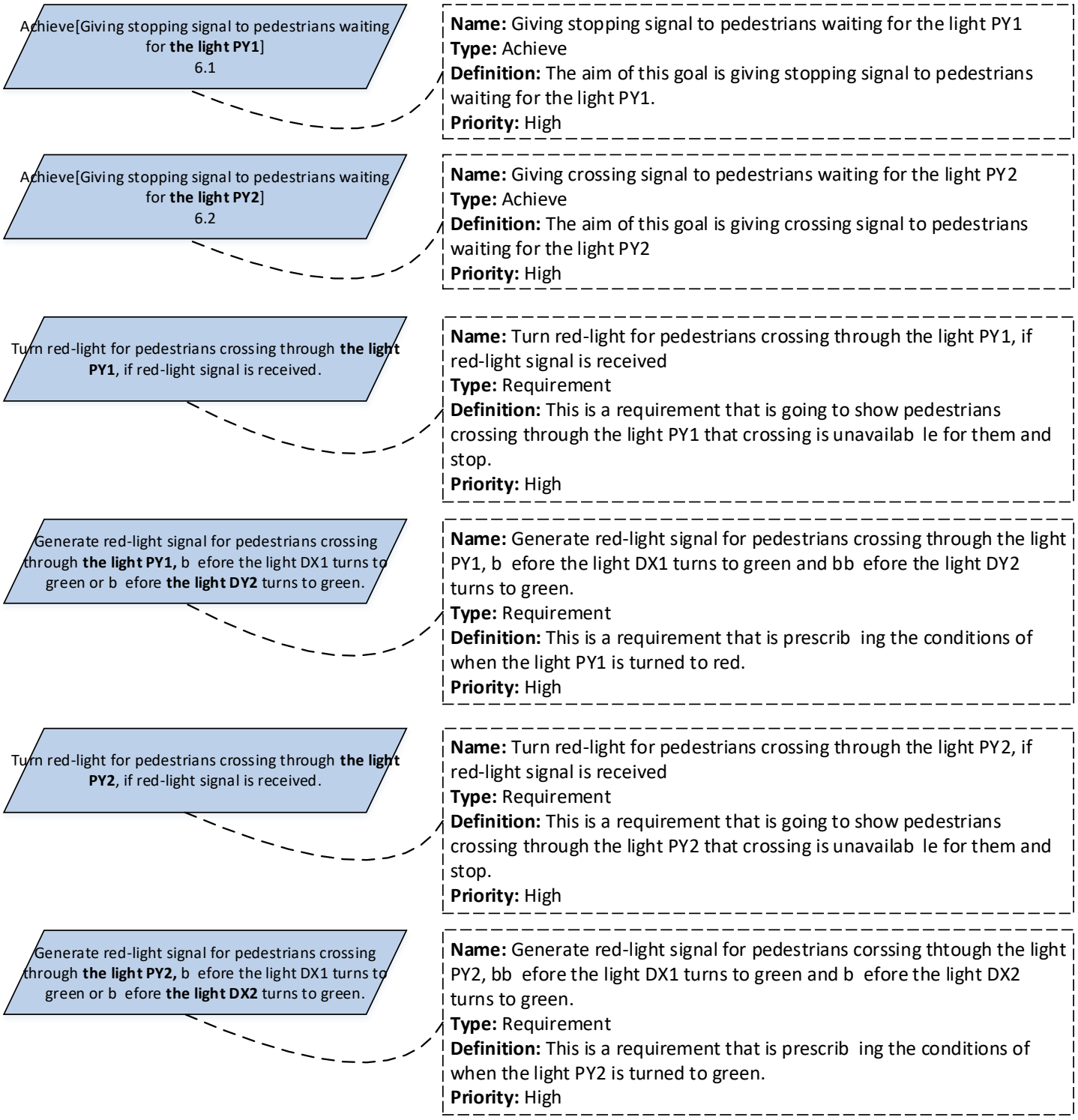


Figure 20 Annotations of sub goals of giving signal to pedestrians to stop on Y direction with traffic lights

2.1.2 Sub goals of avoiding pedestrians and vehicles collision on the same direction

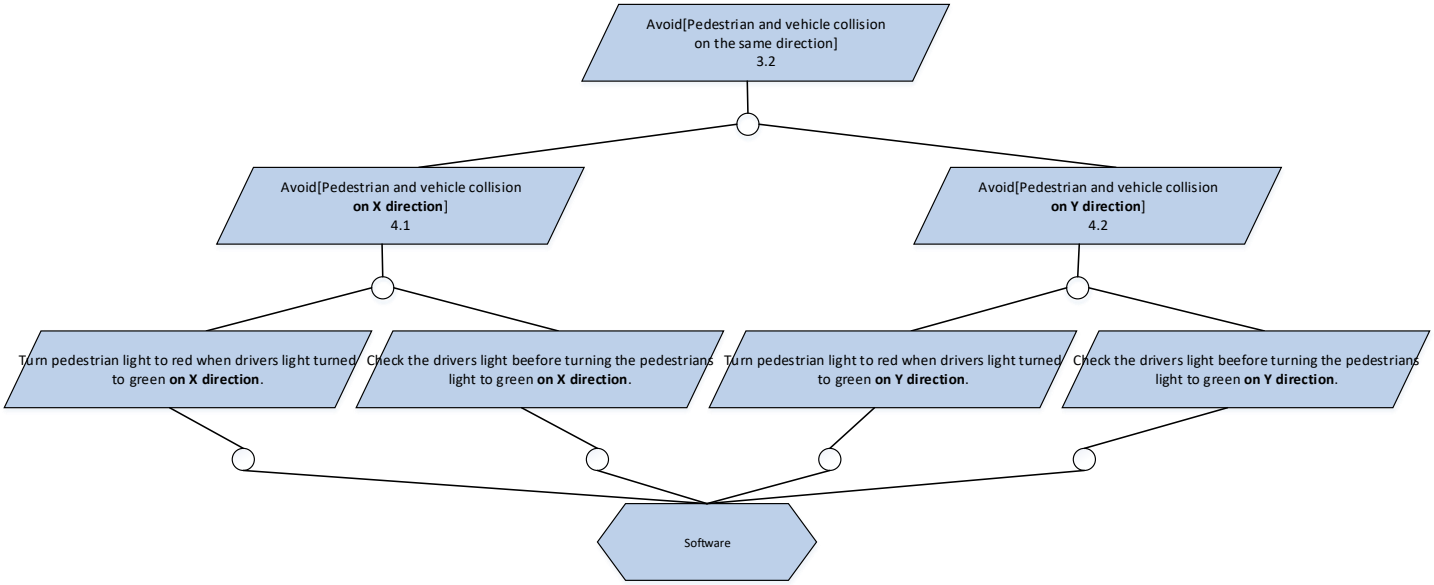


Figure 21 Sub goals of avoiding pedestrians and vehicles collision on the same direction

Avoid[Pedestrian and vehicle collision **on X direction**] 4.1

Name: Pedestrian and vehicle collision
Type: Avoid
Definition: The aim of this goal is avoiding collsions of pedestrians and vehicles on X direction
Priority: High

Avoid[Pedestrian and vehicle collision **on Y direction**] 4.2

Name: Pedestrian and vehicle collision
Type: Avoid
Definition: The aim of this goal is avoiding collsions of pedestrians and vehicles on Y direction
Priority: High

Turn pedestrian light to red when drivers light turned to green **on X direction**.

Name: Turn pedestrian light to red when drivers light turned to green on X direction
Type: Requirement
Definition: This is a requirement showing that the predestrian light is going to bee turned to red when the light of drivers turned to green on X direction.
Priority: High

Check the drivers light beefore turning the pedestrians light to green **on X direction**.

Name: Check the drivers-light beefore turning the pedestrians-light to green on X direction
Type: Requirement
Definition: This is a requirement showing that the light of drivers is going to bee checked beefore turning the pedestrians-light to green on X direction.
Priority: High

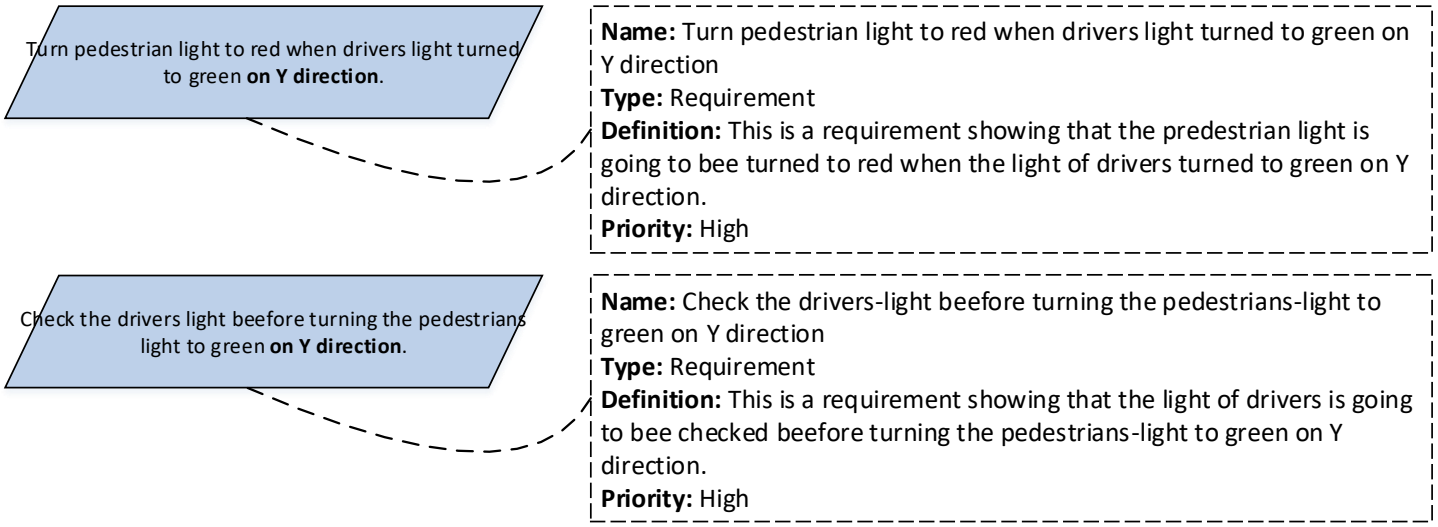


Figure 22 Annotations of sub goals of avoiding pedestrians and vehicles collision on the same direction

2.1.3 Sub goals of avoiding vehicles and vehicles collision on the different directions

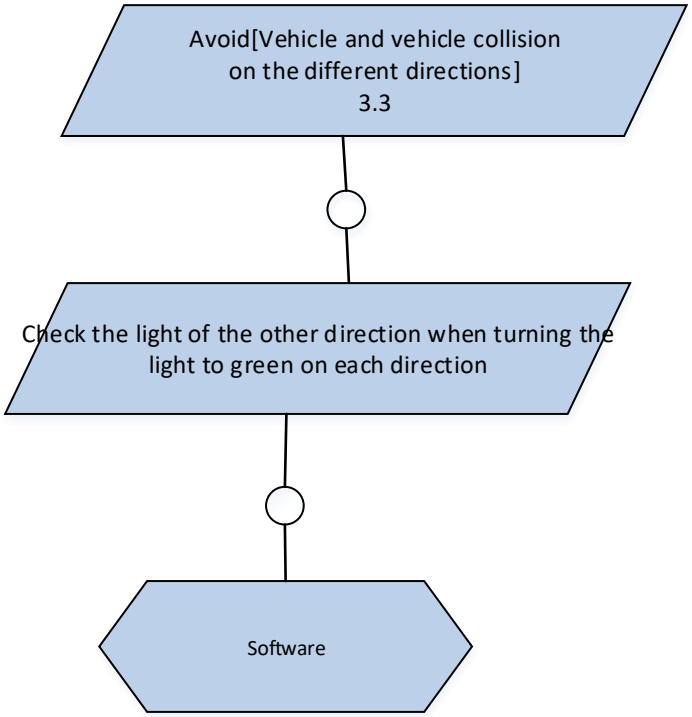


Figure 23 Sub goals of avoiding vehicles and vehicles collision on the different directions

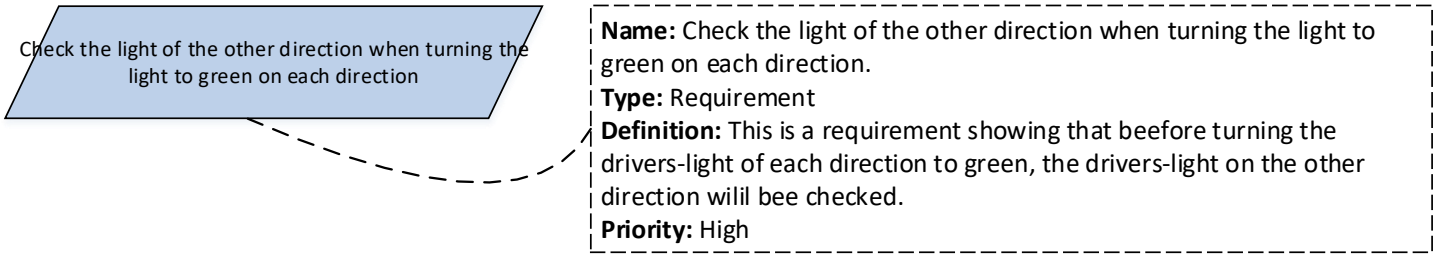


Figure 24 Annotations of sub goals of avoiding vehicles and vehicles collision on the different directions

2.1.4 Sub goals of warning drivers with visual ways correctly

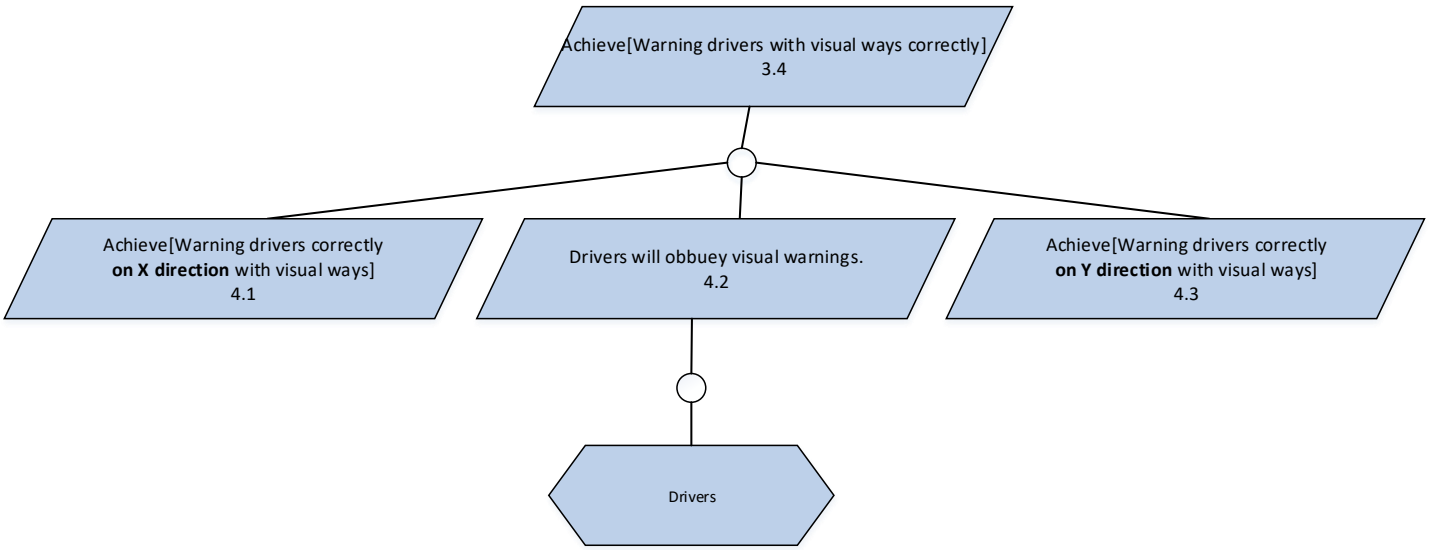


Figure 25 Sub goals of warning drivers with visual ways correctly

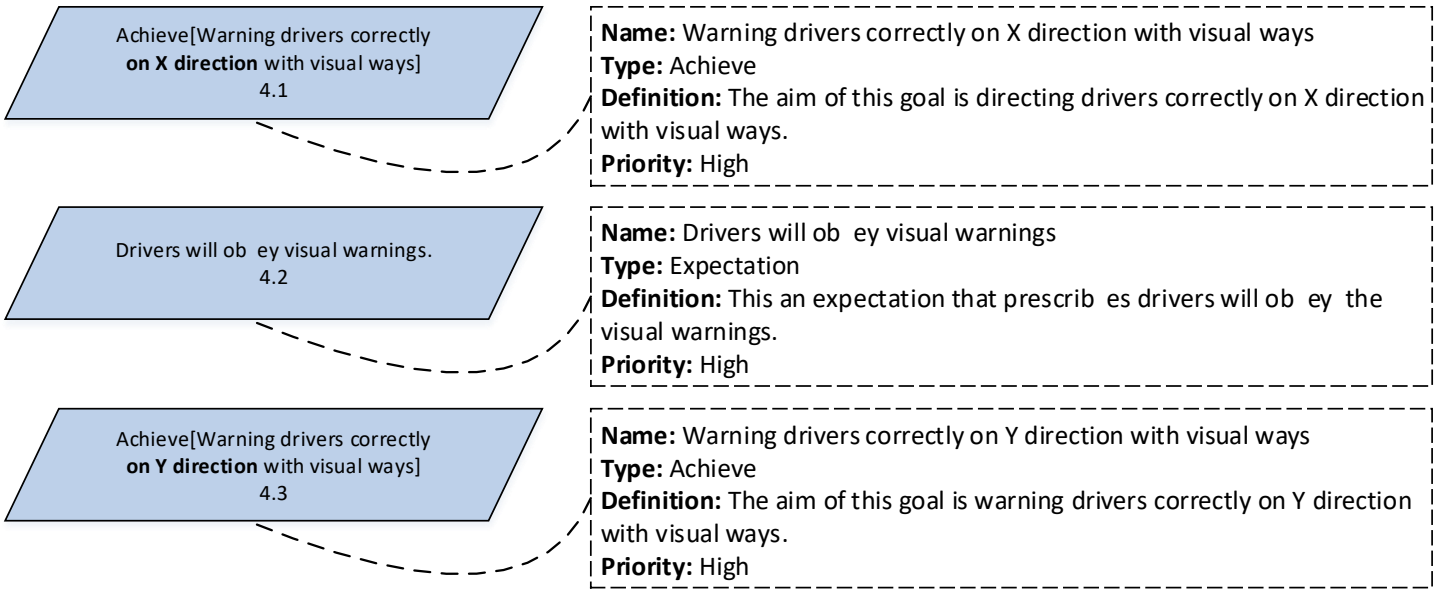


Figure 26 Annotations of sub goals of warning drivers with visual ways correctly

2.1.4.1 Sub goals of warning drivers correctly on X direction with visual ways

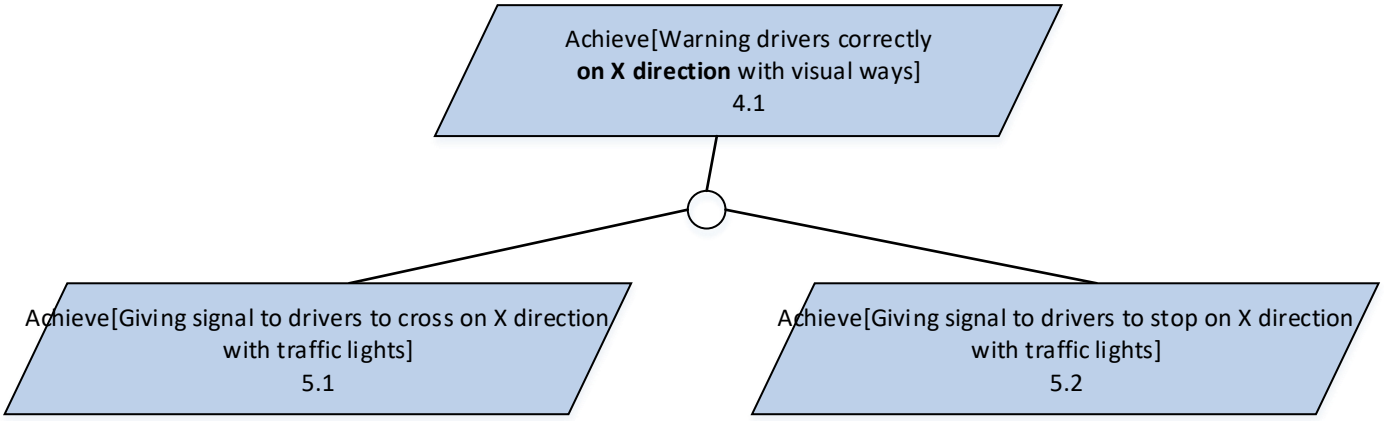


Figure 27 Sub goals of warning drivers correctly on X direction with visual ways

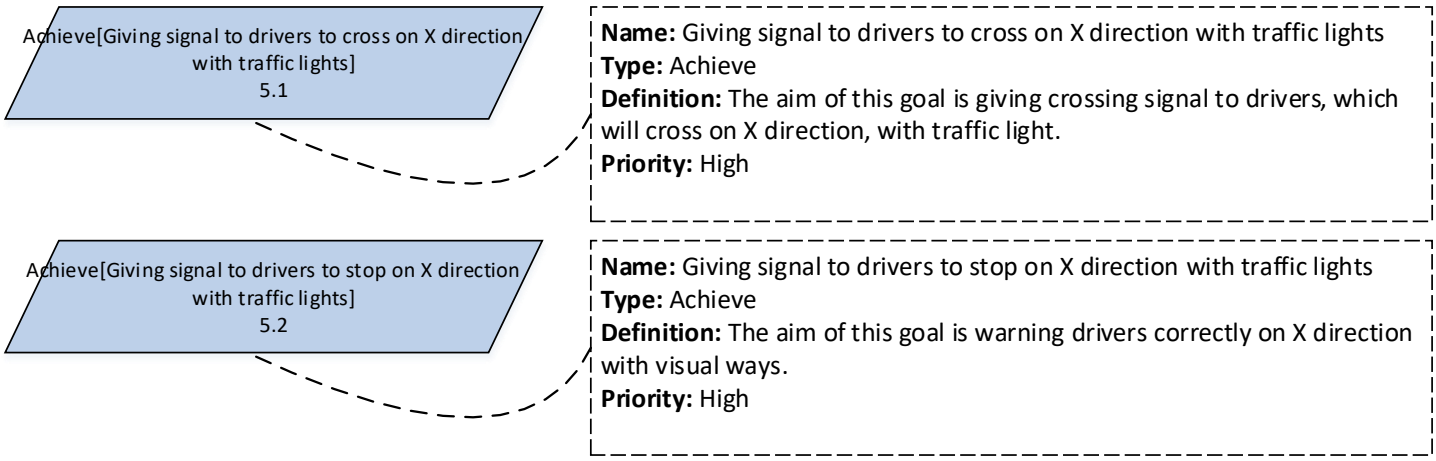


Figure 28 Annotations of sub goals of warning drivers correctly on X direction with visual ways

2.1.4.1.1 Sub goals of giving signal to drivers to cross on X direction with traffic lights

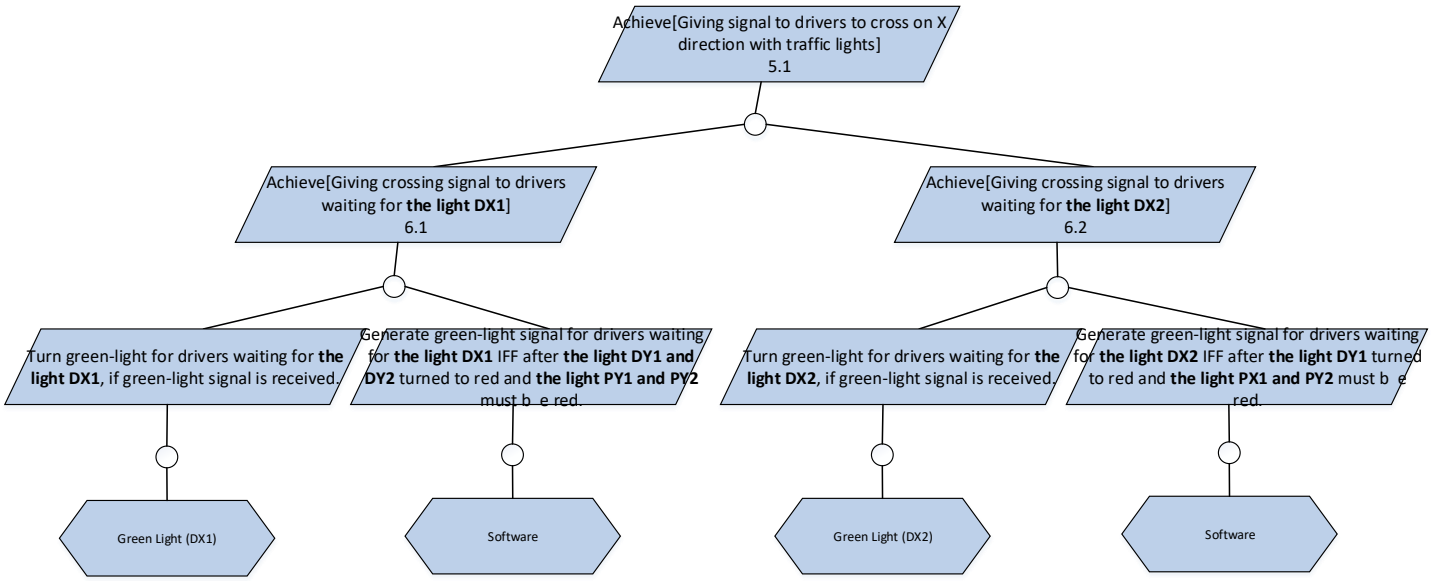


Figure 29 Sub goals of giving signal to drivers to cross on X direction with traffic lights

Achieve[Giving crossing signal to drivers waiting for **the light DX1**]
6.1

Name: Giving crossing signal to pedestrians waiting for the light DX1
Type: Achieve
Definition: The aim of this goal is giving crossing signal to pedestrians waiting for the light DX1.
Priority: High

Achieve[Giving crossing signal to drivers waiting for **the light DX2**]
6.2

Name: Giving crossing signal to pedestrians waiting for the light DX2
Type: Achieve
Definition: The aim of this goal is giving crossing signal to pedestrians waiting for the light DX2
Priority: High

Turn green-light for drivers waiting for **the light DX1**, if green-light signal is received.

Name: Turn green-light for drivers waiting for the light DX1, if green-light signal is received
Type: Requirement
Definition: This is a requirement that is going to show drivers waiting for the light DX1 that crossing is availab le for them.
Priority: High

Generate green-light signal for drivers waiting for **the light DX1** IFF after **the light DY1 and DY2** turned to red and **the light PY1 and PY2** must b e red.

Name: Generate green-light signal for drivers waiting for the light DX1 IFF after the light DY1 and DY2 turned to red and the light PY1 and PY2 must bee red.
Type: Requirement
Definition: This is a requirement that is prescrib ing the conditions of when the light DX1 is turned to green.
Priority: High

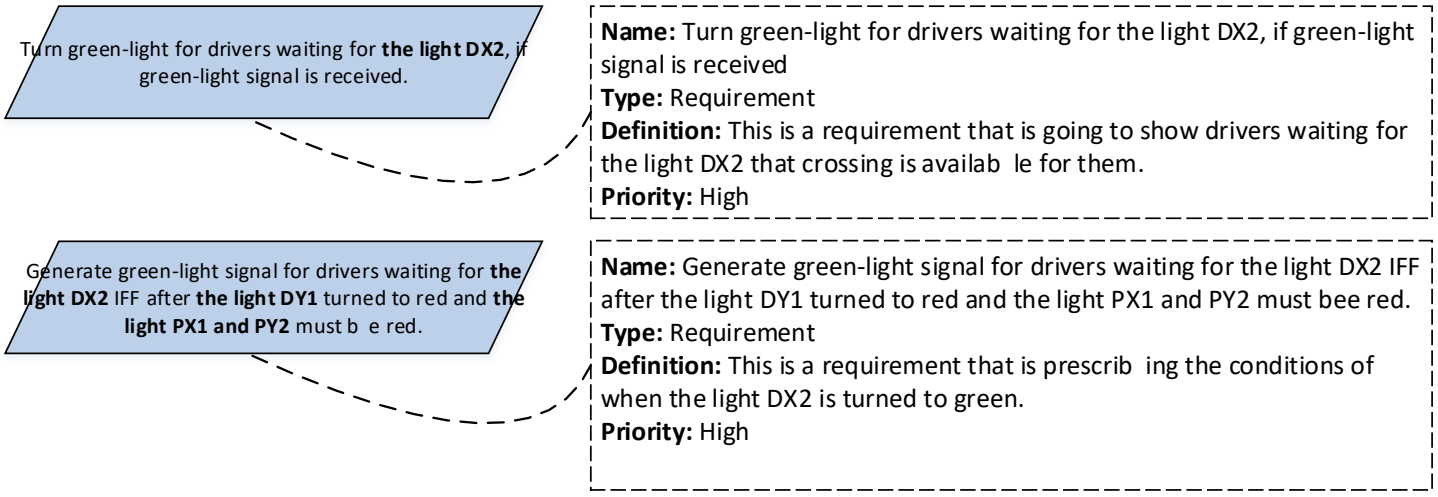


Figure 30 Annotations of sub goals of giving signal to drivers to cross on X direction with traffic lights

2.1.4.1.2 Sub goals of giving signal to drivers to stop on X direction with traffic lights

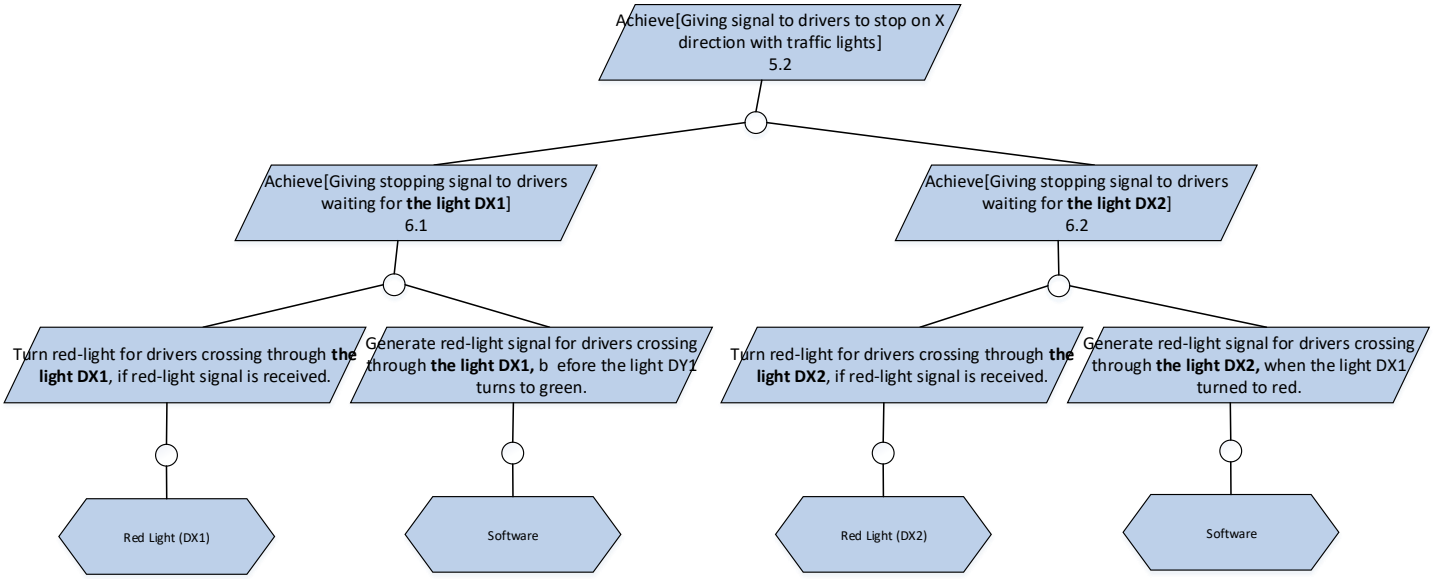
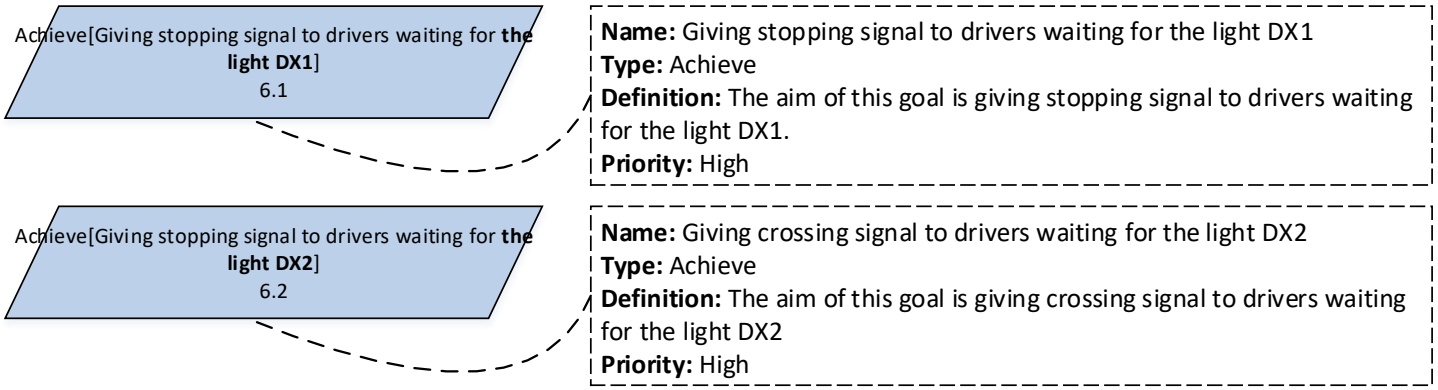


Figure 31 Sub goals of giving signal to drivers to stop on X direction with traffic lights



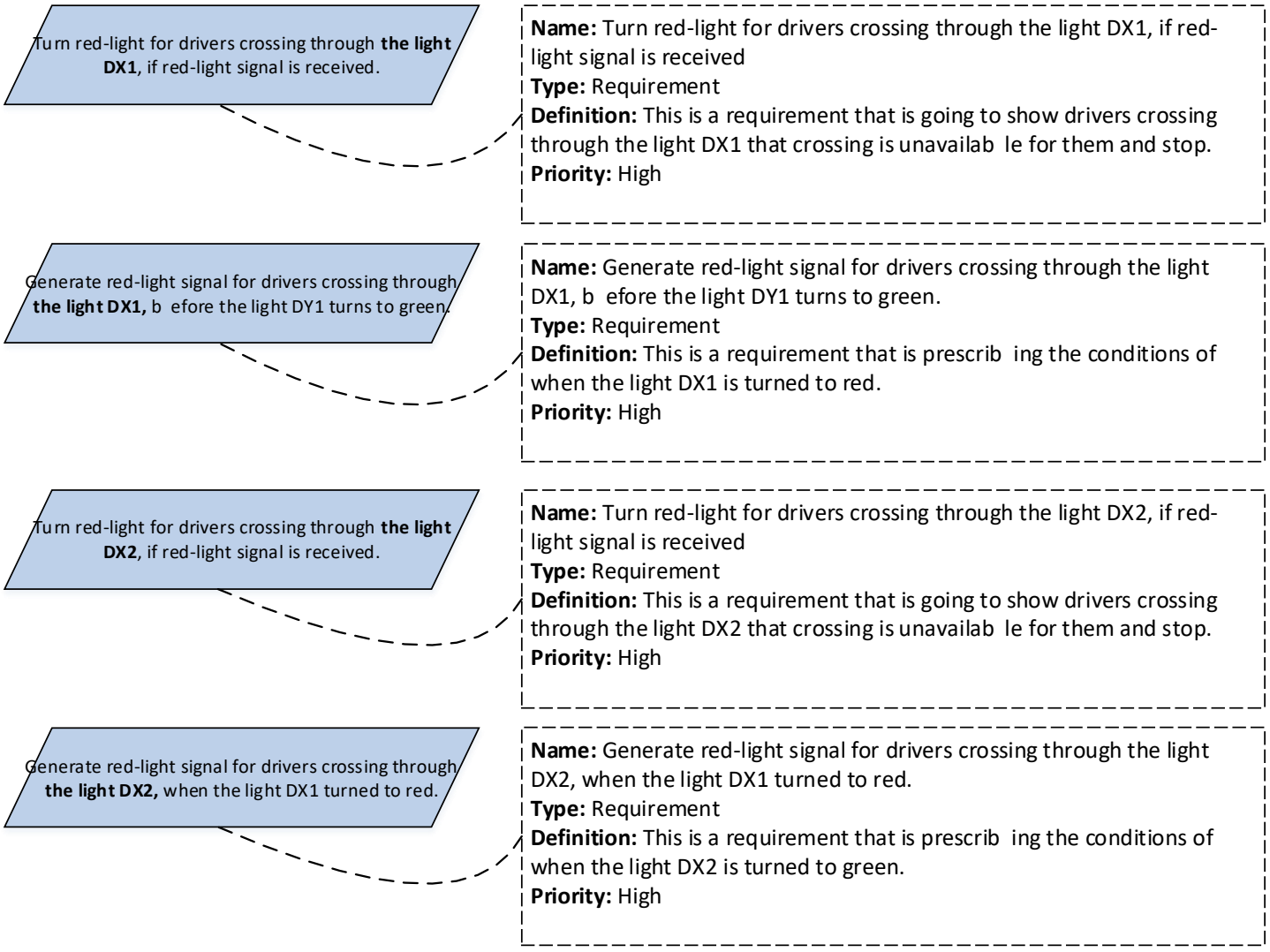


Figure 32 Annotations of sub goals of giving signal to drivers to stop on X direction with traffic lights

2.1.4.2 Sub goals of warning drivers correctly on Y direction with visual ways

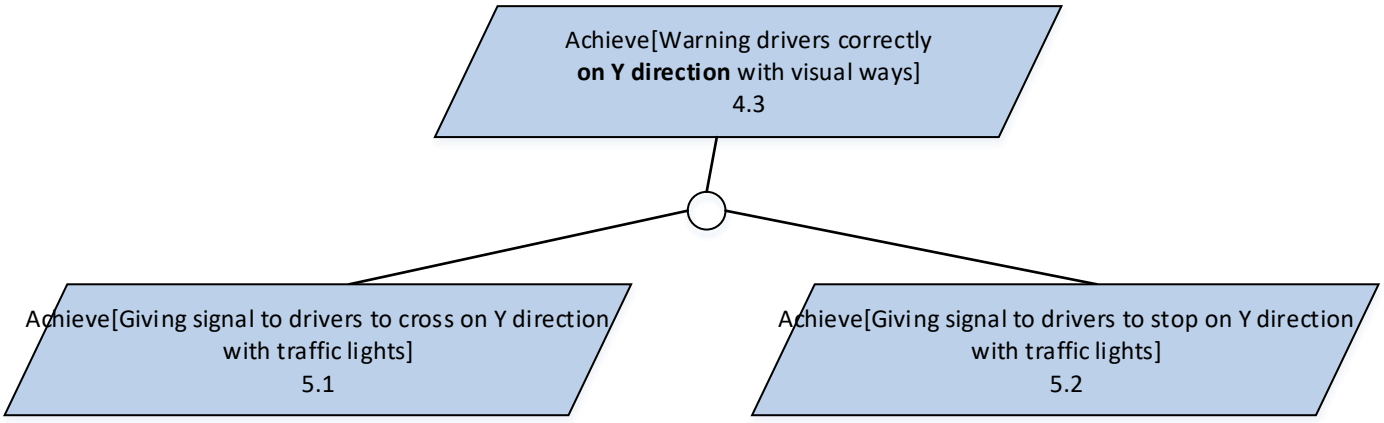


Figure 33 Sub goals of warning drivers correctly on Y direction with visual ways

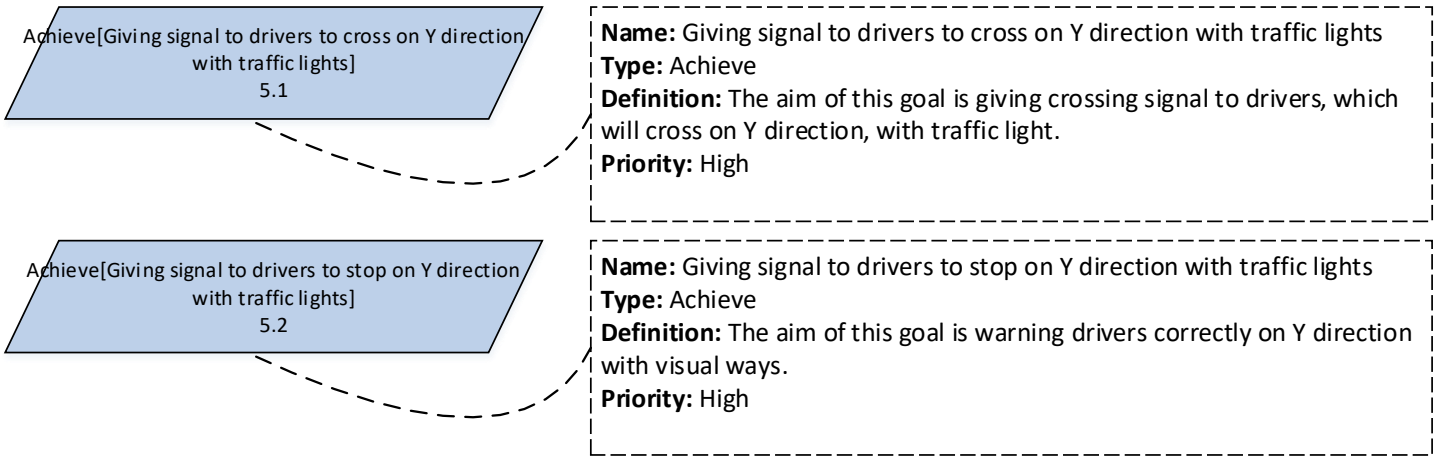


Figure 34 Annotations of sub goals of warning drivers correctly on Y direction with visual ways

2.1.4.2.1 Sub goals of giving signal to drivers to cross on Y direction with traffic lights

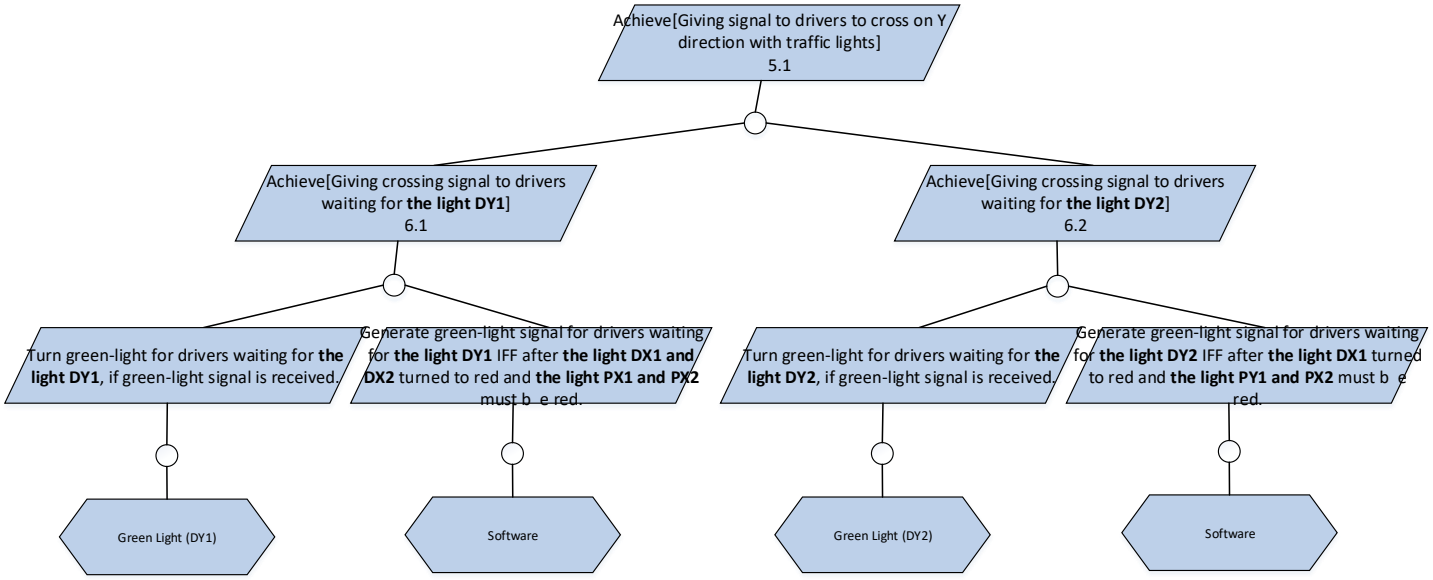
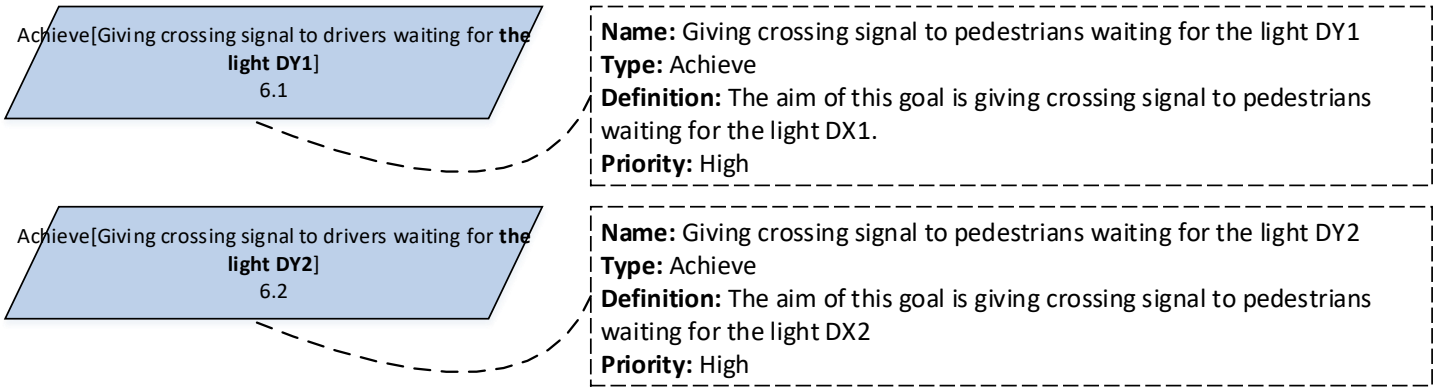


Figure 35 Sub goals of giving signal to drivers to cross on Y direction with traffic lights



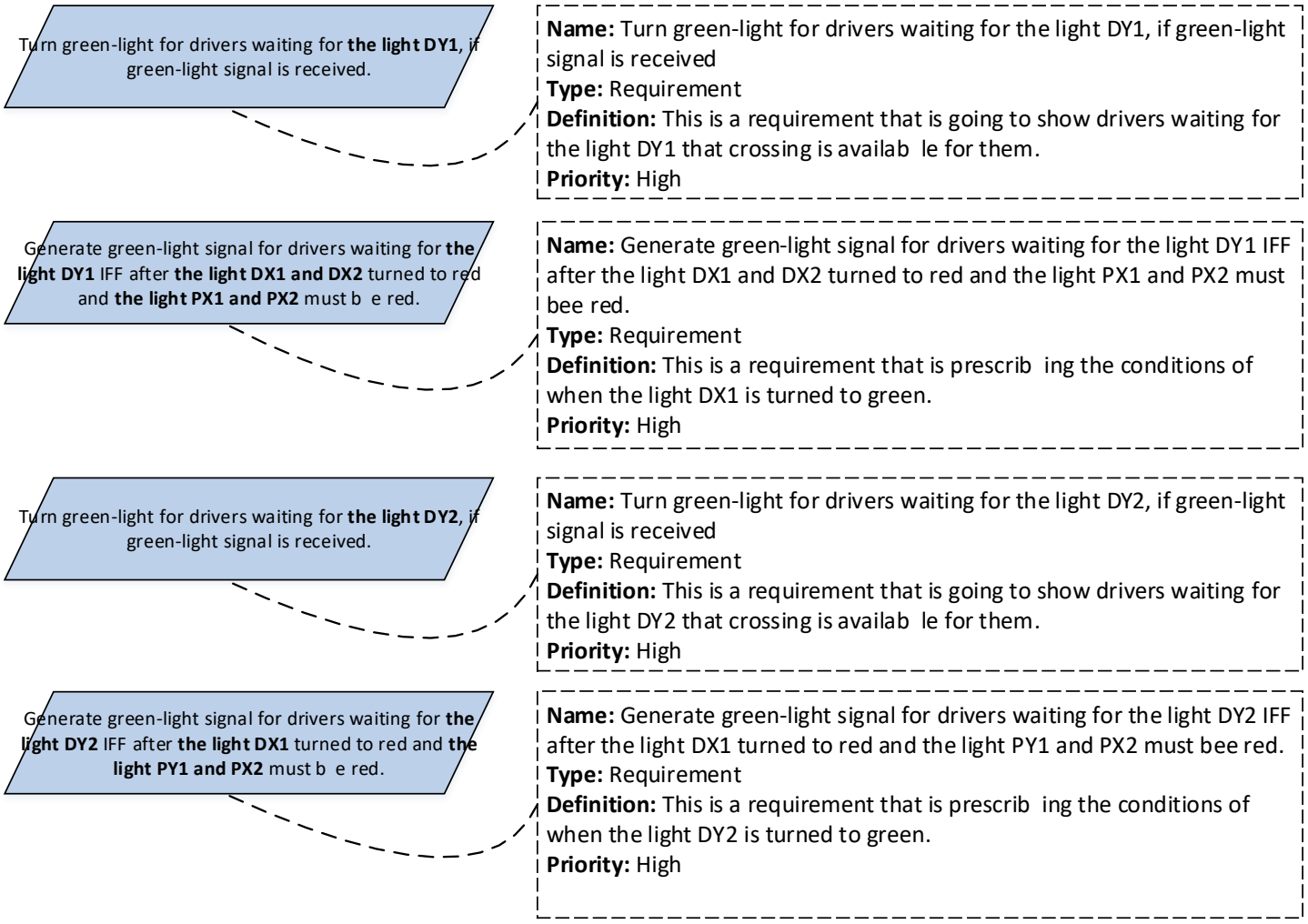


Figure 36 Annotations of sub goals of giving signal to drivers to cross on Y direction with traffic lights

2.1.4.2.2 Sub goals of giving signal to drivers to stop on Y direction with traffic lights

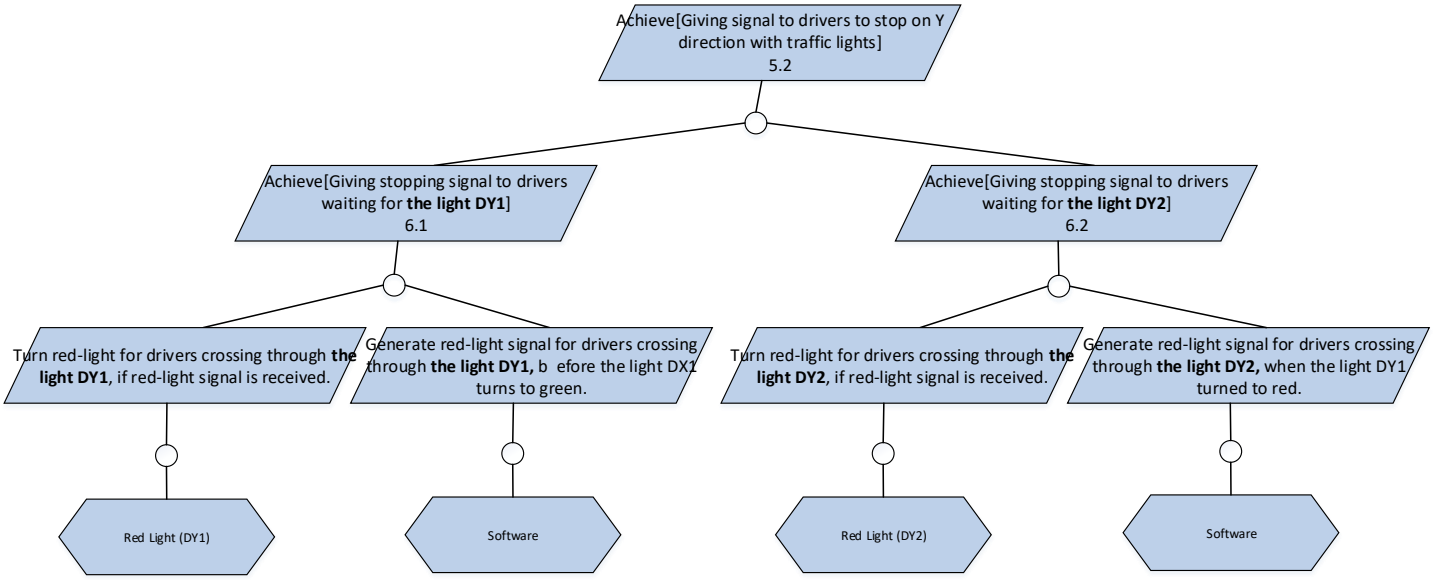


Figure 37 Sub goals of giving signal to drivers to stop on Y direction with traffic lights

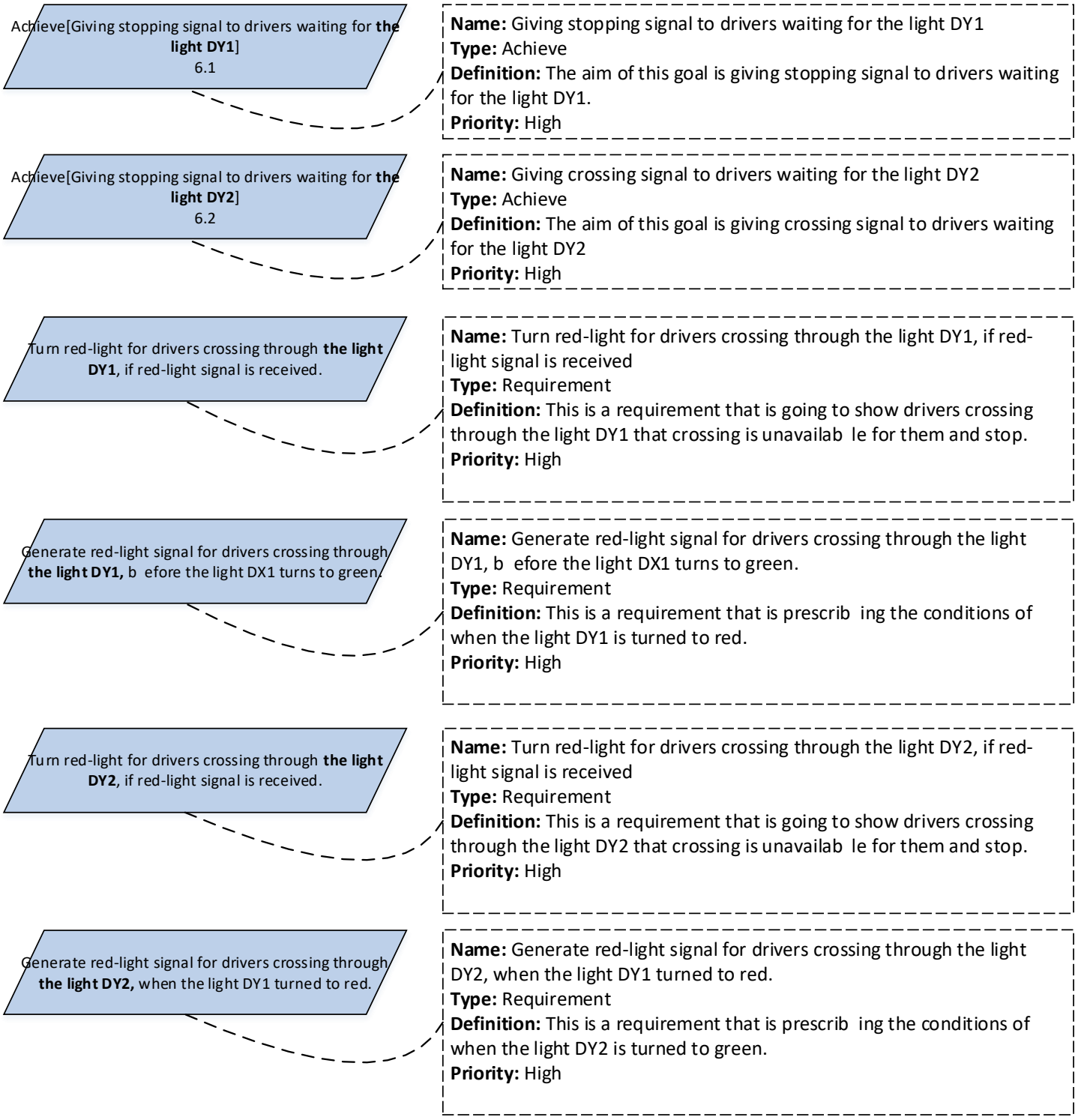


Figure 38 Annotations of sub goals of giving signal to drivers to stop on Y direction with traffic lights

2.2 Sub goals of efficient traffic flow

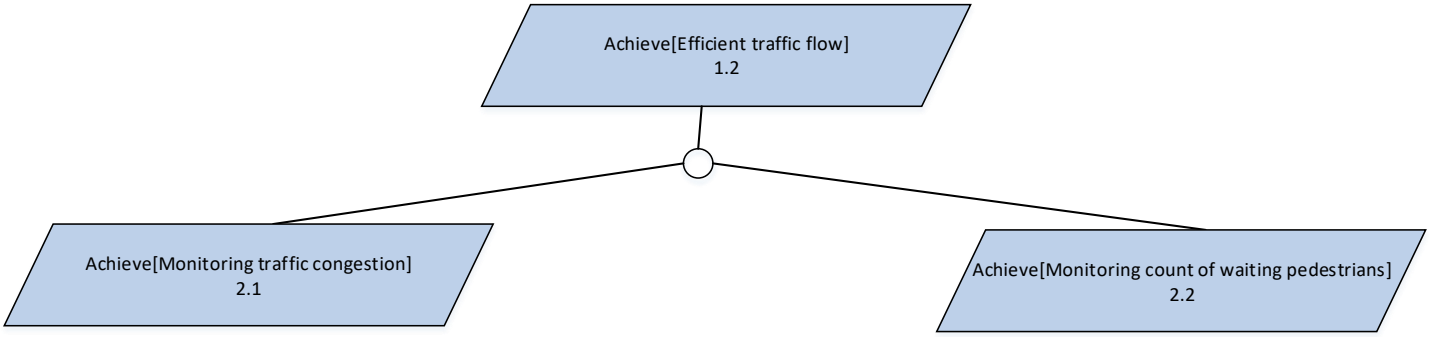


Figure 39 Sub goals of efficient traffic flow

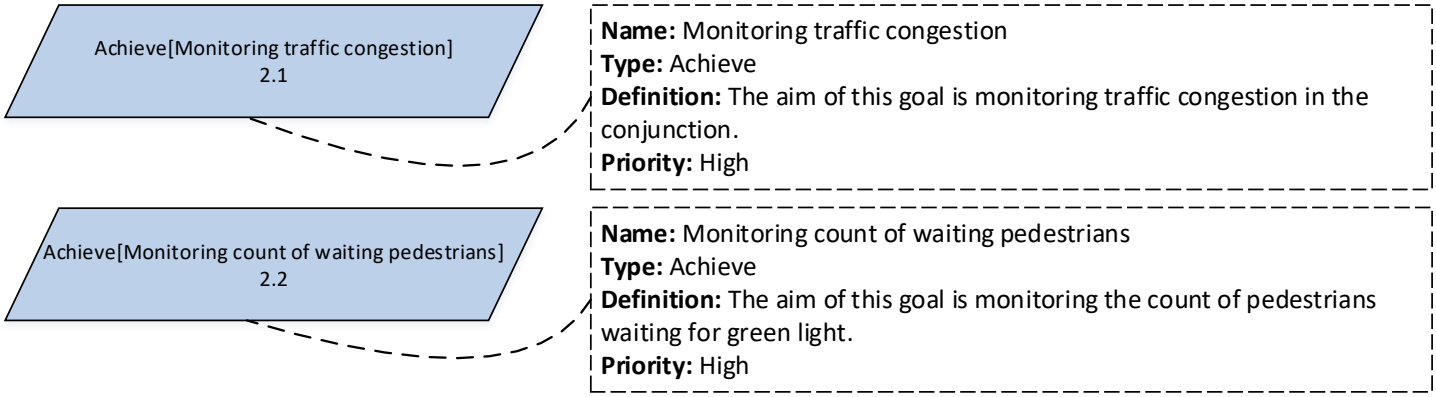


Figure 40 Annotations of sub goals of efficient traffic flow

2.2.1 Sub goals of monitoring traffic congestion

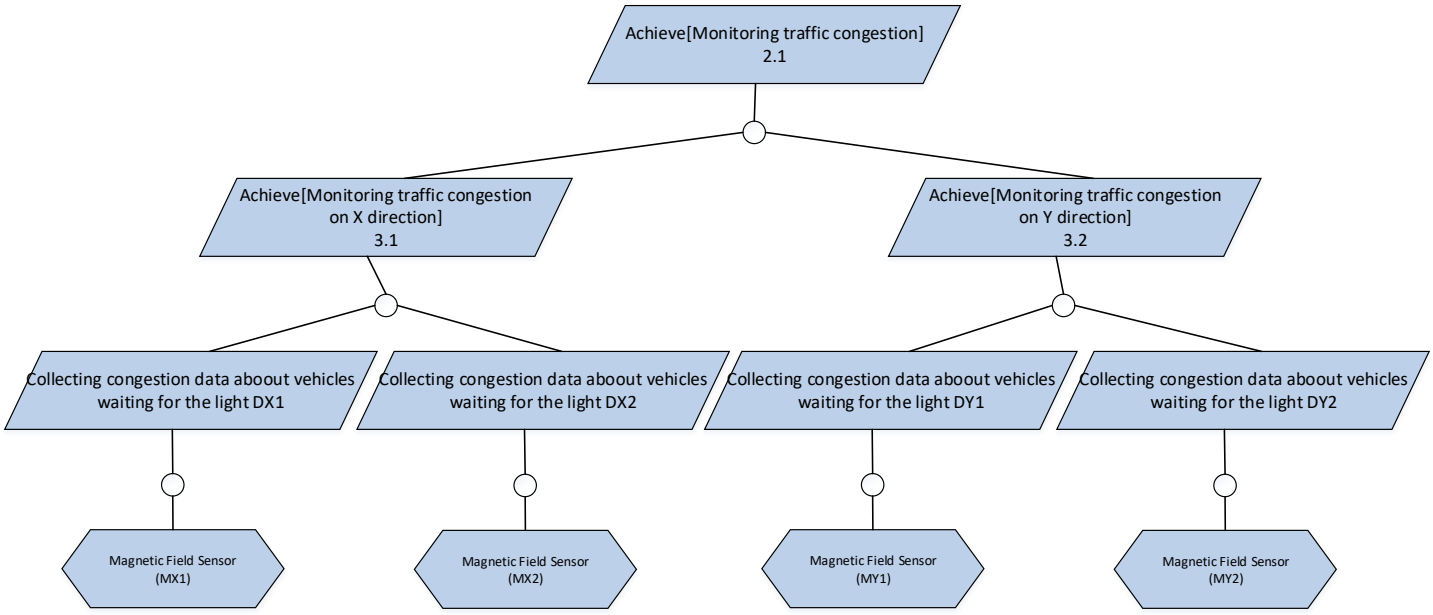


Figure 41 Sub goals of monitoring traffic congestion

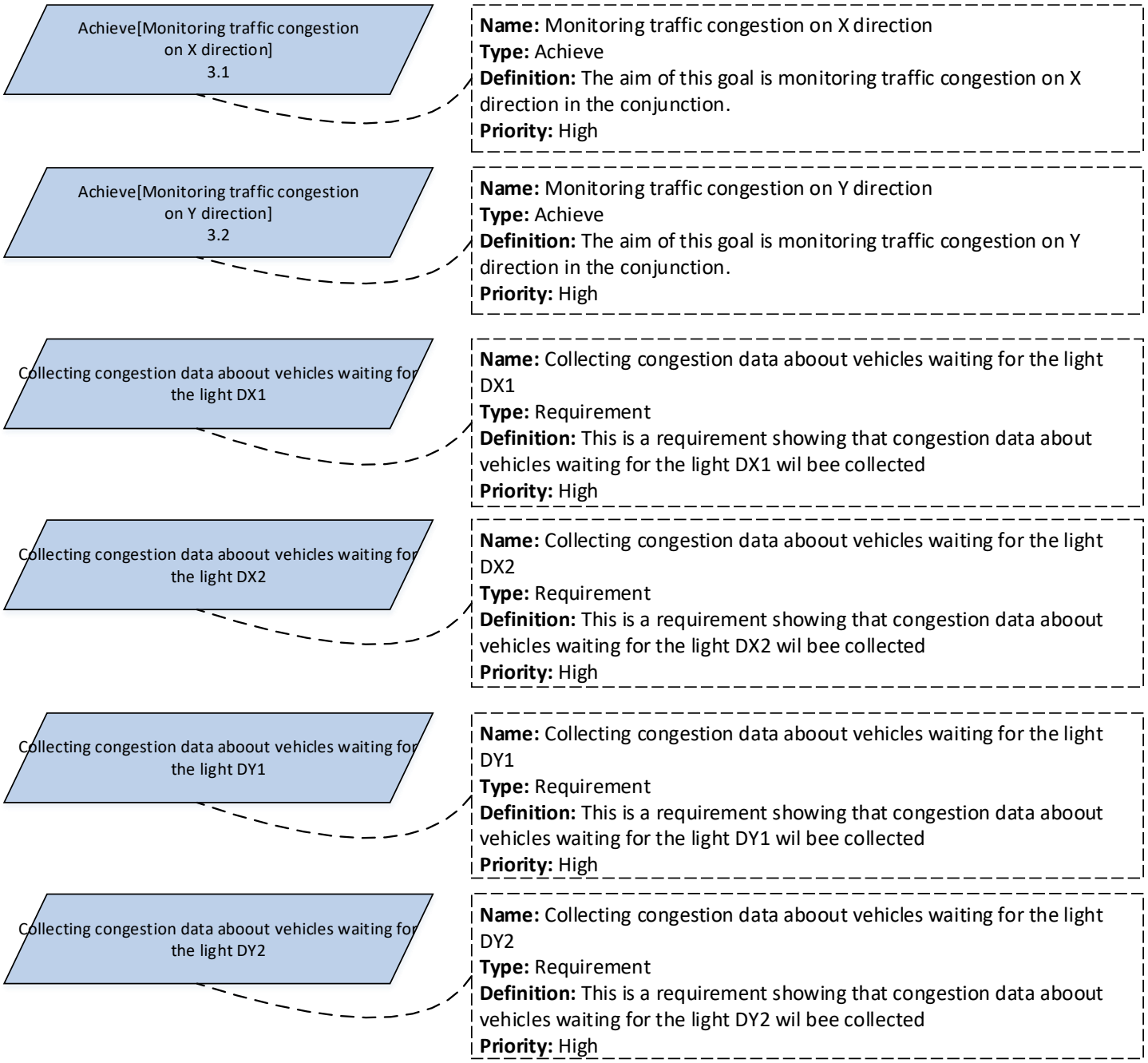


Figure 42 Annotations of sub goals of monitoring traffic congestion

2.2.2 Sub goals of monitoring count of waiting pedestrians

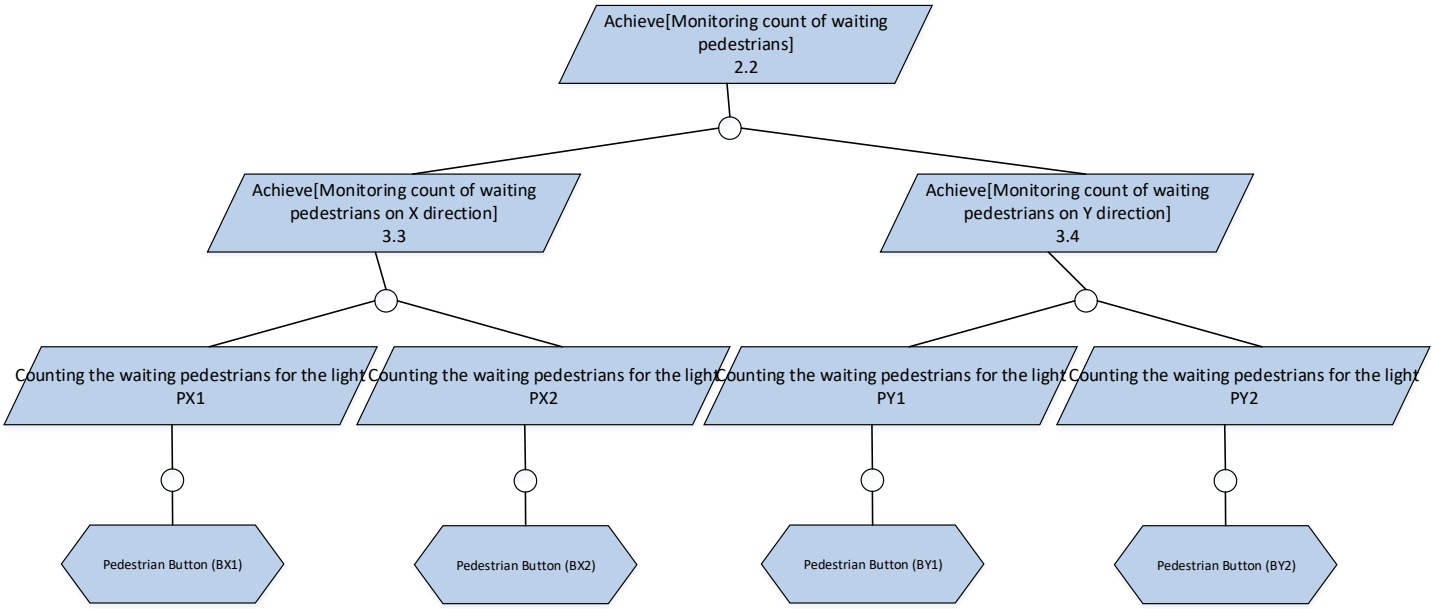
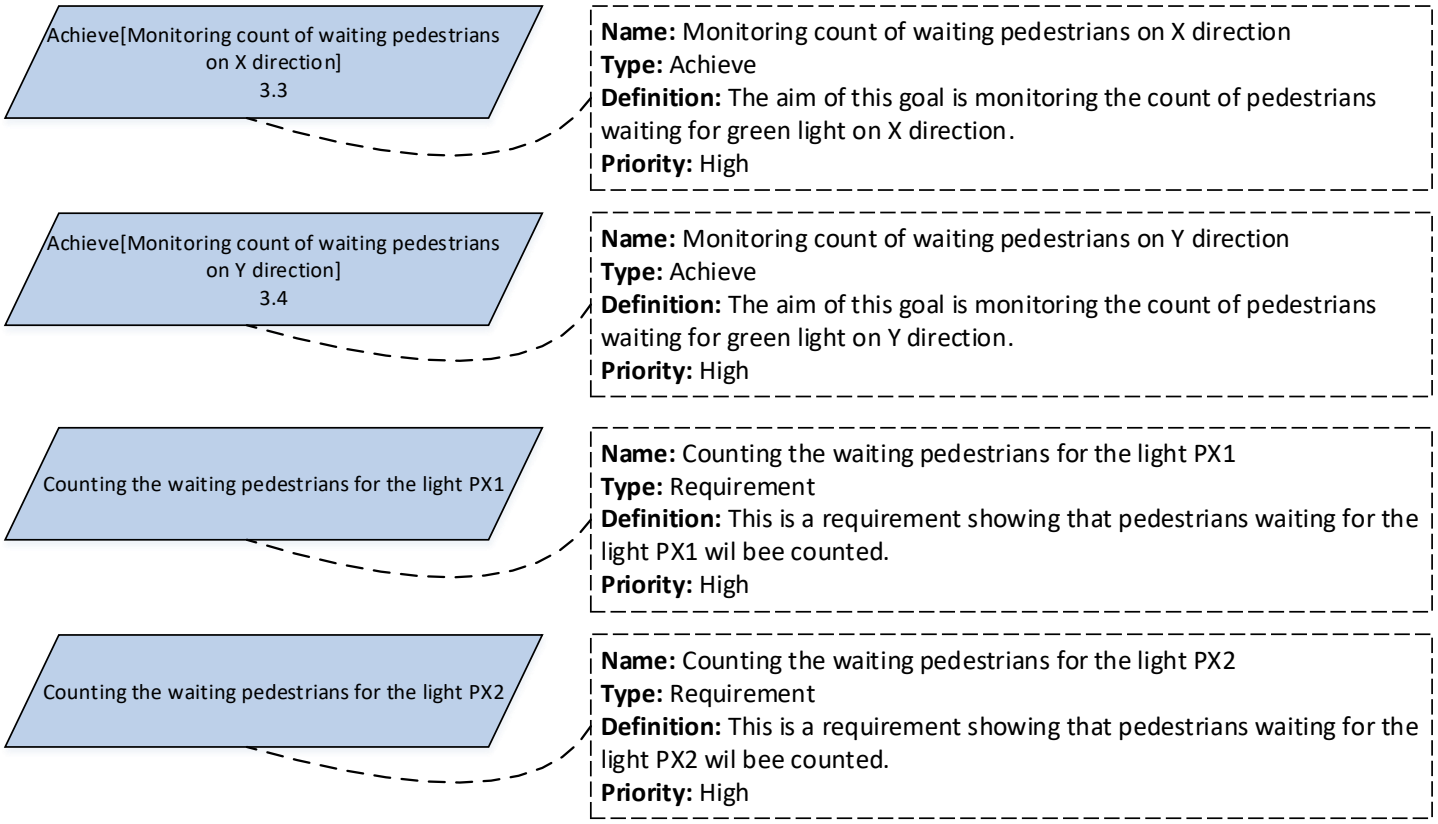


Figure 43 Sub goals of monitoring count of waiting pedestrians



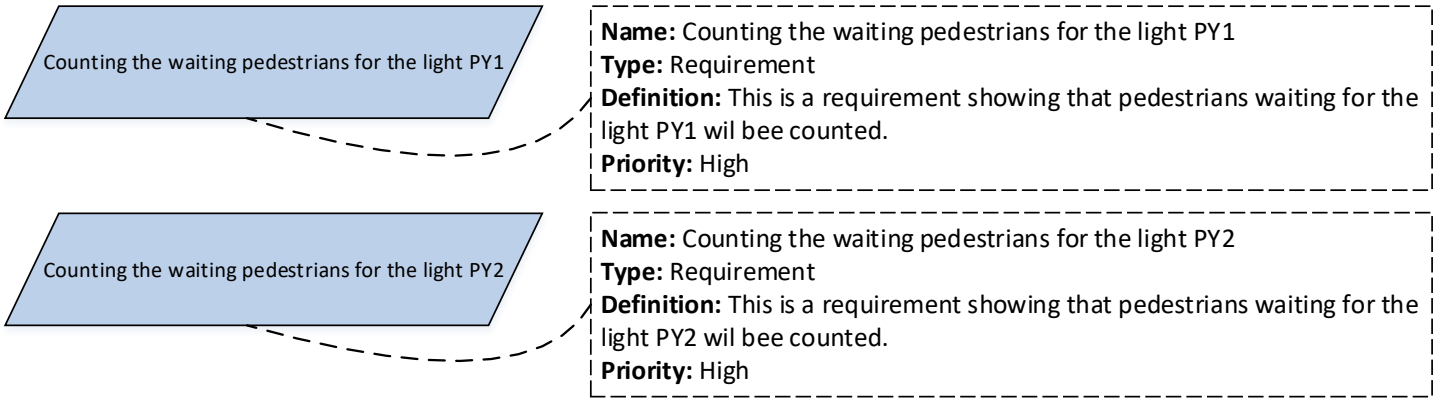


Figure 44 Annotations of sub goals of monitoring count of waiting pedestrians

3. OBSTRUCTION MODEL

4. AGENT MODEL

5. CONCEPTUAL MODEL

6. OPERATION MODEL

7. CONCLUSION