CPCC Simulator

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Outline

Introduction

Task:

- simulation of physical helicopter swarms
- simulation of sensors
- abstraction of virtual vehicles (virtual helicopters)
- migration of virtual vehicles among flying physical helicopters

Project Scope:

- real vehicles (physical helicopters) follow strict flight plans
- no network bandwith limits
- no processing power limits

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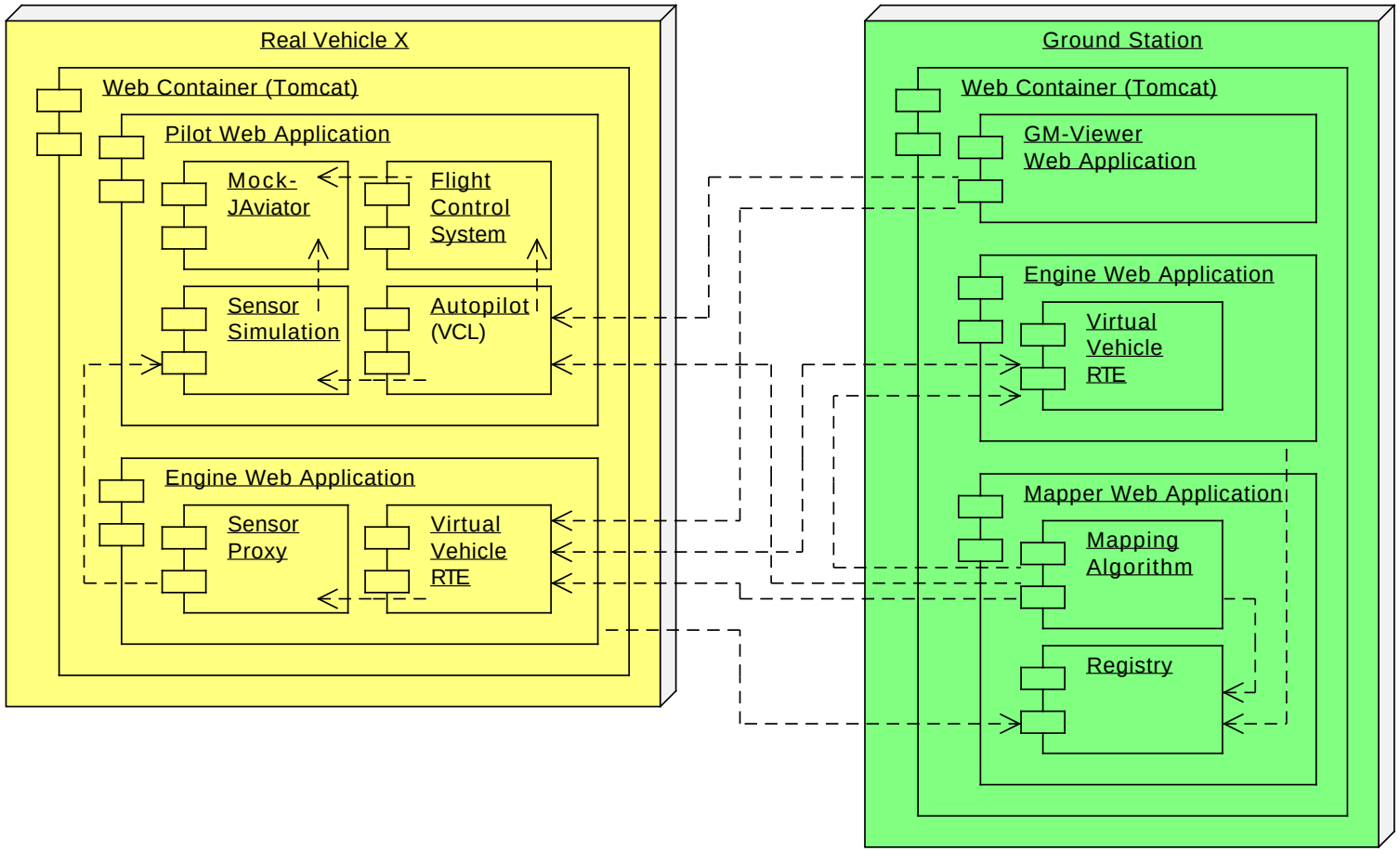
Introduction

Applied Technologies:

- HTTP as protocol for sensor abstraction and data exchange
- Java as programming language
- software implemented as web applications

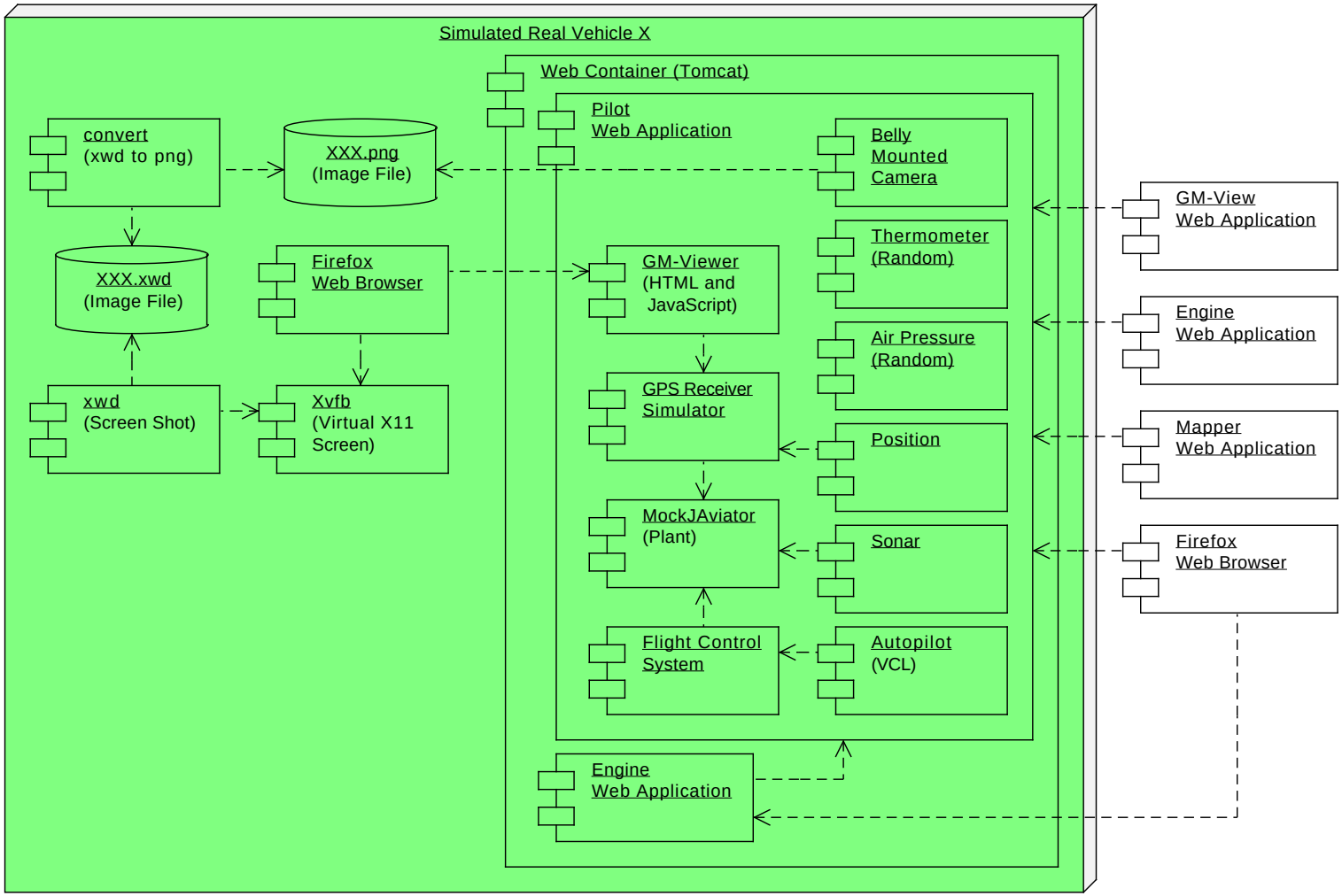
Simulator Overview

System



Simulator Overview

Sensors



Real Vehicles

Vehicle Configuration

```
plant.simulated = true
plant.type = MockJAviator
plant.listener = udp://localhost:9011
plant.location.system.type = gpssim
plant.location.system.listener = tcp://localhost:9012
plant.location.system.update.rate = 10

controller.simulated = true
controller.type = JControl

pilot.type = JPilot
pilot.name = Heli One
pilot.controller.connector = udp://localhost:9014
```

Real Vehicles

Sensor Configuration

```
sensor.list = gps, temp, photo

sensor.gps.name = GPS receiver
sensor.gps.path = position
sensor.gps.uri = gps:///

sensor.temp.name = thermometer
sensor.temp.path = temperature
sensor.temp.uri = rand:///18/22

sensor.photo.name = belly mounted photo camera
sensor.photo.path = photo
sensor.photo.uri = x11:///:21
```

Real Vehicles

Vehicle Control Language

```
#
# @(#) real vehicle set course
#
go auto
takeoff 1m for 5s
fly to (47.82204197, 13.04086670, 20.0)abs precision 1m 2.0mps
fly to (47.82206088, 13.04092035, 20.0)abs precision 1m 2.0mps
fly to (47.82195102, 13.04488063, 20.0)abs precision 1m 2.0mps
hover for 20s
land
go manual
```

Virtual Vehicles

Virtual vehicles

- run in the engine's virtual vehicle RTE as separate threads
- do the actual information aquisition

A virtual vehicle is a ZIP file containing

- a task list,
- collected data as files,
- a virtual vehicle log file, and
- virtual vehicle specific properties

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Virtual Vehicles

Task List

Point 47.82214552 13.04213136 20.0 tolerance 3.0
Picture (1327882656271 "img59520569379428417l.png")
Temperature (1327882768300 21.3)

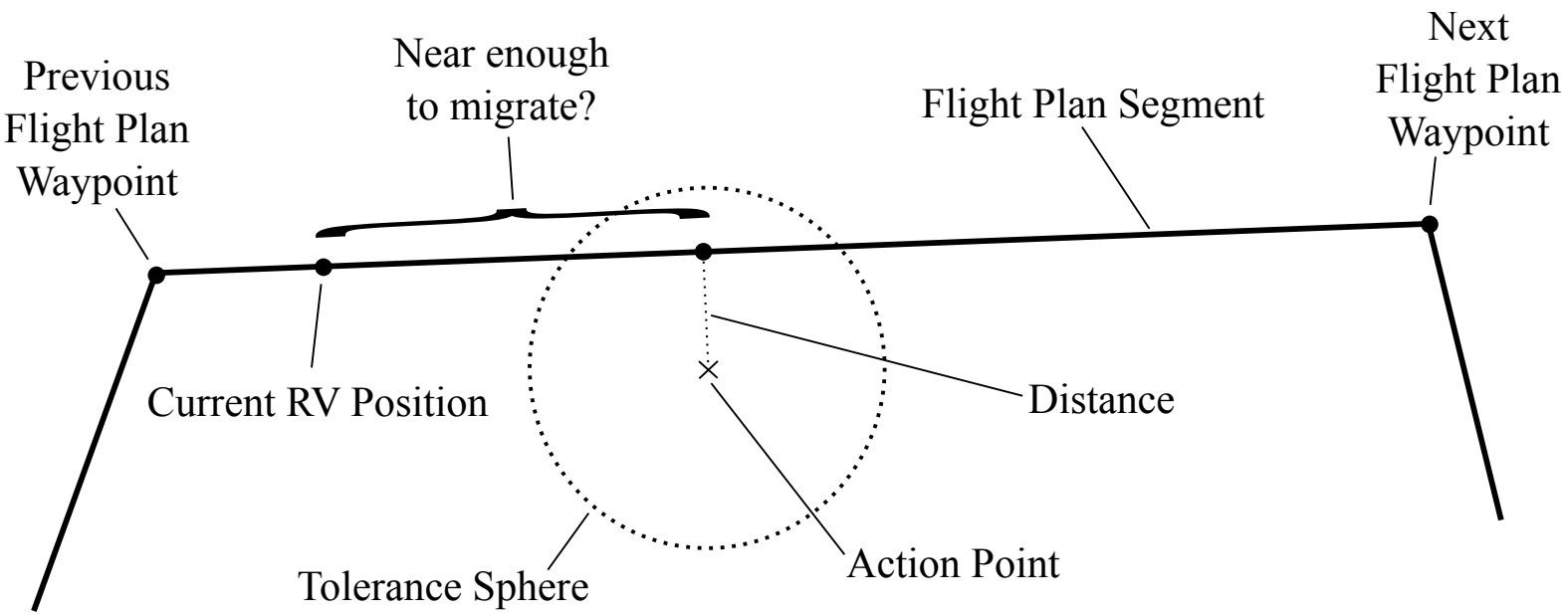
Point 47.82203567 13.04224133 20.0 tolerance 3.0
Airpressure

Point 47.82196903 13.04228157 20.0 tolerance 3.0
Picture

Mapping

Mapper

- knows every engine and pilot web application
- maps virtual vehicles to physical vehicles
- initiates migration of virtual vehicles among engines (based on flight plans and available sensors)



Demonstration

- two helicopters
- one virtual vehicle
- five photos