

# xS3D lab winter seminar

## UAV security escort service : System architecture & Scheduling program

---

March 05, 2015



Hyorin Park

# Contents

---

- Introduction
- Concept of security escort service
- System architecture & scheduling program
- Demonstration
- Concluding remark

# Contents

---

- **Introduction**
- Concept of security escort service
- System architecture & scheduling program
- Demonstration
- Concluding remark

# Introduction

---

- Unmanned aerial vehicles(UAVs) has many strengths.
- Until now, UAVs are mainly used by military
- Recently, companies have interest about UAV
  - Amazon (Delivery service)
  - SECOM (Surveillance)
  - Gofor (Tracking & recording service)
- UAVs will be used in various field including large size mission



# Introduction

---

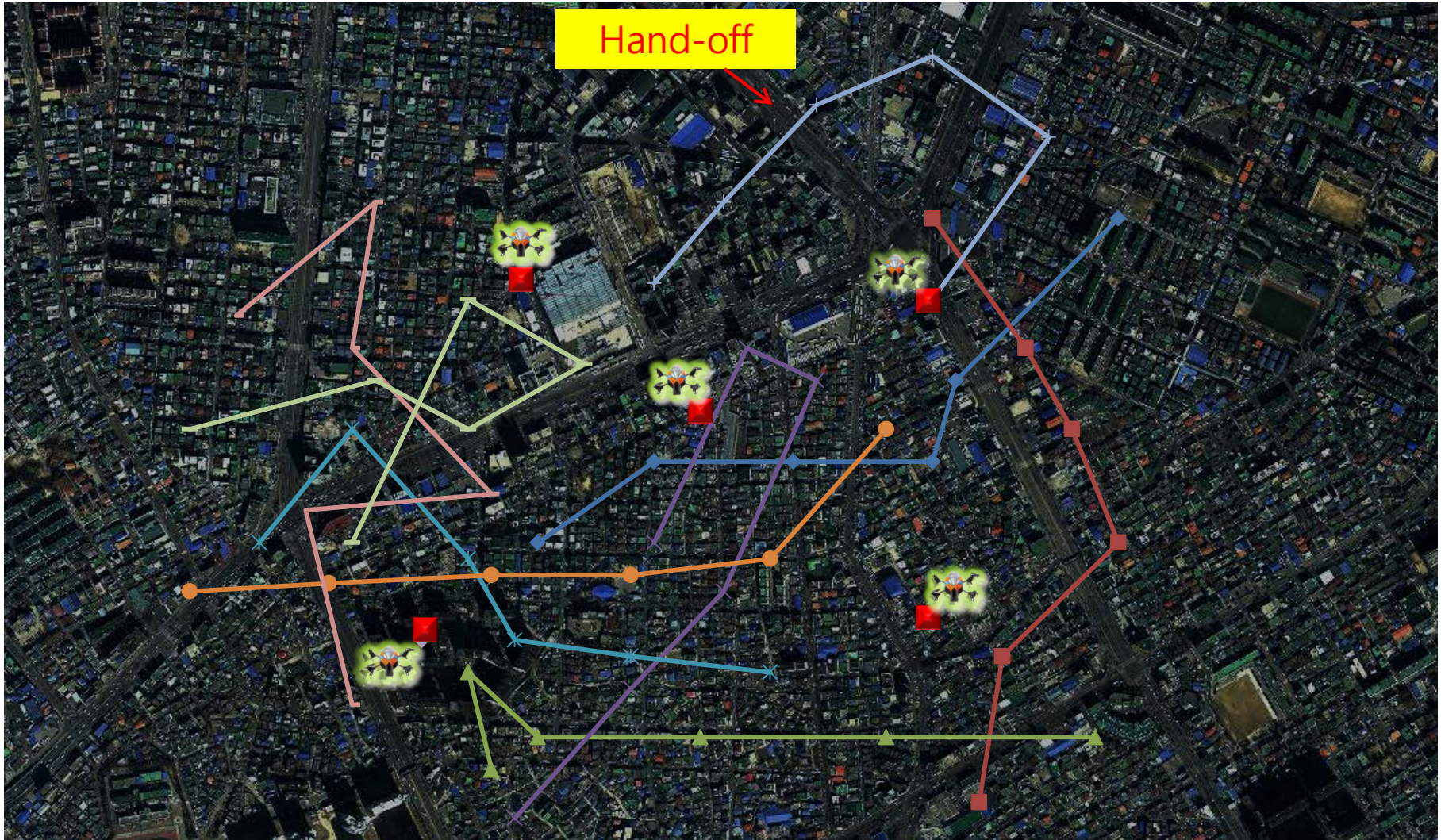
- How can we manage UAVs in large scale mission?
  - A system of UAVs
  - Persistent service
- Persistent service
  - UAV has fundamental limitation : Fuel capacity
  - Services such as patrol, monitoring, and surveillance require continuous service.
  - Depleted robot shift its job to new robot at a proper time

# Contents

---

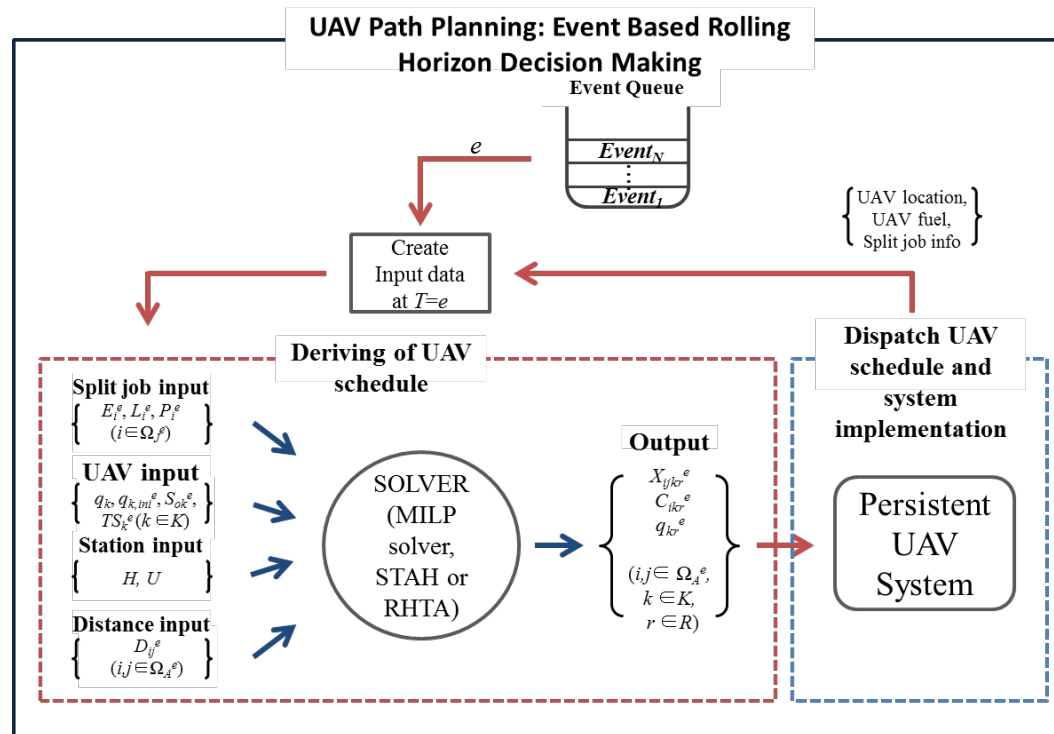
- Introduction
- **Concept of security escort service**
- System architecture & scheduling program
- Demonstration
- Concluding remark

# UAV Service System: Security Escort



# UAV path planning algorithm

- UAV path planning algorithm
  - MILP
  - Heuristic (STAR)





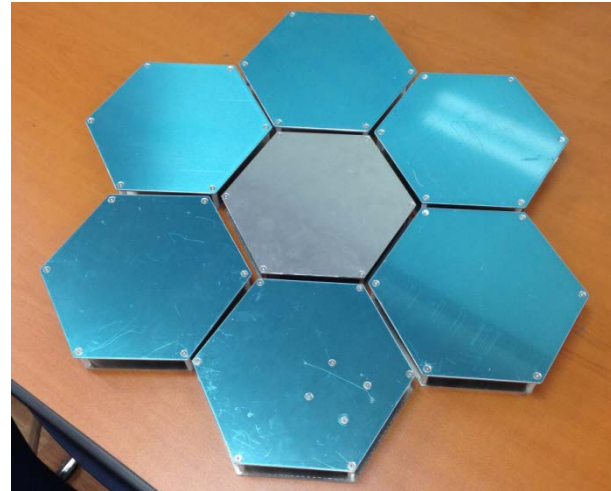
# UAV Service System: Security Escort

---

- Now, developing...



UAV operating system



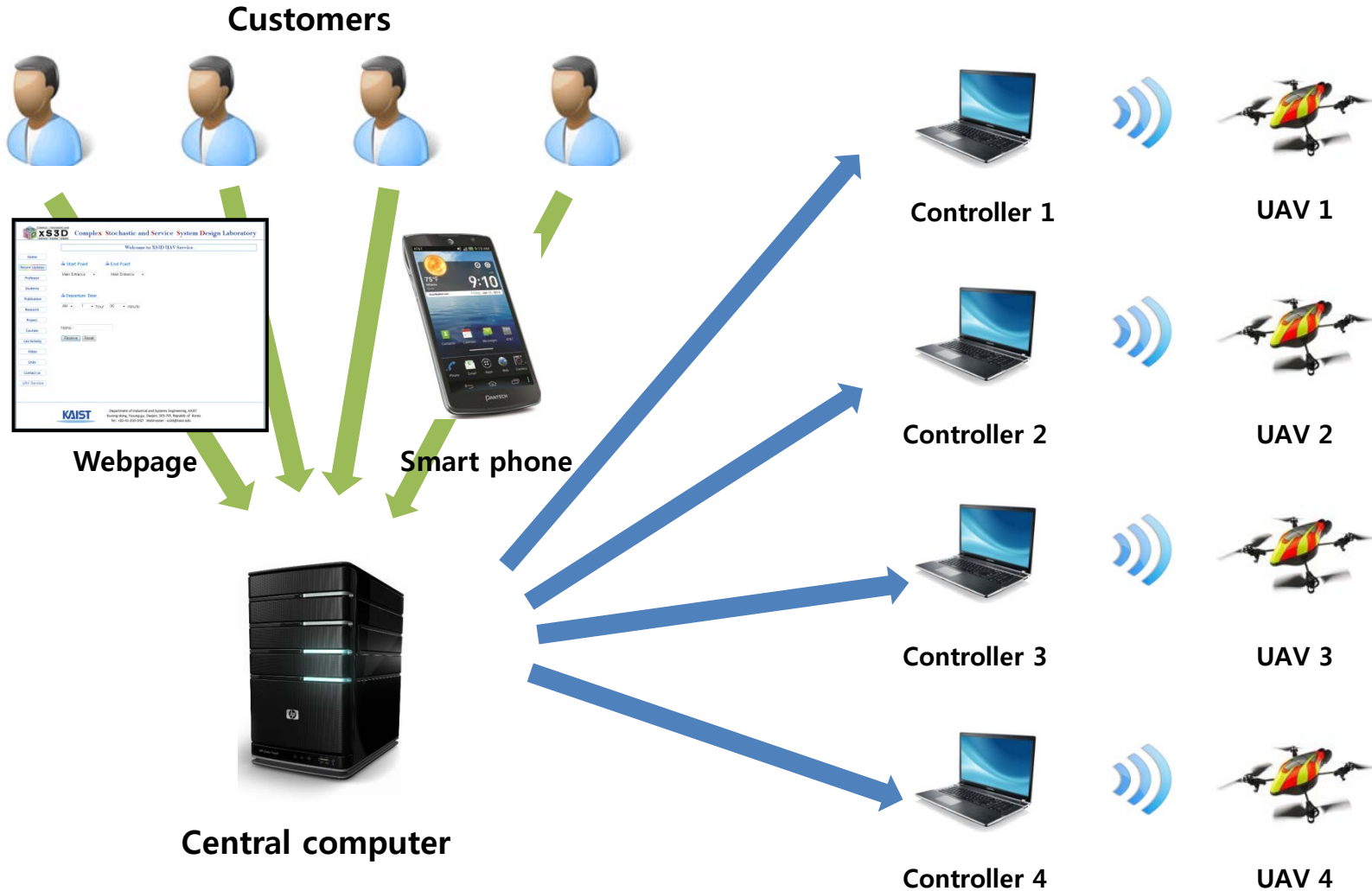
Recharging station

# Contents

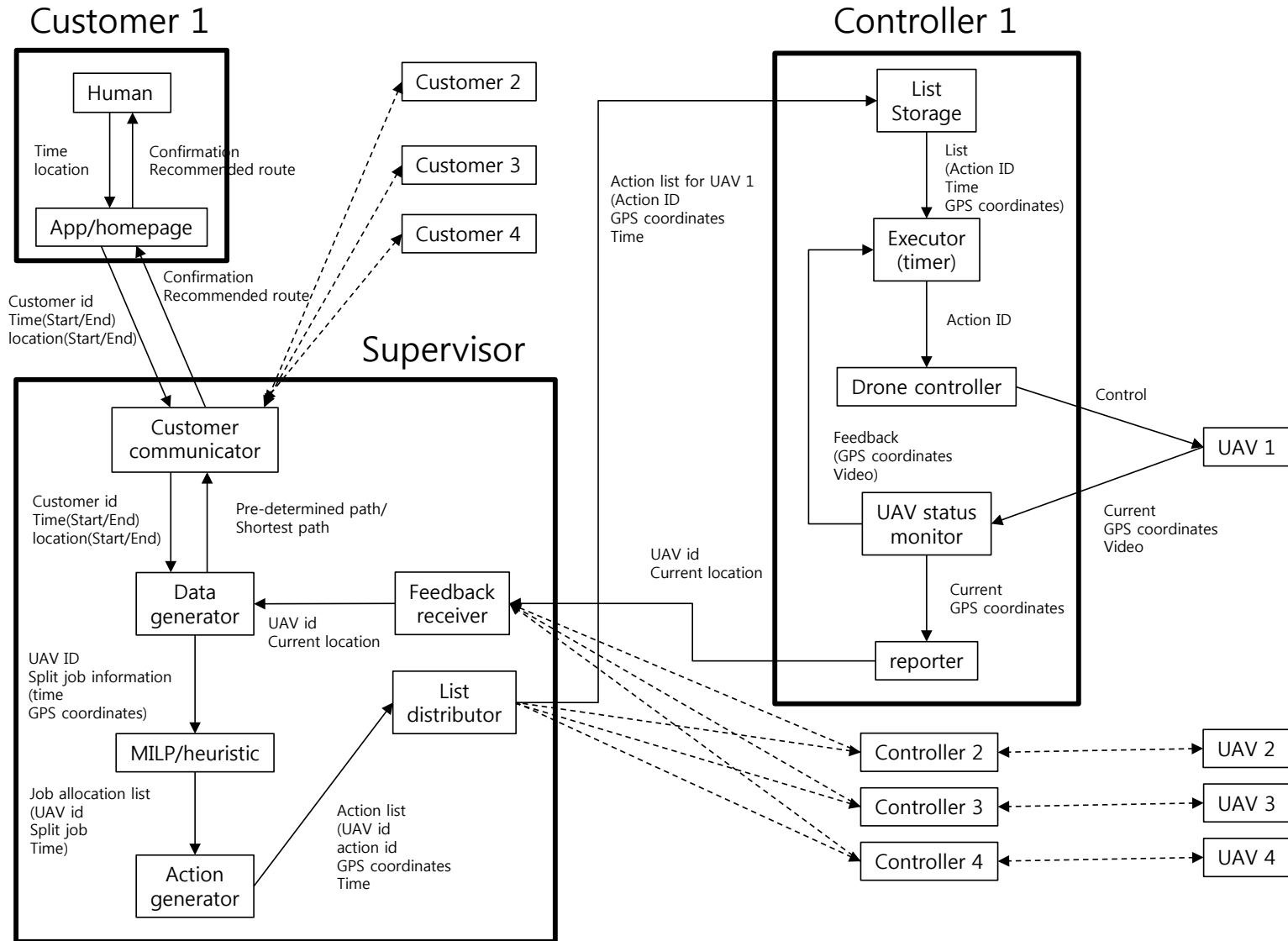
---

- Introduction
- Concept of security escort service
- **System architecture & scheduling program**
- Demonstration
- Concluding remark

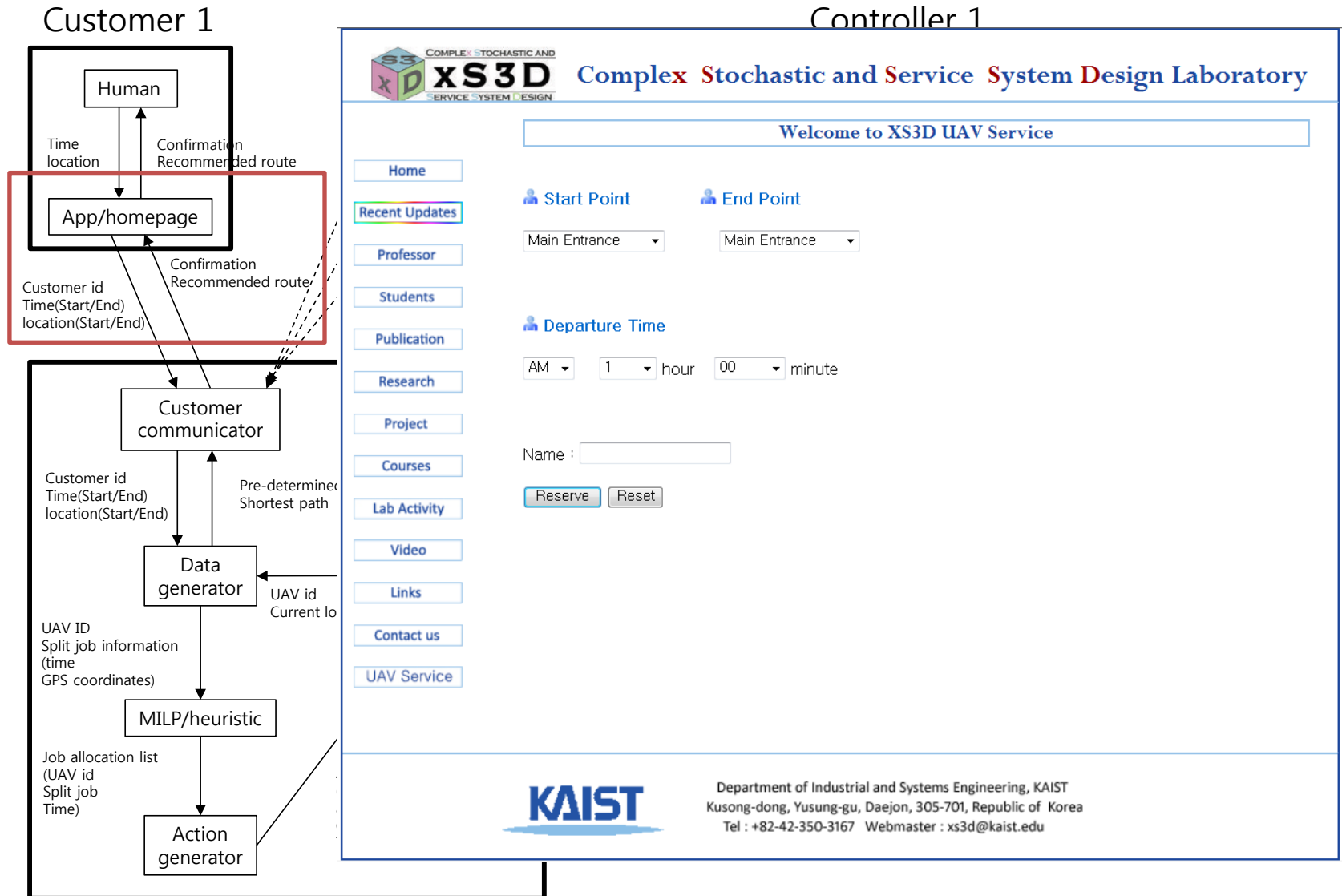
# Concept of the security escort service system



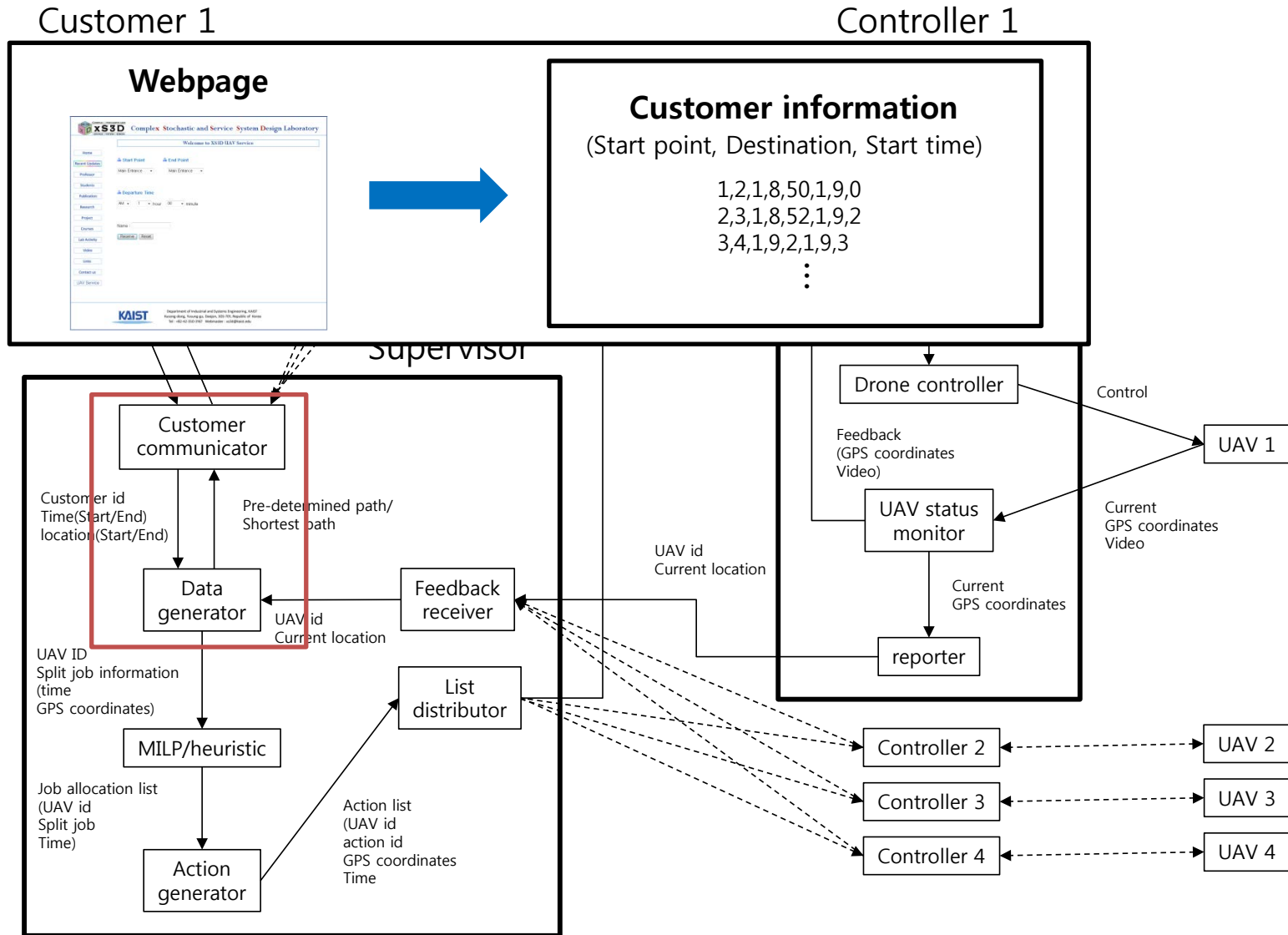
# System architecture



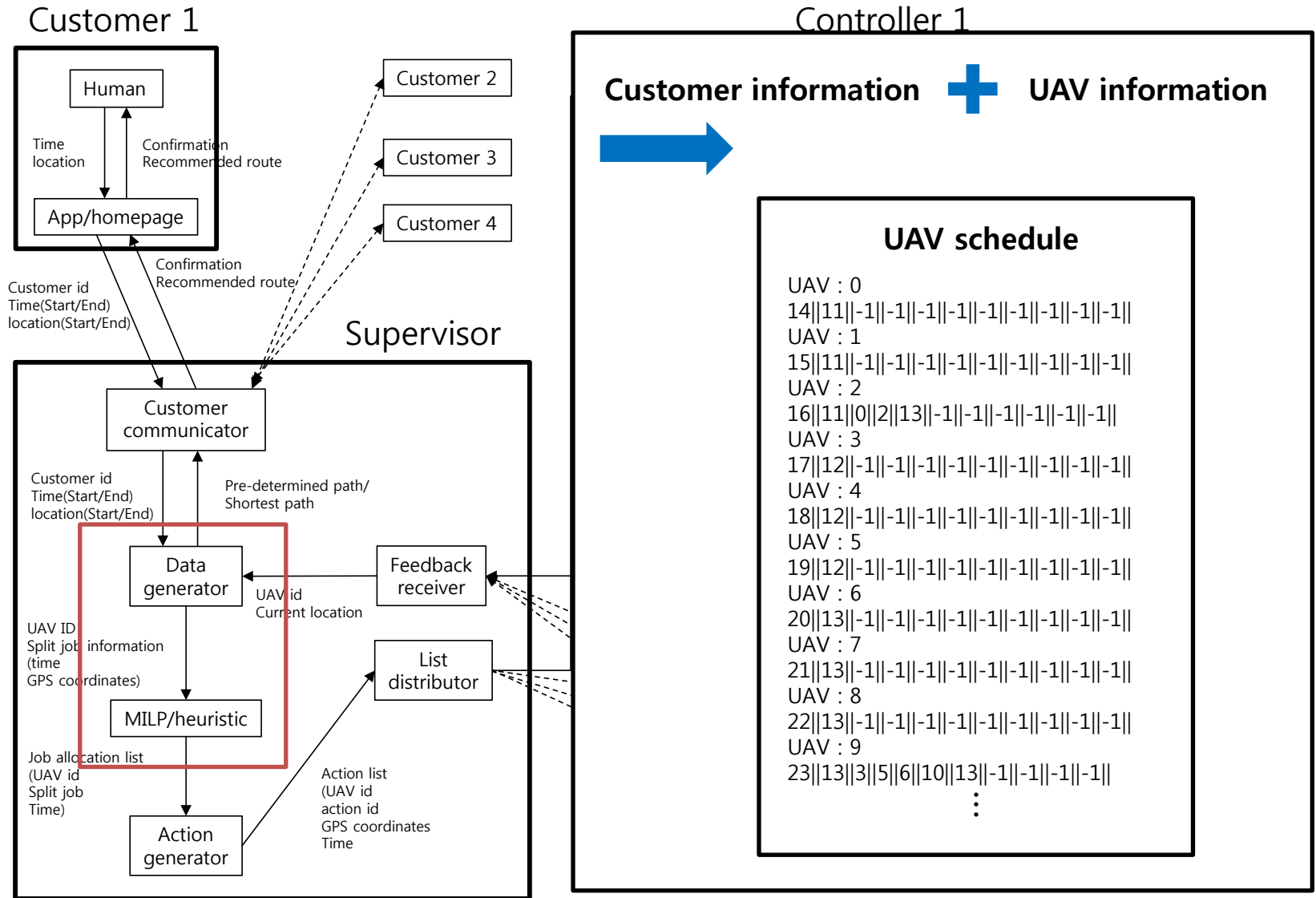
# System architecture



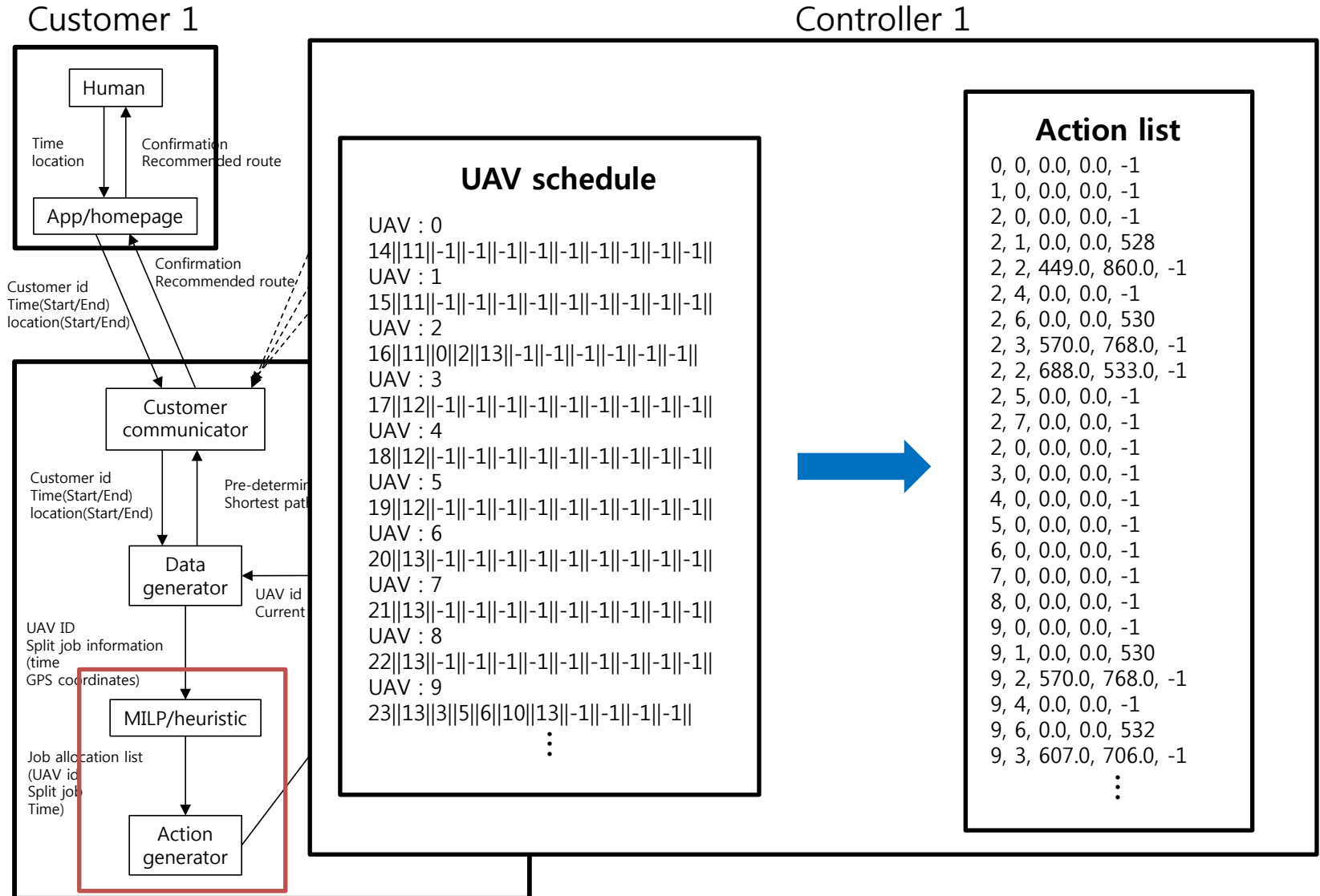
# System architecture



# System architecture

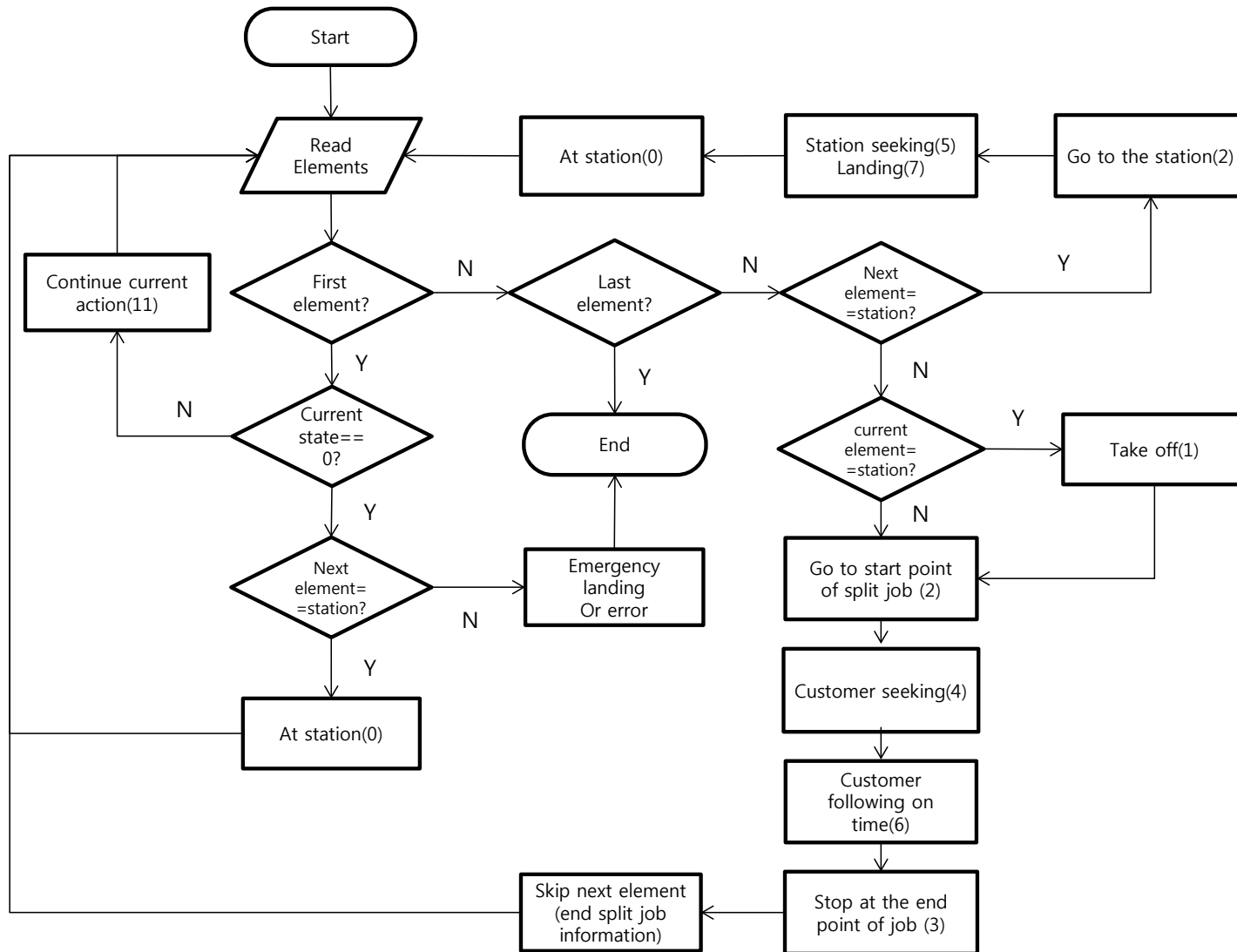


# System architecture





# Logic of action generator



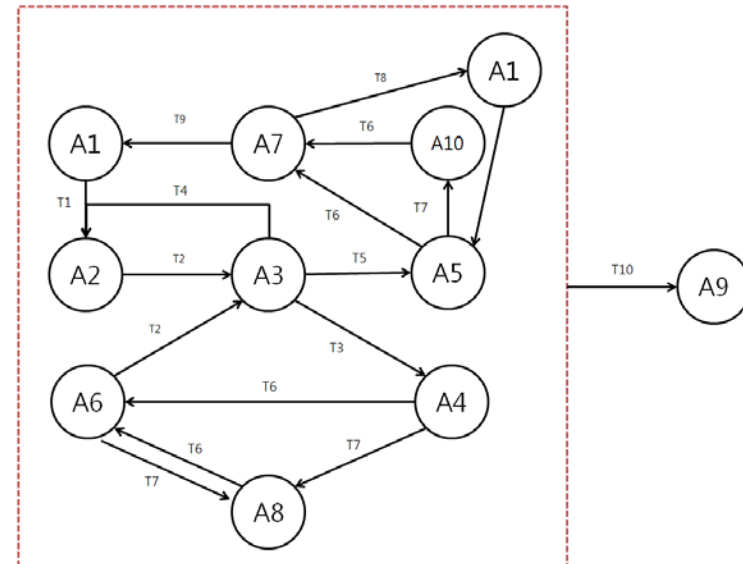
# Logic of action generator

## Actions of UAV

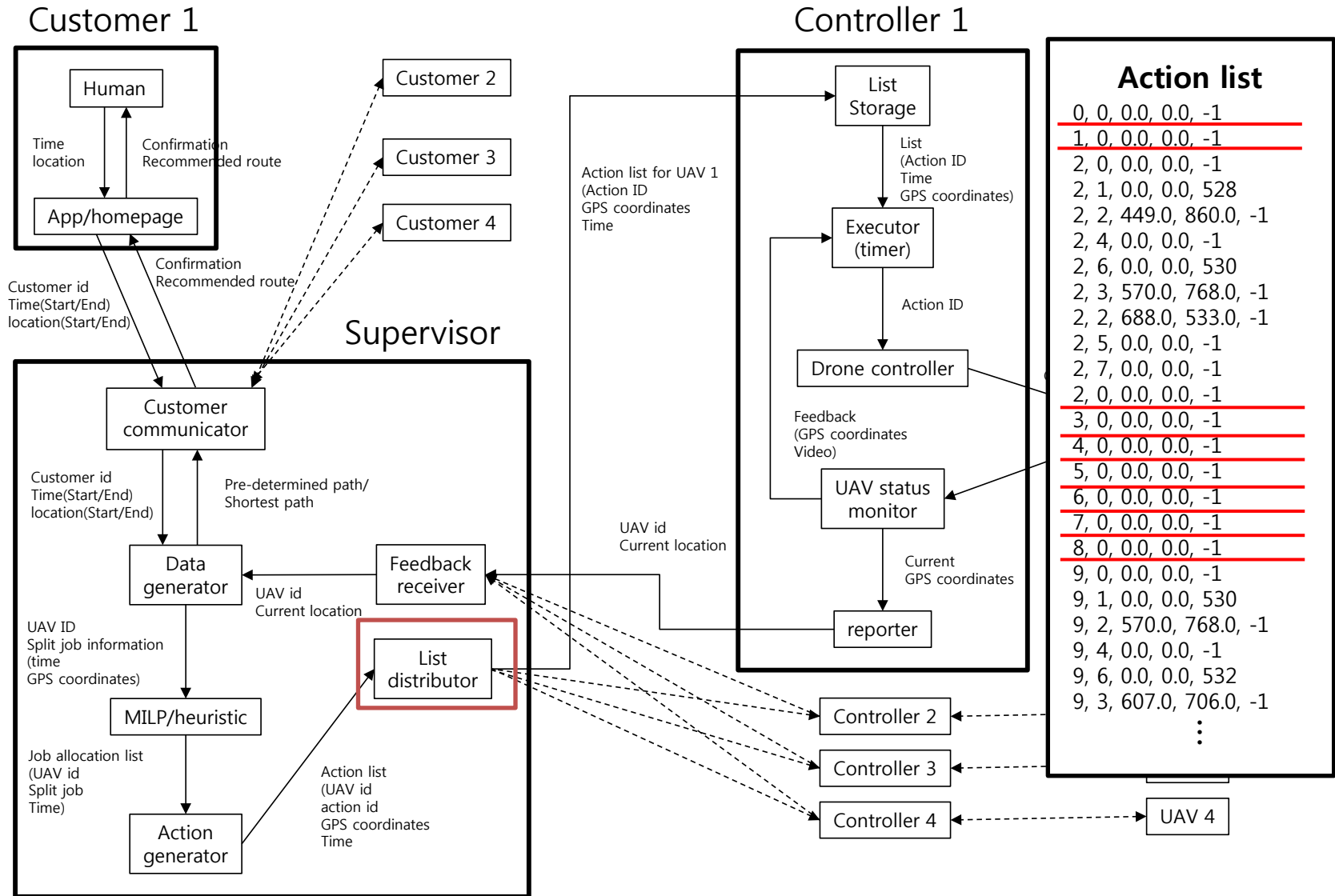
- A1 : Take-off
- A2 : Go to the next designated GPS coordinate
- A3 : Stop at the designated GPS coordinate and hover: Stop current operation when the UAV arrive at the destination.
- A4 : Seek and identify the customer target : Rotate until find the target
- A5 : Seek the station target : Change to belly camera and find station marker
- A6 : Following : Follow the designated target
- A7 : Landing
- A8 : Miss the target during following phase : convert the action from 'following' to 'seek the customer target
- A9 : Emergency situation occur : Supervisor directly execute emergency landing
- A10 : Can't find the station marker during landing phase : Raise altitude of UAV

## Transition condition between actions

- T1 : Hovering in air
- T2 : Arrive at the objective GPS location : Compare objective GPS location and current location on real time.
- T3 : Next destination is Start point of the split job.
- T4 : Next destination is End point of the split job.
- T5 : Next destination is station.
- T6 : Find the target



# System architecture



# Contents

---

- Introduction
- Concept of security escort service
- System architecture & scheduling program
- **Demonstration**
- Concluding remark

# Contents

---

- Introduction
- Concept of security escort service
- System architecture & scheduling program
- Demonstration
- **Concluding remark**

# Concluding remarks

---

- Interests about UAV are increasing
- Scheduling algorithm for large size UAV system is developed
- The prototype of security escort service is developing
- System architecture
- Scheduling program
- Network between supervisor and controllers