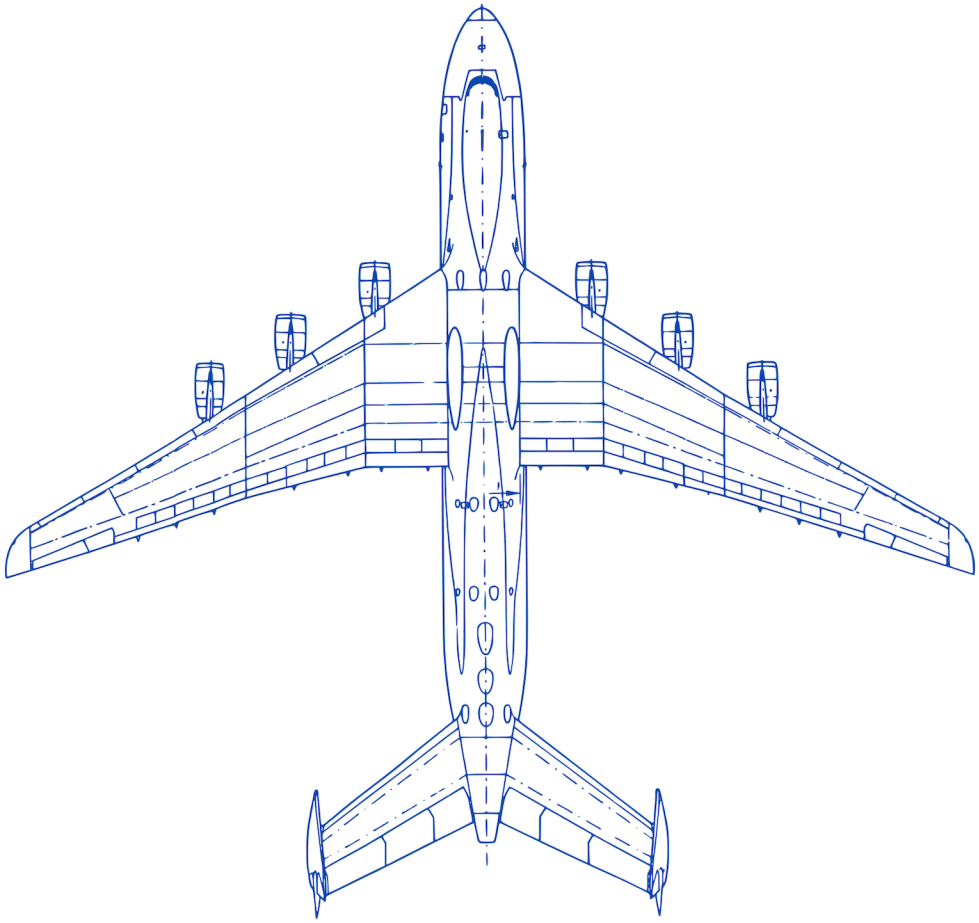
Flight Management System

F28SD - Intro to Software Engineering

Heriot-Watt University



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Coursework 1 – Deliverables

D1: Assumptions & Expectations

Assumptions

An assumption is a constraint on the behavior of the system you intend to build.

1) Pilots are given a valid 6-digit pins to log into the FMS.
2) Air traffic service assistants have valid 6-digit pins to log into the FMS.
3) What if the pilot enters the wrong pin more than 5 times in the FMS
4) What if the Air Traffic Services assistant enters the wrong pin more than 5 times in the FMS
5) The FMS can handle multiple flight plans in a single session.
6) The FMS only suggests the routes where there is an airport the pilot is certified to land on.
7) Assume that flight management system has the latest updated IATA location Identifier format codes.
8) Flight Plans and Flight strips are all created digitally.
9) A day is defined starting at 23:59 Greenwich Mean Time (GMT).

Expectations

An expectation is a constraint that you believe the environment will impose, e.g., a user, operator, external systems, the physical world.

1) The Flight management system has an uninterrupted connection between the FMS and the route finder system.
2) Connection between the FMS and the larger system-of- systems is available.
3) Connection between the FMS and the external flight archive system is available.
4) Only a pilot that intends to make a flight plan can create an associated flight plan.
5) Another system will determine the end of a flight and set flight strip to inactive.

D2: Functional & Non-functional Requirements

Functional Requirements

- FR1: **The** Flight management system **shall** authenticate the Pilot/ATSA before giving access to the flight management system.
- FR2: **The** *Flight Management System* **should** *manage a collection of pilot records which record: a pilot's unique identifier, the PIN associated with the PID; the pilot's name; contact phone number; a list of certified airports.*
- FR3: **The** *Flight Management System* **should** *record for each airport its IATA code; its full name; the name of the nearest city to the airport; its location.*
- FR4: **If** *a flight plan is successfully created* **then** *the Flight Management System* **shall** *create a corresponding Flight Strip before a flight can depart.*

- FR5: **The** *Flight Management System* **shall** send a list of the inactive flights strips to an external Flight Archive System (FAS) at 23:59 daily.
- FR6: **The** *Flight Management System* **should** delete inactive flight strips and their corresponding flight plan records after sending the inactive flight strip list to the FAS.
- FR7: **The** *Flight Management System* **shall** create a Flight Plan which includes FPID, PID, IATA codes for departure and destination airports, and expected departure time (EDT).
- FR8: **If** the 6-digit pin is entered wrong more than 5 times **then** the FMS should lock the system and alert the relevant authorities.
- FR9: **The** FMS **should** let ATSAs create multiple flight strips in a single session.
- FR10: **The** FMS **should** store ATSA's AID and Pin in a record.
- FR11: **The** FMS **should** provide the ATSA with a flight plan and available routes when a flight plan is requested.
- FR12: **The** FMS **shall** create a Flight strip with a unique identifier for the flight strip, known as the FSID; the departure airport (IATA code); the destination airport (IATA code); the allocated route; the EDT; a status flag that indicates if a flight strip is active or inactive.
- FR13: **The** FMS **should** set a flight strip to active after creating one.

Non-Functional Requirements

- The Flight Management System should provide reliability during use with minimal downtime and error.
- The Flight Management System should be compatible with existing aircraft systems and Air traffic control systems.
- The Flight Management System should be User-friendly for pilots and Air traffic service assistants.
- The Flight Management System should have secure login for both pilots and Air traffic service assistants.
- The Flight Management System should store sensitive information such as PID, AID etc. securely with approved encryption standards.
- The Flight Management System should seamlessly integrate with other systems such as the Route Finder System, Flight Archive System etc.
- The Flight Management System should comply with international aviation regulations and IATA standards.

D3: Use Case Model

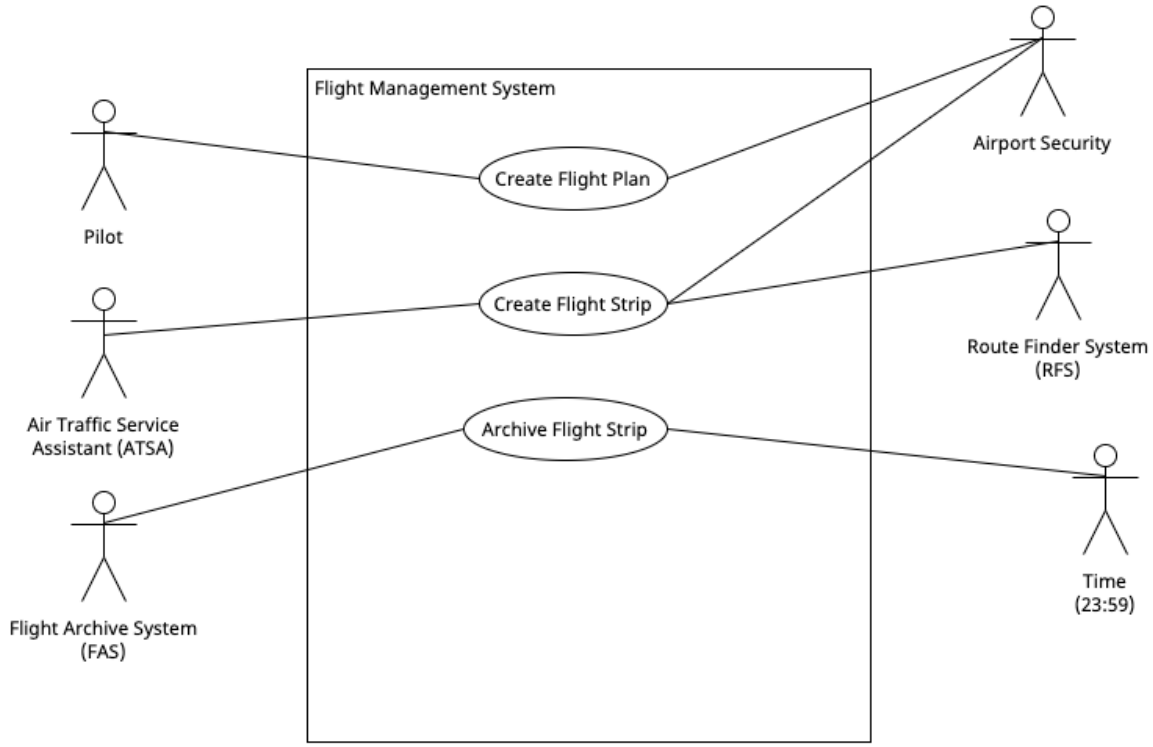
Actors:

- Pilot
- ATSA (Air traffic service assistant)
- Route Finder System (RFS)
- End Of Flight System (EOFS)
- Flight Archive System (FAS)
- Time as an actor (23:59GMT)

Use Cases:

- Create Flight plan
- Create Flight strip
- Archive Flight strip

FMS Use Case Diagram



D4: Use Case Specifications

Create Flight Plan Specification

Use Case: Create Flight Plan
ID: 1
Goal: A pilot uses the Flight management system to create a flight plan
Primary actor: *Pilot*
Secondary actor(s): *Airport Security*
Preconditions: *1. FMS is Available 2. Connection to RFS is available. 3. Airport Security available*
Postconditions: *1. Flight Plan is successfully created*
Main flow: *1. Pilot powers system* *2. Flight Management System (FMS) requests 6-digit pin* *3. Pilot enters 6-digit pin.* *4. FMS validates pin with PID from records.* *5. FMS requests Pilot to enter IATA codes for departure airport, destination airport and departure time.* *6. Pilot enters details of departure airport, destination airport and departure time.* *7. FMS validates format of entered codes.* *8. FMS generates unique identifier (FPID) for flight plan.* *9. FMS creates flight plan.*
Alternative flows: *4a. FMS fails to validate 6-digit pin less than 5 times.* *1. FMS notifies of incorrect pin.* *2. Return to step 2.* *4b. FMS fails to validate 6-digit pin 5 times.* *1. FMS locks system* *2. FMS notifies pilot of action.* *3. FMS alerts airport security of incident* *4. Use case terminates.* *6a. FMS fails to validate entered codes with IATA format.* *1. FMS notifies pilot that codes are not in IATA format.* *2. Return to step 5.*

Create Flight Strip Specification

Use Case: Create Flight Strip
ID: ***3***
Goal: **An Air Traffic Service Assistant (ATSA) uses the FMS to create a Flight strip.**
Primary actor: ***Air Traffic Service Assistant***
Secondary actor(s): ***Route Finder System (RFS)***
Preconditions: ***1. FMS is available 2. Airport security is available***
Postconditions: ***1. Flight strip is successfully created***
Main flow: ***10. ATSA powers system.*** ***11. FMS requests 6-digit pin.*** ***12. ATSA enters 6- digit pin.*** ***13. FMS validates pin with AID from records.*** ***14. FMS starts session.*** ***15. FMS displays list of active flight plans with FPIDs.*** ***16. ATSA chooses a Flight plan to process.*** ***17. FMS sends Departure Airport, Destination Airport and Estimated departure time of the selected flight plan to Route Finder System (RFS).*** ***18. FMS requests RFS to search for available routes.*** ***19. FMS displays flight plan details with available routes.*** ***20. ATSA chooses route to allocate.*** ***21. FMS generates unique identifier for flight strip (FSID).*** ***22. FMS links flight strip with selected flight plan.*** ***23. FMS sets flight strip status flag to active.*** ***24. FMS creates flight strip.*** ***25. FMS asks ATSA if they want to create a new flight strip or logout.*** ***26. FMS ends session and logs ATSA out of system***
Alternative flows: ***4a. FMS fails to validate 6-digit pin less than 5 times.*** ***3. FMS notifies ATSA of incorrect pin.*** ***4. Return to step 2.*** ***4b. FMS fails to validate 6-digit pin 5 times.*** ***5. FMS locks system*** ***6. FMS notifies ATSA of action.*** ***7. FMS alerts airport security of incident***

8. *Use case terminates.*

9a. Route finder system doesn't find available routes.

1. *FMS notifies ATSA that no routes were found for flight plan.*
2. *Return to step 6.*

16a. ATSA selects create new flight strip option.

1. *Return to step 6.*

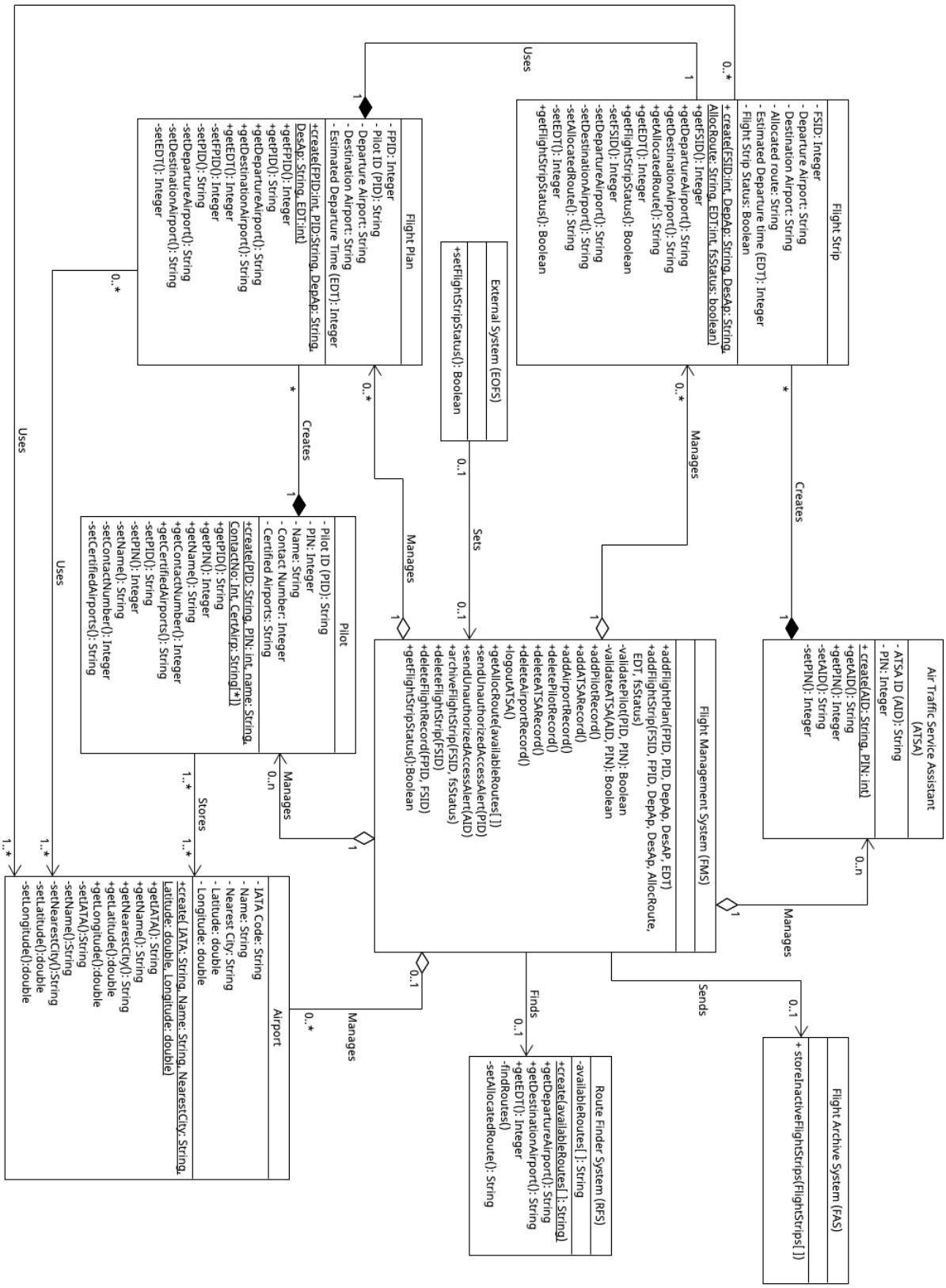
Archive Flight Strip Specification

Use Case: *Archive flight strip*
ID: *4*
Goal: *Flight Management System archives inactive flight strips*
Primary actor: *Time* **(23:59 GMT)**
Secondary actor(s): *1. Flight Archive System (FAS))*
Preconditions: *1. FMS is available 2. Connection to FAS is available. 4. Time is 23:59 GMT*
Postconditions: *1. Inactive flight strips are successfully archived.*
Main flow: 1. *FMS gets list of inactive flight strips from records.* 2. *Compress flight strips to only retain the FSID and IATA codes of departure and destination airports of each flight strip.* 3. *Send compressed inactive flight strips to Flight Archive System.* 4. *Delete flight plans associated with the inactive flight strips.* 5. *Delete inactive flight strips.*

D5: Traceability Matrix

FR/UC	UC1	UC2	UC3	UC4
FR1	**X**	**X**	**X**	
FR2	**X**			
FR3	**X**		**X**	
FR4			**X**	
FR5				**X**
FR6				**X**
FR7	**X**			
FR8	**X**		**X**	
FR9			**X**	
FR10			**X**	
FR11		**X**	**X**	
FR12			**X**	
FR13			**X**	

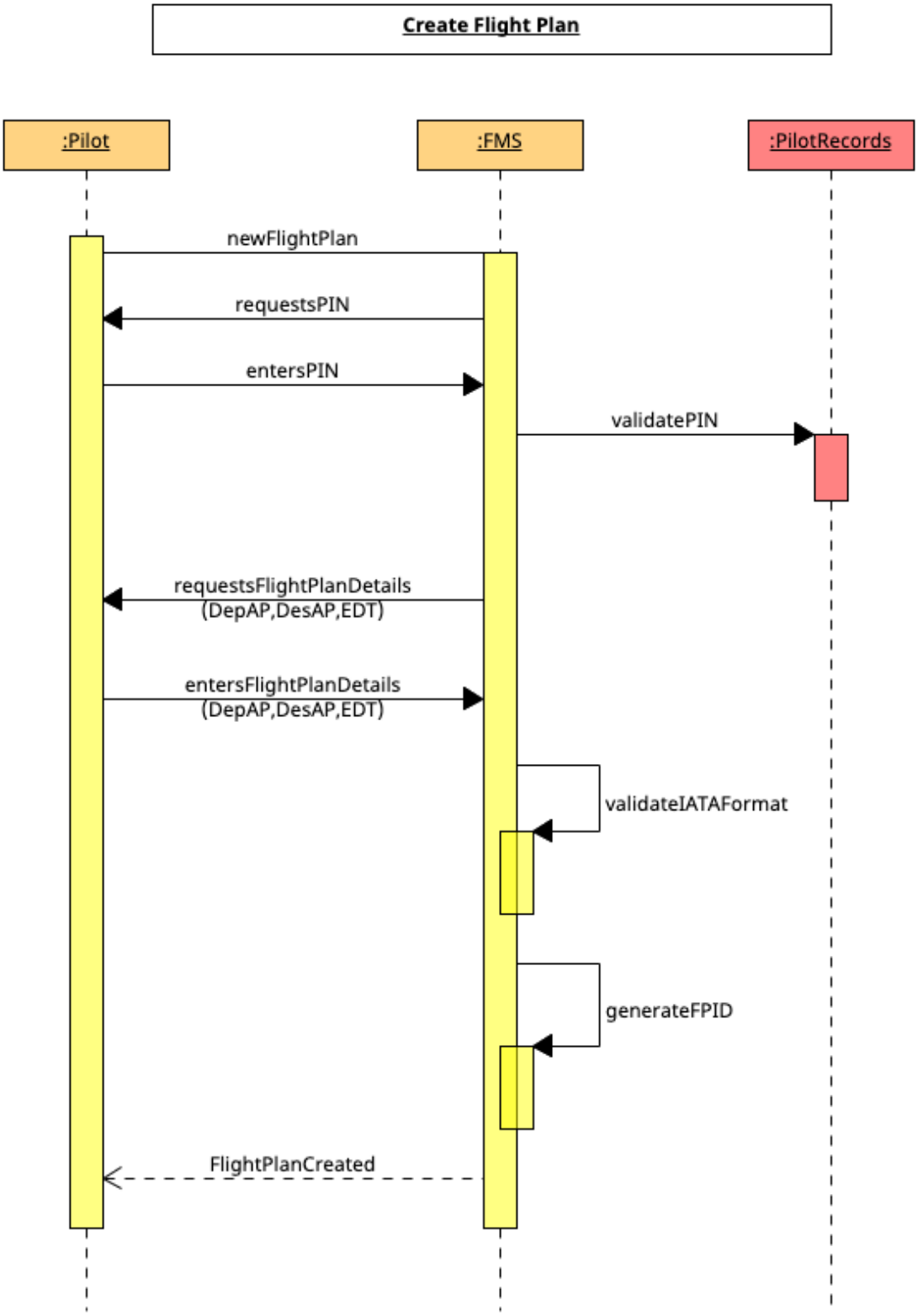
D6: Class Diagram



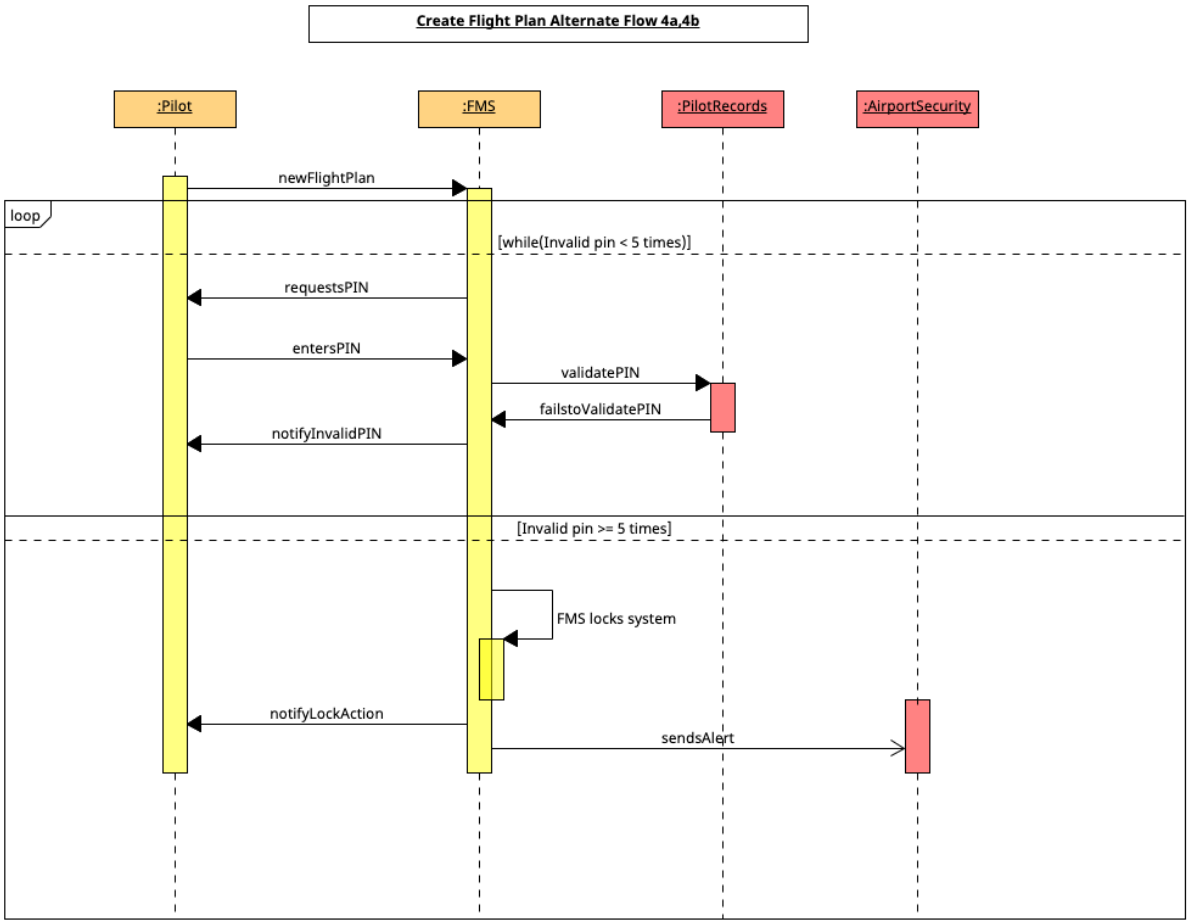
D7: Sequence Diagram

Create Flight Plan

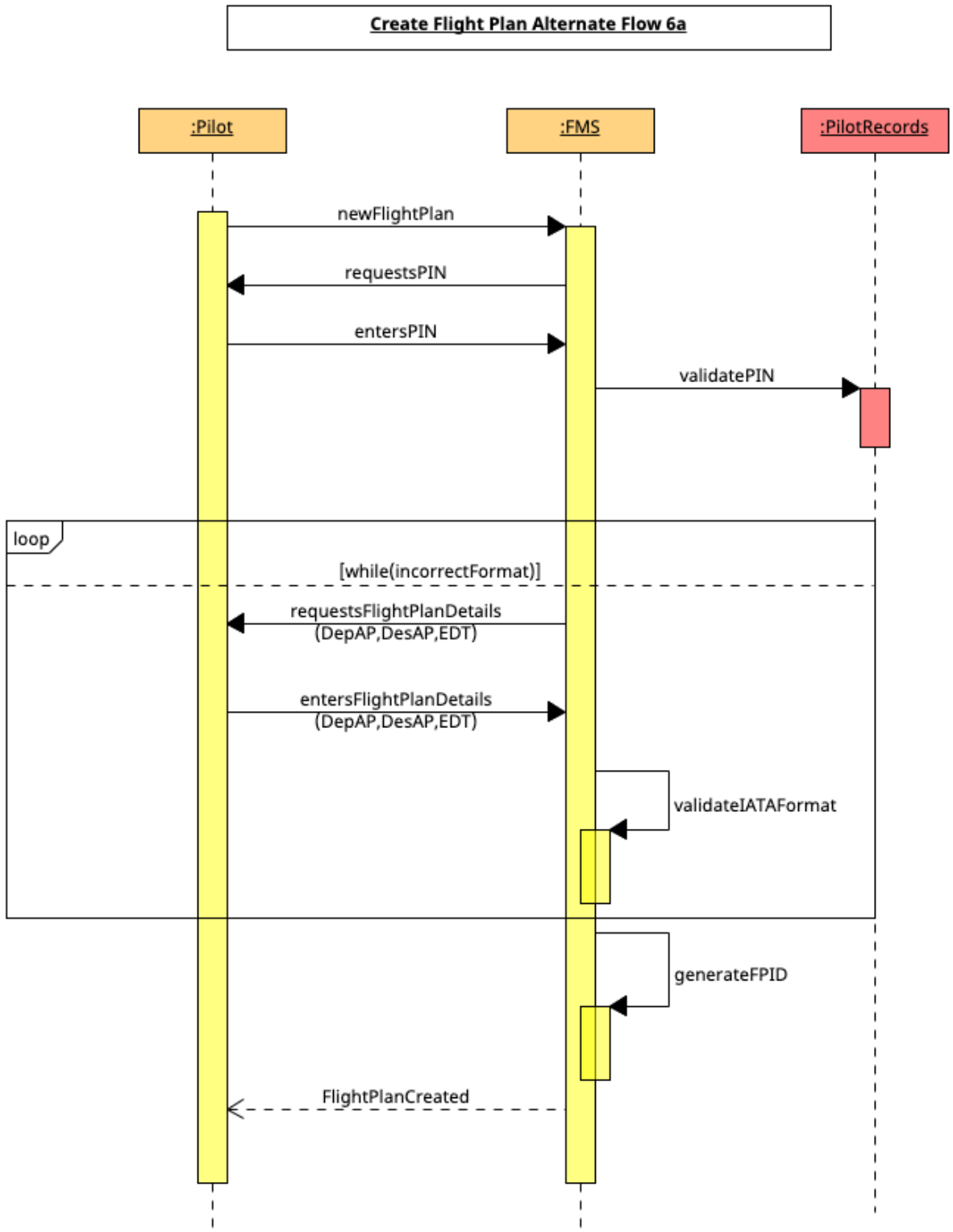
Main Flow



Alternate Flow 4a,4b

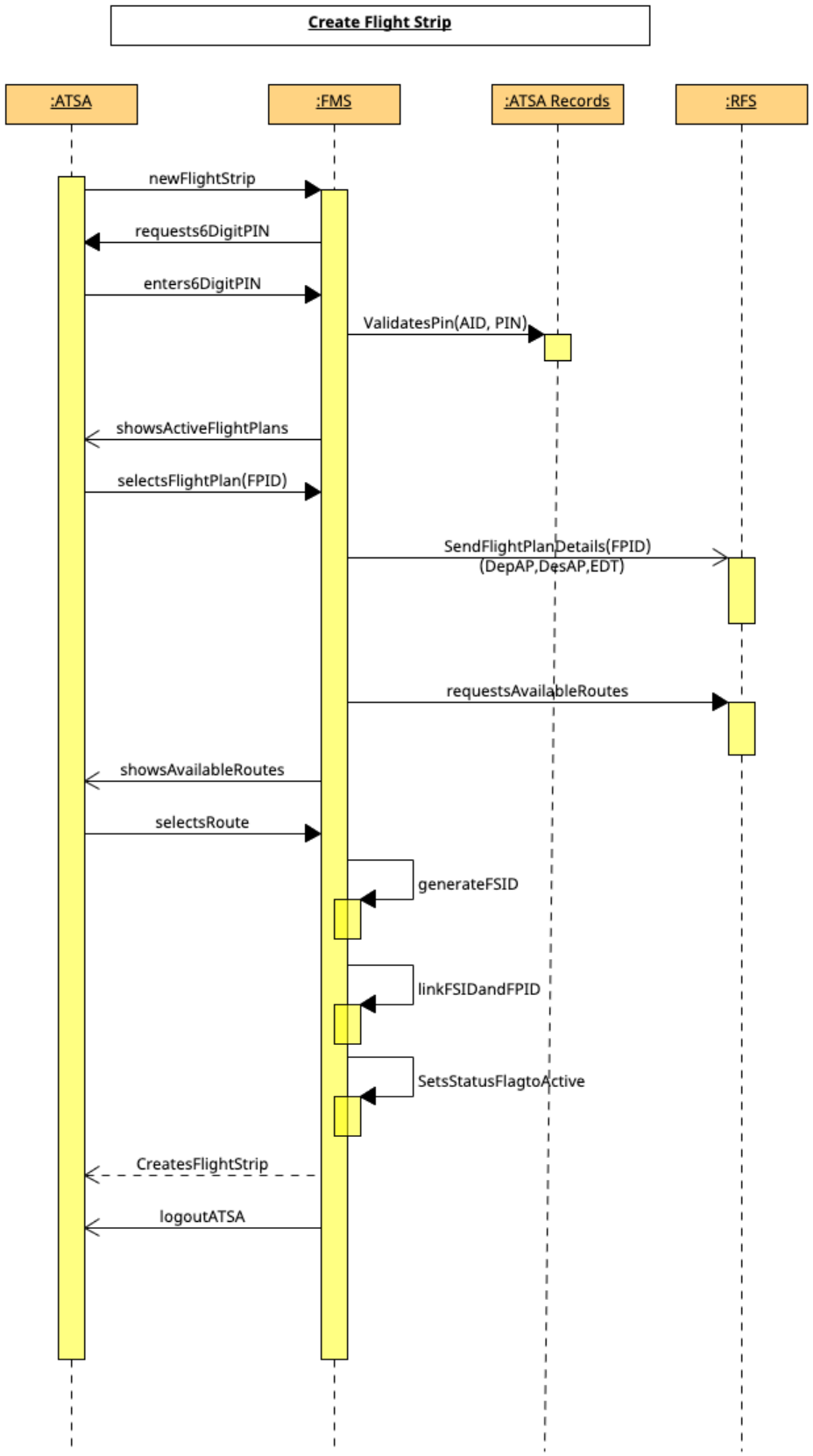


Alternate Flow 6a

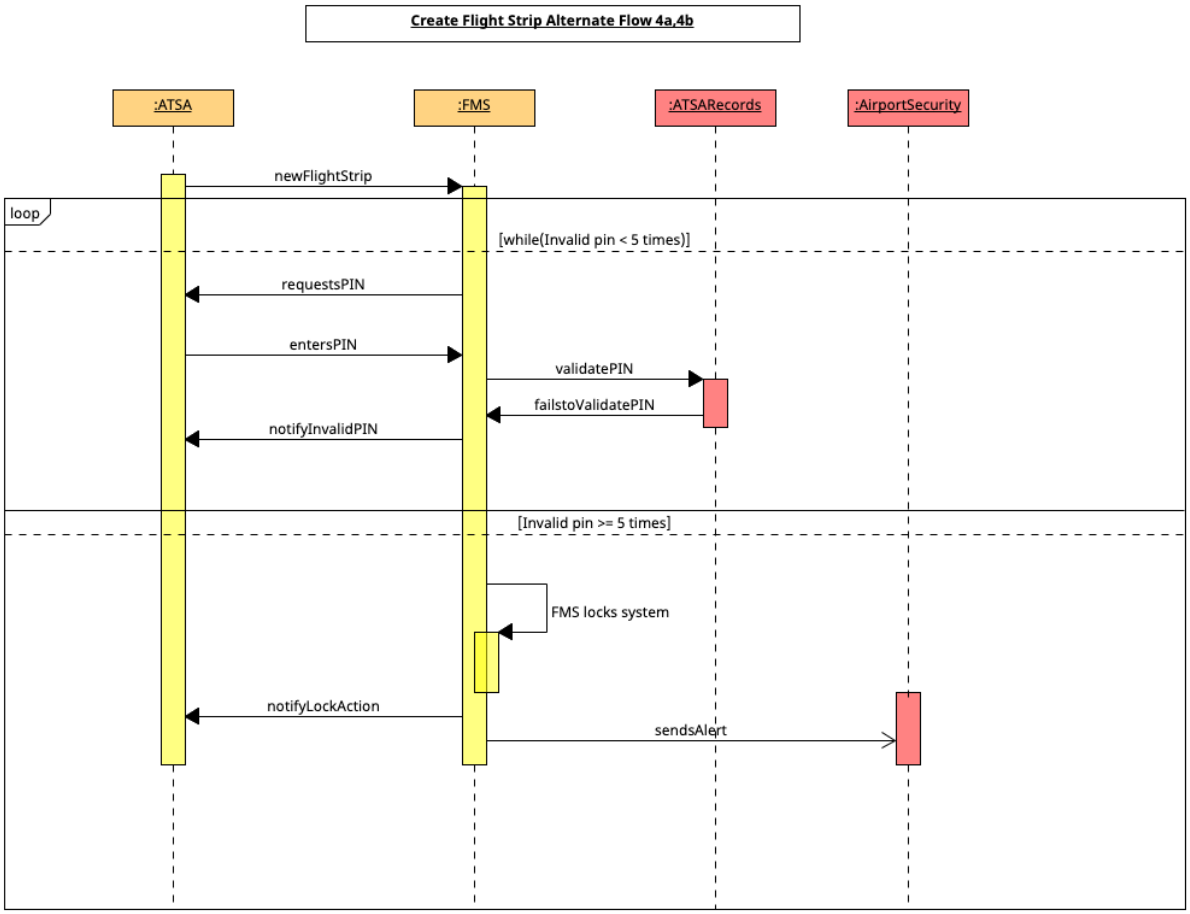


Create Flight Strip

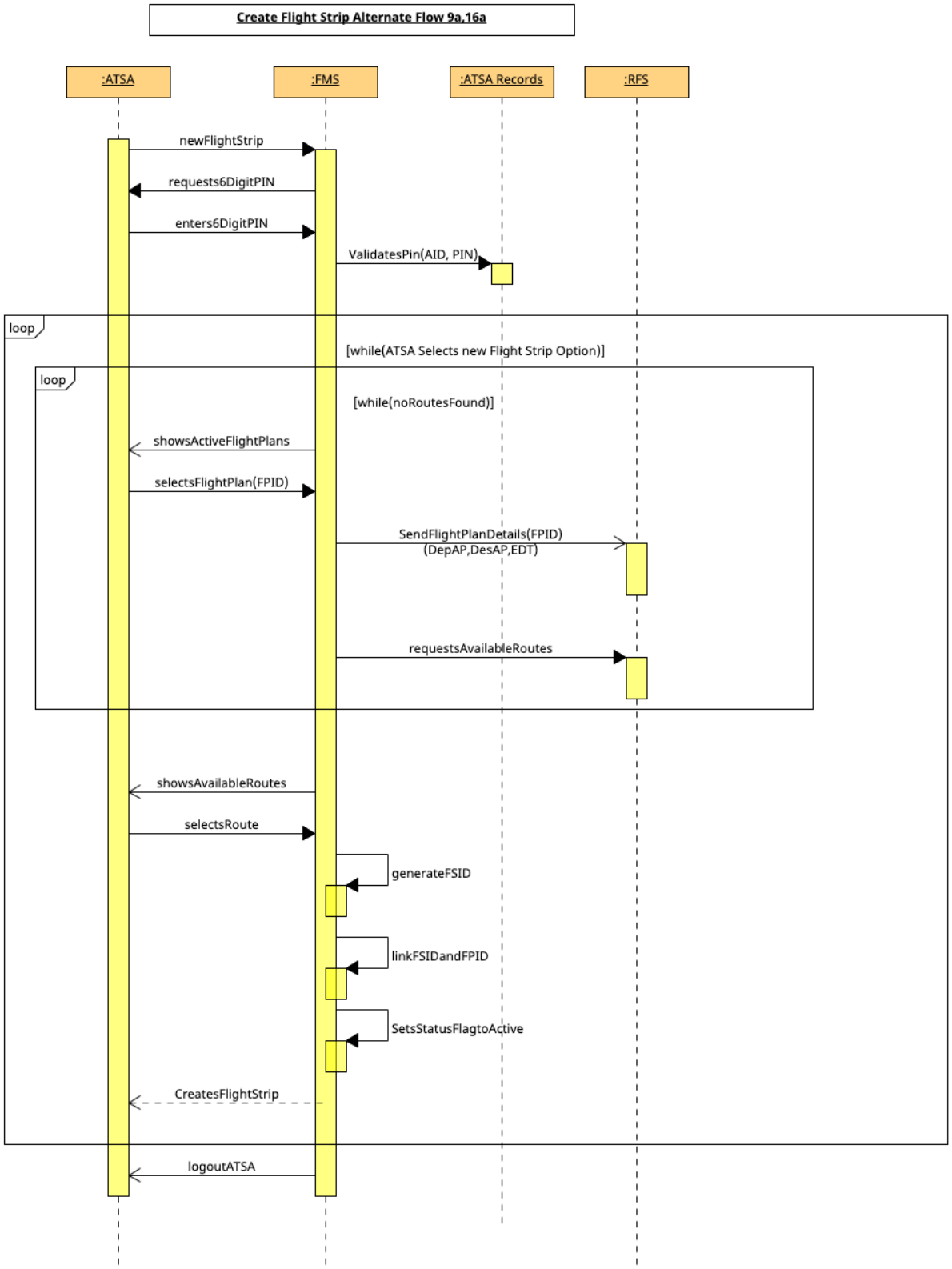
Main Flow



Alternate Flow 4a,4b

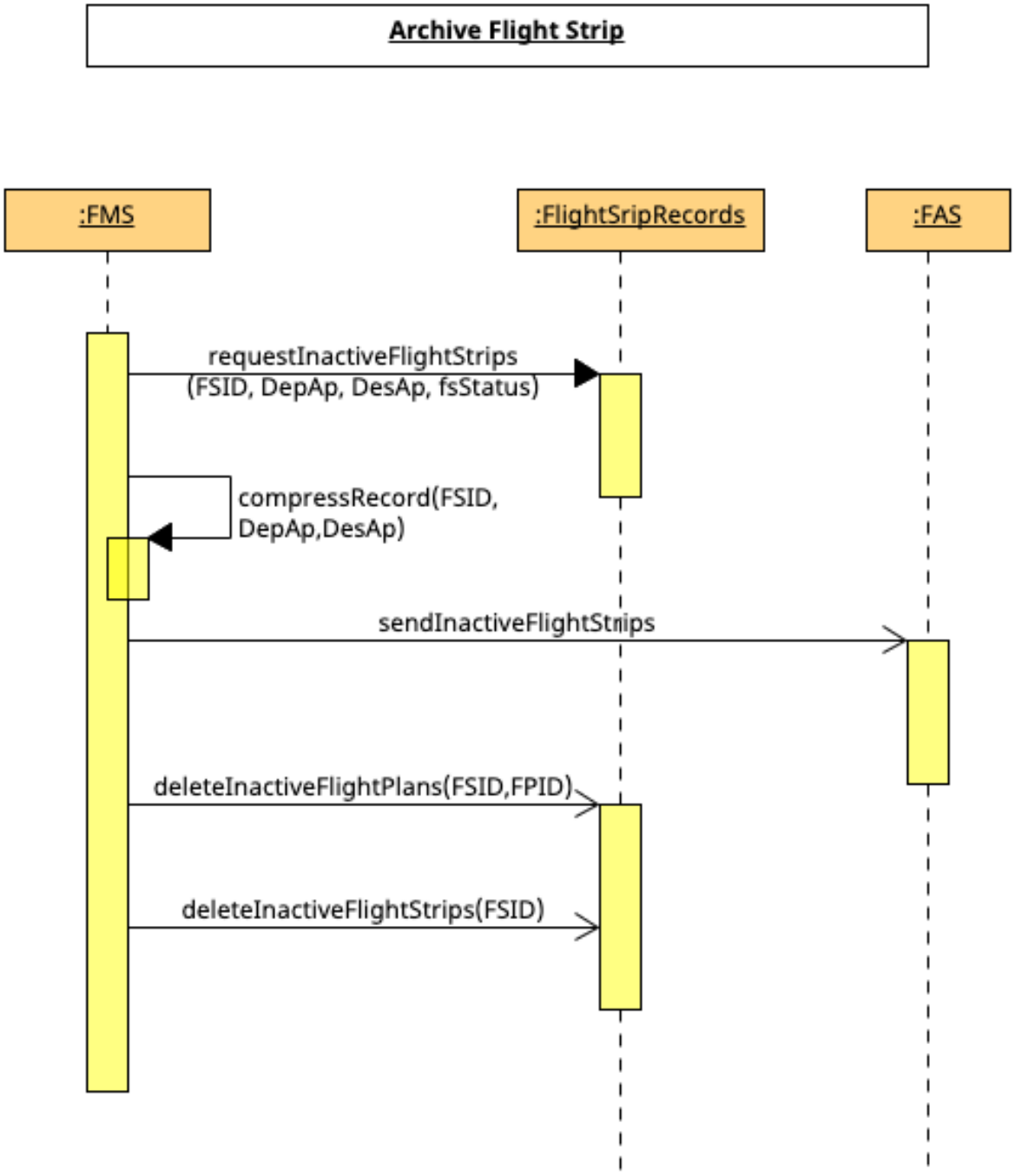


Alternate Flow 9a,16a



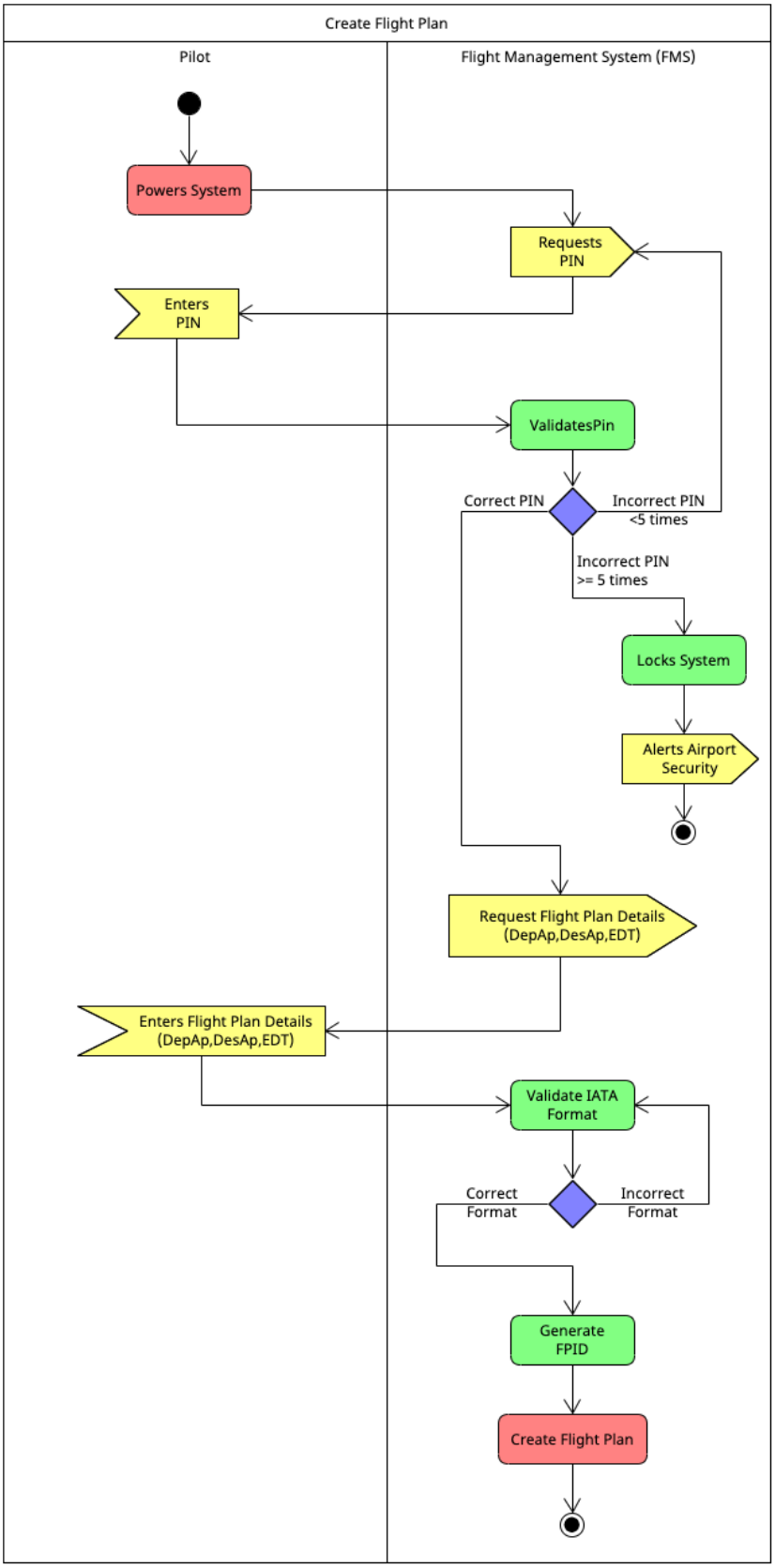
Archive Flight Strip

Main Flow

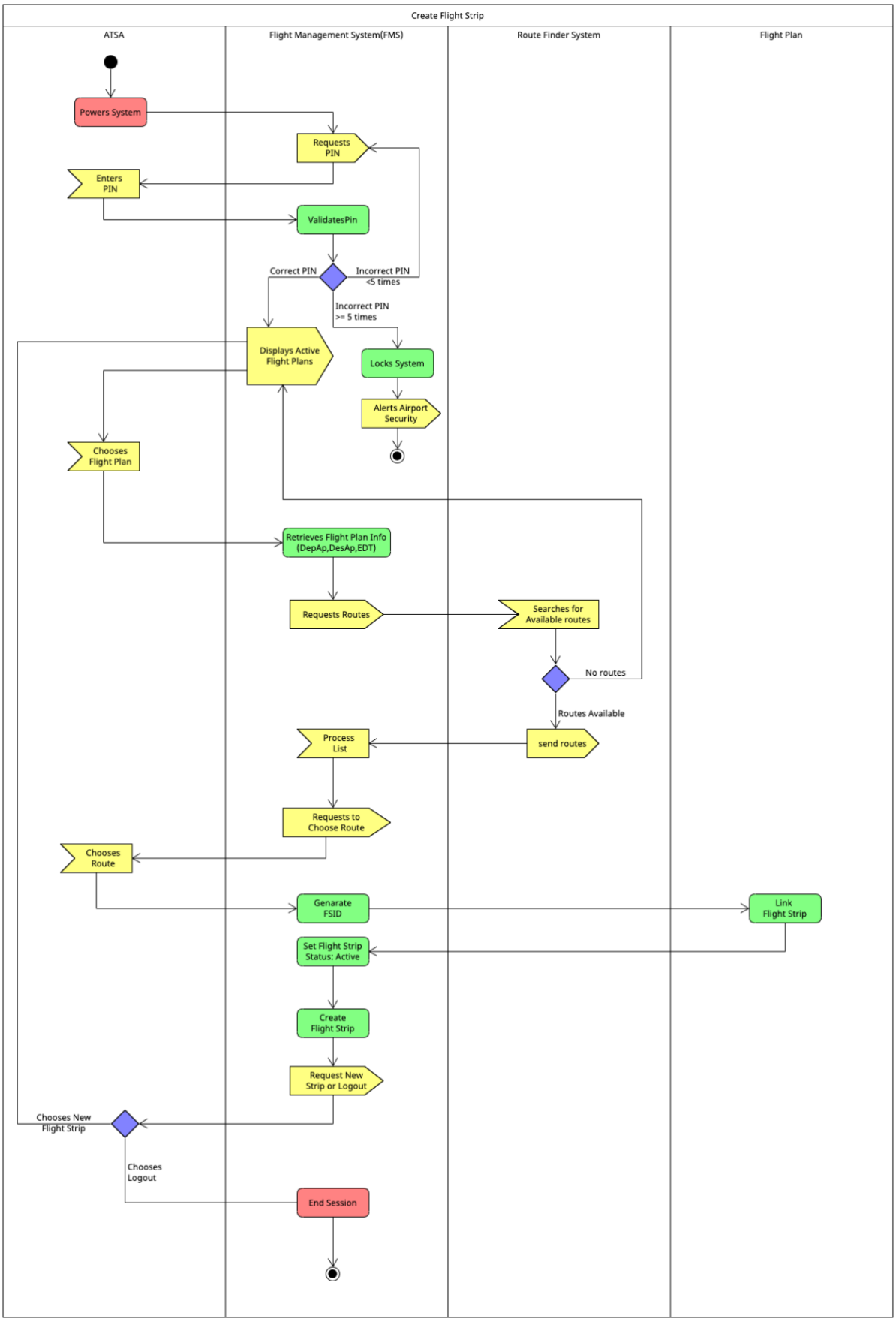


D8: Activity Diagram

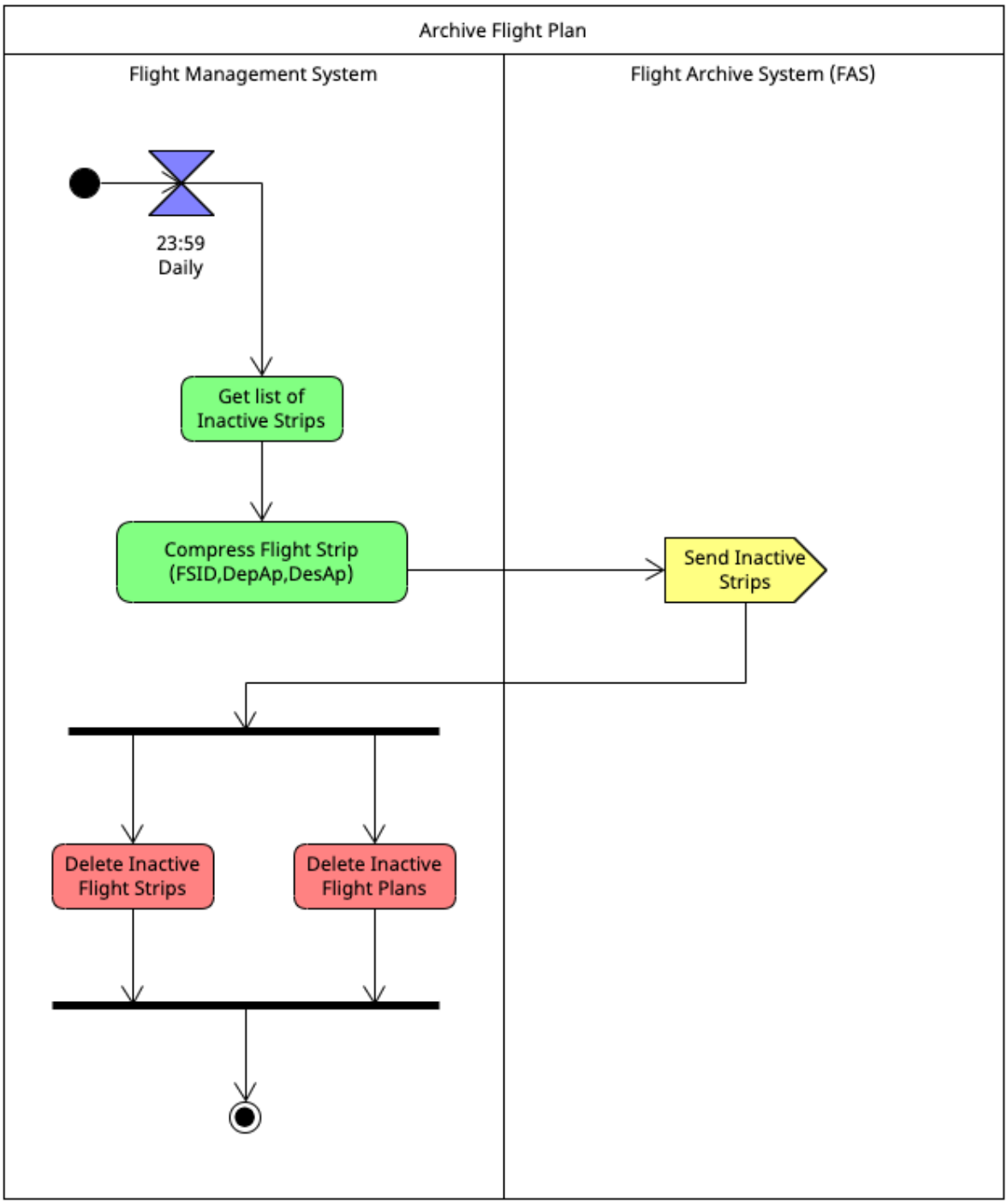
Create Flight Plan



Create Flight Strip

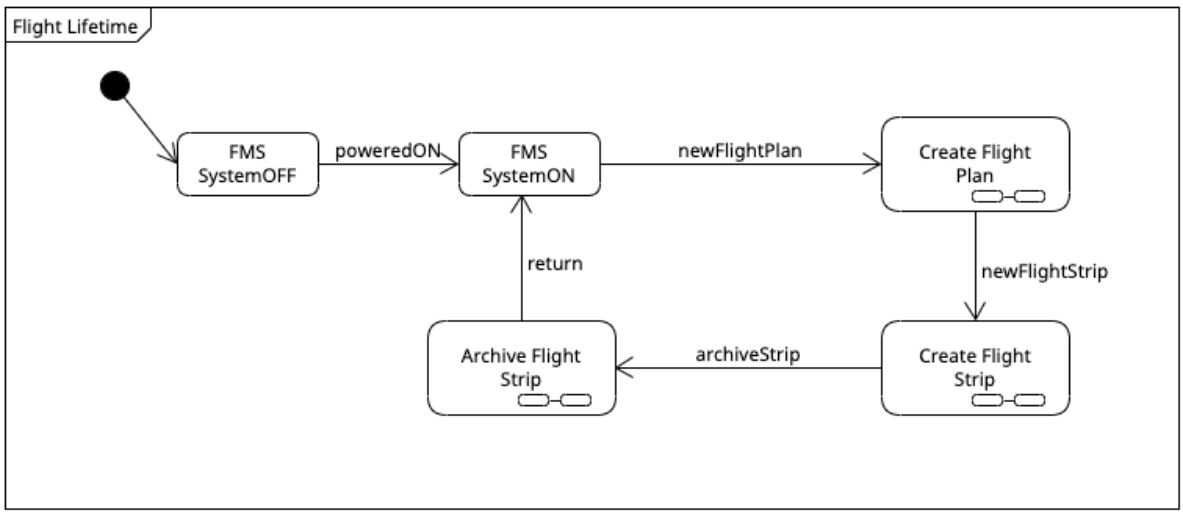


Archive Flight Strip



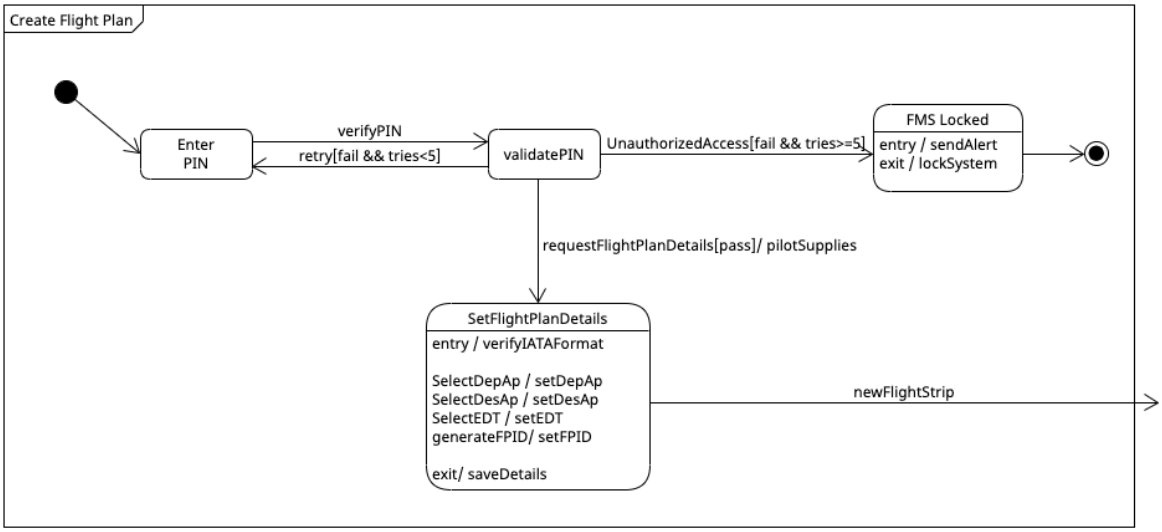
D9: State Machine Diagram

State Diagram

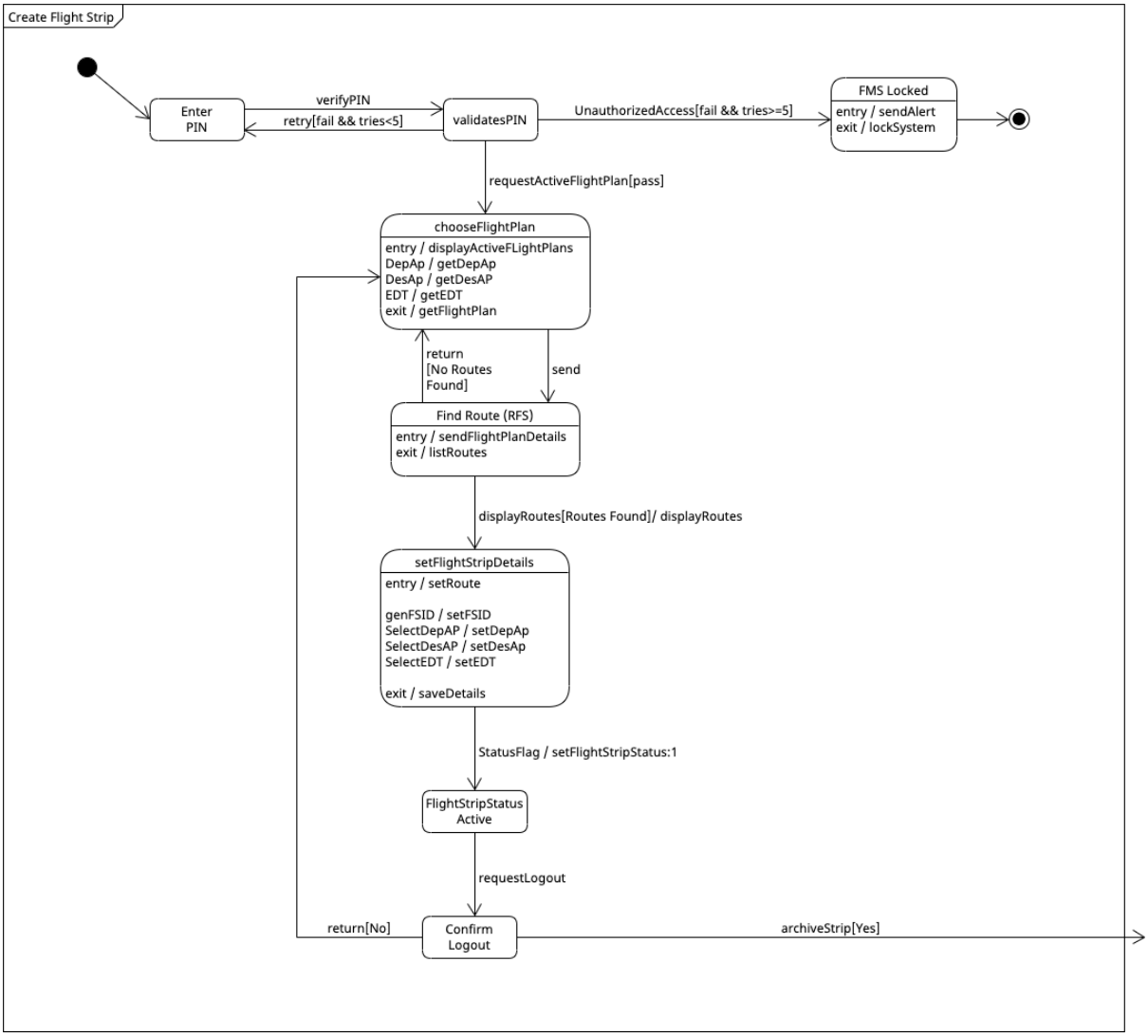


Sub-state Diagrams

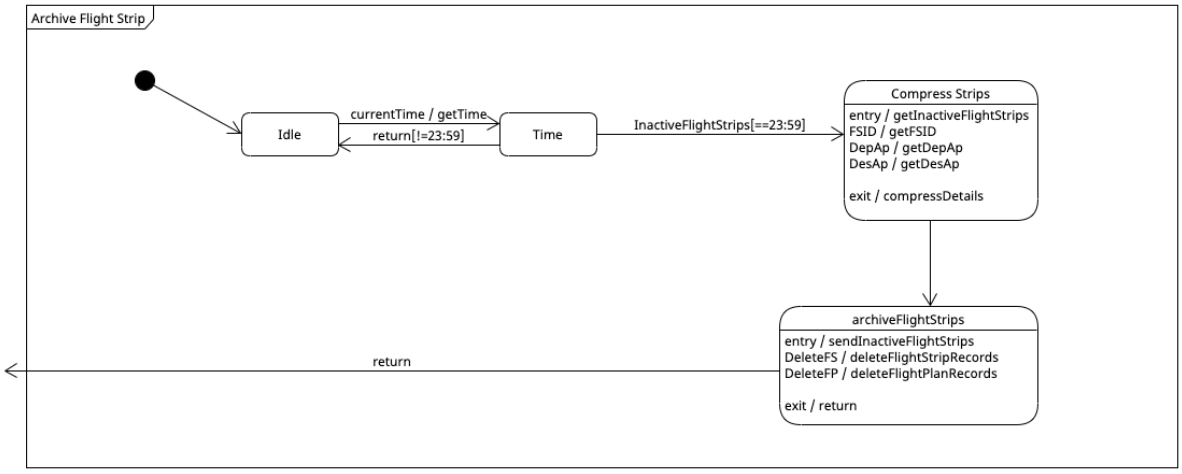
Create Flight Plan Substate



Create Flight Strip Sub-state.



Archive Flight Strip Substate



D10: Test case scenarios

Create Flight Plan

Path	Comment	Path Condition
1	Successful Validation of PIN and Successful validation of Flight Plan detail format.	• system Powered • validatePIN(true) • validateIATAFormat(true)
2	Successful Validation of PIN and Successful validation of Flight Plan detail format on **second** attempt	• system Powered • validatePIN(true) • validateIATAFormat(false) • validateIATAFormat(true)
3	Successful validation of PIN on **second** attempt and Successful validation of Flight Plan detail format.	• system Powered • validatePIN(false) • validatePIN(true) • validateIATAFormat(true)
4	Successful validation of PIN on **second** attempt and Successful validation of Flight Plan detail format on **second** attempt	• system Powered • validatePIN(false) • validatePIN(true) • validateIATAFormat(false) • validateIATAFormat(true)
5	Failure to validate PIN on 5 attempts	• system Powered • validatePIN(false) • validatePIN(false) • validatePIN(false) • validatePIN(false) • validatePIN(false)

Create Flight Strip

Path	Comment	Path Condition
1	Successful Validation of PIN, Routes available and Logout	• validatePIN(true) • routesAvailable(true) • logout(true)
2	Successful Validation of PIN, Routes available on second attempt and Logout	• validatePIN(true) • routesAvailable(false) • routesAvailable(true) • logout(true)

3	Successful Validation of PIN, Routes available and Logout on second attempt	• validatePIN(true) • routesAvailable(true) • logout(false) • logout(true)
4	Successful Validation of PIN, Routes available on second attempt and Logout on second attempt	• validatePIN(true) • routesAvailable(false) • routesAvailable(true) • logout(false) • logout(true)
5	Successful Validation of PIN on second attempt, Routes available and Logout	• validatePIN(false) • validatePIN(true) • routesAvailable(true) • logout(true)
6	Successful Validation of PIN on second attempt, Routes available on second attempt and Logout	• validatePIN(false) • validatePIN(true) • routesAvailable(false) • routesAvailable(true) • logout(true)
7	Successful Validation of PIN on second attempt, Routes available and Logout on second attempt	• validatePIN(false) • validatePIN(true) • routesAvailable(true) • logout(false) • logout(true)
8	Successful Validation of PIN on second attempt, Routes available on second attempt and Logout on second attempt	• validatePIN(false) • validatePIN(true) • routesAvailable(false) • routesAvailable(true) • logout(false) • logout(true)
9	Failure to validate PIN after 5 attempts	• validatePIN(false) • validatePIN(false) • validatePIN(false) • validatePIN(false) • validatePIN(false)

Archive Flight Strip

Path	Comment	Path Condition
1	Time is 23:59	• Time==23:59 (true)

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